



# **EMISSIONS TEST REPORT (REVISED)**

**COLUMBIA STEEL CASTING CO.,  
INC.**

## **EMISSIONS TESTING ON BAGHOUSES #1, #2 AND #15 AND MINIVOL SAMPLING AT BUILDING ROOF VENTS**

**Oregon Department of Environmental Quality Air  
Contaminant Discharge Permit: 26-1869**

Prepared for:

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Prepared by:

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Project Number: SLR220430  
Test Dates: December 6, 2020 through December 18, 2020  
(Revised) Report Issued: April 7, 2021



## EXECUTIVE SUMMARY

Columbia Steel Casting Co., Inc. contracted Bison Engineering, Inc. to perform emissions testing at their facility in Portland, Oregon. Testing was performed on baghouses #1, #2, and #15 and select roof vents on buildings #8 and #11. Testing was conducted to establish site-specific emission factors for use in air emission inventories related to Cleaner Air Oregon, as well as to satisfy source testing requirements specified in the draft Oregon Department of Environmental Quality Air Contaminant Discharge Permit #26-1869. This report presents emissions test data, describes the methods employed and details the quality assurance measures taken to ensure accurate data. Tables 1 - 5 summarize the test results.

**Table 1: Baghouse #1 Results Summary**

| <b>Columbia Steel Casting Co., Inc.<br/>Baghouse #1<br/>Results Summary<br/>December 12-17, 2020</b> |                     |                    |
|------------------------------------------------------------------------------------------------------|---------------------|--------------------|
| <b>Parameter</b>                                                                                     | <b>Units</b>        | <b>Test Result</b> |
| <sup>1</sup> PM <sub>2.5</sub>                                                                       | lb/hr               | < 0.20             |
|                                                                                                      | lb/ton steel melted | < 0.1102           |
| <sup>1</sup> PM <sub>10</sub>                                                                        | lb/hr               | < 0.23             |
|                                                                                                      | lb/ton steel melted | < 0.1271           |
| <sup>2</sup> Total PM                                                                                | lb/hr               | < 0.37             |
|                                                                                                      | lb/ton steel melted | < 0.2015           |
| Cr(VI)                                                                                               | lb/hr               | 1.30E-05           |
|                                                                                                      | lb/ton steel melted | 6.59E-06           |
| TSM                                                                                                  | lb/hr               | < 5.06E-03         |
|                                                                                                      | lb/ton steel melted | < 2.52E-03         |
| NO <sub>x</sub>                                                                                      | ppmvd               | 14.56              |
|                                                                                                      | lb/hr               | 4.34               |
|                                                                                                      | lb/ton steel melted | 2.363              |
| CO                                                                                                   | ppmvd               | 12.30              |
|                                                                                                      | lb/hr               | 2.21               |
|                                                                                                      | lb/ton steel melted | 1.200              |

<sup>1</sup>Measured using Method 201A

<sup>2</sup>Measured using ODEQ Method 5

TSM – total suspended matter

Cr(VI) – hexavalent chromium

PM – particulate matter

PM<sub>10</sub> – particulate matter less than or equal to 10 microns in diameter

PM<sub>2.5</sub> – particulate matter less than or equal to 2.5 microns in diameter

lb/hr – pounds per hour

lb/ton of steel melted – pounds per ton of steel melted

NO<sub>x</sub> – nitrogen oxides

CO – carbon monoxide

ppmvd – parts per million by volume on a dry basis

**Table 2: Baghouse #2 Results Summary**

| <b>Columbia Steel Casting Co., Inc.</b><br><b>Baghouse #2</b><br><b>Results Summary</b><br><b>December 12-17, 2020</b> |                     |                    |
|------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|
| <b>Parameter</b>                                                                                                       | <b>Units</b>        | <b>Test Result</b> |
| <sup>1</sup> PM <sub>2.5</sub>                                                                                         | lb/hr               | < 0.24             |
|                                                                                                                        | lb/ton steel melted | < 0.0554           |
| <sup>1</sup> PM <sub>10</sub>                                                                                          | lb/hr               | < 0.25             |
|                                                                                                                        | lb/ton steel melted | < 0.0591           |
| <sup>2</sup> Total PM                                                                                                  | lb/hr               | < 0.46             |
|                                                                                                                        | lb/ton steel melted | < 0.1077           |
| Cr(VI)                                                                                                                 | lb/hr               | 9.71E-07           |
|                                                                                                                        | lb/ton steel melted | 1.88E-07           |
| TSM                                                                                                                    | lb/hr               | < 4.34E-03         |
|                                                                                                                        | lb/ton steel melted | < 8.94E-04         |
| NO <sub>x</sub>                                                                                                        | ppmvd               | 0.91               |
|                                                                                                                        | lb/hr               | 0.21               |
|                                                                                                                        | lb/ton steel melted | 0.041              |
| CO                                                                                                                     | ppmvd               | 58.7               |
|                                                                                                                        | lb/hr               | 8.30               |
|                                                                                                                        | lb/ton steel melted | 2.052              |

<sup>1</sup>Measured using Method 201A.<sup>2</sup>Measured using ODEQ Method 5.

**Table 3: Baghouse #1 Stainless Steel Melt Results Summary**

| Columbia Steel Casting Co., Inc.<br>Baghouse #1 Stainless Steel Melt<br>Results Summary<br>December 17-18, 2020 |                           |             |
|-----------------------------------------------------------------------------------------------------------------|---------------------------|-------------|
| Parameter                                                                                                       | Units                     | Test Result |
| Cr(VI)                                                                                                          | lb/hr                     | 2.10E-05    |
|                                                                                                                 | lb/ton castings processed | 9.60E-06    |
| SM                                                                                                              | lb/hr                     | < 3.74E-03  |
|                                                                                                                 | lb/ton castings processed | < 1.71E-03  |

**Table 4: Baghouse #15 Results Summary**

| Columbia Steel Casting Co., Inc.<br>Baghouse #15<br>Results Summary<br>December 7-9, 2020 |                           |             |
|-------------------------------------------------------------------------------------------|---------------------------|-------------|
| Parameter                                                                                 | Units                     | Test Result |
| Cr(VI)                                                                                    | lb/hr                     | 9.13E-07    |
|                                                                                           | lb/ton castings processed | 3.28E-07    |
| SM                                                                                        | lb/hr                     | 1.55E-03    |
|                                                                                           | lb/ton castings processed | 6.73E-04    |
| Opacity                                                                                   | %                         | 0.0         |

SM – selected metals (arsenic, lead, chromium, nickel, and manganese)

lb/ton castings processed – pounds per ton castings processed

**Table 5: Building 8 Roof Vents Results Summary**

| <b>Columbia Steel Casting Co., Inc.<br/>Building 8 Roof Vents<br/>Results Summary<br/>December 6 and 13, 2020</b> |                  |                             |                    |
|-------------------------------------------------------------------------------------------------------------------|------------------|-----------------------------|--------------------|
| <b>Roof Vent</b>                                                                                                  | <b>Parameter</b> | <b>Units</b>                | <b>Test Result</b> |
| 1                                                                                                                 | Cr(VI)           | lb/hr                       | 3.32E-07           |
|                                                                                                                   |                  | lb/ton steel (metal) melted | 1.36E-06           |
|                                                                                                                   | SM               | lb/hr                       | < 6.48E-03         |
|                                                                                                                   |                  | lb/ton metal melted         | < 2.91E-02         |
| 7                                                                                                                 | Cr(VI)           | lb/hr                       | 3.67E-08           |
|                                                                                                                   |                  | lb/ton metal melted         | 1.51E-07           |
|                                                                                                                   | SM               | lb/hr                       | < 1.97E-03         |
|                                                                                                                   |                  | lb/ton metal melted         | < 9.36E-03         |

**Table 6: Building 11 Roof Vents Results Summary**

| <b>Columbia Steel Casting Co., Inc.</b><br><b>Building 11 Roof Vents</b><br><b>Results Summary</b><br><b>December 7-17, 2020</b> |                  |                     |                    |
|----------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|--------------------|
| <b>Roof Vent</b>                                                                                                                 | <b>Parameter</b> | <b>Units</b>        | <b>Test Result</b> |
| 1                                                                                                                                | Cr(VI)           | lb/hr               | 2.29E-06           |
|                                                                                                                                  |                  | lb/ton metal melted | 1.63E-06           |
|                                                                                                                                  | SM               | lb/hr               | < 1.06E-01         |
|                                                                                                                                  |                  | lb/ton metal melted | < 7.54E-02         |
| 4                                                                                                                                | Cr(VI)           | lb/hr               | 2.75E-05           |
|                                                                                                                                  |                  | lb/ton metal melted | 1.56E-05           |
|                                                                                                                                  | SM               | lb/hr               | < 2.84E-02         |
|                                                                                                                                  |                  | lb/ton metal melted | < 1.55E-02         |
| 5                                                                                                                                | Cr(VI)           | lb/hr               | 9.54E-05           |
|                                                                                                                                  |                  | lb/ton metal melted | 5.93E-05           |
|                                                                                                                                  | SM               | lb/hr               | < 4.58E-02         |
|                                                                                                                                  |                  | lb/ton metal melted | < 2.87E-02         |
| 7                                                                                                                                | Cr(VI)           | lb/hr               | 9.46E-06           |
|                                                                                                                                  |                  | lb/ton metal melted | 5.03E-06           |
|                                                                                                                                  | SM               | lb/hr               | < 2.59E-02         |
|                                                                                                                                  |                  | lb/ton metal melted | < 1.79E-02         |
| 8                                                                                                                                | Cr(VI)           | lb/hr               | 8.30E-06           |
|                                                                                                                                  |                  | lb/ton metal melted | 4.73E-06           |
|                                                                                                                                  | SM               | lb/hr               | < 3.24E-02         |
|                                                                                                                                  |                  | lb/ton metal melted | < 2.34E-02         |
| 9                                                                                                                                | Cr(VI)           | lb/hr               | 6.04E-06           |
|                                                                                                                                  |                  | lb/ton metal melted | 4.05E-06           |
|                                                                                                                                  | SM               | lb/hr               | < 2.04E-02         |
|                                                                                                                                  |                  | lb/ton metal melted | < 8.99E-03         |

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## **CERTIFICATION FROM RESPONSIBLE OFFICIAL**

I have reviewed the information being submitted in its entirety. Based on information and belief formed after reasonable inquiry, I certify that the statements and information contained in this submittal are true, accurate, and complete.

David C. Faust  
Signature

4/7/2021  
Date

David C. Faust  
Name (printed)

EHS / Facilities Mgr.  
Title

Columbia Steel Casting  
Company

## **REVIEW AND CERTIFICATION**

All work, calculations, other activities, and tasks performed and documented in this report were carried out under my direction and supervision. This test project conforms to the requirements of Bison Engineering, Inc.'s quality manual and American Society for Testing and Materials (ASTM) D7036-04.

Project Manager: Bo Wilkins

Title: Helena Source Team Lead

Signature: 

Date: 4/6/2021

I have reviewed all testing details, calculations, results, conclusions and other appropriate written material contained herein, and hereby certify that the presented material is authentic and accurate.

Reviewer: Kelly Dorsi

Title: Quality Manager

Signature: 

Date: 4/6/2021

## 1.0 INTRODUCTION

### 1.1 Project Summary and Objectives

Columbia Steel Casting Co., Inc. (Columbia Steel) retained Bison Engineering, Inc. (Bison) to perform emissions testing on baghouses #1 (BH#1), #2 (BH#2), and #15 (BH#15) and select roof vents on buildings #8 and #11 at their facility in Portland, Oregon. Bison submitted a pre-test protocol to the Oregon Department of Environmental Quality (ODEQ) on August 18, 2020. Testing was performed in accordance with the Oregon Source Sampling Manual and as detailed in the submitted pre-test protocol. Bison employed U.S. Environmental Protection Agency (EPA) test methods as described in Title 40 Code of Federal Regulations (CFR) Part 60, Appendix A, as well as ODEQ Method 5. The pollutants measured at baghouse exhaust stacks and building roof vents include hexavalent chromium (Cr(VI)); selected metals (SM) to include arsenic, lead, chromium, nickel, and manganese; and total selected metals (TSM) to include the full list of Method 29 metals plus aluminum and vanadium and excluding mercury. Additionally, particulate matter (PM), particulate matter less than or equal to 10 microns in diameter (PM<sub>10</sub>), particulate matter less than or equal to 2.5 microns in diameter (PM<sub>2.5</sub>), nitrogen oxides (NO<sub>x</sub>), and carbon monoxide (CO) were measured on BH#1 and BH#2. Oxygen (O<sub>2</sub>) and carbon dioxide (CO<sub>2</sub>) were measured at BH#1 and BH#2 for molecular weight determination. Opacity was measured on BH#15. Table 6 summarizes the test methods used during the test campaign.

**Table 7: BH#15 Test Matrix**

| <b>Columbia Steel Casting Co., Inc.<br/>BH#15<br/>Test Matrix<br/>December 7-9, 2020</b> |                   |                                                                                 |                                                                                                     |
|------------------------------------------------------------------------------------------|-------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| <b>Source</b>                                                                            | <b>EPA Method</b> | <b>Parameter</b>                                                                | <b>Test Plan and Comments</b>                                                                       |
| <b>BH#15</b>                                                                             | Method 1          | Measurement Location /<br>Traverse Point Determination<br>/ Cyclonic Flow Check | One measurement per source.                                                                         |
|                                                                                          | Method 2          | Volumetric Flow                                                                 | Concurrent with each test run.<br>Bison utilized an assumed<br>molecular weight for ambient<br>air. |
|                                                                                          | Method 4          | Moisture Determination                                                          | Concurrent with Methods 29<br>and 0061.                                                             |
|                                                                                          | Method 29         | SM                                                                              | Three 720-minute test runs.                                                                         |
|                                                                                          | Method 0061       | Cr(VI)                                                                          | Three 720-minute test runs.                                                                         |
|                                                                                          | Method 9          | Opacity                                                                         | Three 60-minute test runs<br>during Method 29 and Method<br>0061 sampling.                          |

**Table 8: BH#1 and BH#2 Test Matrix**

| <b>Columbia Steel Casting Co., Inc.</b><br><b>BH#1 and BH#2</b><br><b>Test Matrix</b><br><b>December 10 and 14-17, 2020</b> |                          |                                                                           |                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------|--------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------|
| Source                                                                                                                      | EPA Method               | Parameter                                                                 | Test Plan and Comments                                               |
| BH#1<br><br>BH#2                                                                                                            | Method 1                 | Measurement Location / Traverse Point Determination / Cyclonic Flow Check | One measurement per source.                                          |
|                                                                                                                             | Method 2                 | Volumetric Flow                                                           | Concurrent with each test run.                                       |
|                                                                                                                             | Method 3A                | O <sub>2</sub> , CO <sub>2</sub> and Molecular Weight                     | Concurrent with Methods 29 and 0061.                                 |
|                                                                                                                             | Method 4                 | Moisture Determination                                                    |                                                                      |
|                                                                                                                             | ODEQ Method 5            | Total PM                                                                  | Three 120-minute test runs concurrent with Method 201A. <sup>1</sup> |
|                                                                                                                             | Method 7E                | NO <sub>x</sub>                                                           | Concurrent with Method 201A.                                         |
|                                                                                                                             | Method 10                | CO                                                                        | Concurrent with Method 201A.                                         |
|                                                                                                                             | Method 29                | SM                                                                        | Three 480-minute test runs. <sup>1</sup>                             |
|                                                                                                                             | Method 0061              | Cr(VI)                                                                    | Three 480-minute test runs. <sup>1</sup>                             |
|                                                                                                                             | Method 201A <sup>2</sup> | PM <sub>10</sub> , PM <sub>2.5</sub>                                      | Three 120-minute test runs. <sup>2</sup>                             |

<sup>1</sup> Run times listed are targeted run times. Due to process operating constraints target sample times were not always achieved. See data sheets for specific run times.

<sup>2</sup> Stack conditions allowed for the performance of Method 201A without Method 202 back-half for condensable particulate matter.

An additional Method 29 and Method 0061 test run was performed on BH#1 while a stainless steel melt was being processed at the facility. Please see section 3.1 for testing details.

**Table 9: Roof Vents Test Matrix**

| <b>Columbia Steel Casting Co., Inc.</b><br><b>Buildings #8 and #11 Roof Vents</b><br><b>Test Matrix</b><br><b>December 6-17, 2020</b> |                                                                                                                           |           |                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------------|
| Source                                                                                                                                | EPA Method                                                                                                                | Parameter | Test Plan and Comments                          |
| Buildings #8 and #11 Roof Vents                                                                                                       | Air Metrics MiniVol samplers. Method 29 lab analysis for metals determination and ASTM D7614-12 for Cr(VI) determination. | Cr(VI)    | Target run times were 22 or 24 hours.           |
|                                                                                                                                       |                                                                                                                           | SM        | Concurrent and collocated with Cr(VI) samplers. |

## 1.2 Project Contacts

**Facility:** **Columbia Steel Casting Co., Inc.**  
Address: 10425 N. Bloss Ave.  
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Email: dave\_f@columbiasteel.com

**Primary Consultant:** **SLR International Corporation**  
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Helena, Montana 59601  
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Contact: Bo Wilkins  
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**State Authority:** **Oregon Department of Environmental Quality**  
Address: 700 NE Multnomah Street, Suite 600  
Portland, Oregon 97232  
Contact: Thomas Rhodes  
Phone: (503) 229-5534  
Email: thomas.rhodes@state.or.us

**Contract Laboratory:** **Chester LabNet**  
Address: 12242 SW Garden Place  
Tigard, Oregon 97223-8246  
Contact: Sheri Heldstab  
Phone: (503) 624-2183  
Website: www.chesterlab.net

### **1.3 Testing Personnel**

The Bison on-site testing team was led by Adam Bender, Qualified Individual (QI), Project Scientist. Mr. Bender was assisted during field testing by Zach Harding, QI, Source Director; Jennifer Kessler, Environmental Scientist; Jacob Rankin, QI, Environmental Engineer; Conor Fox, QI, Environmental Scientist; and Riley Madsen, Environmental Technician. Bo Wilkins, Source Team Lead, served as project coordinator. Kelly Dorsi, Ph.D., Quality Manager; Lynn Dunnington, Environmental Analyst; and Mr. Wilkins processed the test data and Mr. Wilkins authored this report. Dr. Dorsi performed a final quality assurance review of the data and test report.

Dave Faust, Environmental Health and Safety/Facilities Manager was the primary contact for Columbia Steel. Mr. Faust was present on-site for the duration of the testing. Columbia Steel staff members were responsible for monitoring process parameters during testing.

Sarah Kronholm, with SLR, was not present on-site during the test campaign. Facility production data was compiled and organized by Columbia Steel and SLR and provided to Bison.

Thomas Rhodes from ODEQ was not present on-site during the test campaign.

## **2.0 SOURCE DESCRIPTION**

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### **2.1 Facility Description**

Columbia Steel operates an alloy steel casting facility which produces medium to large size castings. They manufacture a wide variety of steel and iron parts for basic industry. The processes include metal melting, olivine green sand mold making and core making, metal pouring, casting shakeout and casting finishing. The main binders used are clay, water, and sodium silicate.

Columbia Steel melts various metals in three electric arc furnaces (EAFs) throughout the year. Alloys include the following:

- High manganese steel
- Low manganese steel
- Low alloy steel
- Chrome iron steel
- Chrome moly steel
- Stainless steel
- Carbon steel

High and low manganese steel account for the majority of the annual production at the facility (approximately 70%). Manganese steel contains up to 2% chromium; however, it is not expected to include other heavy metals except in trace quantities. Low alloy steel and chrome moly steel comprise approximately 25% of production and contain up to 4% chromium and 1% nickel with the remaining heavy metals present in trace quantities. Chrome iron steel and stainless steel account for about 2% of production. These alloys contain up to 26% chromium and 20% nickel. Carbon steel is less than 1% of production and is not expected to contain heavy metals.

### **2.2 Emission Source Description**

#### **2.2.1 BH#15**

BH#15 collects emissions from arcing and burning operations inside the main foundry building, Building #11. Columbia Steel conducts burning and arcing operations to remove gates, risers, fins, and defects from castings, as well as complete some shaping. Dedicated arcing booths are used for work on manganese castings. Emissions from the arcing booths are controlled by BH#15, a Wheelabrator shaker baghouse.

These operations are episodic throughout the day, continuing through three eight-hour shifts. Each shift is manned by one to three operators, with typical pauses for lunch (30-60 minutes), rest breaks (two 10-minute breaks per shift), and allowances for safety and industrial hygiene precautions.

BH#15 exhaust stack is 66 inches inner diameter. Purpose-built sampling ports utilized were accessed via a ladder to a permanent platform. Figure 1 (below) shows a photo of the stack. While on-site, Bison verified the exhaust stack meets EPA Method 1 specifications; detailed Method 1 information is included in the appendices to this report.

**Figure 1. BH#15 Stack**

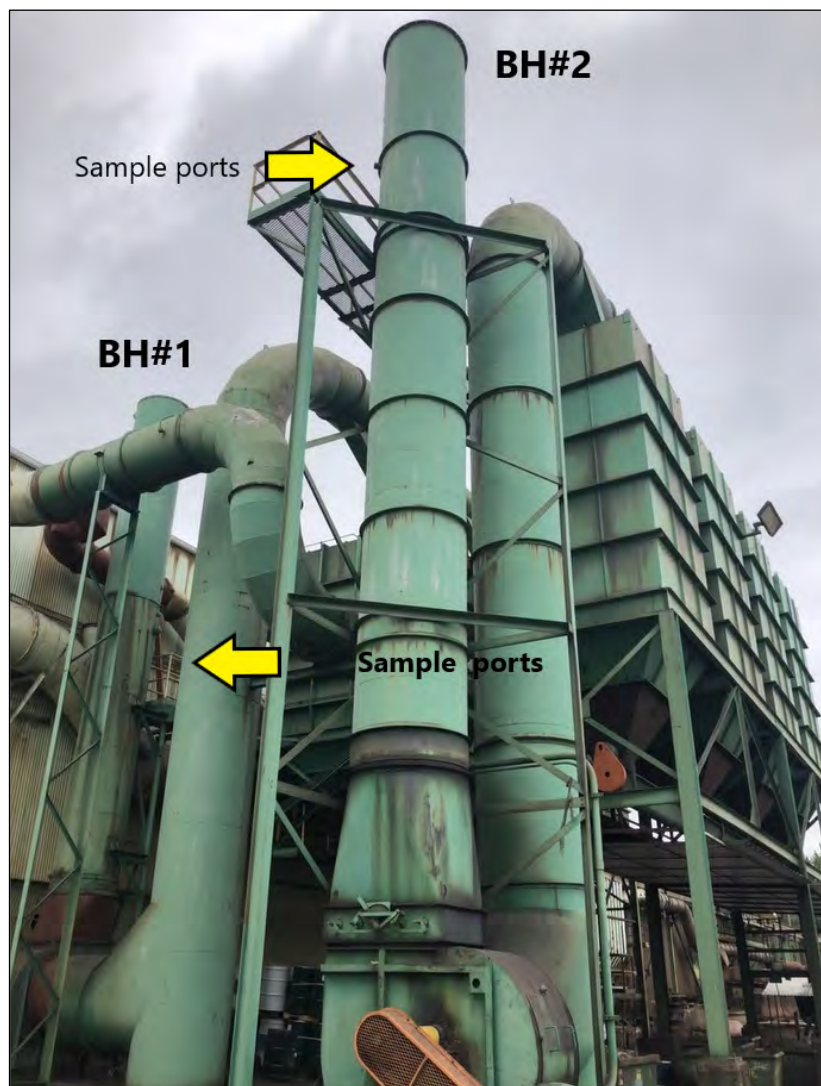


### **2.2.2 BH#1 and BH#2**

Emissions from EAFs located in Building #11 are controlled by BH#1 and BH#2. EAF 1, referred to as the 6MT Steel EAF, and EAF 2, referred to as the South 10TT Steel EAF, primarily melt low alloy steel, but they have the ability to melt other alloys. These furnaces are controlled by BH#1, a Pangborn 264 CT-2 shaker baghouse. EAF 3, referred to as the North 10TT EAF, only melts manganese steel and is controlled by BH#2, a National 240-203-10 shaker baghouse.

BH#1 exhaust stack is 46 inches inner diameter. BH#2 exhaust stack is 46.5 inches inner diameter. Purpose-built sampling ports utilized on each stack were accessed via a ladder to a permanent platform. Figure 2 (below) shows a photo of the stacks. While on-site, Bison verified that each exhaust stack meets EPA Method 1 specifications; detailed Method 1 information is included in the appendices to this report.

**Figure 2. BH#1 and BH#2 Stacks**



### **2.2.3 Building #8 and Building #11 Roof Vents**

The roof vents of Building #8 and Building #11 capture fugitive emissions from ongoing operations inside each building. MiniVol samplers were suspended inside the building as close to vents as possible. Negative air flow at each vent was verified prior to and at the end of each sampling event. Sample locations were accessed via manlift from inside each building. Figure 3 (below) shows a photo of a vent sample location. Emission mass rates collected with the MiniVols are calculated based on fan manufacturers' specifications for air flow. Documentation regarding fan specifications can be found in the appendices of this report.

**Figure 3. Building #11 Roof Vent 8**



### 3.0 EMISSION TEST RESULTS

#### 3.1 Summary of Results

The tables below summarize BH#15, BH#1, BH#2, and roof vent test results. Additional supporting material, including raw data, plant data, example calculations and calibration records, can be found in the appendices to this report.

**Table 10: BH#15 Cr(VI) Results**

| <b>Columbia Steel Casting Co., Inc.<br/>BH#15<br/>Method 0061 Cr(VI) Results</b> |                           |                    |                    |                    |                |
|----------------------------------------------------------------------------------|---------------------------|--------------------|--------------------|--------------------|----------------|
| <b>Parameter</b>                                                                 | <b>Units</b>              | <b>Run 1</b>       | <b>Run 2</b>       | <b>Run 3</b>       | <b>Average</b> |
| Run Start Date/Time                                                              |                           | 12/7/2020<br>07:20 | 12/8/2020<br>08:00 | 12/9/2020<br>07:43 |                |
| Run End Date/Time                                                                |                           | 12/7/2020<br>19:25 | 12/8/2020<br>20:04 | 12/9/2020<br>20:45 |                |
| Run Duration                                                                     | minutes                   | 720                | 720                | 720                | 720            |
| Sample Volume                                                                    | dscm                      | 16.574             | 15.447             | 15.874             | 15.965         |
| Stack Flow                                                                       | dscfm                     | 36,999.6           | 34,134.0           | 35,240.5           | 35,458.0       |
| Stack Moisture                                                                   | %v                        | 0.70               | 1.14               | 1.07 <sup>1</sup>  | 0.97           |
| O <sub>2</sub>                                                                   | %vd                       | 20.90              | 20.90              | 20.90              | 20.90          |
| CO <sub>2</sub>                                                                  | %vd                       | 0.00               | 0.00               | 0.00               | 0.00           |
| Cr(VI)                                                                           | lb/hr                     | 1.44E-06           | 7.57E-08           | 1.22E-06           | 9.13E-07       |
|                                                                                  | lb/ton castings processed | 3.06E-07           | 8.81E-08           | 5.88E-07           | 3.28E-07       |
| Opacity                                                                          | %                         | 0.0                | 0.0                | 0.0                | 0.0            |

<sup>1</sup>Silica gel impinger broke during the test run, moisture gain from the simultaneous Method 29 sample train was substituted.

dscm – dry standard cubic meters

dscfm – dry standard cubic feet per minute

%v – percent by volume

%vd – percent volume dry basis

**Table 11: BH#1 Cr(VI) Results**

| <b>Columbia Steel Casting Co., Inc.</b><br><b>BH#1</b><br><b>Method 0061 Cr(VI) Results</b> |                     |                     |                     |                     |          |
|---------------------------------------------------------------------------------------------|---------------------|---------------------|---------------------|---------------------|----------|
| Parameter                                                                                   | Units               | Run 1               | Run 2               | Run 3               | Average  |
| Run Start Date/Time                                                                         |                     | 12/10/2020<br>21:25 | 12/14/2020<br>22:15 | 12/15/2020<br>21:20 |          |
| Run End Date/Time                                                                           |                     | 12/11/2020<br>06:00 | 12/15/2020<br>03:55 | 12/16/2020<br>03:11 |          |
| Run Duration                                                                                | minutes             | 480                 | 309                 | 304                 | 364      |
| Sample Volume                                                                               | dscm                | 12.053              | 7.416               | 7.449               | 8.973    |
| Stack Flow                                                                                  | dscfm               | 43,544.8            | 41,306.2            | 41,824.9            | 42,225.3 |
| Stack Moisture                                                                              | %v                  | 0.85                | 0.73                | 1.19                | 0.92     |
| O <sub>2</sub>                                                                              | %vd                 | 21.02               | 21.00               | 21.06               | 21.03    |
| CO <sub>2</sub>                                                                             | %vd                 | 0.00                | 0.03                | 0.00                | 0.01     |
| Cr(VI)                                                                                      | lb/hr               | 1.33E-05            | 8.45E-06            | 1.72E-05            | 1.30E-05 |
|                                                                                             | lb/ton steel melted | 7.51E-06            | 4.16E-06            | 8.11E-06            | 6.59E-06 |

**Table 12: BH#1 Stainless Steel Melt Cr(VI) Results**

| <b>Columbia Steel Casting Co., Inc.</b><br><b>BH#1 Stainless Steel Melt</b><br><b>Method 0061 Cr(VI) Results</b> |                     |                     |
|------------------------------------------------------------------------------------------------------------------|---------------------|---------------------|
| Parameter                                                                                                        | Units               | Run 1               |
| Run Start Date/Time                                                                                              |                     | 12/17/2020<br>21:06 |
| Run End Date/Time                                                                                                |                     | 12/18/2020<br>02:07 |
| Run Duration                                                                                                     | minutes             | 271                 |
| Sample Volume                                                                                                    | dscm                | 6.909               |
| Stack Flow                                                                                                       | dscfm               | 43,721.8            |
| Stack Moisture                                                                                                   | %v                  | 1.52                |
| O <sub>2</sub>                                                                                                   | %vd                 | 20.9                |
| CO <sub>2</sub>                                                                                                  | %vd                 | 0.00                |
| Cr(VI)                                                                                                           | lb/hr               | 2.10E-05            |
|                                                                                                                  | lb/ton steel melted | 9.60E-06            |

**Table 13: BH#2 Cr(VI) Results**

| <b>Columbia Steel Casting Co., Inc.</b><br><b>BH#2</b><br><b>Method 0061 Cr(VI) Results</b> |                     |                     |                     |                     |                |
|---------------------------------------------------------------------------------------------|---------------------|---------------------|---------------------|---------------------|----------------|
| <b>Parameter</b>                                                                            | <b>Units</b>        | <b>Run 1</b>        | <b>Run 2</b>        | <b>Run 3</b>        | <b>Average</b> |
| Run Start Date/Time                                                                         |                     | 12/10/2020<br>22:23 | 12/14/2020<br>22:18 | 12/15/2020<br>22:02 |                |
| Run End Date/Time                                                                           |                     | 12/11/2020<br>05:10 | 12/15/2020<br>02:55 | 12/16/2020<br>04:13 |                |
| Run Duration                                                                                | minutes             | 373                 | 241                 | 335                 | 317            |
| Sample Volume                                                                               | dscm                | 6.680               | 7.297               | 10.431              | 8.136          |
| Stack Flow                                                                                  | dscfm               | 31,017.4            | 33,518.6            | 34,560.6            | 33,032.2       |
| Stack Moisture                                                                              | %v                  | 0.36                | 0.63                | 1.29                | 0.76           |
| O <sub>2</sub>                                                                              | %vd                 | 20.76               | 20.77               | 20.65               | 20.73          |
| CO <sub>2</sub>                                                                             | %vd                 | 0.13                | 0.13                | 0.00                | 0.09           |
| Cr(VI)                                                                                      | lb/hr               | 2.19E-07            | 6.98E-07            | 2.30E-08            | 9.71E-07       |
|                                                                                             | lb/ton steel melted | 4.42E-07            | 1.62E-07            | 3.70E-09            | 1.88E-07       |

**Table 14: BH#15 SM Results**

| <b>Columbia Steel Casting Co., Inc.</b><br><b>BH#15</b><br><b>Method 29 SM Results</b> |                           |                    |                    |                    |                |
|----------------------------------------------------------------------------------------|---------------------------|--------------------|--------------------|--------------------|----------------|
| <b>Parameter</b>                                                                       | <b>Units</b>              | <b>Run 1</b>       | <b>Run 2</b>       | <b>Run 3</b>       | <b>Average</b> |
| Run Start Date/Time                                                                    |                           | 12/7/2020<br>07:20 | 12/8/2020<br>08:00 | 12/9/2020<br>07:45 |                |
| Run End Date/Time                                                                      |                           | 12/7/2020<br>19:25 | 12/8/2020<br>20:04 | 12/9/2020<br>19:48 |                |
| Run Duration                                                                           | minutes                   | 720                | 720                | 720                | 720            |
| Sample Volume                                                                          | dscm                      | 19.097             | 16.607             | 17.009             | 17.571         |
| Stack Flow                                                                             | dscfm                     | 42,934.1           | 36,753.7           | 37,542.2           | 39,076.7       |
| Stack Moisture                                                                         | %v                        | 0.46               | 0.71               | 1.00               | 0.72           |
| O <sub>2</sub>                                                                         | %vd                       | 20.90              | 20.90              | 20.90              | 20.90          |
| CO <sub>2</sub>                                                                        | %vd                       | 0.00               | 0.00               | 0.00               | 0.00           |
| Arsenic                                                                                | lb/hr                     | 5.90E-06           | 5.80E-06           | 5.79E-06           | 5.83E-06       |
|                                                                                        | lb/ton castings processed | 1.25E-06           | 6.75E-06           | 2.78E-06           | 3.60E-06       |
| Chromium                                                                               | lb/hr                     | 9.07E-05           | 2.11E-05           | 2.26E-05           | 4.48E-05       |
|                                                                                        | lb/ton castings processed | 1.93E-05           | 2.46E-05           | 1.09E-05           | 1.82E-05       |
| Lead                                                                                   | lb/hr                     | 1.47E-05           | 1.58E-05           | 1.60E-05           | 1.55E-05       |
|                                                                                        | lb/ton castings processed | 3.14E-06           | 1.83E-05           | 7.70E-06           | 9.73E-06       |
| Manganese                                                                              | lb/hr                     | 2.65E-03           | 7.34E-04           | 9.80E-04           | 1.46E-03       |
|                                                                                        | lb/ton castings processed | 5.65E-04           | 8.53E-04           | 4.71E-04           | 6.30E-04       |
| Nickel                                                                                 | lb/hr                     | 5.59E-05           | 1.44E-05           | 1.65E-05           | 2.89E-05       |
|                                                                                        | lb/ton castings processed | 1.19E-05           | 1.68E-05           | 7.91E-06           | 1.22E-05       |
| SM <sup>1</sup>                                                                        | lb/hr                     | 2.82E-03           | 7.91E-04           | 1.04E-03           | 1.55E-03       |
|                                                                                        | lb/ton castings processed | 6.00E-04           | 9.20E-04           | 5.00E-04           | 6.73E-04       |

<sup>1</sup>SM is the sum values of the metals listed in this table.

**Table 15: BH#1 TSM Results**

| <b>Columbia Steel Casting Co., Inc.</b><br><b>BH#1</b><br><b>Method 29 TSM Results</b> |              |                     |                     |                     |                |
|----------------------------------------------------------------------------------------|--------------|---------------------|---------------------|---------------------|----------------|
| <b>Parameter</b>                                                                       | <b>Units</b> | <b>Run 1</b>        | <b>Run 2</b>        | <b>Run 3</b>        | <b>Average</b> |
| Run Start Date/Time                                                                    |              | 12/10/2020<br>21:25 | 12/14/2020<br>22:15 | 12/15/2020<br>21:20 |                |
| Run End Date/Time                                                                      |              | 12/11/2020<br>06:00 | 12/15/2020<br>03:55 | 12/16/2020<br>03:11 |                |
| Run Duration                                                                           | minutes      | 480                 | 309                 | 304                 | 364            |
| Sample Volume                                                                          | dscm         | 12.381              | 8.440               | 8.474               | 9.765          |
| Stack Flow                                                                             | dscfm        | 39,727.6            | 41,869.7            | 42,706.7            | 41,434.7       |
| Stack Moisture                                                                         | %v           | 0.87                | 1.02                | 1.05                | 0.98           |
| O <sub>2</sub>                                                                         | %vd          | 21.02               | 21.00               | 21.06               | 21.03          |
| CO <sub>2</sub>                                                                        | %vd          | 0.00                | 0.03                | 0.00                | 0.01           |
| Aluminum                                                                               | lb/hr        | 4.43E-04            | 3.49E-04            | 7.31E-04            | 5.08E-04       |
|                                                                                        | lb/ton       | 2.51E-04            | 1.72E-04            | 3.45E-04            | 2.56E-04       |
| Antimony                                                                               | lb/hr        | < 2.10E-05          | < 3.26E-05          | < 3.30E-05          | < 2.89E-05     |
|                                                                                        | lb/ton       | < 1.19E-05          | < 1.61E-05          | < 1.56E-05          | < 1.45E-05     |
| Arsenic                                                                                | lb/hr        | < 1.66E-05          | < 4.46E-05          | < 2.38E-05          | < 2.83E-05     |
|                                                                                        | lb/ton       | < 9.37E-06          | < 2.20E-05          | < 1.12E-05          | < 1.42E-05     |
| Barium                                                                                 | lb/hr        | 6.25E-05            | 1.08E-05            | 2.41E-05            | 3.25E-05       |
|                                                                                        | lb/ton       | 3.53E-05            | 5.32E-06            | 1.14E-05            | 1.73E-05       |
| Beryllium                                                                              | lb/hr        | < 1.20E-06          | < 1.30E-06          | < 1.44E-06          | < 1.31E-06     |
|                                                                                        | lb/ton       | < 6.79E-07          | < 6.41E-07          | < 6.77E-07          | < 6.66E-07     |
| Cadmium                                                                                | lb/hr        | < 4.81E-07          | < 7.43E-07          | < 7.55E-07          | < 6.60E-07     |
|                                                                                        | lb/ton       | < 2.72E-07          | < 3.66E-07          | < 3.56E-07          | < 3.31E-07     |
| Chromium                                                                               | lb/hr        | 2.77E-04            | 1.16E-04            | 7.45E-04            | 3.79E-04       |
|                                                                                        | lb/ton       | 1.57E-04            | 5.69E-05            | 3.52E-04            | 1.88E-04       |
| Cobalt                                                                                 | lb/hr        | < 2.10E-06          | < 3.25E-06          | < 4.30E-06          | < 3.22E-06     |
|                                                                                        | lb/ton       | < 1.19E-06          | < 1.60E-06          | < 2.03E-06          | < 1.61E-06     |
| Copper                                                                                 | lb/hr        | 9.22E-05            | 1.19E-04            | 1.46E-04            | 1.19E-04       |
|                                                                                        | lb/ton       | 5.21E-05            | 5.85E-05            | 6.88E-05            | 5.98E-05       |
| Lead                                                                                   | lb/hr        | 3.85E-06            | 1.30E-06            | 1.77E-05            | 7.63E-06       |
|                                                                                        | lb/ton       | 2.17E-06            | 6.41E-07            | 8.37E-06            | 3.73E-06       |
| Manganese                                                                              | lb/hr        | 2.24E-03            | 9.97E-04            | 6.46E-03            | 3.23E-03       |
|                                                                                        | lb/ton       | 1.27E-03            | 4.91E-04            | 3.05E-03            | 1.60E-03       |
| Nickel                                                                                 | lb/hr        | 6.34E-05            | 3.93E-05            | 1.44E-04            | 8.22E-05       |
|                                                                                        | lb/ton       | 3.58E-05            | 1.94E-05            | 6.79E-05            | 4.10E-05       |

| <b>Columbia Steel Casting Co., Inc.</b><br><b>BH#1</b><br><b>Method 29 TSM Results</b> |        |            |            |            |            |
|----------------------------------------------------------------------------------------|--------|------------|------------|------------|------------|
| Parameter                                                                              | Units  | Run 1      | Run 2      | Run 3      | Average    |
| Phosphorus                                                                             | lb/hr  | 8.29E-05   | < 3.72E-05 | < 2.09E-04 | < 1.10E-04 |
|                                                                                        | lb/ton | 4.69E-05   | < 1.83E-05 | < 9.86E-05 | < 5.46E-05 |
| Selenium                                                                               | lb/hr  | < 6.31E-05 | < 9.76E-05 | < 9.91E-05 | < 8.66E-05 |
|                                                                                        | lb/ton | < 3.56E-05 | < 4.81E-05 | < 4.67E-05 | < 4.35E-05 |
| Silver                                                                                 | lb/hr  | < 8.41E-06 | < 1.30E-05 | < 1.32E-05 | < 1.15E-05 |
|                                                                                        | lb/ton | < 4.75E-06 | < 6.41E-06 | < 6.23E-06 | < 5.80E-06 |
| Thallium                                                                               | lb/hr  | < 4.21E-05 | < 6.50E-05 | < 6.61E-05 | < 5.77E-05 |
|                                                                                        | lb/ton | < 2.38E-05 | < 3.20E-05 | < 3.12E-05 | < 2.90E-05 |
| Vanadium                                                                               | lb/hr  | < 8.29E-06 | < 6.50E-06 | < 1.54E-05 | < 1.01E-05 |
|                                                                                        | lb/ton | < 4.69E-06 | < 3.20E-06 | < 7.26E-06 | < 5.05E-06 |
| Zinc                                                                                   | lb/hr  | 1.95E-04   | 3.20E-04   | 5.72E-04   | 3.62E-04   |
|                                                                                        | lb/ton | 1.10E-04   | 1.57E-04   | 2.70E-04   | 1.79E-04   |
| TSM <sup>1</sup>                                                                       | lb/hr  | < 3.63E-03 | < 2.25E-03 | < 9.31E-03 | < 5.06E-03 |
|                                                                                        | lb/ton | < 2.05E-03 | < 1.11E-03 | < 4.39E-03 | < 2.52E-03 |

<sup>1</sup>TSM is the sum value of the metals listed in this table.

lb/ton – pound per ton steel melted

**Table 16: BH#1 Stainless Steel Melt TSM Results**

| <b>Columbia Steel Casting Co., Inc.</b><br><b>BH#1 Stainless Steel Melt</b><br><b>Method 29 TSM Results</b> |         |                     |
|-------------------------------------------------------------------------------------------------------------|---------|---------------------|
| Parameter                                                                                                   | Units   | Run 1               |
| Run Start Date/Time                                                                                         |         | 12/17/2020<br>21:06 |
| Run End Date/Time                                                                                           |         | 12/18/2020<br>02:08 |
| Run Duration                                                                                                | minutes | 271.4               |
| Sample Volume                                                                                               | dscm    | 7.691               |
| Stack Flow                                                                                                  | dscfm   | 43,112.1            |
| Stack Moisture                                                                                              | %v      | 0.98                |
| O <sub>2</sub>                                                                                              | %vd     | 20.90               |
| CO <sub>2</sub>                                                                                             | %vd     | 0.00                |
| Aluminum                                                                                                    | lb/hr   | 7.01E-04            |
|                                                                                                             | lb/ton  | 3.20E-04            |
| Antimony                                                                                                    | lb/hr   | < 3.67E-05          |
|                                                                                                             | lb/ton  | < 1.68E-05          |

| <b>Columbia Steel Casting Co., Inc.</b><br><b>BH#1 Stainless Steel Melt</b><br><b>Method 29 TSM Results</b> |              |              |
|-------------------------------------------------------------------------------------------------------------|--------------|--------------|
| <b>Parameter</b>                                                                                            | <b>Units</b> | <b>Run 1</b> |
| Arsenic                                                                                                     | lb/hr        | < 6.63E-05   |
|                                                                                                             | lb/ton       | < 3.03E-05   |
| Barium                                                                                                      | lb/hr        | 3.07E-05     |
|                                                                                                             | lb/ton       | 1.40E-05     |
| Beryllium                                                                                                   | lb/hr        | < 1.47E-06   |
|                                                                                                             | lb/ton       | < 6.71E-07   |
| Cadmium                                                                                                     | lb/hr        | < 8.40E-07   |
|                                                                                                             | lb/ton       | < 3.84E-07   |
| Chromium                                                                                                    | lb/hr        | 3.83E-04     |
|                                                                                                             | lb/ton       | 1.75E-04     |
| Cobalt                                                                                                      | lb/hr        | < 8.19E-06   |
|                                                                                                             | lb/ton       | < 3.74E-06   |
| Copper                                                                                                      | lb/hr        | 1.07E-04     |
|                                                                                                             | lb/ton       | 4.90E-05     |
| Lead                                                                                                        | lb/hr        | 4.54E-05     |
|                                                                                                             | lb/ton       | 2.07E-05     |
| Manganese                                                                                                   | lb/hr        | 1.57E-03     |
|                                                                                                             | lb/ton       | 7.15E-04     |
| Nickel                                                                                                      | lb/hr        | 1.60E-04     |
|                                                                                                             | lb/ton       | 7.30E-05     |
| Phosphorus                                                                                                  | lb/hr        | 1.43E-04     |
|                                                                                                             | lb/ton       | 6.51E-05     |
| Selenium                                                                                                    | lb/hr        | < 1.10E-04   |
|                                                                                                             | lb/ton       | < 5.03E-05   |
| Silver                                                                                                      | lb/hr        | < 1.47E-05   |
|                                                                                                             | lb/ton       | < 6.71E-06   |
| Thallium                                                                                                    | lb/hr        | < 7.35E-05   |
|                                                                                                             | lb/ton       | < 3.36E-05   |
| Vanadium                                                                                                    | lb/hr        | < 7.54E-06   |
|                                                                                                             | lb/ton       | < 3.44E-06   |
| Zinc                                                                                                        | lb/hr        | 2.83E-04     |
|                                                                                                             | lb/ton       | 1.29E-04     |
| TSM                                                                                                         | lb/hr        | < 3.74E-03   |
|                                                                                                             | lb/ton       | < 1.71E-03   |

**Table 17: BH#2 TSM Results**

| <b>Columbia Steel Casting Co., Inc.</b><br><b>BH#2</b><br><b>Method 29 TSM Results</b> |              |                     |                     |                     |                |
|----------------------------------------------------------------------------------------|--------------|---------------------|---------------------|---------------------|----------------|
| <b>Parameter</b>                                                                       | <b>Units</b> | <b>Run 1</b>        | <b>Run 2</b>        | <b>Run 3</b>        | <b>Average</b> |
| Run Start Date/Time                                                                    |              | 12/10/2020<br>22:20 | 12/14/2020<br>22:18 | 12/15/2020<br>22:02 |                |
| Run End Date/Time                                                                      |              | 12/11/2020<br>05:10 | 12/15/2020<br>02:55 | 12/16/2020<br>04:13 |                |
| Run Duration                                                                           | minutes      | 373                 | 241                 | 335                 | 317            |
| Sample Volume                                                                          | dscm         | 5.685               | 6.350               | 9.853               | 7.296          |
| Stack Flow                                                                             | dscfm        | 30,944.3            | 29,158.8            | 32,991.7            | 31,031.6       |
| Stack Moisture                                                                         | %v           | 1.10                | 1.12                | 1.17                | 1.13           |
| O <sub>2</sub>                                                                         | %vd          | 20.76               | 20.77               | 20.65               | 20.73          |
| CO <sub>2</sub>                                                                        | %vd          | 0.13                | 0.13                | 0.00                | 0.09           |
| Aluminum                                                                               | lb/hr        | 1.22E-03            | 1.88E-03            | 7.17E-04            | 1.27E-03       |
|                                                                                        | lb/ton       | 2.45E-04            | 4.38E-04            | 1.16E-04            | 2.66E-04       |
| Antimony                                                                               | lb/hr        | < 4.67E-05          | < 3.01E-05          | < 2.50E-05          | < 3.39E-05     |
|                                                                                        | lb/ton       | < 9.41E-06          | < 7.00E-06          | < 4.02E-06          | < 6.81E-06     |
| Arsenic                                                                                | lb/hr        | < 1.43E-05          | < 4.06E-05          | < 8.78E-06          | < 2.12E-05     |
|                                                                                        | lb/ton       | < 2.88E-06          | < 9.44E-06          | < 1.41E-06          | < 4.58E-06     |
| Barium                                                                                 | lb/hr        | 3.40E-05            | 5.99E-05            | 6.35E-06            | 3.34E-05       |
|                                                                                        | lb/ton       | 6.86E-06            | 1.39E-05            | 1.02E-06            | 7.27E-06       |
| Beryllium                                                                              | lb/hr        | < 1.43E-06          | < 1.20E-06          | < 8.78E-07          | < 1.17E-06     |
|                                                                                        | lb/ton       | < 2.88E-07          | < 2.80E-07          | < 1.41E-07          | < 2.36E-07     |
| Cadmium                                                                                | lb/hr        | < 3.43E-06          | < 2.00E-06          | < 5.02E-07          | < 1.97E-06     |
|                                                                                        | lb/ton       | < 6.91E-07          | < 4.64E-07          | < 8.08E-08          | < 4.12E-07     |
| Chromium                                                                               | lb/hr        | 4.83E-05            | 4.11E-05            | 2.10E-05            | 3.68E-05       |
|                                                                                        | lb/ton       | 9.73E-06            | 9.57E-06            | 3.38E-06            | 7.56E-06       |
| Cobalt                                                                                 | lb/hr        | < 1.84E-05          | < 1.30E-05          | < 2.20E-06          | < 1.12E-05     |
|                                                                                        | lb/ton       | < 3.71E-06          | < 3.02E-06          | < 3.53E-07          | < 2.36E-06     |
| Copper                                                                                 | lb/hr        | 1.61E-04            | 9.25E-05            | 6.66E-05            | 1.07E-04       |
|                                                                                        | lb/ton       | 3.25E-05            | 2.15E-05            | 1.07E-05            | 2.16E-05       |
| Lead                                                                                   | lb/hr        | 9.79E-06            | 1.53E-05            | 0.00E+00            | 8.36E-06       |
|                                                                                        | lb/ton       | 1.97E-06            | 3.56E-06            | 0.00E+00            | 1.84E-06       |
| Manganese                                                                              | lb/hr        | 3.09E-03            | 2.39E-03            | 1.31E-03            | 2.27E-03       |
|                                                                                        | lb/ton       | 6.24E-04            | 5.56E-04            | 2.11E-04            | 4.64E-04       |
| Nickel                                                                                 | lb/hr        | 2.75E-05            | 2.85E-05            | 1.41E-05            | 2.34E-05       |
|                                                                                        | lb/ton       | 5.55E-06            | 6.63E-06            | 2.27E-06            | 4.82E-06       |

| <b>Columbia Steel Casting Co., Inc.</b><br><b>BH#2</b><br><b>Method 29 TSM Results</b> |              |              |              |              |                |
|----------------------------------------------------------------------------------------|--------------|--------------|--------------|--------------|----------------|
| <b>Parameter</b>                                                                       | <b>Units</b> | <b>Run 1</b> | <b>Run 2</b> | <b>Run 3</b> | <b>Average</b> |
| Phosphorus                                                                             | lb/hr        | < 6.06E-05   | < 1.03E-04   | < 5.23E-05   | < 7.18E-05     |
|                                                                                        | lb/ton       | < 1.22E-05   | < 2.39E-05   | < 8.42E-06   | < 1.48E-05     |
| Selenium                                                                               | lb/hr        | < 1.07E-04   | < 1.30E-04   | < 6.58E-05   | < 1.01E-04     |
|                                                                                        | lb/ton       | < 2.16E-05   | < 3.02E-05   | < 1.06E-05   | < 2.08E-05     |
| Silver                                                                                 | lb/hr        | < 1.43E-05   | < 1.20E-05   | < 8.78E-06   | < 1.17E-05     |
|                                                                                        | lb/ton       | < 2.88E-06   | < 2.80E-06   | < 1.41E-06   | < 2.36E-06     |
| Thallium                                                                               | lb/hr        | < 7.14E-05   | < 6.02E-05   | < 4.39E-05   | < 5.85E-05     |
|                                                                                        | lb/ton       | < 1.44E-05   | < 1.40E-05   | < 7.07E-06   | < 1.18E-05     |
| Vanadium                                                                               | lb/hr        | < 7.14E-06   | < 6.02E-06   | < 4.39E-06   | < 5.85E-06     |
|                                                                                        | lb/ton       | < 1.44E-06   | < 1.40E-06   | < 7.07E-07   | < 1.18E-06     |
| Zinc                                                                                   | lb/hr        | 2.42E-04     | 3.52E-04     | 2.32E-04     | 2.75E-04       |
|                                                                                        | lb/ton       | 4.89E-05     | 8.19E-05     | 3.74E-05     | 5.60E-05       |
| TSM                                                                                    | lb/hr        | < 5.18E-03   | < 5.26E-03   | < 2.58E-03   | < 4.34E-03     |
|                                                                                        | lb/ton       | < 1.04E-03   | < 1.22E-03   | < 4.16E-04   | < 8.94E-04     |

**Table 18: BH#1 ODEQ Method 5 PM, NO<sub>x</sub>, & CO Results**

| <b>Columbia Steel Casting Co., Inc.</b><br><b>BH#1</b><br><b>ODEQ Method 5, Method 7E, &amp; Method 10 Results</b> |                     |                     |                     |                     |                |
|--------------------------------------------------------------------------------------------------------------------|---------------------|---------------------|---------------------|---------------------|----------------|
| <b>Parameter</b>                                                                                                   | <b>Units</b>        | <b>Run 1</b>        | <b>Run 2</b>        | <b>Run 3</b>        | <b>Average</b> |
| Run Start Date/Time                                                                                                |                     | 12/16/2020<br>21:13 | 12/16/2020<br>23:47 | 12/17/2020<br>02:10 |                |
| Run End Date/Time                                                                                                  |                     | 12/16/2020<br>23:09 | 12/17/2020<br>01:40 | 12/17/2020<br>03:55 |                |
| Run Duration                                                                                                       | minutes             | 115                 | 110                 | 105                 | 110            |
| Sample Volume                                                                                                      | dscm                | 3.161               | 3.017               | 2.746               | 2.975          |
| Stack Flow                                                                                                         | dscfm               | 42,575.1            | 41,982.9            | 39,961.0            | 41,507.8       |
| Stack Moisture                                                                                                     | %v                  | 1.40                | 1.20                | 1.30                | 1.30           |
| O <sub>2</sub>                                                                                                     | %vd                 | 21.31               | 21.36               | 21.41               | 21.36          |
| CO <sub>2</sub>                                                                                                    | %vd                 | 0.01                | 0.00                | 0.00                | 0.00           |
| NO <sub>x</sub>                                                                                                    | ppmvd               | 18.47               | 10.42               | 14.80               | 14.56          |
|                                                                                                                    | lb/hr               | 5.64                | 3.14                | 4.24                | 4.34           |
|                                                                                                                    | lb/ton steel melted | 3.082               | 1.610               | 2.395               | 2.363          |
| CO                                                                                                                 | ppmvd               | 7.85                | 13.05               | 16.01               | 12.30          |
|                                                                                                                    | lb/hr               | 1.46                | 2.39                | 2.79                | 2.21           |
|                                                                                                                    | lb/ton steel melted | 0.798               | 1.226               | 1.576               | 1.200          |
| *Total PM                                                                                                          | lb/hr               | 0.37                | < 0.36              | < 0.38              | < 0.37         |
|                                                                                                                    | lb/ton steel melted | 0.2018              | < 0.1871            | < 0.2156            | < 0.2014       |

\*Runs 2 and 3 PM results are below the method detection limit. Results for runs 2 and 3 are calculated using the method detection limit of 7 milligrams.

**Table 19: BH#2 ODEQ Method 5 PM, NO<sub>x</sub>, & CO Results**

| <b>Columbia Steel Casting Co., Inc.</b><br><b>BH#2</b><br><b>ODEQ Method 5, Method 7E, &amp; Method 10 Results</b> |                     |                     |                     |                     |                |
|--------------------------------------------------------------------------------------------------------------------|---------------------|---------------------|---------------------|---------------------|----------------|
| <b>Parameter</b>                                                                                                   | <b>Units</b>        | <b>Run 1</b>        | <b>Run 2</b>        | <b>Run 3</b>        | <b>Average</b> |
| Run Start Date/Time                                                                                                |                     | 12/16/2020<br>22:37 | 12/17/2020<br>0:18  | 12/17/2020<br>1:56  |                |
| Run End Date/Time                                                                                                  |                     | 12/16/2020<br>23:46 | 12/17/2020<br>01:28 | 12/17/2020<br>03:06 |                |
| Run Duration                                                                                                       | minutes             | 64                  | 64                  | 64                  | 64             |
| Sample Volume                                                                                                      | dscm                | 1.867               | 1.818               | 1.891               | 1.859          |
| Stack Flow                                                                                                         | dscfm               | 32,369.4            | 31,719.7            | 33,099.7            | 32,396.3       |
| Stack Moisture                                                                                                     | %v                  | 1.31                | 0.77                | 0.68                | 0.92           |
| O <sub>2</sub>                                                                                                     | %vd                 | 20.97               | 20.85               | 20.95               | 20.92          |
| CO <sub>2</sub>                                                                                                    | %vd                 | 0.11                | 0.09                | 0.11                | 0.10           |
| NO <sub>x</sub>                                                                                                    | ppmvd               | 0.40                | 0.58                | 1.75                | 0.91           |
|                                                                                                                    | lb/hr               | 0.09                | 0.13                | 0.42                | 0.21           |
|                                                                                                                    | lb/ton steel melted | 0.025               | 0.037               | 0.061               | 0.041          |
| CO                                                                                                                 | ppmvd               | 92.58               | 40.61               | 43.04               | 58.74          |
|                                                                                                                    | lb/hr               | 13.07               | 5.62                | 6.21                | 8.30           |
|                                                                                                                    | lb/ton steel melted | 3.671               | 1.579               | 0.905               | 2.052          |
| Total PM                                                                                                           | lb/hr               | < 0.45              | < 0.46              | < 0.46              | < 0.46         |
|                                                                                                                    | lb/ton steel melted | < 0.1277            | < 0.1285            | < 0.0669            | < 0.1077       |

\*Runs 1, 2 and 3 PM results are below the method detection limit. Results for runs 2 and 3 are calculated using the method detection limit of 7 milligrams.

**Table 20: BH#1 Method 201A PM<sub>2.5</sub> & PM<sub>10</sub> Results**

| Columbia Steel Casting Co., Inc.<br>BH#1<br>Method 201A Results |                     |                     |                     |                     |          |
|-----------------------------------------------------------------|---------------------|---------------------|---------------------|---------------------|----------|
| Parameter                                                       | Units               | Run 1               | Run 2               | Run 3               | Average  |
| Run Start Date/Time                                             |                     | 12/16/2020<br>21:13 | 12/16/2020<br>23:47 | 12/17/2020<br>02:10 |          |
| Run End Date/Time                                               |                     | 12/16/2020<br>23:07 | 12/17/2020<br>01:39 | 12/17/2020<br>03:53 |          |
| Run Duration                                                    | minutes:seconds     | 113:30              | 111:45              | 103:15              | 109:30   |
| Sample Volume                                                   | dscm                | 1.294               | 1.254               | 1.149               | 1.232    |
| Stack Flow                                                      | dscfm               | 42,021.5            | 41,348.9            | 42,621.8            | 41,997.4 |
| Stack Moisture                                                  | %v                  | 1.64                | 1.76                | 0.33                | 1.24     |
| O <sub>2</sub>                                                  | %vd                 | 21.31               | 21.36               | 21.41               | 21.36    |
| CO <sub>2</sub>                                                 | %vd                 | 0.01                | 0.00                | 0.00                | 0.00     |
| PM <sub>2.5</sub>                                               | lb/hr               | 0.24                | < 0.17              | 0.20                | < 0.20   |
|                                                                 | lb/ton steel melted | 0.1336              | < 0.0855            | 0.1114              | < 0.1102 |
| PM <sub>10</sub>                                                | lb/hr               | 0.32                | < 0.18              | 0.20                | < 0.23   |
|                                                                 | lb/ton steel melted | 0.1761              | < 0.0912            | 0.1138              | < 0.1271 |

Note: Run 2 results are below the method detection limit. Results are reported and calculated using the method detection limits.

**Table 21: BH#2 Method 201A PM<sub>2.5</sub> & PM<sub>10</sub> Results**

| <b>Columbia Steel Casting Co., Inc.</b><br><b>BH#2</b><br><b>Method 201A Results</b> |                     |                     |                     |                     |                |
|--------------------------------------------------------------------------------------|---------------------|---------------------|---------------------|---------------------|----------------|
| <b>Parameter</b>                                                                     | <b>Units</b>        | <b>Run 1</b>        | <b>Run 2</b>        | <b>Run 3</b>        | <b>Average</b> |
| Run Start Date/Time                                                                  |                     | 12/16/2020<br>22:37 | 12/17/2020<br>12:18 | 12/17/2020<br>01:56 |                |
| Run End Date/Time                                                                    |                     | 12/16/2020<br>23:46 | 12/17/2020<br>01:24 | 12/17/2020<br>03:04 |                |
| Run Duration                                                                         | minutes:seconds     | 64:00               | 61:30               | 61:15               | 62:15          |
| Sample Volume                                                                        | dscm                | 0.739               | 0.705               | 0.698               | 0.714          |
| Stack Flow                                                                           | dscfm               | 34,365.0            | 32,653.7            | 32,546.9            | 33,188.5       |
| Stack Moisture                                                                       | %v                  | 0.29                | 1.07                | 0.93                | 0.76           |
| O <sub>2</sub>                                                                       | %vd                 | 20.97               | 20.85               | 29.95               | 23.82          |
| CO <sub>2</sub>                                                                      | %vd                 | 0.11                | 0.09                | 0.11                | 0.10           |
| PM <sub>2.5</sub>                                                                    | lb/hr               | 0.21                | 0.07                | 0.01                | 0.10           |
|                                                                                      | lb/ton steel melted | 0.0602              | 0.0184              | 0.0020              | 0.0269         |
| PM <sub>10</sub>                                                                     | lb/hr               | < 0.25              | < 0.25              | < 0.25              | < 0.25         |
|                                                                                      | lb/ton steel melted | < 0.0704            | < 0.0702            | < 0.0367            | < 0.0591       |

Note: PM<sub>10</sub> results are below the method detection limit. Results are reported and calculated using the method detection limits.

**Table 22: Buildings #8 & #11 Roof Vent Cr(VI) Results**

| <b>Columbia Steel Casting Co., Inc.<br/>Buildings #8 &amp; #11 Roof Vents<br/>MiniVol Sampling Results</b> |             |                     |              |                            |
|------------------------------------------------------------------------------------------------------------|-------------|---------------------|--------------|----------------------------|
| <b>Building</b>                                                                                            | <b>Vent</b> | <b>Parameter</b>    | <b>lb/hr</b> | <b>lb/ton steel melted</b> |
| 8                                                                                                          | 1           | Cr(VI)              | 3.32E-07     | 1.36E-06                   |
| 8                                                                                                          | 7           | Cr(VI)              | 3.67E-08     | 1.51E-07                   |
| 11                                                                                                         | 1           | Cr(VI)              | 2.29E-06     | 1.63E-06                   |
| 11                                                                                                         | 4           | Cr(VI) <sup>1</sup> | 2.75E-05     | 1.56E-05                   |
| 11                                                                                                         | 5           | Cr(VI) <sup>1</sup> | 9.54E-05     | 5.93E-05                   |
| 11                                                                                                         | 7           | Cr(VI) <sup>1</sup> | 9.46E-06     | 5.03E-06                   |
| 11                                                                                                         | 8           | Cr(VI) <sup>1</sup> | 8.30E-06     | 4.73E-06                   |
| 11                                                                                                         | 9           | Cr(VI) <sup>1</sup> | 6.04E-06     | 4.05E-06                   |

<sup>1</sup> Average of multiple runs.

**Table 23 Buildings #8 & #11 Roof Vent SM Results**

| <b>Columbia Steel Casting Co., Inc.<br/>Buildings #8 &amp; #11 Roof Vents<br/>MiniVol Sampling Results</b> |                |                  |                      |                            |
|------------------------------------------------------------------------------------------------------------|----------------|------------------|----------------------|----------------------------|
| <b>Building</b>                                                                                            | <b>Vent</b>    | <b>Parameter</b> | <b>lb/hr</b>         | <b>lb/ton steel melted</b> |
| 8                                                                                                          | 1 <sup>a</sup> | Arsenic          | < 8.13E-06           | < 3.82E-05                 |
|                                                                                                            |                | Chromium         | 1.08E-04             | 4.83E-04                   |
|                                                                                                            |                | Lead             | 8.08E-05             | 3.90E-04                   |
|                                                                                                            |                | Manganese        | 6.26E-03             | 2.81E-02                   |
|                                                                                                            |                | Nickel           | 2.70E-05             | 1.27E-04                   |
|                                                                                                            |                | <b>SM</b>        | <b>&lt; 6.48E-03</b> | <b>&lt; 2.91E-02</b>       |
| 8                                                                                                          | 7 <sup>a</sup> | Arsenic          | < 7.63E-06           | < 3.58E-05                 |
|                                                                                                            |                | Chromium         | 3.07E-04             | 1.42E-04                   |
|                                                                                                            |                | Lead             | 2.21E-05             | 1.09E-04                   |
|                                                                                                            |                | Manganese        | 1.88E-03             | 8.95E-03                   |
|                                                                                                            |                | Nickel           | 2.83E-05             | 1.25E-04                   |
|                                                                                                            |                | <b>SM</b>        | <b>&lt; 1.97E-03</b> | <b>&lt; 9.36E-03</b>       |
| 11                                                                                                         | 1              | Arsenic          | < 3.71E-05           | < 2.63E-05                 |
|                                                                                                            |                | Chromium         | 6.96E-04             | 4.84E-04                   |
|                                                                                                            |                | Lead             | 7.70E-04             | 5.46E-04                   |
|                                                                                                            |                | Manganese        | 1.04E-01             | 7.42E-02                   |
|                                                                                                            |                | Nickel           | 1.81E-04             | 1.29E-04                   |
|                                                                                                            |                | <b>SM</b>        | <b>&lt; 1.06E-01</b> | <b>&lt; 7.54E-02</b>       |
| 11                                                                                                         | 4 <sup>a</sup> | Arsenic          | < 3.59E-05           | < 2.10E-05                 |
|                                                                                                            |                | Chromium         | 3.80E-04             | 2.12E-04                   |
|                                                                                                            |                | Lead             | 1.90E-04             | 1.05E-04                   |
|                                                                                                            |                | Manganese        | 2.75E-02             | 1.50E-02                   |
|                                                                                                            |                | Nickel           | 3.52E-04             | 2.10E-04                   |
|                                                                                                            |                | <b>SM</b>        | <b>&lt; 2.84E-02</b> | <b>&lt; 1.55E-02</b>       |
| 11                                                                                                         | 5 <sup>a</sup> | Arsenic          | < 3.52E-05           | < 2.20E-05                 |
|                                                                                                            |                | Chromium         | 1.09E-03             | 6.85E-04                   |
|                                                                                                            |                | Lead             | 6.66E-04             | 3.90E-04                   |
|                                                                                                            |                | Manganese        | 4.31E-02             | 2.70E-02                   |
|                                                                                                            |                | Nickel           | 9.64E-04             | 6.19E-04                   |
|                                                                                                            |                | <b>SM</b>        | <b>&lt; 4.58E-02</b> | <b>&lt; 2.87E-02</b>       |

| Columbia Steel Casting Co., Inc.<br>Buildings #8 & #11 Roof Vents<br>MiniVol Sampling Results |                |           |                      |                      |
|-----------------------------------------------------------------------------------------------|----------------|-----------|----------------------|----------------------|
| Building                                                                                      | Vent           | Parameter | lb/hr                | lb/ton steel melted  |
| 11                                                                                            | 7              | Arsenic   | < 3.77E-05           | < 2.61E-05           |
|                                                                                               |                | Chromium  | 4.94E-04             | 3.42E-04             |
|                                                                                               |                | Lead      | 2.39E-04             | 1.66E-04             |
|                                                                                               |                | Manganese | 2.42E-02             | 1.67E-02             |
|                                                                                               |                | Nickel    | 9.64E-04             | 6.68E-04             |
|                                                                                               |                | <b>SM</b> | <b>&lt; 2.59E-02</b> | <b>&lt; 1.79E-02</b> |
| 11                                                                                            | 8 <sup>a</sup> | Arsenic   | < 3.89E-05           | < 2.43E-05           |
|                                                                                               |                | Chromium  | 1.54E-03             | 1.12E-03             |
|                                                                                               |                | Lead      | 1.48E-04             | 8.27E-05             |
|                                                                                               |                | Manganese | 2.91E-02             | 2.10E-02             |
|                                                                                               |                | Nickel    | 1.62E-03             | 1.15E-03             |
|                                                                                               |                | <b>SM</b> | <b>&lt; 3.24E-02</b> | <b>&lt; 2.34E-02</b> |
| 11                                                                                            | 9              | Arsenic   | < 4.25E-05           | < 1.87E-05           |
|                                                                                               |                | Chromium  | 2.75E-04             | 1.21E-04             |
|                                                                                               |                | Lead      | 3.38E-04             | 1.49E-04             |
|                                                                                               |                | Manganese | 1.93E-02             | 8.48E-03             |
|                                                                                               |                | Nickel    | 5.01E-04             | 2.21E-04             |
|                                                                                               |                | <b>SM</b> | <b>&lt; 2.04E-02</b> | <b>&lt; 8.99E-03</b> |

<sup>a</sup> Average of multiple runs.

## 3.2 Operating Conditions

Representatives of Columbia Steel recorded details of plant operations during testing. SLR personnel compiled the raw process data and provided it to Bison for use in this report. Process data is presented in the report appendices.

## 3.3 Discussion of Results

No adverse or unusual environmental conditions were noted that are known to have influenced the outcome of these tests. Testing was performed as outlined in the test protocol dated August 18, 2020 with the following deviations.

Prior to testing the need for emissions testing on BH#26 was reassessed and it was determined that there was no need to test this emission source. ODEQ was notified and approved this change to the test plan prior to the start of the campaign.

Runs were conducted simultaneously with production processes. Run durations were coordinated with plant personnel to capture melt cycle intervals. Testing was paused episodically between furnace heats. Because runs were simultaneous with production, in some instances the end of the production process occurred prior to the end of a full run/sample point. In these instances, sample runs were stopped to match facility operations and on some occasions the last several traverse points were not sampled.

The test protocol indicated that roof vent samples performed with MiniVol samplers would be 24 hours in duration. After completing the first three days of MiniVol sampling it was determined that 24-hour sample runs were not practicable. In coordination with ODEQ, the decision was made to change the target sample time to 22 hours. From that point forward sampling began at 20:00 hours and ended at 18:00 each day. Ms. Kronholm of SLR discussed this with Mr. Rhodes on December 10, 2020, he did not see an issue with this change.

Several of the MiniVol sample runs either did not start or were inadvertently cut short. The reason for this is uncertain but Bison believes that this occurred due to battery or programing errors. MiniVol samplers are programed to start at a specified time and run for a specified duration. Due to accessibility of the sampling locations once samplers were placed, they were not able to be accessed until completion of the anticipated sample duration. For this reason, any failure to sample for the entire target duration was not known until the completion of the anticipate sample duration. Results from samples where this occurred were omitted from data averages. Detailed run results can be found in the appendices of this report.

During the lab analysis of BH#1 ODEQ Method 5 Run 1 approximately 54 milliliters of the sample fraction was spilled during methylene chloride extraction. ChesterLab Net notes that this would most likely bias results low. After reviewing results and comparing them to the additional test runs Bison has concluded that the relatively small fraction of sample that was spilled had a minor effect on total emission results and Run 1 values were included in emission rate averages. Ultimately, if ODEQ arrives at a different conclusion Runs 2 and 3 showed no discrepancies with the promulgated sampling method and the average of Run 2 and 3 would be acceptable.

During BH#2 Method 201A testing minimum sample volumes of 31.8 dscf were not achieved. This was due to limited production and facility operation duration on BH#2 processes. The test protocol proposed run times of 120-minutes. Prior to commencement of Method 201A sampling on BH#2 it was identified that there would not be enough production to complete three 120-minute test runs. This issue was brought up with Mr. Rhodes of ODEQ prior to PM sampling and it was determined that testing would proceed with three 60-minute test runs that match facility operations.

Minimum sample volumes that were proposed for BH#1 and BH#2 test runs were not achieved. This was due to lower stack flows than anticipated and limited run times due to facility production.

During BH#15 Method 0061 run 3 sampling approximately eight hours into the 12-hour test run the silica gel impinger of the sample train broke at the bottom. This was noticed immediately by the meter box operator and the run was paused. It was determined that because of where the impinger broke that there was no risk of contamination to the sample. However, the moisture caught by the silica gel to determine stack moisture was lost. For this run Bison substituted the moisture gain values from the Method 29 sample train that was running simultaneously with this sample. The impinger was replaced and the remainder of the run was carried out. Mr. Rhodes of ODEQ was notified of this situation after it occurred and agreed with the course of action to

continue the test and analysis of the results. Results of this test run do not show any abnormalities and are consistent with other test runs.

## **4.0 EMISSION TEST METHODS AND PROCEDURES**

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### **4.1 Testing Methods and Procedures**

Bison testing personnel performed the following EPA methods as described in 40 CFR 60, Appendix A.

**EPA Reference Method 1, "Sample and Velocity Traverses for Stationary Sources."** The objective of Method 1 is to determine a suitable location for testing and to determine the velocity and/or sample points for the source. The results of Method 1 sampling location and sample or velocity point measurement locations are included in the appendices.

**EPA Reference Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type-S Pitot Tube)."** The objective of Method 2 is to determine volumetric flow. The average velocity, temperature, static pressure, and source area are used to calculate volumetric flow for the source. Method 2 Section 8.6 allows for the use of 29 as dry molecular weight for ambient sources, in lieu of performing actual measurements, and was used for baghouse 15.

**EPA Reference Method 3A, "Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)."** The objective of Method 3A is to determine the O<sub>2</sub> and CO<sub>2</sub> concentrations in the stack gas stream.

**EPA Reference Method 4, "Determination of Moisture Content in the Stack Gases."** The objective of Method 4 is to determine the moisture content of a gas stream.

**ODEQ Method 5, "Sampling Particulate Emissions from Stationary Sources." (Methods 2 & 4 inclusive).** The objective of ODEQ Method 5 is to determine the total particulate matter emissions (filterable and condensable) from a source. Method 5 is an isokinetic sampling method for determination of PM. The exhaust gas stream is sampled along a cross-section of the stack and PM is captured within the nozzle, probe, filter-bell, quartz fiber filter, and glass impingers. Method 5 incorporates Method 2 "velocity measurements" and Method 4 "moisture measurements."

**EPA Reference Method 7E, "Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)."** The objective of Method 7E is to determine the NO<sub>x</sub> concentration from the source.

**EPA Reference Method 10, "Determination of Carbon Monoxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)."** The objective of Method 10 is to determine the concentration of CO in the stack gas stream.

**EPA Reference Method 29, "Determination of Metals Emissions from Stationary Sources" (Methods 2 & 4 Inclusive).** The objective of Method 29 is to determine metals emissions from a source. Method 29 is an isokinetic sampling method. The exhaust gas stream is sampled along a cross-section of the stack and metal emissions are captured within the front-half and back-half of the sampling system. The front-half includes the nozzle, probe, filter-bell, and quartz filter. The back-half consists of the impinger solutions. The front-half and back-half samples are sent to a contract lab for analysis. Method 29 incorporates Method 2 "velocity measurements" and Method 4 "moisture measurements".

Method 29 limits the mass of each metal in a sample blank that can be subtracted from the sample results in blank correction calculations. In the case of aluminum, blank values were significantly higher than the Method 29 allowable blank weights. This was anticipated and direct blank subtraction was approved in the source test protocol. This was carried out within the calculated results for aluminum.

**EPA Reference Method 201A, "Determination of PM<sub>10</sub> and PM<sub>2.5</sub> Emissions from Stationary Sources (Constant Sampling Rate Procedure)" (Methods 2 & 4 Inclusive).** Method 201A is used to quantify emissions of particulate matter with an aerodynamic diameter of 10 micrometers or less and 2.5 micrometers or less.

**EPA Reference Method 202, "Dry Impinger Method for Determining Condensable Particulate Emissions from Stationary Sources." Concurrent with Method 201.** The objective of Method 202 is to determine the condensable particulate matter (CPM) that passes through the heated filter and is collected in a dry impinger and ambient air temperature-controlled Teflon filter. The condensed water, rinses and the Teflon filter are analyzed for organic and inorganic particulate matter.

Method 202 was not performed as allowed by Method 201A and Method 202 because the stack temperature was below 85° Fahrenheit. This was discussed with ODEQ prior to PM sampling.

**EPA Reference Method 205, "Verification of Gas Dilution Systems for Field Instrument Calibrations."** The objective of Method 205 is to produce a known and verified set of calibration gases that are used in instrumental analysis emission testing.

**SW-846 Test Method 0061: "Determination of Hexavalent Chromium Emissions from Stationary Sources."** Emissions are collected isokinetically from the source. To eliminate the possibility of Cr(VI) reduction between the nozzle and impinger, the Cr(VI) emission samples are collected with a recirculatory train where the impinger reagent is continuously recirculated to the nozzle. Recovery procedures include a post-sampling purge and filtration. The impinger train samples are analyzed for Cr(VI) by an ion chromatograph (IC) equipped with a post-column Cr(VI) reactor (PCR) and a visible wavelength detector. The IC/PCR separates the Cr(VI) as chromate from other diphenylcarbazide reactions that occur in the post-column reactor.

**Modified ASTM D7614-12, "Standard Test Method for Determination of Total Suspended Particulate (TSP) Hexavalent Chromium in Ambient Air Analyzed by Ion Chromatography (IC) and Spectrophotometric Measurements."** The objective of ASTM D7614-12 is to determine the concentration of CR(VI) in ambient air samples.

**MiniVol Sampling, "As described in the approved source test plan, submitted to ODEQ August 18, 2020"** Bison used Airmetrics MiniVol portable air samplers to sample air discharged from process vents. The MiniVol samplers operated at five liters per minute (lpm) for a target of 22 consecutive hours at each sampling location. Two MiniVol samplers operated simultaneously during each sample run at each location. The filter from one sampler was analyzed for Cr(VI) concentration per ASTM D7614-12 methods. The filter from the second sampler was analyzed for SM per Method 29 analytical methodology. Mass emission rates for Cr(VI) and SM was calculated using flow specifications provided by Columbia Steel for the ventilation fans at each sampling location.

**EPA Reference Method 9, "Visual Determination of the Opacity of Emissions from Stationary Sources."** The objective of Method 9 is to quantify the visible opacity of the source plume. This method is performed by a certified observer during Method 5 testing. As stated in the source test protocol opacity was not performed on BH#1 and BH#2 due to operations taking place at night.

## **4.2 Sample Handling and Analytical Procedures**

All analytical procedures complied with the cited methodology as stated in the test protocol. Chester LabNet analyzed all MiniVol samples, particulate matter samples, SM samples, TSM samples and Cr(VI) samples. All physical samples were transported by Bison personnel to Chester LabNet. NO<sub>x</sub>, CO, O<sub>2</sub>, and CO<sub>2</sub> data was processed by Bison personnel.

## **APPENDIX A: ODEQ APPROVAL LETTERS**

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# Oregon

January 20, 2021

Sarah D. Kronholm, P.E.  
SLR International Corporation  
1800 Blankenship Road, Suite 440  
West Linn, OR 97068

Re: Cleaner Air Oregon Baghouse 26 Dust Sampling and Analysis Plan  
Columbia Steel Casting Co., Inc.

Ms. Kronholm,

On December 31, 2020, the Oregon Department of Environmental Quality (DEQ) received the revised Baghouse 26 Dust Sampling and Analysis Plan (SAP) dated December 31, 2020, submitted by SLR International Corporation (SLR) on behalf of Columbia Steel Casting Co., Inc. (CSSC).

In the SAP, CSSC proposes to:

1. Perform random sampling of materials from Baghouse 26 accumulated on-site, stored in 55-gallon collection drums, for analysis.
2. Analyze collected samples for total metals per EPA Method 6020 and hexavalent chromium per EPA Method 7196A.
3. Complete one sampling event in 2021 for the purpose of developing site-specific emission factors for the facility's toxic air contaminant Emissions Inventory for the Toxics Emissions Units controlled by Baghouse 26 no later than February 28, 2021.
4. Complete annual compliance sampling for subsequent years to verify emission rates established in the facility's approved Emissions Inventory.
5. Collect samples immediately upon drum changeout at Baghouse 26.

DEQ approves the facility's SAP with the following conditions:

1. Submit the Sampling and Analysis Report to DEQ no later than March 28, 2021.
2. Incorporate results into your Emissions Inventory, Modeling Protocol, and Risk Assessment Work Plan. As cited in DEQ's August 9, 2019 response to Columbia Steel's source testing extension request dated July 17, 2019, your Emissions Inventory, Modeling Protocol, and Risk Assessment Work Plan are due within 30 days of receipt of the DEQ approved Source Test Report.

DEQ appreciates your continued assistance with this process. If you have any questions or concerns, please contact me directly.

Sincerely,

Kenzie Billings  
DEQ Air Toxics Project Manager

Cc: Marty Cox, Columbia Steel Casting  
Dave Faust, Columbia Steel Casting  
Bruce Schacht, Columbia Steel Casting  
Brien Flanagan, Schwabe  
Keith Johnson, DEQ  
Thomas Rhodes, DEQ  
Steve Dietrich, DEQ  
David Graiver, DEQ  
File



# Oregon

January 20, 2021

Sarah D. Kronholm, P.E.  
SLR International Corporation  
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West Linn, OR 97068

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1. Submit the Sampling and Analysis Report to DEQ no later than March 28, 2021.
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DEQ appreciates your continued assistance with this process. If you have any questions or concerns, please contact me directly.

Sincerely,

Kenzie Billings  
DEQ Air Toxics Project Manager

Cc: Marty Cox, Columbia Steel Casting  
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Bruce Schacht, Columbia Steel Casting  
Brien Flanagan, Schwabe  
Keith Johnson, DEQ  
Thomas Rhodes, DEQ  
Steve Dietrich, DEQ  
David Graiver, DEQ  
File

## **APPENDIX B: BAGHOUSE #1 TEST DATA**

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|           |                         |
|-----------|-------------------------|
| COMPANY   | Columbia Steel Casting  |
| FACILITY  | Steel Foundry           |
| LOCATION  | Portland, Oregon        |
| SOURCE    | Baghouse 1              |
| DATES     | 12/10/2020 - 12/16/2020 |
| METHOD    | 29                      |
| POLLUTANT | TSM                     |



### Pre Traverse Flow Information

**Client:** Columbia Steel Casting

**Location:** Portland, Oregon

**Source:** Baghouse 1

**Stack Temp:** 73

| Traverse Point | Velocity<br>P "H <sub>2</sub> O) | Null<br>Angle |
|----------------|----------------------------------|---------------|
| 1              | 0.95                             | 0.0           |
| 2              | 1.00                             | 0.0           |
| 3              | 1.00                             | 0.0           |
| 4              | 1.00                             | 0.0           |
| 5              | 1.00                             | 0.0           |
| 6              | 1.10                             | 0.0           |
| 7              | 1.10                             | 0.0           |
| 8              | 1.10                             | 0.0           |
| 9              | 1.10                             | 0.0           |
| 10             | 1.10                             | 0.0           |
| 11             | 1.10                             | 0.0           |
| 12             | 1.10                             | 0.0           |
| 13             | 1.20                             | 5.0           |
| 14             | 1.20                             | 5.0           |
| 15             | 1.20                             | 5.0           |
| 16             | 1.30                             | 0.0           |
| 17             | 1.10                             | 5.0           |
| 18             | 1.10                             | 0.0           |
| 19             | 1.10                             | 0.0           |
| 20             | 1.00                             | 0.0           |
| 21             | 1.00                             | 0.0           |
| 22             | 1.00                             | 0.0           |
| 23             | 1.00                             | 0.0           |
| 24             | 1.10                             | 0.0           |

Average: 1.08 0.8

Flow is found to be:

Non-cyclonic x

Cyclonic

**Isokinetic Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** Baghouse 1  
**EPA Method:** 29  
**Box Operator:** JCR  
**Tec nician s** JCR

**Run: 1**  
**Start Date/Time:** 12/10/2020 21:25  
**End Date/Time:** 12/11/2020 6:00  
**Environmental Conditions/Test Notes:**  
Overcast and 40 degrees F.

**Stack Dimensional Data:**

Circular  
Diameter 46.000 in  
Rectangular  
Width in  
Length in  
Stack Area 11.541 sq.ft.

**Equipment:**

|             |        |            |      |             |                 |
|-------------|--------|------------|------|-------------|-----------------|
| Meterbox ID | 9      | Probe ID   | 6E   | Liner type  | glass           |
| Y factor    | 0.9743 | Nozzle ID  | NA   | Nozzle size | 0.2203 inches   |
| ΔH@         | 1.792  | Hot box ID | HB3  | Nozzle area | 0.000265 sq.ft. |
|             |        | Pitot Cp   | 0.84 | Probe heat  | 250 F           |
|             |        | Pitot ID   | 6E   | Filter heat | 250 F           |

**Source Information:**

|                        |                        |                 |              |
|------------------------|------------------------|-----------------|--------------|
| Barometric Pressure    | 30.09 "Hg              | O <sub>2</sub>  | 20.90 %      |
| Static Pressure        | 0.05 "H <sub>2</sub> O | CO <sub>2</sub> | 0.00 %       |
| Ave. ΔP                | 1.1 "H <sub>2</sub> O  | Rec. Nz.        | 0.201 inches |
| Stack Temperature      | 73 F                   |                 |              |
| Assumed moisture       | 1 %                    |                 |              |
| Assumed meter temp.    | 55 F                   |                 |              |
| Total number of points | 24                     |                 |              |
| Time per point         | 20                     |                 |              |
| Total run time         | 480                    |                 |              |

**Leak Checks:**

|                        | Pre-test | Post-test |
|------------------------|----------|-----------|
| Pitot                  | x        | x         |
| Train leak rate, dcf   | 0.000    | 0.000     |
| Leak check vacuum, "Hg | 12       | 12        |

**Nozzle check for roundness:**

| 1           | 2     | 3            |
|-------------|-------|--------------|
| 0.221       | 0.220 | 0.220 inches |
| Caliper ID# | WS2   |              |

**Post Test Calculations:**

|                         |                               |                     |                          |
|-------------------------|-------------------------------|---------------------|--------------------------|
| Sample volume           | 435.814 dcf                   | Ave. ΔP             | 1.065 "H <sub>2</sub> O  |
| Wet mol. weight         | 28.75 M <sub>s</sub> (actual) | Ave. √ΔP            | 1.0311 "H <sub>2</sub> O |
| Actual H <sub>2</sub> O | 0.87 %                        | Ave. ΔH             | 2.64 "H <sub>2</sub> O   |
| Std. meter vol.         | 437.226 dscf                  | Ave. T <sub>s</sub> | 73.5 °F                  |
| Isokinetic Average      | 99.9 %                        | Ave. T <sub>m</sub> | 58.8 °F                  |

**Moisture/Lab:**

| Filter        | NA #              |        |      |
|---------------|-------------------|--------|------|
|               | Initial           | Final  | Gain |
| Impingers, g  | 206.7             | 221.3  | 14.6 |
| Silica gel, g | 1763.9            | 1831.2 | 67.3 |
|               | Total water gain: |        | 81.9 |

| Traverse Point | Time min. | Meter Volume dcf | Velocity P "H <sub>2</sub> O | Stack Temp. F | Meter Temp. F | Calc. H | Run H | Vacuum "Hg | Filter Box F | Condenser Temp F | Mid-run Restart Vol. dcf | Mid-run Leak check Vol. |
|----------------|-----------|------------------|------------------------------|---------------|---------------|---------|-------|------------|--------------|------------------|--------------------------|-------------------------|
|                |           | 729.097          |                              |               |               |         |       |            |              |                  |                          |                         |
| 1              | 20.0      | 745.600          | 0.89                         | 60            | 48            | 2.21    | 2.20  | 3          | 250          | 45               |                          |                         |
| 2              | 40.0      | 762.280          | 0.92                         | 63            | 55            | 2.30    | 2.30  | 3          | 250          | 46               |                          |                         |
| 3              | 60.0      | 780.050          | 0.99                         | 66            | 61            | 2.49    | 2.50  | 4          | 251          | 46               |                          |                         |
| 4              | 80.0      | 797.470          | 0.95                         | 71            | 63            | 2.38    | 2.40  | 4          | 250          | 48               |                          |                         |
| 5              | 100.0     | 815.490          | 1.00                         | 77            | 62            | 2.47    | 2.50  | 4          | 250          | 47               |                          |                         |
| 6              | 120.0     | 832.230          | 0.96                         | 78            | 63            | 2.37    | 2.40  | 4          | 250          | 47               |                          |                         |
| 7              | 140.0     | 851.490          | 1.20                         | 83            | 59            | 2.91    | 2.90  | 4          | 251          | 46               |                          |                         |
| 8              | 160.0     | 870.820          | 1.15                         | 73            | 63            | 2.87    | 2.90  | 4          | 250          | 50               |                          |                         |
| 9              | 180.0     | 890.240          | 1.20                         | 74            | 63            | 2.99    | 3.00  | 4          | 250          | 50               |                          |                         |
| 10             | 200.0     | 909.080          | 1.10                         | 74            | 63            | 2.74    | 2.75  | 4          | 249          | 49               |                          |                         |
| 11             | 220.0     | 926.700          | 1.00                         | 74            | 65            | 2.50    | 2.50  | 4          | 250          | 51               |                          |                         |
| 12             | 240.0     | 945.591          | 1.10                         | 79            | 67            | 2.73    | 2.75  | 4          | 251          | 52               |                          |                         |
| 13             | 260.0     | 964.237          | 1.20                         | 78            | 58            | 2.94    | 2.95  | 4          | 249          | 47               | 964.313                  | 0.076                   |
| 14             | 280.0     | 982.500          | 1.10                         | 82            | 51            | 2.63    | 2.65  | 5          | 250          | 47               |                          |                         |
| 15             | 300.0     | 1000.830         | 1.10                         | 71            | 55            | 2.71    | 2.70  | 5          | 252          | 42               |                          |                         |
| 16             | 320.0     | 1019.220         | 1.10                         | 70            | 55            | 2.72    | 2.70  | 5          | 250          | 42               |                          |                         |
| 17             | 340.0     | 1037.880         | 1.10                         | 71            | 57            | 2.72    | 2.70  | 5          | 251          | 43               |                          |                         |
| 18             | 360.0     | 1055.770         | 1.10                         | 72            | 58            | 2.72    | 2.70  | 5          | 250          | 44               |                          |                         |
| 19             | 380.0     | 1073.580         | 1.00                         | 78            | 56            | 2.44    | 2.45  | 6          | 250          | 44               |                          |                         |
| 20             | 400.0     | 1091.780         | 1.10                         | 80            | 58            | 2.68    | 2.70  | 6          | 250          | 45               |                          |                         |
| 21             | 420.0     | 1109.400         | 1.00                         | 73            | 56            | 2.46    | 2.50  | 6          | 250          | 42               |                          |                         |
| 22             | 440.0     | 1127.700         | 1.10                         | 71            | 57            | 2.72    | 2.70  | 6          | 251          | 45               |                          |                         |
| 23             | 460.0     | 1145.680         | 1.00                         | 73            | 58            | 2.47    | 2.50  | 6          | 251          | 45               |                          |                         |
| 24             | 480.0     | 1164.987         | 1.20                         | 73            | 59            | 2.97    | 3.00  | 6          | 250          | 46               |                          |                         |

**Isokinetic Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** Baghouse 1  
**EPA Method:** 29  
**Box Operator:** JCR  
**Tec nician s** JCR

**Run: 2**  
**Start Date/Time:** 12/14/2020 22:15  
**End Date/Time:** 12/15/2020 3:55  
**Environmental Conditions/Test Notes:**  
Overcast and 40 degrees F.  
Test run ended after 5 hours 9 minutes and 14 seconds

**Stack Dimensional Data:**

Circular  
Diameter 46.000 in  
Rectangular  
Width in  
Length in  
Stack Area 11.541 sq.ft.

**Equipment:**

Meterbox ID 9  
Y factor 0.9743  
 $\Delta H@$  1.792  
Probe ID 6E  
Nozzle ID NA  
Hot box ID HB3  
Pitot Cp 0.84  
Pitot ID 6E  
Liner type: glass  
Nozzle size: 0.2203 inches  
Nozzle area: 0.000265 sq.ft.  
Probe heat: 250 F  
Filter heat: 250 F

**Source Information:**

Barometric Pressure 30.24 "Hg  
Static Pressure 0.05 "H<sub>2</sub>O  
Ave.  $\Delta P$  1.1 "H<sub>2</sub>O  
Stack Temperature 73 F  
Assumed moisture 0.87 %  
Assumed meter temp. 58.8 F  
Total number of points 16  
Time per point 20  
Total run time 309  
O<sub>2</sub> 20.9 %  
CO<sub>2</sub> 0.0 %  
Rec. Nz. 0.201 inches

**Leak Checks:**

|                         | Pre-test | Post-test |
|-------------------------|----------|-----------|
| Pitot:                  | x        | x         |
| Train leak rate, dcf:   | 0.000    | 0.000     |
| Leak check vacuum, "Hg: | 12       | 17        |

**Nozzle check for roundness:**

| 1           | 2     | 3            |
|-------------|-------|--------------|
| 0.221       | 0.220 | 0.220 inches |
| Caliper ID# |       | WS2          |

**Post Test Calculations:**

Sample volume 294.871 dcf  
Wet mol. weight 28.73 M<sub>s</sub> (actual)  
Actual H<sub>2</sub>O 1.02 %  
Std. meter vol. 298.071 dscf  
Isokinetic Average 100.3 %  
Ave.  $\Delta P$  1.173 "H<sub>2</sub>O  
Ave.  $\sqrt{\Delta P}$  1.0822 "H<sub>2</sub>O  
Ave.  $\Delta H$  2.922 "H<sub>2</sub>O  
Ave. T<sub>s</sub> 70.5 °F  
Ave. T<sub>m</sub> 57.8 °F

**Moisture/Lab:**

| Filter            | NA #   | Initial | Final | Gain |
|-------------------|--------|---------|-------|------|
| Impingers, g      | 214.0  | 231     | 17.0  |      |
| Silica gel, g     | 1773.3 | 1821.5  | 48.2  |      |
| Total water gain: |        |         |       | 65.2 |

| Traverse Point | Time min. | Meter Volume dcf | Velocity P "H <sub>2</sub> O) | Stack Temp. F | Meter Temp. F | Calc. H | Run H | Vacuum "Hg | Filter Box F | Condenser Temp F |
|----------------|-----------|------------------|-------------------------------|---------------|---------------|---------|-------|------------|--------------|------------------|
|                |           | 165.140          |                               |               |               |         |       |            |              |                  |
| 1              | 20.0      | 183.780          | 1.10                          | 59            | 47            | 2.74    | 2.75  | 5          | 250          | 50               |
| 2              | 40.0      | 202.640          | 1.10                          | 60            | 53            | 2.76    | 2.75  | 5          | 250          | 46               |
| 3              | 60.0      | 220.720          | 1.10                          | 61            | 57            | 2.78    | 2.75  | 5          | 250          | 47               |
| 4              | 80.0      | 239.560          | 1.10                          | 64            | 59            | 2.78    | 2.75  | 5          | 247          | 47               |
| 5              | 100.0     | 259.020          | 1.20                          | 66            | 60            | 3.02    | 3.00  | 5          | 252          | 48               |
| 6              | 120.0     | 279.290          | 1.30                          | 72            | 59            | 3.23    | 3.25  | 5.5        | 250          | 47               |
| 7              | 140.0     | 299.330          | 1.30                          | 68            | 61            | 3.27    | 3.25  | 5.5        | 252          | 50               |
| 8              | 160.0     | 318.640          | 1.20                          | 70            | 58            | 2.99    | 3.00  | 5.5        | 249          | 50               |
| 9              | 180.0     | 338.110          | 1.20                          | 71            | 59            | 2.99    | 3.00  | 5.5        | 248          | 50               |
| 10             | 200.0     | 357.870          | 1.30                          | 73            | 60            | 3.23    | 3.25  | 5.5        | 250          | 46               |
| 11             | 220.0     | 377.730          | 1.30                          | 84            | 60            | 3.17    | 3.15  | 5.5        | 251          | 46               |
| 12             | 240.0     | 396.311          | 1.10                          | 73            | 61            | 2.74    | 2.75  | 5.5        | 251          | 47               |
| 13             | 260.0     | 415.440          | 1.20                          | 72            | 57            | 2.97    | 3.00  | 6          | 253          | 44               |
| 14             | 280.0     | 433.700          | 1.10                          | 73            | 58            | 2.72    | 2.75  | 6          | 252          | 45               |
| 15             | 300.0     | 451.320          | 0.97                          | 82            | 59            | 2.37    | 2.40  | 5.5        | 248          | 46               |
| 16             | 309.2     | 460.011          | 1.20                          | 80            | 57            | 2.93    | 2.95  | 6.5        | 249          | 46               |

**Isokinetic Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** Baghouse 1  
**EPA Method:** 29  
**Box Operator:** JCR  
**Tec nician s** JCR

**Environmental Conditions/Test Notes:**  
Overcast and 40 degrees F.  
Run ended at 5 hours 3 minutes and 50 seconds

**Run: 3**  
**Start Date/Time:** 12/15/2020 21:20  
**End Date/Time:** 12/16/2020 3:11

**Stack Dimensional Data:**

Circular  
Diameter 46.000 in  
Rectangular  
Width in  
Length in  
Stack Area 11.541 sq.ft.

**Equipment:**

Meterbox ID 9 Probe ID 6E Liner type: glass  
Y factor 0.9743 Nozzle ID NA Nozzle size: 0.2203 inches  
 $\Delta H@$  1.792 Hot box ID HB3 Nozzle area: 0.000265 sq.ft.  
Pitot Cp 0.84 Probe heat: 250 F  
Pitot ID 6E Filter heat: 250 F

**Source Information:**

Barometric Pressure 30.2 "Hg O<sub>2</sub> 20.9 %  
Static Pressure 0.05 "H<sub>2</sub>O CO<sub>2</sub> 0.0 %  
Ave.  $\Delta P$  1.1 "H<sub>2</sub>O Rec. Nz. 0.201 inches  
Stack Temperature 73 F  
Assumed moisture 1.02 %  
Assumed meter temp. 57.8 F  
Total number of points 16  
Time per point 20  
Total run time 304

**Leak Checks:**

|                         | Pre-test | Post-test |
|-------------------------|----------|-----------|
| Pitot:                  | x        | x         |
| Train leak rate, dcf:   | 0.000    | 0.000     |
| Leak check vacuum, "Hg: | 14       | 14        |

**Nozzle check for roundness:**

| 1           | 2     | 3            |
|-------------|-------|--------------|
| 0.221       | 0.220 | 0.220 inches |
| Caliper ID# |       | WS2          |

**Post Test Calculations:**

Sample volume 302.347 dcf Ave.  $\Delta P$  1.261 "H<sub>2</sub>O  
Wet mol. weight 28.73 M<sub>s</sub> (actual) Ave.  $\sqrt{\Delta P}$  1.1192 "H<sub>2</sub>O  
Actual H<sub>2</sub>O 1.05 % Ave.  $\Delta H$  3.119 "H<sub>2</sub>O  
Std. meter vol. 299.241 dscf Ave. T<sub>s</sub> 84.4 °F  
Isokinetic Average 100.5 % Ave. T<sub>m</sub> 68.4 °F

**Moisture/Lab:**

| Filter            | NA #    |        | Gain |
|-------------------|---------|--------|------|
|                   | Initial | Final  |      |
| Impingers, g      | 208.8   | 230.2  | 21.4 |
| Silica gel, g     | 1870.9  | 1917.2 | 46.3 |
| Total water gain: |         |        | 67.7 |

| Traverse Point | Time min. | Meter Volume dcf | Velocity P "H <sub>2</sub> O) | Stack Temp. F | Meter Temp. F | Calc. H | Run H | Vacuum "Hg | Filter Box F | Condenser Temp F | Mid-run Restart Vol. dcf | Mid-run Leak Check Vol. dcf |
|----------------|-----------|------------------|-------------------------------|---------------|---------------|---------|-------|------------|--------------|------------------|--------------------------|-----------------------------|
| 1              | 20.0      | 461.090          | 1.10                          | 70            | 57            | 2.73    | 2.75  | 5.5        | 252          | 51               |                          |                             |
| 2              | 40.0      | 479.650          | 1.10                          | 74            | 63            | 2.74    | 2.75  | 5.5        | 251          | 51               |                          |                             |
| 3              | 60.0      | 498.000          | 1.10                          | 77            | 67            | 2.74    | 2.75  | 5.5        | 250          | 52               |                          |                             |
| 4              | 80.0      | 516.580          | 1.10                          | 78            | 68            | 2.74    | 2.75  | 5.5        | 250          | 51               |                          |                             |
| 5              | 100.0     | 534.990          | 1.10                          | 90            | 72            | 2.70    | 2.70  | 6          | 250          | 54               |                          |                             |
| 6              | 120.0     | 553.690          | 0.97                          | 86            | 71            | 2.40    | 2.40  | 5.5        | 251          | 54               |                          |                             |
| 7              | 140.0     | 570.860          | 1.20                          | 81            | 66            | 2.96    | 3.00  | 6.5        | 250          | 53               |                          |                             |
| 8              | 160.0     | 590.380          | 1.40                          | 81            | 71            | 3.49    | 3.50  | 7          | 251          | 57               |                          |                             |
| 9              | 180.0     | 611.710          | 1.60                          | 81            | 71            | 3.99    | 4.00  | 7          | 251          | 56               |                          |                             |
| 10             | 200.0     | 634.290          | 1.40                          | 89            | 72            | 3.45    | 3.50  | 6.5        | 251          | 53               |                          |                             |
| 11             | 220.0     | 655.380          | 1.50                          | 91            | 72            | 3.68    | 3.70  | 7.5        | 251          | 53               |                          |                             |
| 12             | 240.0     | 677.300          | 1.50                          | 85            | 68            | 3.69    | 3.70  | 7.5        | 249          | 53               | 698.610                  | 0.138                       |
| 13             | 260.0     | 698.472          | 1.10                          | 83            | 65            | 2.70    | 2.70  | 5.5        | 252          | 53               |                          |                             |
| 14             | 280.0     | 718.110          | 1.60                          | 84            | 68            | 3.95    | 3.95  | 6          | 250          | 51               |                          |                             |
| 15             | 300.0     | 740.300          | 1.30                          | 109           | 71            | 3.08    | 3.05  | 5          | 250          | 50               |                          |                             |
| 16             | 303.8     | 759.920          | 1.10                          | 91            | 73            | 2.70    | 2.70  | 5          | 250          | 50               |                          |                             |
|                |           | 763.575          |                               |               |               |         |       |            |              |                  |                          |                             |

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** Baghouse 1  
**Method:** 29

**Run:** 1  
**Start Date/Time:** 12/10/2020 21:25  
**End Date/Time:** 12/11/2020 6:00

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 729.097                  |                                 |                            |                   |                         |                            |             |
| 20.0          | 745.600                  | 2.20                            | 48                         | 1                 | 0.89                    | 60                         | 0.9434      |
| 40.0          | 762.280                  | 2.30                            | 55                         | 2                 | 0.92                    | 63                         | 0.9592      |
| 60.0          | 780.050                  | 2.50                            | 61                         | 3                 | 0.99                    | 66                         | 0.9950      |
| 80.0          | 797.470                  | 2.40                            | 63                         | 4                 | 0.95                    | 71                         | 0.9747      |
| 100.0         | 815.490                  | 2.50                            | 62                         | 5                 | 1.00                    | 77                         | 1.0000      |
| 120.0         | 832.230                  | 2.40                            | 63                         | 6                 | 0.96                    | 78                         | 0.9798      |
| 140.0         | 851.490                  | 2.90                            | 59                         | 7                 | 1.20                    | 83                         | 1.0954      |
| 160.0         | 870.820                  | 2.90                            | 63                         | 8                 | 1.15                    | 73                         | 1.0724      |
| 180.0         | 890.240                  | 3.00                            | 63                         | 9                 | 1.20                    | 74                         | 1.0954      |
| 200.0         | 909.080                  | 2.75                            | 63                         | 10                | 1.10                    | 74                         | 1.0488      |
| 220.0         | 926.700                  | 2.50                            | 65                         | 11                | 1.00                    | 74                         | 1.0000      |
| 240.0         | 945.591                  | 2.75                            | 67                         | 12                | 1.10                    | 79                         | 1.0488      |
| 260.0         | 964.237                  | 2.95                            | 58                         | 13                | 1.20                    | 78                         | 1.0954      |
| 280.0         | 982.500                  | 2.65                            | 51                         | 14                | 1.10                    | 82                         | 1.0488      |
| 300.0         | 1000.830                 | 2.70                            | 55                         | 15                | 1.10                    | 71                         | 1.0488      |
| 320.0         | 1019.220                 | 2.70                            | 55                         | 16                | 1.10                    | 70                         | 1.0488      |
| 340.0         | 1037.880                 | 2.70                            | 57                         | 17                | 1.10                    | 71                         | 1.0488      |
| 360.0         | 1055.770                 | 2.70                            | 58                         | 18                | 1.10                    | 72                         | 1.0488      |
| 380.0         | 1073.580                 | 2.45                            | 56                         | 19                | 1.00                    | 78                         | 1.0000      |
| 400.0         | 1091.780                 | 2.70                            | 58                         | 20                | 1.10                    | 80                         | 1.0488      |
| 420.0         | 1109.400                 | 2.50                            | 56                         | 21                | 1.00                    | 73                         | 1.0000      |
| 440.0         | 1127.700                 | 2.70                            | 57                         | 22                | 1.10                    | 71                         | 1.0488      |
| 460.0         | 1145.680                 | 2.50                            | 58                         | 23                | 1.00                    | 73                         | 1.0000      |
| 480.0         | 1164.987                 | 3.00                            | 59                         | 24                | 1.20                    | 73                         | 1.0954      |

Mid-run leak check volume: 0.076 dcf

**Client: Columbia Steel Casting****Run: 1****Source: Baghouse 1****Dates: 12/10/20-12/11/20****Field Data Input Continued**Moisture Data

|                        |                 |
|------------------------|-----------------|
| Total Test Time        | 480.0 min       |
| Sample Time Interval   | 20.0 min        |
| Meter Volume, $V_m$    | 435.814 dcf     |
| Water Volume           | 81.9 g          |
| Nozzle Diameter, $N_z$ | 0.2203 in.      |
| Nozzle Area            | 0.000265 sq.ft. |

Stack Dimensional Data:

|             |               |
|-------------|---------------|
| Circular    |               |
| Diameter    | 46.000 in     |
| Rectangular |               |
| Width       | in            |
| Length      | in            |
| Stack Area  | 11.541 sq.ft. |

Traverse Data

|                            |                        |
|----------------------------|------------------------|
| Barometric Pressure, $P_b$ | 30.09 "Hg              |
| Static Pressure            | 0.05 "H <sub>2</sub> O |
| Pitot Factor, cp           | 0.84                   |
| Meter Cal Factor           | 0.9743 Y               |

Molecular Weight:

|                         |           |
|-------------------------|-----------|
| CO <sub>2</sub> Average | 0.00 %vd  |
| O <sub>2</sub> Average  | 21.02 %vd |

**Field Data Averages**Meter

|                       |                         |
|-----------------------|-------------------------|
| $\Delta H$            | 2.640 "H <sub>2</sub> O |
| Temperature, $T_m$    | 58.8 °F                 |
| Temperature, $T_m$    | 518.8 °A (°R)           |
| Pressure Meter, $P_m$ | 30.284 "Hg              |

Stack

|                       |                          |
|-----------------------|--------------------------|
| $\sqrt{D_p}$          | 1.0311 "H <sub>2</sub> O |
| Temperature, $T_s$    | 73.5 °F                  |
| Temperature, $T_s$    | 533.5 °A (°R)            |
| Pressure Stack, $P_s$ | 30.094 "Hg               |

**Field Data Calculations**Meter Box Capture

|                                |              |
|--------------------------------|--------------|
| Standard Volume, $V_{m(std)}$  | 437.226 dscf |
|                                | 12.381 dscm  |
| Actual Volume, $V_{m(actual)}$ | 443.258 awcf |

Gas Stream Moisture

|                              |           |
|------------------------------|-----------|
| Moisture Vapor, $V_{w(std)}$ | 3.854 scf |
| Moisture, $B_{ws}$           | 0.0087    |
| Moisture EPA M4              | 0.87 %v   |

EPA Method 2 Stack Gas Flowrate:

|                   |                     |
|-------------------|---------------------|
| Velocity, $V_s$   | 58.14 fps           |
| Volume (actual)   | 40,259.6 acfm       |
|                   | 39,909.3 adcfm      |
| Volume (standard) | 2,404,577.6 wscf/hr |
|                   | 2,383,657.8 dscf/hr |
|                   | 39,727.6 dscf/min   |

EPA Method 3 Gas Density

|            |                  |
|------------|------------------|
| Dry, $M_d$ | 28.84 lb/lb-mole |
| Wet, $M_s$ | 28.75 lb/lb-mole |

|                    |        |
|--------------------|--------|
| Percent Isokinetic | 99.9 % |
|--------------------|--------|

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** Baghouse 1  
**Method:** 29

**Run:** 2  
**Start Date/Time:** 12/14/2020 22:15  
**End Date/Time:** 12/15/2020 3:55

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 165.140                  |                                 |                            |                   |                         |                            |             |
| 20.0          | 183.780                  | 2.75                            | 47                         | 1                 | 1.10                    | 59                         | 1.0488      |
| 40.0          | 202.640                  | 2.75                            | 53                         | 2                 | 1.10                    | 60                         | 1.0488      |
| 60.0          | 220.720                  | 2.75                            | 57                         | 3                 | 1.10                    | 61                         | 1.0488      |
| 80.0          | 239.560                  | 2.75                            | 59                         | 4                 | 1.10                    | 64                         | 1.0488      |
| 100.0         | 259.020                  | 3.00                            | 60                         | 5                 | 1.20                    | 66                         | 1.0954      |
| 120.0         | 279.290                  | 3.25                            | 59                         | 6                 | 1.30                    | 72                         | 1.1402      |
| 140.0         | 299.330                  | 3.25                            | 61                         | 7                 | 1.30                    | 68                         | 1.1402      |
| 160.0         | 318.640                  | 3.00                            | 58                         | 8                 | 1.20                    | 70                         | 1.0954      |
| 180.0         | 338.110                  | 3.00                            | 59                         | 9                 | 1.20                    | 71                         | 1.0954      |
| 200.0         | 357.870                  | 3.25                            | 60                         | 10                | 1.30                    | 73                         | 1.1402      |
| 220.0         | 377.730                  | 3.15                            | 60                         | 11                | 1.30                    | 84                         | 1.1402      |
| 240.0         | 396.311                  | 2.75                            | 61                         | 12                | 1.10                    | 73                         | 1.0488      |
| 260.0         | 415.440                  | 3.00                            | 57                         | 13                | 1.20                    | 72                         | 1.0954      |
| 280.0         | 433.700                  | 2.75                            | 58                         | 14                | 1.10                    | 73                         | 1.0488      |
| 300.0         | 451.320                  | 2.40                            | 59                         | 15                | 0.97                    | 82                         | 0.9849      |
| 309.2         | 460.011                  | 2.95                            | 57                         | 16                | 1.20                    | 80                         | 1.0954      |

**Client: Columbia Steel Casting****Run: 2****Source: Baghouse 1****Dates: 12/14/20-12/15/20****Field Data Input Continued**Moisture Data

|                        |                 |
|------------------------|-----------------|
| Total Test Time        | 309.2 min       |
| Sample Time Interval   | 20.0 min        |
| Meter Volume, $V_m$    | 294.871 dcf     |
| Water Volume           | 65.2 g          |
| Nozzle Diameter, $N_z$ | 0.2203 in.      |
| Nozzle Area            | 0.000265 sq.ft. |

Stack Dimensional Data:

|             |               |
|-------------|---------------|
| Circular    |               |
| Diameter    | 46.000 in     |
| Rectangular |               |
| Width       | in            |
| Length      | in            |
| Stack Area  | 11.541 sq.ft. |

Traverse Data

|                            |                        |
|----------------------------|------------------------|
| Barometric Pressure, $P_b$ | 30.24 "Hg              |
| Static Pressure            | 0.05 "H <sub>2</sub> O |
| Pitot Factor, cp           | 0.84                   |
| Meter Cal Factor           | 0.9743 Y               |

Molecular Weight:

|                         |           |
|-------------------------|-----------|
| CO <sub>2</sub> Average | 0.03 %vd  |
| O <sub>2</sub> Average  | 21.00 %vd |

**Field Data Averages**Meter

|                       |                         |
|-----------------------|-------------------------|
| $\Delta H$            | 2.922 "H <sub>2</sub> O |
| Temperature, $T_m$    | 57.8 °F                 |
| Temperature, $T_m$    | 517.8 °A (°R)           |
| Pressure Meter, $P_m$ | 30.455 "Hg              |

Stack

|                       |                          |
|-----------------------|--------------------------|
| $\sqrt{D_p}$          | 1.0822 "H <sub>2</sub> O |
| Temperature, $T_s$    | 70.5 °F                  |
| Temperature, $T_s$    | 530.5 °A (°R)            |
| Pressure Stack, $P_s$ | 30.244 "Hg               |

**Field Data Calculations**Meter Box Capture

|                                |              |
|--------------------------------|--------------|
| Standard Volume, $V_{m(std)}$  | 298.071 dscf |
|                                | 8.440 dscm   |
| Actual Volume, $V_{m(actual)}$ | 299.447 awcf |

Gas Stream Moisture

|                              |           |
|------------------------------|-----------|
| Moisture Vapor, $V_{w(std)}$ | 3.068 scf |
| Moisture, $B_{ws}$           | 0.0102    |
| Moisture EPA M4              | 1.02 %v   |

EPA Method 3 Gas Density

|            |                  |
|------------|------------------|
| Dry, $M_d$ | 28.84 lb/lb-mole |
| Wet, $M_s$ | 28.73 lb/lb-mole |

|                    |         |
|--------------------|---------|
| Percent Isokinetic | 100.3 % |
|--------------------|---------|

EPA Method 2 Stack Gas Flowrate:

|                   |                     |
|-------------------|---------------------|
| Velocity, $V_s$   | 60.72 fps           |
| Volume (actual)   | 42,046.2 acfm       |
|                   | 41,617.3 adcfm      |
| Volume (standard) | 2,538,071.7 wscf/hr |
|                   | 2,512,183.4 dscf/hr |
|                   | 41,869.7 dscf/min   |

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** Baghouse 1  
**Method:** 29

**Run:** 3  
**Start Date/Time:** 12/15/2020 21:20  
**End Date/Time:** 12/16/2020 3:11

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 461.090                  |                                 |                            |                   |                         |                            |             |
| 20.0          | 479.650                  | 2.75                            | 57                         | 1                 | 1.10                    | 70                         | 1.0488      |
| 40.0          | 498.000                  | 2.75                            | 63                         | 2                 | 1.10                    | 74                         | 1.0488      |
| 60.0          | 516.580                  | 2.75                            | 67                         | 3                 | 1.10                    | 77                         | 1.0488      |
| 80.0          | 534.990                  | 2.75                            | 68                         | 4                 | 1.10                    | 78                         | 1.0488      |
| 100.0         | 553.690                  | 2.70                            | 72                         | 5                 | 1.10                    | 90                         | 1.0488      |
| 120.0         | 570.860                  | 2.40                            | 71                         | 6                 | 0.97                    | 86                         | 0.9849      |
| 140.0         | 590.380                  | 3.00                            | 66                         | 7                 | 1.20                    | 81                         | 1.0954      |
| 160.0         | 611.710                  | 3.50                            | 71                         | 8                 | 1.40                    | 81                         | 1.1832      |
| 180.0         | 634.290                  | 4.00                            | 71                         | 9                 | 1.60                    | 81                         | 1.2649      |
| 200.0         | 655.380                  | 3.50                            | 72                         | 10                | 1.40                    | 89                         | 1.1832      |
| 220.0         | 677.300                  | 3.70                            | 72                         | 11                | 1.50                    | 91                         | 1.2247      |
| 240.0         | 698.470                  | 3.70                            | 68                         | 12                | 1.50                    | 85                         | 1.2247      |
| 260.0         | 718.110                  | 2.70                            | 65                         | 13                | 1.10                    | 83                         | 1.0488      |
| 280.0         | 740.300                  | 3.95                            | 68                         | 14                | 1.60                    | 84                         | 1.2649      |
| 300.0         | 759.920                  | 3.05                            | 71                         | 15                | 1.30                    | 109                        | 1.1402      |
| 303.8         | 763.575                  | 2.70                            | 73                         | 16                | 1.10                    | 91                         | 1.0488      |

Mid-run leak check volume: 0.138 dcf

**Client:** Columbia Steel Casting  
**Source:** Baghouse 1

**Run:** 3  
**Dates:** 12/15/20-12/16/20

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**Field Data Input Continued**Moisture Data

Total Test Time 303.8 min  
Sample Time Interval 20.0 min  
Meter Volume,  $V_m$  302.347 dcf  
Water Volume 67.7 g  
Nozzle Diameter,  $N_z$  0.2203 in.  
Nozzle Area 0.000265 sq.ft.

Stack Dimensional Data:

Circular  
Diameter 46.000 in  
Rectangular  
Width in  
Length in  
Stack Area 11.541 sq.ft.

Traverse Data

Barometric Pressure,  $P_b$  30.20 "Hg  
Static Pressure 0.05 "H<sub>2</sub>O  
Pitot Factor, cp 0.84  
Meter Cal Factor 0.9743 Y

Molecular Weight:

CO<sub>2</sub> Average 0.00 %vd  
O<sub>2</sub> Average 21.06 %vd

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**Field Data Averages**Meter

$\Delta H$  3.119 "H<sub>2</sub>O  
Temperature,  $T_m$  68.4 °F  
Temperature,  $T_m$  528.4 °A (°R)  
Pressure Meter,  $P_m$  30.429 "Hg

Stack

$\sqrt{D_p}$  1.1192 "H<sub>2</sub>O  
Temperature,  $T_s$  84.4 °F  
Temperature,  $T_s$  544.4 °A (°R)  
Pressure Stack,  $P_s$  30.204 "Hg

**Field Data Calculations**Meter Box Capture

Standard Volume,  $V_{m(std)}$  299.241 dscf  
8.474 dscm  
Actual Volume,  $V_{m(actual)}$  309.002 awcf

Gas Stream Moisture

Moisture Vapor,  $V_{w(std)}$  3.186 scf  
Moisture,  $B_{ws}$  0.0105  
Moisture EPA M4 1.05 %v

EPA Method 3 Gas Density

Dry,  $M_d$  28.84 lb/lb-mole  
Wet,  $M_s$  28.73 lb/lb-mole

Percent Isokinetic 100.5 %

EPA Method 2 Stack Gas Flowrate:

Velocity,  $V_s$  63.66 fps  
Volume (actual) 44,082.0 acfm  
43,619.1 adcfm  
Volume (standard) 2,589,591.5 wscf/hr  
2,562,400.8 dscf/hr  
42,706.7 dscf/min

|             |            |        |           |                            |        |        |           |
|-------------|------------|--------|-----------|----------------------------|--------|--------|-----------|
| Source:     | Baghouse 1 |        |           | Sample Date: 12/10-11/2020 |        |        |           |
| Run:        | 1          |        |           |                            |        |        |           |
|             | Filter +   |        |           |                            |        |        |           |
| Client ID:  | Front Half |        | Back Half |                            |        |        |           |
| Analyte     | <          | Result | <         | Result                     | FH MDL | BH MDL | Units     |
| Aluminum    |            | 114    |           | 19.6                       | 3.75   | 1.50   | µg/sample |
| Antimony    | <          | MDL    | <         | MDL                        | 1.25   | 0.500  | µg/sample |
| Arsenic     |            | 4.26   | <         | MDL                        | 1.75   | 0.700  | µg/sample |
| Barium      |            | 2.32   |           | 4.83                       | 0.125  | 0.050  | µg/sample |
| Beryllium   | <          | MDL    | <         | MDL                        | 0.050  | 0.050  | µg/sample |
| Cadmium     |            | 0.258  | <         | MDL                        | 0.100  | 0.040  | µg/sample |
| Chromium    |            | 23.6   |           | 0.700                      | 0.200  | 0.080  | µg/sample |
| Cobalt      | <          | MDL    | <         | MDL                        | 0.125  | 0.050  | µg/sample |
| Copper      |            | 5.00   |           | 3.67                       | 1.25   | 0.500  | µg/sample |
| Lead        |            | 1.89   |           | 0.724                      | 1.25   | 0.500  | µg/sample |
| Manganese   |            | 185    |           | 3.24                       | 0.075  | 0.030  | µg/sample |
| Nickel      |            | 4.77   |           | 0.503                      | 0.750  | 0.300  | µg/sample |
| Phosphorus  |            | 14.1   |           | 4.43                       | 5.00   | 2.00   | µg/sample |
| Selenium    | <          | MDL    | <         | MDL                        | 3.75   | 1.50   | µg/sample |
| Silver      | <          | MDL    | <         | MDL                        | 0.500  | 0.200  | µg/sample |
| Thallium    | <          | MDL    | <         | MDL                        | 2.50   | 1.00   | µg/sample |
| Vanadium    |            | 0.590  | <         | MDL                        | 0.250  | 0.100  | µg/sample |
| Zinc        |            | 15.5   |           | 3.51                       | 0.750  | 0.300  | µg/sample |
| Lab ID:     | 20-S2348   |        | 20-S2349  |                            |        |        |           |
| Sample Vol: | 250        |        | 100       |                            | mL     |        |           |

|             |            |        |                            |        |        |        |           |
|-------------|------------|--------|----------------------------|--------|--------|--------|-----------|
| Source:     | Baghouse 1 |        | Sample Date: 12/14-15/2020 |        |        |        |           |
| Run:        | 2          |        |                            |        |        |        |           |
|             | Filter +   |        |                            |        |        |        |           |
| Client ID:  | Front Half |        | Back Half                  |        |        |        |           |
| Analyte     | <          | Result | <                          | Result | FH MDL | BH MDL | Units     |
| Aluminum    |            | 105    |                            | 10.5   | 3.75   | 1.5    | µg/sample |
| Antimony    | <          | MDL    |                            | 0.507  | 1.25   | 0.50   | µg/sample |
| Arsenic     |            | 5.28   | <                          | MDL    | 1.75   | 0.700  | µg/sample |
| Barium      |            | 1.57   |                            | 0.961  | 0.125  | 0.050  | µg/sample |
| Beryllium   | <          | MDL    | <                          | MDL    | 0.050  | 0.020  | µg/sample |
| Cadmium     |            | 0.110  | <                          | MDL    | 0.100  | 0.040  | µg/sample |
| Chromium    |            | 6.86   |                            | 0.592  | 0.200  | 0.080  | µg/sample |
| Cobalt      | <          | MDL    | <                          | MDL    | 0.125  | 0.050  | µg/sample |
| Copper      |            | 3.20   |                            | 4.190  | 1.25   | 0.500  | µg/sample |
| Lead        |            | 1.48   |                            | 1.070  | 1.25   | 0.500  | µg/sample |
| Manganese   |            | 52.2   |                            | 3.100  | 0.075  | 0.030  | µg/sample |
| Nickel      |            | 1.63   |                            | 0.484  | 0.750  | 0.300  | µg/sample |
| Phosphorus  |            | 9.28   | <                          | MDL    | 5.00   | 2.00   | µg/sample |
| Selenium    | <          | MDL    | <                          | MDL    | 3.75   | 1.50   | µg/sample |
| Silver      | <          | MDL    | <                          | MDL    | 0.500  | 0.200  | µg/sample |
| Thallium    | <          | MDL    | <                          | MDL    | 2.50   | 1.00   | µg/sample |
| Vanadium    | <          | MDL    | <                          | MDL    | 0.250  | 0.100  | µg/sample |
| Zinc        |            | 6.56   |                            | 13.400 | 0.750  | 0.300  | µg/sample |
| Lab ID:     | 20-S2350   |        | 20-S2351                   |        |        |        |           |
| Sample Vol: | 250        |        | 100                        | mL     |        |        |           |

Source: Baghouse 1  
Run: 3

Sample Date: 12/15-16/2020

|                |   | Filter +      |   |               |               |               |              |
|----------------|---|---------------|---|---------------|---------------|---------------|--------------|
| Client ID:     |   | Front Half    |   | Back Half     |               |               |              |
| <u>Analyte</u> | < | <u>Result</u> | < | <u>Result</u> | <u>FH MDL</u> | <u>BH MDL</u> | <u>Units</u> |
| Aluminum       |   | 117           |   | 18.4          | 3.75          | 1.50          | µg/sample    |
| Antimony       | < | MDL           | < | MDL           | 1.25          | 0.500         | µg/sample    |
| Arsenic        |   | 4.14          | < | MDL           | 1.75          | 0.700         | µg/sample    |
| Barium         |   | 2.30          |   | 0.927         | 0.125         | 0.050         | µg/sample    |
| Beryllium      |   | 0.056         | < | MDL           | 0.050         | 0.020         | µg/sample    |
| Cadmium        |   | 0.233         | < | MDL           | 0.100         | 0.040         | µg/sample    |
| Chromium       |   | 40.2          |   | 0.527         | 0.200         | 0.080         | µg/sample    |
| Cobalt         | < | MDL           |   | 0.103         | 0.125         | 0.050         | µg/sample    |
| Copper         |   | 6.28          |   | 2.450         | 1.25          | 0.500         | µg/sample    |
| Lead           |   | 2.51          |   | 0.746         | 1.25          | 0.500         | µg/sample    |
| Manganese      |   | 341           |   | 2.850         | 0.075         | 0.030         | µg/sample    |
| Nickel         |   | 7.21          |   | 0.420         | 0.750         | 0.300         | µg/sample    |
| Phosphorus     |   | 20.7          | < | MDL           | 5.00          | 2.00          | µg/sample    |
| Selenium       | < | MDL           | < | MDL           | 3.75          | 1.50          | µg/sample    |
| Silver         | < | MDL           | < | MDL           | 0.500         | 0.200         | µg/sample    |
| Thallium       | < | MDL           | < | MDL           | 2.50          | 1.00          | µg/sample    |
| Vanadium       |   | 0.715         | < | MDL           | 0.250         | 0.100         | µg/sample    |
| Zinc           |   | 25.9          |   | 7.180         | 0.750         | 0.300         | µg/sample    |
| Lab ID:        |   | 20-S2352      |   | 20-S2353      |               |               |              |
| Sample Vol:    |   | 250           |   | 100           | mL            |               |              |

**Source: Baghouse 1**  
**Blank Values**

| Client ID:      | Filter             | MDL              | BH Capture Soln.                                           | MDL                                                        | FH/BH Rinse            | MDL                    |
|-----------------|--------------------|------------------|------------------------------------------------------------|------------------------------------------------------------|------------------------|------------------------|
|                 |                    |                  | 5% HNO <sub>3</sub> /<br>10% H <sub>2</sub> O <sub>2</sub> | 5% HNO <sub>3</sub> / 10%<br>H <sub>2</sub> O <sub>2</sub> | 0.1 N HNO <sub>3</sub> | 0.1 N HNO <sub>3</sub> |
|                 |                    | Filter MDL       |                                                            | MDL                                                        |                        | MDL                    |
| <u>Analyte</u>  | < <u>µg/sample</u> | <u>µg/sample</u> | < <u>µg/sample</u>                                         | <u>µg/sample</u>                                           | < <u>µg/sample</u>     | <u>µg/sample</u>       |
| Aluminum        | 95.7               | 3.75             | 6.36                                                       | 1.50                                                       | < MDL                  | 3.75                   |
| Antimony        | < MDL              | 1.25             | < MDL                                                      | 0.500                                                      | < MDL                  | 1.25                   |
| Arsenic         | 3.58               | 1.75             | < MDL                                                      | 0.700                                                      | < MDL                  | 1.75                   |
| Barium          | 0.917              | 0.125            | 0.586                                                      | 0.050                                                      | 0.282                  | 0.125                  |
| Beryllium       | < MDL              | 0.050            | < MDL                                                      | 0.020                                                      | < MDL                  | 0.050                  |
| Cadmium         | 0.358              | 0.100            | < MDL                                                      | 0.040                                                      | < MDL                  | 0.100                  |
| Chromium        | 0.934              | 0.200            | 0.377                                                      | 0.080                                                      | < MDL                  | 0.200                  |
| Cobalt          | < MDL              | 0.125            | < MDL                                                      | 0.050                                                      | < MDL                  | 0.125                  |
| Copper          | < MDL              | 1.25             | 1.91                                                       | 0.500                                                      | < MDL                  | 1.25                   |
| Lead            | < MDL              | 1.25             | 0.814                                                      | 0.500                                                      | 1.57                   | 1.25                   |
| Manganese       | 1.27               | 0.075            | 0.2560                                                     | 0.030                                                      | 0.077                  | 0.075                  |
| Nickel          | < MDL              | 0.750            | < MDL                                                      | 0.300                                                      | < MDL                  | 0.750                  |
| Phosphorus      | 13.8               | 5.00             | < MDL                                                      | 2.00                                                       | < MDL                  | 5.00                   |
| Selenium        | < MDL              | 3.75             | < MDL                                                      | 1.50                                                       | < MDL                  | 3.75                   |
| Silver          | < MDL              | 0.500            | < MDL                                                      | 0.200                                                      | < MDL                  | 0.500                  |
| Thallium        | < MDL              | 2.50             | < MDL                                                      | 1.00                                                       | < MDL                  | 2.50                   |
| Vanadium        | < MDL              | 0.250            | < MDL                                                      | 0.100                                                      | < MDL                  | 0.250                  |
| Zinc            | 2.33               | 0.750            | 0.541                                                      | 0.300                                                      | < MDL                  | 0.750                  |
| Lab ID:         | 20-S2357           |                  | 20-S2358                                                   |                                                            | 20-S2356               |                        |
| Sample Vol, ml: | 250                |                  | 250                                                        |                                                            | 100                    |                        |

## Columbia Steel Casting

Baghouse 1

12/10-11/2020

## Method 29 Metals Blank Calculations

Run: 1

| 12/10-11/2020 | I                                 |         | II                   |        | III                  |        | IV                                                                 |       | V                                |        | VI                               |       | VII                  |        | VIII      |          |            |
|---------------|-----------------------------------|---------|----------------------|--------|----------------------|--------|--------------------------------------------------------------------|-------|----------------------------------|--------|----------------------------------|-------|----------------------|--------|-----------|----------|------------|
|               | Sample*                           |         | Blank*               |        | Blank*               |        | Sample*                                                            |       | Blank*                           |        | BH Blank*                        |       | BH Blank*            |        | Allowable |          |            |
|               | FH                                |         | FH                   |        | FH                   |        | BH                                                                 |       | BH                               |        | Corrected                        |       | Corrected            |        | BH        |          |            |
| Species       | Wash+Filter                       |         | Wash, µg             |        | Filter, µg           |        | Cap.Sol.                                                           |       | Cap.Sol.                         |        | Cap.Sol.                         |       | Wash, µg             |        | Blank, µg |          |            |
| Volume(ml)    | 100                               |         | 100                  |        | N/A                  |        | 100                                                                |       | µg/mL                            |        | 200                              |       | 100                  |        |           |          |            |
| Al            | 114.000                           | <       | 3.7500               |        | 95.700               |        | 19.600                                                             |       | 0.0254                           |        | 5.088                            | <     | 3.7500               |        | 5.088     | Aluminum |            |
| Sb            | <                                 | 1.250   | <                    | 1.2500 | <                    | 1.250  | <                                                                  | 0.500 | <                                | 0.0020 | <                                | 0.400 | <                    | 1.2500 |           | 0.000    | Antimony   |
| As            |                                   | 4.260   | <                    | 1.7500 |                      | 3.580  | <                                                                  | 0.700 | <                                | 0.0028 | <                                | 0.560 | <                    | 1.7500 |           | 0.000    | Arsenic    |
| Ba            |                                   | 2.320   |                      | 0.2820 |                      | 0.917  |                                                                    | 4.830 |                                  | 0.0023 |                                  | 0.469 |                      | 0.2820 |           | 0.751    | Barium     |
| Be            | <                                 | 0.050   | <                    | 0.0500 | <                    | 0.050  | <                                                                  | 0.050 | <                                | 0.0001 | <                                | 0.016 | <                    | 0.0500 |           | 0.000    | Beryllium  |
| Cd            |                                   | 0.258   | <                    | 0.1000 |                      | 0.358  | <                                                                  | 0.040 | <                                | 0.0002 | <                                | 0.032 | <                    | 0.1000 |           | 0.000    | Cadmium    |
| Cr            |                                   | 23.600  | <                    | 0.2000 |                      | 0.934  |                                                                    | 0.700 |                                  | 0.0015 |                                  | 0.302 | <                    | 0.2000 |           | 0.302    | Chromium   |
| Co            | <                                 | 0.125   | <                    | 0.1250 | <                    | 0.125  | <                                                                  | 0.050 | <                                | 0.0002 | <                                | 0.040 | <                    | 0.1250 |           | 0.000    | Cobalt     |
| Cu            |                                   | 5.000   | <                    | 1.2500 |                      | 1.250  |                                                                    | 3.670 |                                  | 0.0076 |                                  | 1.528 | <                    | 1.2500 |           | 1.528    | Copper     |
| Pb            |                                   | 1.890   |                      | 1.5700 | <                    | 1.250  |                                                                    | 0.724 |                                  | 0.0033 |                                  | 0.651 |                      | 1.5700 |           | 2.221    | Lead       |
| Mn            |                                   | 185.000 |                      | 0.0770 |                      | 1.270  |                                                                    | 3.240 |                                  | 0.0010 |                                  | 0.205 |                      | 0.0770 |           | 0.282    | Manganese  |
| Ni            |                                   | 4.770   | <                    | 0.7500 | <                    | 0.750  |                                                                    | 0.503 | <                                | 0.0012 | <                                | 0.240 | <                    | 0.7500 |           | 0.000    | Nickel     |
| P             |                                   | 14.100  | <                    | 5.0000 |                      | 13.800 |                                                                    | 4.430 | <                                | 0.0080 | <                                | 1.600 | <                    | 5.0000 |           | 0.000    | Phosphorus |
| Se            | <                                 | 3.750   | <                    | 3.7500 | <                    | 3.750  | <                                                                  | 1.500 | <                                | 0.0060 | <                                | 1.200 | <                    | 3.7500 |           | 0.000    | Selenium   |
| Ag            | <                                 | 0.500   | <                    | 0.5000 | <                    | 0.500  | <                                                                  | 0.200 | <                                | 0.0008 | <                                | 0.160 | <                    | 0.5000 |           | 0.000    | Silver     |
| Tl            | <                                 | 2.500   | <                    | 2.5000 | <                    | 2.500  | <                                                                  | 1.000 | <                                | 0.0040 | <                                | 0.800 | <                    | 2.5000 |           | 0.000    | Thallium   |
| V             |                                   | 0.590   | <                    | 0.2500 | <                    | 0.250  | <                                                                  | 0.100 | <                                | 0.0004 | <                                | 0.080 | <                    | 0.2500 |           | 0.000    | Vanadium   |
| Zn            |                                   | 15.500  | <                    | 0.7500 |                      | 2.330  |                                                                    | 3.510 |                                  | 0.0022 |                                  | 0.433 | <                    | 0.7500 |           | 0.433    | Zinc       |
| Lab ID:       | 20-S2348                          |         | 20-S2356             |        | 20-S2357             |        | 20-S2349                                                           |       | 20-S2358                         |        |                                  |       |                      |        |           |          |            |
| Content:      | 0.1NHNO <sub>3</sub>              |         | 0.1NHNO <sub>3</sub> |        | 0.1NHNO <sub>3</sub> |        | 5%HNO <sub>3</sub> /                                               |       | 5%HNO <sub>3</sub> /             |        | 5%HNO <sub>3</sub> /             |       | 0.1NHNO <sub>3</sub> |        |           |          |            |
|               | FH Filter & Probe Rinse           |         |                      |        |                      |        | 10%H <sub>2</sub> O <sub>2</sub>                                   |       | 10%H <sub>2</sub> O <sub>2</sub> |        | 10%H <sub>2</sub> O <sub>2</sub> |       |                      |        |           |          |            |
|               | 100ml 0.1N HNO <sub>3</sub> rinse |         |                      |        |                      |        | BH Imps 1&2                                                        |       |                                  |        |                                  |       |                      |        |           |          |            |
|               |                                   |         | Same as BH           |        |                      |        | 100ml .1N HNO <sub>3</sub> rinse                                   |       |                                  |        |                                  |       | Same as FH           |        |           |          |            |
|               |                                   |         | Blank Wash           |        |                      |        | 200ml 5%HNO <sub>3</sub> /10%H <sub>2</sub> O <sub>2</sub> reagent |       |                                  |        |                                  |       | Blank Wash           |        |           |          |            |

Blanks are prorated to reflect 100ml for HNO<sub>3</sub> and 200ml for HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>

## \* Blank Rules:

"&lt;" indicates value is below the minimum detection limit (MDL)

If Blank is a "&lt;" value it is treated as zero.

If Sample is a "&lt;" it used for emission rate calculations but the final answer contains a "&lt;" to demonstrate the value is unknown

Baghouse 1  
12/10-11/2020

Method 29 Metals Blank Calculations

Run: 1

2 of 3

| Species         | X<br>Allowable<br>FH<br>Blank, $\mu g$ | XI<br>FH Blank<br>Corrected<br>$\mu g$ | XII<br>5% of FH<br>Sample, $\mu g$ | XIII<br>Lessor of<br>XI or XII | XIV<br>Greater of<br>A or XIII | XV<br>FH<br>Net<br>Sample, $\mu g$ | Species               |
|-----------------|----------------------------------------|----------------------------------------|------------------------------------|--------------------------------|--------------------------------|------------------------------------|-----------------------|
| Al <sup>†</sup> | 95.700                                 | 95.700                                 | 5.700                              | 5.700                          | 11.63                          | 18.300                             | Aluminum <sup>†</sup> |
| Sb              | 0.000                                  | 0.000 <                                | 0.063                              | 0.000                          | 11.63 <                        | 1.250                              | Antimony              |
| As              | 3.580                                  | 3.580                                  | 0.213                              | 0.213                          | 11.63                          | 0.680                              | Arsenic               |
| Ba              | 1.199                                  | 1.199                                  | 0.116                              | 0.116                          | 11.63                          | 1.121                              | Barium                |
| Be              | 0.000                                  | 0.000 <                                | 0.003                              | 0.000                          | 11.63 <                        | 0.050                              | Beryllium             |
| Cd              | 0.358                                  | 0.358                                  | 0.013                              | 0.013                          | 11.63                          | -0.100                             | Cadmium               |
| Cr              | 0.934                                  | 0.934                                  | 1.180                              | 0.934                          | 11.63                          | 22.666                             | Chromium              |
| Co              | 0.000                                  | 0.000 <                                | 0.006                              | 0.000                          | 11.63 <                        | 0.125                              | Cobalt                |
| Cu              | 0.000                                  | 0.000                                  | 0.250                              | 0.000                          | 11.63                          | 5.000                              | Copper                |
| Pb              | 1.570                                  | 1.570                                  | 0.095                              | 0.095                          | 11.63                          | 0.320                              | Lead                  |
| Mn              | 1.347                                  | 1.347                                  | 9.250                              | 1.347                          | 11.63                          | 183.653                            | Manganese             |
| Ni              | 0.000                                  | 0.000                                  | 0.239                              | 0.000                          | 11.63                          | 4.770                              | Nickel                |
| P               | 11.630                                 | 13.800                                 | 0.705                              | 0.705                          | 11.63                          | 2.470                              | Phosphorus            |
| Se              | 0.000                                  | 0.000 <                                | 0.188                              | 0.000                          | 11.63 <                        | 3.750                              | Selenium              |
| Ag              | 0.000                                  | 0.000 <                                | 0.025                              | 0.000                          | 11.63 <                        | 0.500                              | Silver                |
| Tl              | 0.000                                  | 0.000 <                                | 0.125                              | 0.000                          | 11.63 <                        | 2.500                              | Thallium              |
| V               | 0.000                                  | 0.000                                  | 0.030                              | 0.000                          | 11.63                          | 0.590                              | Vanadium              |
| Zn              | 2.330                                  | 2.330                                  | 0.775                              | 0.775                          | 11.63                          | 13.170                             | Zinc                  |

† The value shown for "allowable FH blank" for aluminum is the actual filter blank mass, not the max allowable blank as calculated by Method 29.

Allowable FH Blank Calculation:

A = (area of filter, sq. in.)\*(1.4  $\mu g/sq.in.$ )=  $\mu g$  A= 11.63  $\mu g$

if A>blank>0, use blank derived

if blank > A, use greater of A or 5% of sample  $\mu g$  or FH blank whichever is lessor.

**\* Blank Rules:**

"<" indicates value is below the minimum detection limit (MDL)

If Blank is a "<" value it is treated as zero.

If Sample is a "<" it used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

Baghouse 1  
12/10-11/2020

Method 29 Metals Blank Calculations

Run: 1

3 of 3

| Species | XVI<br>Allowable<br>BH<br>Blank, $\mu g$ | XVII<br>Blank BH<br>Total | XVIII<br>5% of BH<br>sample, $\mu g$ | XIX<br>Lessor of<br>XVII or XVIII | XX<br>Greater of<br>1 $\mu g$ or XIX | XXI<br>BH<br>Net<br>Sample, $\mu g$ | XXII<br>FH<br>Net<br>Sample, $\mu g$ | XXIII<br>FH+BH<br>Total Net<br>Sample, $\mu g$ | Species    |
|---------|------------------------------------------|---------------------------|--------------------------------------|-----------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|------------------------------------------------|------------|
| Al      | 1.000                                    | 5.088                     | 0.980                                | 0.980                             | 1.000                                | 18.600                              | 18.300                               | 36.900                                         | Aluminum   |
| Sb      | 0.000                                    | 0.000 <                   | 0.025                                | 0.000                             | 1.000 <                              | 0.500 <                             | 1.250 <                              | 1.750                                          | Antimony   |
| As      | 0.000                                    | 0.000 <                   | 0.035                                | 0.000                             | 1.000 <                              | 0.700                               | 0.680 <                              | 1.380                                          | Arsenic    |
| Ba      | 0.751                                    | 0.751                     | 0.242                                | 0.242                             | 1.000                                | 4.079                               | 1.121                                | 5.200                                          | Barium     |
| Be      | 0.000                                    | 0.000 <                   | 0.003                                | 0.000                             | 1.000 <                              | 0.050 <                             | 0.050 <                              | 0.100                                          | Beryllium  |
| Cd      | 0.000                                    | 0.000 <                   | 0.002                                | 0.000                             | 1.000 <                              | 0.040                               | 0.000 <                              | 0.040                                          | Cadmium    |
| Cr      | 0.302                                    | 0.302                     | 0.035                                | 0.035                             | 1.000                                | 0.398                               | 22.666                               | 23.064                                         | Chromium   |
| Co      | 0.000                                    | 0.000 <                   | 0.003                                | 0.000                             | 1.000 <                              | 0.050 <                             | 0.125 <                              | 0.175                                          | Cobalt     |
| Cu      | 1.000                                    | 1.528                     | 0.184                                | 0.184                             | 1.000                                | 2.670                               | 5.000                                | 7.670                                          | Copper     |
| Pb      | 1.000                                    | 2.221                     | 0.036                                | 0.036                             | 1.000                                | 0.000                               | 0.320                                | 0.320                                          | Lead       |
| Mn      | 0.282                                    | 0.282                     | 0.162                                | 0.162                             | 1.000                                | 2.958                               | 183.653                              | 186.611                                        | Manganese  |
| Ni      | 0.000                                    | 0.000                     | 0.025                                | 0.000                             | 1.000                                | 0.503                               | 4.770                                | 5.273                                          | Nickel     |
| P       | 0.000                                    | 0.000                     | 0.222                                | 0.000                             | 1.000                                | 4.430                               | 2.470                                | 6.900                                          | Phosphorus |
| Se      | 0.000                                    | 0.000 <                   | 0.075                                | 0.000                             | 1.000 <                              | 1.500 <                             | 3.750 <                              | 5.250                                          | Selenium   |
| Ag      | 0.000                                    | 0.000 <                   | 0.010                                | 0.000                             | 1.000 <                              | 0.200 <                             | 0.500 <                              | 0.700                                          | Silver     |
| Tl      | 0.000                                    | 0.000 <                   | 0.050                                | 0.000                             | 1.000 <                              | 1.000 <                             | 2.500 <                              | 3.500                                          | Thallium   |
| V       | 0.000                                    | 0.000 <                   | 0.005                                | 0.000                             | 1.000 <                              | 0.100                               | 0.590 <                              | 0.690                                          | Vanadium   |
| Zn      | 0.433                                    | 0.433                     | 0.176                                | 0.176                             | 1.000                                | 3.077                               | 13.170                               | 16.247                                         | Zinc       |

Allowable BH Blank Calculation:

if 1.00 $\mu g$  > blank > 0, use blank derived

if blank > 1.00 $\mu g$ , use greater of 1.00 or 5% of sample ug or BH blank whichever is lessor

**\* Blank Rules:**

"<" indicates value is below the minimum detection limit (MDL)

If Blank is a "<" value it is treated as zero.

If Sample is a "<" it is used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

Columbia Steel Casting  
Baghouse 1  
12/14-15/2020

Method 29 Metals Blank Calculations

Run: 2

1 of 3

|            | I                                 |   | II                   |   | III                  |   | IV                                                                 |   | V                                |   | VI                               |   | VII                  |  | VIII      |            |
|------------|-----------------------------------|---|----------------------|---|----------------------|---|--------------------------------------------------------------------|---|----------------------------------|---|----------------------------------|---|----------------------|--|-----------|------------|
|            | Sample*                           |   | Blank*               |   | Blank*               |   | Sample*                                                            |   | Blank*                           |   | BH Blank*                        |   | BH Blank*            |  | Allowable |            |
|            | FH                                |   | FH                   |   | FH                   |   | BH                                                                 |   | BH                               |   | Corrected                        |   | Corrected            |  | BH        |            |
| Species    | Wash+Filter                       |   | Wash, µg             |   | Filter, µg           |   | Cap.Sol.                                                           |   | Cap.Sol.                         |   | Cap.Sol.                         |   | Wash, µg             |  | Blank, µg | Species    |
| Volume(ml) | 100                               |   | 100                  |   | N/A                  |   | 100                                                                |   | µg/mL                            |   | 200                              |   | 100                  |  |           |            |
| Al         | 105.000                           | < | 3.7500               |   | 95.700               |   | 10.500                                                             |   | 0.0254                           |   | 5.088                            | < | 3.7500               |  | 5.088     | Aluminum   |
| Sb         | < 1.250                           | < | 1.2500               | < | 1.250                |   | 0.507                                                              | < | 0.0020                           | < | 0.400                            | < | 1.2500               |  | 0.000     | Antimony   |
| As         | 5.280                             | < | 1.7500               |   | 3.580                | < | 0.700                                                              | < | 0.0028                           | < | 0.560                            | < | 1.7500               |  | 0.000     | Arsenic    |
| Ba         | 1.570                             |   | 0.2820               |   | 0.917                |   | 0.961                                                              |   | 0.0023                           |   | 0.469                            |   | 0.2820               |  | 0.751     | Barium     |
| Be         | < 0.050                           | < | 0.0500               | < | 0.050                | < | 0.020                                                              | < | 0.0001                           | < | 0.016                            | < | 0.0500               |  | 0.000     | Beryllium  |
| Cd         | 0.110                             | < | 0.1000               |   | 0.358                | < | 0.040                                                              | < | 0.0002                           | < | 0.032                            | < | 0.1000               |  | 0.000     | Cadmium    |
| Cr         | 6.860                             | < | 0.2000               |   | 0.934                |   | 0.592                                                              |   | 0.0015                           |   | 0.302                            | < | 0.2000               |  | 0.302     | Chromium   |
| Co         | < 0.125                           | < | 0.1250               | < | 0.125                | < | 0.050                                                              | < | 0.0002                           | < | 0.040                            | < | 0.1250               |  | 0.000     | Cobalt     |
| Cu         | 3.200                             | < | 1.2500               | < | 1.250                |   | 4.190                                                              |   | 0.0076                           |   | 1.528                            | < | 1.2500               |  | 1.528     | Copper     |
| Pb         | 1.480                             |   | 1.5700               | < | 1.250                |   | 1.070                                                              |   | 0.0033                           |   | 0.651                            |   | 1.5700               |  | 2.221     | Lead       |
| Mn         | 52.200                            |   | 0.0770               |   | 1.270                |   | 3.100                                                              |   | 0.0010                           |   | 0.205                            |   | 0.0770               |  | 0.282     | Manganese  |
| Ni         | 1.630                             | < | 0.7500               | < | 0.750                |   | 0.484                                                              | < | 0.0012                           | < | 0.240                            | < | 0.7500               |  | 0.000     | Nickel     |
| P          | 9.280                             | < | 5.0000               |   | 13.800               | < | 2.000                                                              | < | 0.0080                           | < | 1.600                            | < | 5.0000               |  | 0.000     | Phosphorus |
| Se         | < 3.750                           | < | 3.7500               | < | 3.750                | < | 1.500                                                              | < | 0.0060                           | < | 1.200                            | < | 3.7500               |  | 0.000     | Selenium   |
| Ag         | < 0.500                           | < | 0.5000               | < | 0.500                | < | 0.200                                                              | < | 0.0008                           | < | 0.160                            | < | 0.5000               |  | 0.000     | Silver     |
| Tl         | < 2.500                           | < | 2.5000               | < | 2.500                | < | 1.000                                                              | < | 0.0040                           | < | 0.800                            | < | 2.5000               |  | 0.000     | Thallium   |
| V          | < 0.250                           | < | 0.2500               | < | 0.250                | < | 0.100                                                              | < | 0.0004                           | < | 0.080                            | < | 0.2500               |  | 0.000     | Vanadium   |
| Zn         | 6.560                             | < | 0.7500               |   | 2.330                |   | 13.400                                                             |   | 0.0022                           |   | 0.433                            | < | 0.7500               |  | 0.433     | Zinc       |
| Lab:       | 20-S2350                          |   | 20-S2356             |   | 20-S2357             |   | 20-S2351                                                           |   | 20-S2358                         |   |                                  |   |                      |  |           |            |
| Content:   | 0.1NHNO <sub>3</sub>              |   | 0.1NHNO <sub>3</sub> |   | 0.1NHNO <sub>3</sub> |   | 5%HNO <sub>3</sub> /                                               |   | 5%HNO <sub>3</sub> /             |   | 5%HNO <sub>3</sub> /             |   | 0.1NHNO <sub>3</sub> |  |           |            |
|            | FH Filter & Probe Rinse           |   |                      |   |                      |   | 10%H <sub>2</sub> O <sub>2</sub>                                   |   | 10%H <sub>2</sub> O <sub>2</sub> |   | 10%H <sub>2</sub> O <sub>2</sub> |   |                      |  |           |            |
|            | 100ml 0.1N HNO <sub>3</sub> rinse |   |                      |   |                      |   | BH Imps 1&2                                                        |   |                                  |   |                                  |   |                      |  |           |            |
|            |                                   |   | Same as BH           |   |                      |   | 100ml .1N HNO <sub>3</sub> rinse                                   |   |                                  |   |                                  |   | Same as FH           |  |           |            |
|            |                                   |   | Blank Wash           |   |                      |   | 200ml 5%HNO <sub>3</sub> /10%H <sub>2</sub> O <sub>2</sub> reagent |   |                                  |   |                                  |   | Blank Wash           |  |           |            |

Blanks are prorated to reflect 100ml for HNO<sub>3</sub> and 200ml for HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>

\* Blank Rules:

"<" indicates value is below the minimum detection limit (MDL)

If Blank is a "<" value it is treated as zero.

If Sample is a "<" it used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

Baghouse 1  
12/14-15/2020

Method 29 Metals Blank Calculations

Run: 2

2 of 3

| Species         | X<br>Allowable<br>FH<br>Blank, $\mu g$ | XI<br>FH Blank<br>Corrected<br>$\mu g$ | XII<br>5% of FH<br>Sample, $\mu g$ | XIII<br>Lessor of<br>XI or XII | XIV<br>Greater of<br>A or XIII | XV<br>FH<br>Net<br>Sample, $\mu g$ | Species               |
|-----------------|----------------------------------------|----------------------------------------|------------------------------------|--------------------------------|--------------------------------|------------------------------------|-----------------------|
| Al <sup>†</sup> | 95.700                                 | 95.700                                 | 5.250                              | 5.250                          | 11.63                          | 9.300                              | Aluminum <sup>†</sup> |
| Sb              | 0.000                                  | 0.000 <                                | 0.063                              | 0.000                          | 11.63 <                        | 1.250                              | Antimony              |
| As              | 3.580                                  | 3.580                                  | 0.264                              | 0.264                          | 11.63                          | 1.700                              | Arsenic               |
| Ba              | 1.199                                  | 1.199                                  | 0.079                              | 0.079                          | 11.63                          | 0.371                              | Barium                |
| Be              | 0.000                                  | 0.000 <                                | 0.003                              | 0.000                          | 11.63 <                        | 0.050                              | Beryllium             |
| Cd              | 0.358                                  | 0.358                                  | 0.006                              | 0.006                          | 11.63                          | -0.248                             | Cadmium               |
| Cr              | 0.934                                  | 0.934                                  | 0.343                              | 0.343                          | 11.63                          | 5.926                              | Chromium              |
| Co              | 0.000                                  | 0.000 <                                | 0.006                              | 0.000                          | 11.63 <                        | 0.125                              | Cobalt                |
| Cu              | 0.000                                  | 0.000                                  | 0.160                              | 0.000                          | 11.63                          | 3.200                              | Copper                |
| Pb              | 1.570                                  | 1.570                                  | 0.074                              | 0.074                          | 11.63                          | -0.090                             | Lead                  |
| Mn              | 1.347                                  | 1.347                                  | 2.610                              | 1.347                          | 11.63                          | 50.853                             | Manganese             |
| Ni              | 0.000                                  | 0.000                                  | 0.082                              | 0.000                          | 11.63                          | 1.630                              | Nickel                |
| P               | 11.630                                 | 13.800                                 | 0.464                              | 0.464                          | 11.63                          | -2.350                             | Phosphorus            |
| Se              | 0.000                                  | 0.000 <                                | 0.188                              | 0.000                          | 11.63 <                        | 3.750                              | Selenium              |
| Ag              | 0.000                                  | 0.000 <                                | 0.025                              | 0.000                          | 11.63 <                        | 0.500                              | Silver                |
| Tl              | 0.000                                  | 0.000 <                                | 0.125                              | 0.000                          | 11.63 <                        | 2.500                              | Thallium              |
| V               | 0.000                                  | 0.000 <                                | 0.013                              | 0.000                          | 11.63 <                        | 0.250                              | Vanadium              |
| Zn              | 2.330                                  | 2.330                                  | 0.328                              | 0.328                          | 11.63                          | 4.230                              | Zinc                  |

† The value shown for "allowable FH blank" for aluminum is the actual filter blank mass, not the max allowable blank as calculated by Method 29.

Allowable FH Blank Calculation:

$$A = (\text{area of filter, sq. in.}) \times (1.4 \mu g/\text{sq. in.}) = \mu g \quad A = 11.63 \mu g$$

if  $A > \text{blank} > 0$ , use blank derived

if blank > A, use greater of A or 5% of sample  $\mu g$  or FH blank whichever is lessor.

**\* Blank Rules:**

"<" indicates value is below the minimum detection limit (MDL)

If Blank is a "<" value it is treated as zero.

If Sample is a "<" it used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

Baghouse 1  
12/14-15/2020

Method 29 Metals Blank Calculations

Run: 2

3 of 3

| Species | XVI<br>Allowable<br>BH<br>Blank, $\mu g$ | XVII<br>Blank BH<br>Total | XVIII<br>5% of BH<br>sample, $\mu g$ | XIX<br>Lessor of<br>XVII or XVIII | XX<br>Greater of<br>1 $\mu g$ or XIX | XXI<br>BH<br>Net<br>Sample, $\mu g$ | XXII<br>FH<br>Net<br>Sample, $\mu g$ | XXIII<br>FH+BH<br>Total Net<br>Sample, $\mu g$ | Species    |
|---------|------------------------------------------|---------------------------|--------------------------------------|-----------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|------------------------------------------------|------------|
| Al      | 1.000                                    | 5.088                     | 0.525                                | 0.525                             | 1.000                                | 9.500                               | 9.300                                | 18.800                                         | Aluminum   |
| Sb      | 0.000                                    | 0.000                     | 0.025                                | 0.000                             | 1.000                                | 0.507 <                             | 1.250 <                              | 1.757                                          | Antimony   |
| As      | 0.000                                    | 0.000 <                   | 0.035                                | 0.000                             | 1.000 <                              | 0.700                               | 1.700 <                              | 2.400                                          | Arsenic    |
| Ba      | 0.751                                    | 0.751                     | 0.048                                | 0.048                             | 1.000                                | 0.210                               | 0.371                                | 0.581                                          | Barium     |
| Be      | 0.000                                    | 0.000 <                   | 0.001                                | 0.000                             | 1.000 <                              | 0.020 <                             | 0.050 <                              | 0.070                                          | Beryllium  |
| Cd      | 0.000                                    | 0.000 <                   | 0.002                                | 0.000                             | 1.000 <                              | 0.040                               | 0.000 <                              | 0.040                                          | Cadmium    |
| Cr      | 0.302                                    | 0.302                     | 0.030                                | 0.030                             | 1.000                                | 0.290                               | 5.926                                | 6.216                                          | Chromium   |
| Co      | 0.000                                    | 0.000 <                   | 0.003                                | 0.000                             | 1.000 <                              | 0.050 <                             | 0.125 <                              | 0.175                                          | Cobalt     |
| Cu      | 1.000                                    | 1.528                     | 0.210                                | 0.210                             | 1.000                                | 3.190                               | 3.200                                | 6.390                                          | Copper     |
| Pb      | 1.000                                    | 2.221                     | 0.054                                | 0.054                             | 1.000                                | 0.070                               | 0.000                                | 0.070                                          | Lead       |
| Mn      | 0.282                                    | 0.282                     | 0.155                                | 0.155                             | 1.000                                | 2.818                               | 50.853                               | 53.671                                         | Manganese  |
| Ni      | 0.000                                    | 0.000                     | 0.024                                | 0.000                             | 1.000                                | 0.484                               | 1.630                                | 2.114                                          | Nickel     |
| P       | 0.000                                    | 0.000 <                   | 0.100                                | 0.000                             | 1.000 <                              | 2.000                               | 0.000 <                              | 2.000                                          | Phosphorus |
| Se      | 0.000                                    | 0.000 <                   | 0.075                                | 0.000                             | 1.000 <                              | 1.500 <                             | 3.750 <                              | 5.250                                          | Selenium   |
| Ag      | 0.000                                    | 0.000 <                   | 0.010                                | 0.000                             | 1.000 <                              | 0.200 <                             | 0.500 <                              | 0.700                                          | Silver     |
| Tl      | 0.000                                    | 0.000 <                   | 0.050                                | 0.000                             | 1.000 <                              | 1.000 <                             | 2.500 <                              | 3.500                                          | Thallium   |
| V       | 0.000                                    | 0.000 <                   | 0.005                                | 0.000                             | 1.000 <                              | 0.100 <                             | 0.250 <                              | 0.350                                          | Vanadium   |
| Zn      | 0.433                                    | 0.433                     | 0.670                                | 0.433                             | 1.000                                | 12.967                              | 4.230                                | 17.197                                         | Zinc       |

Allowable BH Blank Calculation:

if 1.00 $\mu g$  > blank > 0, use blank derived

if blank > 1.00 $\mu g$ , use greater of 1.00 or 5% of sample ug or BH blank whichever is lessor

**\* Blank Rules:**

"<" indicates value is below the minimum detection limit (MDL)

If Blank is a "<" value it is treated as zero.

If Sample is a "<" it used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

Columbia Steel Casting  
Baghouse 1  
12/15-16/2020

Method 29 Metals Blank Calculations

Run: 3

1 of 3

| Species<br>Volume(ml) | I<br>Sample*<br>FH                |   | II<br>Blank*<br>FH   |   | III<br>Blank*<br>FH  |   | IV<br>Sample*<br>BH                                                |   | V<br>Blank*<br>BH                |   | VI<br>BH Blank*<br>Corrected     |   | VII<br>BH Blank*<br>Corrected |   | VIII<br>Allowable<br>BH |   | Species    |
|-----------------------|-----------------------------------|---|----------------------|---|----------------------|---|--------------------------------------------------------------------|---|----------------------------------|---|----------------------------------|---|-------------------------------|---|-------------------------|---|------------|
|                       | Wash+Filter<br>100                | < | Wash, µg<br>100      | < | Filter, µg<br>N/A    | < | Cap.Sol.<br>100                                                    | < | Cap.Sol.<br>µg/mL                | < | Cap.Sol.<br>200                  | < | Wash, µg<br>100               | < | Blank, µg               | < |            |
| Al                    | 117.000                           | < | 3.7500               | < | 95.700               | < | 18.400                                                             | < | 0.0254                           | < | 5.088                            | < | 3.7500                        | < | 5.088                   | < | Aluminum   |
| Sb                    | 1.250                             | < | 1.2500               | < | 1.250                | < | 0.500                                                              | < | 0.0020                           | < | 0.400                            | < | 1.2500                        | < | 0.000                   | < | Antimony   |
| As                    | 4.140                             | < | 1.7500               | < | 3.580                | < | 0.700                                                              | < | 0.0028                           | < | 0.560                            | < | 1.7500                        | < | 0.000                   | < | Arsenic    |
| Ba                    | 2.300                             | < | 0.2820               | < | 0.917                | < | 0.927                                                              | < | 0.0023                           | < | 0.469                            | < | 0.2820                        | < | 0.751                   | < | Barium     |
| Be                    | 0.056                             | < | 0.0500               | < | 0.050                | < | 0.020                                                              | < | 0.0001                           | < | 0.016                            | < | 0.0500                        | < | 0.000                   | < | Beryllium  |
| Cd                    | 0.233                             | < | 0.1000               | < | 0.358                | < | 0.040                                                              | < | 0.0002                           | < | 0.032                            | < | 0.1000                        | < | 0.000                   | < | Cadmium    |
| Cr                    | 40.200                            | < | 0.2000               | < | 0.934                | < | 0.527                                                              | < | 0.0015                           | < | 0.302                            | < | 0.2000                        | < | 0.302                   | < | Chromium   |
| Co                    | 0.125                             | < | 0.1250               | < | 0.125                | < | 0.103                                                              | < | 0.0002                           | < | 0.040                            | < | 0.1250                        | < | 0.000                   | < | Cobalt     |
| Cu                    | 6.280                             | < | 1.2500               | < | 1.250                | < | 2.450                                                              | < | 0.0076                           | < | 1.528                            | < | 1.2500                        | < | 1.528                   | < | Copper     |
| Pb                    | 2.510                             | < | 1.5700               | < | 1.250                | < | 0.746                                                              | < | 0.0033                           | < | 0.651                            | < | 1.5700                        | < | 2.221                   | < | Lead       |
| Mn                    | 341.000                           | < | 0.0770               | < | 1.270                | < | 2.850                                                              | < | 0.0010                           | < | 0.205                            | < | 0.0770                        | < | 0.282                   | < | Manganese  |
| Ni                    | 7.210                             | < | 0.7500               | < | 0.750                | < | 0.420                                                              | < | 0.0012                           | < | 0.240                            | < | 0.7500                        | < | 0.000                   | < | Nickel     |
| P                     | 20.700                            | < | 5.0000               | < | 13.800               | < | 2.000                                                              | < | 0.0080                           | < | 1.600                            | < | 5.0000                        | < | 0.000                   | < | Phosphorus |
| Se                    | 3.750                             | < | 3.7500               | < | 3.750                | < | 1.500                                                              | < | 0.0060                           | < | 1.200                            | < | 3.7500                        | < | 0.000                   | < | Selenium   |
| Ag                    | 0.500                             | < | 0.5000               | < | 0.500                | < | 0.200                                                              | < | 0.0008                           | < | 0.160                            | < | 0.5000                        | < | 0.000                   | < | Silver     |
| Tl                    | 2.500                             | < | 2.5000               | < | 2.500                | < | 1.000                                                              | < | 0.0040                           | < | 0.800                            | < | 2.5000                        | < | 0.000                   | < | Thallium   |
| V                     | 0.715                             | < | 0.2500               | < | 0.250                | < | 0.100                                                              | < | 0.0004                           | < | 0.080                            | < | 0.2500                        | < | 0.000                   | < | Vanadium   |
| Zn                    | 25.900                            | < | 0.7500               | < | 2.330                | < | 7.180                                                              | < | 0.0022                           | < | 0.433                            | < | 0.7500                        | < | 0.433                   | < | Zinc       |
| Lab:                  | 20-S2352                          |   | 20-S2356             |   | 20-S2357             |   | 20-S2353                                                           |   | 20-S2358                         |   |                                  |   |                               |   |                         |   |            |
| Content:              | 0.1NHNO <sub>3</sub>              |   | 0.1NHNO <sub>3</sub> |   | 0.1NHNO <sub>3</sub> |   | 5%HNO <sub>3</sub> /                                               |   | 5%HNO <sub>3</sub> /             |   | 5%HNO <sub>3</sub> /             |   | 0.1NHNO <sub>3</sub>          |   |                         |   |            |
|                       | FH Filter & Probe Rinse           |   |                      |   |                      |   | 10%H <sub>2</sub> O <sub>2</sub>                                   |   | 10%H <sub>2</sub> O <sub>2</sub> |   | 10%H <sub>2</sub> O <sub>2</sub> |   |                               |   |                         |   |            |
|                       | 100ml 0.1N HNO <sub>3</sub> rinse |   |                      |   |                      |   | BH Imps 1&2                                                        |   |                                  |   |                                  |   |                               |   |                         |   |            |
|                       |                                   |   | Same as BH           |   |                      |   | 100ml .1N HNO <sub>3</sub> rinse                                   |   |                                  |   |                                  |   | Same as FH                    |   |                         |   |            |
|                       |                                   |   | Blank Wash           |   |                      |   | 200ml 5%HNO <sub>3</sub> /10%H <sub>2</sub> O <sub>2</sub> reagent |   |                                  |   |                                  |   | Blank Wash                    |   |                         |   |            |

Blanks are prorated to reflect 100ml for HNO<sub>3</sub> and 200ml for HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>

\* Blank Rules:

"<" indicates value is below the minimum detection limit (MDL)

If Blank is a "<" value it is treated as zero.

If Sample is a "<" it used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

| Species         | X<br>Allowable<br>FH<br>Blank, $\mu g$ | XI<br>FH Blank<br>Corrected<br>$\mu g$ | XII<br>5% of FH<br>Sample, $\mu g$ | XIII<br>Lessor of<br>XI or XII | XIV<br>Greater of<br>A or XIII | XV<br>FH<br>Net<br>Sample, $\mu g$ | Species               |
|-----------------|----------------------------------------|----------------------------------------|------------------------------------|--------------------------------|--------------------------------|------------------------------------|-----------------------|
| Al <sup>†</sup> | 95.700                                 | 95.700                                 | 5.850                              | 5.850                          | 11.63                          | 21.300                             | Aluminum <sup>†</sup> |
| Sb              | 0.000                                  | 0.000 <                                | 0.063                              | 0.000                          | 11.63 <                        | 1.250                              | Antimony              |
| As              | 3.580                                  | 3.580                                  | 0.207                              | 0.207                          | 11.63                          | 0.560                              | Arsenic               |
| Ba              | 1.199                                  | 1.199                                  | 0.115                              | 0.115                          | 11.63                          | 1.101                              | Barium                |
| Be              | 0.000                                  | 0.000                                  | 0.003                              | 0.000                          | 11.63                          | 0.056                              | Beryllium             |
| Cd              | 0.358                                  | 0.358                                  | 0.012                              | 0.012                          | 11.63                          | -0.125                             | Cadmium               |
| Cr              | 0.934                                  | 0.934                                  | 2.010                              | 0.934                          | 11.63                          | 39.266                             | Chromium              |
| Co              | 0.000                                  | 0.000 <                                | 0.006                              | 0.000                          | 11.63 <                        | 0.125                              | Cobalt                |
| Cu              | 0.000                                  | 0.000                                  | 0.314                              | 0.000                          | 11.63                          | 6.280                              | Copper                |
| Pb              | 1.570                                  | 1.570                                  | 0.126                              | 0.126                          | 11.63                          | 0.940                              | Lead                  |
| Mn              | 1.347                                  | 1.347                                  | 17.050                             | 1.347                          | 11.63                          | 339.653                            | Manganese             |
| Ni              | 0.000                                  | 0.000                                  | 0.361                              | 0.000                          | 11.63                          | 7.210                              | Nickel                |
| P               | 11.630                                 | 13.800                                 | 1.035                              | 1.035                          | 11.63                          | 9.070                              | Phosphorus            |
| Se              | 0.000                                  | 0.000 <                                | 0.188                              | 0.000                          | 11.63 <                        | 3.750                              | Selenium              |
| Ag              | 0.000                                  | 0.000 <                                | 0.025                              | 0.000                          | 11.63 <                        | 0.500                              | Silver                |
| Tl              | 0.000                                  | 0.000 <                                | 0.125                              | 0.000                          | 11.63 <                        | 2.500                              | Thallium              |
| V               | 0.000                                  | 0.000                                  | 0.036                              | 0.000                          | 11.63                          | 0.715                              | Vanadium              |
| Zn              | 2.330                                  | 2.330                                  | 1.295                              | 1.295                          | 11.63                          | 23.570                             | Zinc                  |

† The value shown for "allowable FH blank" for aluminum is the actual filter blank mass, not the max allowable blank as calculated by Method 29.

Allowable FH Blank Calculation:

$$A = (\text{area of filter, sq. in.}) \times (1.4 \mu g/\text{sq.in.}) = \mu g \quad A = 11.63 \mu g$$

if  $A > \text{blank} > 0$ , use blank derived

if blank > A, use greater of A or 5% of sample  $\mu g$  or FH blank whichever is lessor.

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Baghouse 1  
12/15-16/2020

Method 29 Metals Blank Calculations

Run: 3

3 of 3

| Species | XVI<br>Allowable<br>BH<br>Blank, $\mu g$ | XVII<br>Blank BH<br>Total | XVIII<br>5% of BH<br>sample, $\mu g$ | XIX<br>Lessor of<br>XVII or XVIII | XX<br>Greater of<br>1 $\mu g$ or XIX | XXI<br>BH<br>Net<br>Sample, $\mu g$ | XXII<br>FH<br>Net<br>Sample, $\mu g$ | XXIII<br>FH+BH<br>Total Net<br>Sample, $\mu g$ | Species    |
|---------|------------------------------------------|---------------------------|--------------------------------------|-----------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|------------------------------------------------|------------|
| Al      | 1.000                                    | 5.088                     | 0.920                                | 0.920                             | 1.000                                | 17.400                              | 21.300                               | 38.700                                         | Aluminum   |
| Sb      | 0.000                                    | 0.000 <                   | 0.025                                | 0.000                             | 1.000 <                              | 0.500 <                             | 1.250 <                              | 1.750                                          | Antimony   |
| As      | 0.000                                    | 0.000 <                   | 0.035                                | 0.000                             | 1.000 <                              | 0.700                               | 0.560 <                              | 1.260                                          | Arsenic    |
| Ba      | 0.751                                    | 0.751                     | 0.046                                | 0.046                             | 1.000                                | 0.176                               | 1.101                                | 1.277                                          | Barium     |
| Be      | 0.000                                    | 0.000 <                   | 0.001                                | 0.000                             | 1.000 <                              | 0.020                               | 0.056 <                              | 0.076                                          | Beryllium  |
| Cd      | 0.000                                    | 0.000 <                   | 0.002                                | 0.000                             | 1.000 <                              | 0.040                               | 0.000 <                              | 0.040                                          | Cadmium    |
| Cr      | 0.302                                    | 0.302                     | 0.026                                | 0.026                             | 1.000                                | 0.225                               | 39.266                               | 39.491                                         | Chromium   |
| Co      | 0.000                                    | 0.000                     | 0.005                                | 0.000                             | 1.000                                | 0.103 <                             | 0.125 <                              | 0.228                                          | Cobalt     |
| Cu      | 1.000                                    | 1.528                     | 0.123                                | 0.123                             | 1.000                                | 1.450                               | 6.280                                | 7.730                                          | Copper     |
| Pb      | 1.000                                    | 2.221                     | 0.037                                | 0.037                             | 1.000                                | 0.000                               | 0.940                                | 0.940                                          | Lead       |
| Mn      | 0.282                                    | 0.282                     | 0.143                                | 0.143                             | 1.000                                | 2.568                               | 339.653                              | 342.221                                        | Manganese  |
| Ni      | 0.000                                    | 0.000                     | 0.021                                | 0.000                             | 1.000                                | 0.420                               | 7.210                                | 7.630                                          | Nickel     |
| P       | 0.000                                    | 0.000 <                   | 0.100                                | 0.000                             | 1.000 <                              | 2.000                               | 9.070 <                              | 11.070                                         | Phosphorus |
| Se      | 0.000                                    | 0.000 <                   | 0.075                                | 0.000                             | 1.000 <                              | 1.500 <                             | 3.750 <                              | 5.250                                          | Selenium   |
| Ag      | 0.000                                    | 0.000 <                   | 0.010                                | 0.000                             | 1.000 <                              | 0.200 <                             | 0.500 <                              | 0.700                                          | Silver     |
| Tl      | 0.000                                    | 0.000 <                   | 0.050                                | 0.000                             | 1.000 <                              | 1.000 <                             | 2.500 <                              | 3.500                                          | Thallium   |
| V       | 0.000                                    | 0.000 <                   | 0.005                                | 0.000                             | 1.000 <                              | 0.100                               | 0.715 <                              | 0.815                                          | Vanadium   |
| Zn      | 0.433                                    | 0.433                     | 0.359                                | 0.359                             | 1.000                                | 6.747                               | 23.570                               | 30.317                                         | Zinc       |

Allowable BH Blank Calculation:

if 1.00 $\mu g$  > blank > 0, use blank derived

if blank > 1.00 $\mu g$ , use greater of 1.00 or 5% of sample ug or BH blank whichever is lessor

**\* Blank Rules:**

"<" indicates value is below the minimum detection limit (MDL)

If Blank is a "<" value it is treated as zero.

If Sample is a "<" it used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

**EPA Method 29**  
**Gas Stream Characteristics**  
**Test Summary**

**Client:** Columbia Steel Casting  
**Source:** Baghouse 1  
**Location:** Portland, OR

| Run                              | 1                      | 2          | 3          |                 |
|----------------------------------|------------------------|------------|------------|-----------------|
| Run Start Date                   | 12/10/2020             | 12/14/2020 | 12/15/2020 |                 |
| Run Start Time                   | 21:25                  | 22:15      | 21:20      |                 |
| Run End Date                     | 12/11/2020             | 12/15/2020 | 12/16/2020 |                 |
| Run End Time                     | 6:00                   | 3:55       | 3:11       |                 |
| Duration, min.                   | 480                    | 309        | 304        | <b>Average</b>  |
| Barometric Pressure, "Hg         | 30.09                  | 30.24      | 30.20      | <b>30.18</b>    |
| Nozzle Dia., in.                 | 0.2203                 | 0.2203     | 0.2203     | <b>0.2203</b>   |
| Isokinetic Average, %            | 99.9                   | 100.3      | 100.5      | <b>100.2</b>    |
| Sample Volume, dscf              | 437.226                | 298.071    | 299.241    | <b>344.846</b>  |
| Sample Volume, dscm              | 12.381                 | 8.440      | 8.474      | <b>9.765</b>    |
| Stack Diameter, in.              | 46.00                  | 46.00      | 46.00      | <b>46.00</b>    |
| Stack Area, sq.ft.               | 11.541                 | 11.541     | 11.541     | <b>11.541</b>   |
| CO <sub>2</sub> %vd              | 0.00                   | 0.03       | 0.00       | <b>0.01</b>     |
| O <sub>2</sub> %vd               | 21.02                  | 21.00      | 21.06      | <b>21.03</b>    |
| Static Press., "H <sub>2</sub> O | 0.05                   | 0.05       | 0.05       | <b>0.05</b>     |
| H <sub>2</sub> O %v              | 0.87                   | 1.02       | 1.05       | <b>0.98</b>     |
| Wet Molecular Weight, lb/lb-mole | 28.75                  | 28.73      | 28.73      | <b>28.74</b>    |
| Velocity, FPS                    | 58.14                  | 60.72      | 63.66      | <b>60.84</b>    |
| ADCFM                            | 39,909.3               | 41,617.3   | 43,619.1   | <b>41,715.2</b> |
| ACFM                             | 40,259.6               | 42,046.2   | 44,082.0   | <b>42,129.3</b> |
| DSCFM                            | 39,727.6               | 41,869.7   | 42,706.7   | <b>41,434.7</b> |
| Stack Temperature, °F            | 73.5                   | 70.5       | 84.4       | <b>76.1</b>     |
| Production Data                  | Tons steel melted/hour | 1.77       | 2.03       | 2.12            |
|                                  |                        |            |            | <b>2.0</b>      |

Columbia Steel Casting  
Baghouse 1  
Metals Results Summary

Test: M29

| Run 1      |         |         |            |                     |         |         |            |                     |         |         |            |                     |    |
|------------|---------|---------|------------|---------------------|---------|---------|------------|---------------------|---------|---------|------------|---------------------|----|
| Total      |         |         |            |                     | FH Net  |         |            |                     | BH Net  |         |            |                     |    |
| Species    | µg      | µg/dscm | lb/hr      | lb/ton steel melted | µg      | µg/dscm | lb/hr      | lb/ton steel melted | µg      | µg/dscm | lb/hr      | lb/ton steel melted |    |
| Aluminum   | 36.900  | 2.980   | 4.43E-04   | 2.51E-04            | 18.300  | 1.478   | 2.20E-04   | 1.24E-04            | 18.600  | 1.502   | 2.24E-04   | 1.26E-04            | Al |
| Antimony   | < 1.750 | < 0.141 | < 2.10E-05 | < 1.19E-05          | < 1.250 | < 0.101 | < 1.50E-05 | < 8.49E-06          | < 0.500 | < 0.040 | < 6.01E-06 | < 3.39E-06          | Sb |
| Arsenic    | < 1.380 | < 0.111 | < 1.66E-05 | < 9.37E-06          | 0.680   | 0.055   | 8.17E-06   | 4.62E-06            | < 0.700 | < 0.057 | < 8.41E-06 | < 4.75E-06          | As |
| Barium     | 5.200   | 0.420   | 6.25E-05   | 3.53E-05            | 1.121   | 0.091   | 1.35E-05   | 7.61E-06            | 4.079   | 0.329   | 4.90E-05   | 2.77E-05            | Ba |
| Beryllium  | < 0.100 | < 0.008 | < 1.20E-06 | < 6.79E-07          | < 0.050 | < 0.004 | < 6.01E-07 | < 3.40E-07          | < 0.050 | < 0.004 | < 6.01E-07 | < 3.40E-07          | Be |
| Cadmium    | < 0.040 | < 0.003 | < 4.81E-07 | < 2.72E-07          | 0.000   | 0.000   | 0.00E+00   | 0.00E+00            | < 0.040 | < 0.003 | < 4.81E-07 | < 2.72E-07          | Cd |
| Chromium   | 23.064  | 1.863   | 2.77E-04   | 1.57E-04            | 22.666  | 1.831   | 2.72E-04   | 1.54E-04            | 0.398   | 0.032   | 4.78E-06   | 2.70E-06            | Cr |
| Cobalt     | < 0.175 | < 0.014 | < 2.10E-06 | < 1.19E-06          | < 0.125 | < 0.010 | < 1.50E-06 | < 8.49E-07          | < 0.050 | < 0.004 | < 6.01E-07 | < 3.40E-07          | Co |
| Copper     | 7.670   | 0.619   | 9.22E-05   | 5.21E-05            | 5.000   | 0.404   | 6.01E-05   | 3.40E-05            | 2.670   | 0.216   | 3.21E-05   | 1.81E-05            | Cu |
| Lead       | 0.320   | 0.026   | 3.85E-06   | 2.17E-06            | 0.320   | 0.026   | 3.85E-06   | 2.17E-06            | 0.000   | 0.000   | 0.00E+00   | 0.00E+00            | Pb |
| Manganese  | 186.611 | 15.072  | 2.24E-03   | 1.27E-03            | 183.653 | 14.833  | 2.21E-03   | 1.25E-03            | 2.958   | 0.239   | 3.56E-05   | 2.01E-05            | Mn |
| Nickel     | 5.273   | 0.426   | 6.34E-05   | 3.58E-05            | 4.770   | 0.385   | 5.73E-05   | 3.24E-05            | 0.503   | 0.041   | 6.05E-06   | 3.42E-06            | Ni |
| Phosphorus | 6.900   | 0.557   | 8.29E-05   | 4.69E-05            | 2.470   | 0.199   | 2.97E-05   | 1.68E-05            | 4.430   | 0.358   | 5.32E-05   | 3.01E-05            | P  |
| Selenium   | < 5.250 | < 0.424 | < 6.31E-05 | < 3.56E-05          | < 3.750 | < 0.303 | < 4.51E-05 | < 2.55E-05          | < 1.500 | < 0.121 | < 1.80E-05 | < 1.02E-05          | Se |
| Silver     | < 0.700 | < 0.057 | < 8.41E-06 | < 4.75E-06          | < 0.500 | < 0.040 | < 6.01E-06 | < 3.39E-06          | < 0.200 | < 0.016 | < 2.40E-06 | < 1.36E-06          | Ag |
| Thallium   | < 3.500 | < 0.283 | < 4.21E-05 | < 2.38E-05          | < 2.500 | < 0.202 | < 3.00E-05 | < 1.70E-05          | < 1.000 | < 0.081 | < 1.20E-05 | < 6.79E-06          | Tl |
| Vanadium   | < 0.690 | < 0.056 | < 8.29E-06 | < 4.69E-06          | 0.590   | 0.048   | 7.09E-06   | 4.01E-06            | < 0.100 | < 0.008 | < 1.20E-06 | < 6.79E-07          | V  |
| Zinc       | 16.247  | 1.312   | 1.95E-04   | 1.10E-04            | 13.170  | 1.064   | 1.58E-04   | 8.94E-05            | 3.077   | 0.249   | 3.70E-05   | 2.09E-05            | Zn |
| TSM        |         |         | < 3.63E-03 | < 2.05E-03          |         |         |            |                     |         |         |            |                     |    |

| Run 2      |         |         |            |                     |         |         |            |                     |         |         |            |                     |    |
|------------|---------|---------|------------|---------------------|---------|---------|------------|---------------------|---------|---------|------------|---------------------|----|
| Total      |         |         |            |                     | FH Net  |         |            |                     | BH Net  |         |            |                     |    |
| Species    | µg      | µg/dscm | lb/hr      | lb/ton steel melted | µg      | µg/dscm | lb/hr      | lb/ton steel melted | µg      | µg/dscm | lb/hr      | lb/ton steel melted |    |
| Aluminum   | 18.800  | 2.227   | 3.49E-04   | 1.72E-04            | 9.300   | 1.102   | 1.73E-04   | 8.51E-05            | 9.500   | 1.126   | 1.77E-04   | 8.70E-05            | Al |
| Antimony   | < 1.757 | < 0.208 | < 3.26E-05 | < 1.61E-05          | < 1.250 | < 0.148 | < 2.32E-05 | < 1.14E-05          | 0.507   | 0.060   | 9.42E-06   | 4.64E-06            | Sb |
| Arsenic    | < 2.400 | < 0.284 | < 4.46E-05 | < 2.20E-05          | 1.700   | 0.201   | 3.16E-05   | 1.56E-05            | < 0.700 | < 0.083 | < 1.30E-05 | < 6.41E-06          | As |
| Barium     | 0.581   | 0.069   | 1.08E-05   | 5.32E-06            | 0.371   | 0.044   | 6.89E-06   | 3.40E-06            | 0.210   | 0.025   | 3.90E-06   | 1.92E-06            | Ba |
| Beryllium  | < 0.070 | < 0.008 | < 1.30E-06 | < 6.41E-07          | < 0.050 | < 0.006 | < 9.29E-07 | < 4.58E-07          | < 0.020 | < 0.002 | < 3.72E-07 | < 1.83E-07          | Be |
| Cadmium    | < 0.040 | < 0.005 | < 7.43E-07 | < 3.66E-07          | 0.000   | 0.000   | 0.00E+00   | 0.00E+00            | < 0.040 | < 0.005 | < 7.43E-07 | < 3.66E-07          | Cd |
| Chromium   | 6.216   | 0.736   | 1.16E-04   | 5.69E-05            | 5.926   | 0.702   | 1.10E-04   | 5.42E-05            | 0.290   | 0.034   | 5.39E-06   | 2.65E-06            | Cr |
| Cobalt     | < 0.175 | < 0.021 | < 3.25E-06 | < 1.60E-06          | < 0.125 | < 0.015 | < 2.32E-06 | < 1.14E-06          | < 0.050 | < 0.006 | < 9.29E-07 | < 4.58E-07          | Co |
| Copper     | 6.390   | 0.757   | 1.19E-04   | 5.85E-05            | 3.200   | 0.379   | 5.95E-05   | 2.93E-05            | 3.190   | 0.378   | 5.93E-05   | 2.92E-05            | Cu |
| Lead       | 0.070   | 0.008   | 1.30E-06   | 6.41E-07            | 0.000   | 0.000   | 0.00E+00   | 0.00E+00            | 0.070   | 0.008   | 1.30E-06   | 6.41E-07            | Pb |
| Manganese  | 53.671  | 6.359   | 9.97E-04   | 4.91E-04            | 50.853  | 6.025   | 9.45E-04   | 4.65E-04            | 2.818   | 0.334   | 5.24E-05   | 2.58E-05            | Mn |
| Nickel     | 2.114   | 0.250   | 3.93E-05   | 1.94E-05            | 1.630   | 0.193   | 3.03E-05   | 1.49E-05            | 0.484   | 0.057   | 8.99E-06   | 4.43E-06            | Ni |
| Phosphorus | < 2.000 | < 0.237 | < 3.72E-05 | < 1.83E-05          | 0.000   | 0.000   | 0.00E+00   | 0.00E+00            | < 2.000 | < 0.237 | < 3.72E-05 | 1.83E-05            | P  |
| Selenium   | < 5.250 | < 0.622 | < 9.76E-05 | < 4.81E-05          | < 3.750 | < 0.444 | < 6.97E-05 | < 3.43E-05          | < 1.500 | < 0.178 | < 2.79E-05 | 1.37E-05            | Se |
| Silver     | < 0.700 | < 0.083 | < 1.30E-05 | < 6.41E-06          | < 0.500 | < 0.059 | < 9.29E-06 | < 4.58E-06          | < 0.200 | < 0.024 | < 3.72E-06 | 1.83E-06            | Ag |
| Thallium   | < 3.500 | < 0.415 | < 6.50E-05 | < 3.20E-05          | < 2.500 | < 0.296 | < 4.65E-05 | < 2.29E-05          | < 1.000 | < 0.118 | < 1.86E-05 | 9.15E-06            | Tl |
| Vanadium   | < 0.350 | < 0.041 | < 6.50E-06 | < 3.20E-06          | < 0.250 | < 0.030 | < 4.65E-06 | < 2.29E-06          | < 0.100 | < 0.012 | < 1.86E-06 | 9.15E-07            | V  |
| Zinc       | 17.197  | 2.038   | 3.20E-04   | 1.57E-04            | 4.230   | 0.501   | 7.86E-05   | 3.87E-05            | 12.967  | 1.536   | 2.41E-04   | 1.19E-04            | Zn |
| TSM        |         |         | < 2.25E-03 | < 1.11E-03          |         |         |            |                     |         |         |            |                     |    |

Columbia Steel Casting  
Baghouse 1  
Metals Results Summary

Test: M29

| Run 3      |          |         |            |                     |         |         |            |                     |         |         |            |                     |    |
|------------|----------|---------|------------|---------------------|---------|---------|------------|---------------------|---------|---------|------------|---------------------|----|
| Total      |          |         |            |                     | FH Net  |         |            |                     | BH Net  |         |            |                     |    |
| Species    | µg       | µg/dscm | lb/hr      | lb/ton steel melted | µg      | µg/dscm | lb/hr      | lb/ton steel melted | µg      | µg/dscm | lb/hr      | lb/ton steel melted |    |
| Aluminum   | 38.700   | 4.567   | 7.31E-04   | 3.45E-04            | 21.300  | 2.514   | 4.02E-04   | 1.90E-04            | 17.400  | 2.053   | 3.28E-04   | 1.55E-04            | Al |
| Antimony   | < 1.750  | < 0.207 | < 3.30E-05 | < 1.56E-05          | < 1.250 | < 0.148 | < 2.36E-05 | < 1.11E-05          | < 0.500 | < 0.059 | < 9.44E-06 | < 4.45E-06          | Sb |
| Arsenic    | < 1.260  | < 0.149 | < 2.38E-05 | < 1.12E-05          | 0.560   | 0.066   | 1.06E-05   | 4.99E-06            | < 0.700 | < 0.083 | < 1.32E-05 | < 6.23E-06          | As |
| Barium     | 1.277    | 0.151   | 2.41E-05   | 1.14E-05            | 1.101   | 0.130   | 2.08E-05   | 9.80E-06            | 0.176   | 0.021   | 3.32E-06   | 1.57E-06            | Ba |
| Beryllium  | < 0.076  | < 0.009 | < 1.44E-06 | < 6.77E-07          | 0.056   | 0.007   | 1.06E-06   | 4.99E-07            | < 0.020 | < 0.002 | < 3.78E-07 | < 1.78E-07          | Be |
| Cadmium    | < 0.040  | < 0.005 | < 7.55E-07 | < 3.56E-07          | 0.000   | 0.000   | 0.00E+00   | 0.00E+00            | < 0.040 | < 0.005 | < 7.55E-07 | < 3.56E-07          | Cd |
| Chromium   | 39.491   | 4.660   | 7.45E-04   | 3.52E-04            | 39.266  | 4.634   | 7.41E-04   | 3.50E-04            | 0.225   | 0.027   | 4.25E-06   | 2.00E-06            | Cr |
| Cobalt     | < 0.228  | < 0.027 | < 4.30E-06 | < 2.03E-06          | < 0.125 | < 0.015 | < 2.36E-06 | < 1.11E-06          | 0.103   | 0.012   | 1.94E-06   | 9.17E-07            | Co |
| Copper     | 7.730    | 0.912   | 1.46E-04   | 6.88E-05            | 6.280   | 0.741   | 1.19E-04   | 5.59E-05            | 1.450   | 0.171   | 2.74E-05   | 1.29E-05            | Cu |
| Lead       | 0.940    | 0.111   | 1.77E-05   | 8.37E-06            | 0.940   | 0.111   | 1.77E-05   | 8.37E-06            | 0.000   | 0.000   | 0.00E+00   | 0.00E+00            | Pb |
| Manganese  | 342.221  | 40.385  | 6.46E-03   | 3.05E-03            | 339.653 | 40.082  | 6.41E-03   | 3.02E-03            | 2.568   | 0.303   | 4.85E-05   | 2.29E-05            | Mn |
| Nickel     | 7.630    | 0.900   | 1.44E-04   | 6.79E-05            | 7.210   | 0.851   | 1.36E-04   | 6.42E-05            | 0.420   | 0.050   | 7.93E-06   | 3.74E-06            | Ni |
| Phosphorus | < 11.070 | < 1.306 | < 2.09E-04 | < 9.86E-05          | 9.070   | 1.070   | 1.71E-04   | 8.08E-05            | < 2.000 | < 0.236 | < 3.78E-05 | 1.78E-05            | P  |
| Selenium   | < 5.250  | < 0.620 | < 9.91E-05 | < 4.67E-05          | < 3.750 | < 0.443 | < 7.08E-05 | < 3.34E-05          | < 1.500 | < 0.177 | < 2.83E-05 | 1.34E-05            | Se |
| Silver     | < 0.700  | < 0.083 | < 1.32E-05 | < 6.23E-06          | < 0.500 | < 0.059 | < 9.44E-06 | < 4.45E-06          | < 0.200 | < 0.024 | < 3.78E-06 | 1.78E-06            | Ag |
| Thallium   | < 3.500  | < 0.413 | < 6.61E-05 | < 3.12E-05          | < 2.500 | < 0.295 | < 4.72E-05 | < 2.23E-05          | < 1.000 | < 0.118 | < 1.89E-05 | 8.90E-06            | Tl |
| Vanadium   | < 0.815  | < 0.096 | < 1.54E-05 | < 7.26E-06          | 0.715   | 0.084   | 1.35E-05   | 6.37E-06            | < 0.100 | < 0.012 | < 1.89E-06 | 8.91E-07            | V  |
| Zinc       | 30.317   | 3.578   | 5.72E-04   | 2.70E-04            | 23.570  | 2.781   | 4.45E-04   | 2.10E-04            | 6.747   | 0.796   | 1.27E-04   | 6.01E-05            | Zn |
| TSM        |          |         | < 9.31E-03 | < 4.39E-03          |         |         |            |                     |         |         |            |                     |    |

| Mean Runs 1-3 |          |         |            |                     |          |         |            |                     |         |         |            |                     |    |
|---------------|----------|---------|------------|---------------------|----------|---------|------------|---------------------|---------|---------|------------|---------------------|----|
| Total         |          |         |            |                     | FH Net   |         |            |                     | BH Net  |         |            |                     |    |
| Species       | µg       | µg/dscm | lb/hr      | lb/ton steel melted | µg       | µg/dscm | lb/hr      | lb/ton steel melted | µg      | µg/dscm | lb/hr      | lb/ton steel melted |    |
| Aluminum      | 31.467   | 3.258   | 5.08E-04   | 2.56E-04            | 16.300   | 1.698   | 2.65E-04   | 1.33E-04            | 15.167  | 1.560   | 2.43E-04   | 1.23E-04            | Al |
| Antimony      | < 1.752  | < 0.185 | < 2.89E-05 | < 1.45E-05          | < 1.250  | < 0.132 | < 2.06E-05 | < 1.04E-05          | < 0.502 | < 0.053 | < 8.29E-06 | < 4.16E-06          | Sb |
| Arsenic       | < 1.680  | < 0.182 | < 2.83E-05 | < 1.42E-05          | 0.980    | 0.107   | 1.68E-05   | 8.39E-06            | < 0.700 | < 0.074 | < 1.15E-05 | < 5.80E-06          | As |
| Barium        | 2.353    | 0.213   | 3.25E-05   | 1.73E-05            | 0.864    | 0.088   | 1.37E-05   | 6.94E-06            | 1.488   | 0.125   | 1.87E-05   | 1.04E-05            | Ba |
| Beryllium     | < 0.082  | < 0.008 | < 1.31E-06 | < 6.66E-07          | < 0.052  | < 0.006 | < 8.62E-07 | < 4.32E-07          | < 0.030 | < 0.003 | < 4.50E-07 | < 2.34E-07          | Be |
| Cadmium       | < 0.040  | < 0.004 | < 6.60E-07 | < 3.31E-07          | 0.000    | 0.000   | 0.00E+00   | 0.00E+00            | < 0.040 | < 0.004 | < 6.60E-07 | < 3.31E-07          | Cd |
| Chromium      | 22.924   | 2.420   | 3.79E-04   | 1.88E-04            | 22.619   | 2.389   | 3.75E-04   | 1.86E-04            | 0.304   | 0.031   | 4.81E-06   | 2.45E-06            | Cr |
| Cobalt        | < 0.193  | < 0.021 | < 3.22E-06 | < 1.61E-06          | < 0.125  | < 0.013 | < 2.06E-06 | < 1.04E-06          | < 0.068 | < 0.007 | < 1.16E-06 | < 5.71E-07          | Co |
| Copper        | 7.263    | 0.763   | 1.19E-04   | 5.98E-05            | 4.827    | 0.508   | 7.94E-05   | 3.97E-05            | 2.437   | 0.255   | 3.96E-05   | 2.01E-05            | Cu |
| Lead          | 0.443    | 0.048   | 7.63E-06   | 3.73E-06            | 0.420    | 0.046   | 7.20E-06   | 3.51E-06            | 0.023   | 0.003   | 4.34E-07   | 2.14E-07            | Pb |
| Manganese     | 194.168  | 20.605  | 3.23E-03   | 1.60E-03            | 191.386  | 20.313  | 3.19E-03   | 1.58E-03            | 2.781   | 0.292   | 4.55E-05   | 2.29E-05            | Mn |
| Nickel        | 5.006    | 0.526   | 8.22E-05   | 4.10E-05            | 4.537    | 0.476   | 7.46E-05   | 3.72E-05            | 0.469   | 0.049   | 7.66E-06   | 3.86E-06            | Ni |
| Phosphorus    | < 6.657  | < 0.700 | < 1.10E-04 | < 5.46E-05          | 3.847    | 0.423   | 6.70E-05   | 3.25E-05            | < 2.810 | < 0.277 | < 4.27E-05 | 2.21E-05            | P  |
| Selenium      | < 5.250  | < 0.555 | < 8.66E-05 | < 4.35E-05          | < 3.750  | < 0.397 | < 6.18E-05 | < 3.11E-05          | < 1.500 | < 0.159 | < 2.47E-05 | 1.24E-05            | Se |
| Silver        | < 0.700  | < 0.074 | < 1.15E-05 | < 5.80E-06          | < 0.500  | < 0.053 | < 8.25E-06 | < 4.14E-06          | < 0.200 | < 0.021 | < 3.30E-06 | 1.66E-06            | Ag |
| Thallium      | < 3.500  | < 0.370 | < 5.77E-05 | < 2.90E-05          | < 2.500  | < 0.264 | < 4.12E-05 | < 2.07E-05          | < 1.000 | < 0.106 | < 1.65E-05 | 8.28E-06            | Tl |
| Vanadium      | < 0.618  | < 0.064 | < 1.01E-05 | < 5.05E-06          | < 0.518  | < 0.054 | < 8.41E-06 | < 4.22E-06          | < 0.100 | < 0.011 | < 1.65E-06 | 8.28E-07            | V  |
| Zinc          | 21.254   | 2.309   | 3.62E-04   | 1.79E-04            | 13.657   | 1.449   | 2.27E-04   | 1.13E-04            | 7.597   | 0.860   | 1.35E-04   | 6.66E-05            | Zn |
| TSM           | < 305.35 | < 32.31 | < 5.06E-03 | < 2.52E-03          | < 268.13 | < 28.42 | < 4.46E-03 | < 2.21E-03          | < 37.22 | < 3.89  | < 6.06E-04 | < 3.06E-04          |    |

'<' denotes results which were calculated using the minimum detection limit for front half or back half results that were non-detect.

**EPA Methods 1-4, 29**  
**Example Calculations**

**Client: Columbia Steel Casting**  
**Location: Portland, OR**  
**Source: Baghouse 1**  
**Method: 29**

**Run: 1**  
**Start Time: 21:25**  
**End Time: 6:00**  
**Date: 12/10/20**

**EPA Methods 1-4:**

$$1) P_m = P_b + (\Delta H/13.6) = 30.284 \text{ "Hg}$$

where  $P_b$ : 30.09 "Hg  
 $\Delta H$ : 2.640 "H<sub>2</sub>O

$$2) P_s = P_b + (\text{Static Press.}/13.6) = 30.094 \text{ "Hg}$$

where  $P_b$ : 30.09 "Hg  
Static Press.: 0.05 "H<sub>2</sub>O

$$3) V_m(\text{std}) = V_m(17.64)(Y)\left(\frac{P_m}{T_m}\right) = 437.226 \text{ dscf}$$

where  $V_m$ : 435.814 dcf  
 $Y$ : 0.9743  
 $P_m$ : 30.284 "Hg  
 $T_m$ : 518.8 °A

$$4) V_w(\text{std}) = (0.04706)(H_2O) = 3.854 \text{ scf}$$

where  $H_2O$ : 81.90 g

$$5) Bws = \left( \frac{V_w(\text{std})}{V_w(\text{std}) + V_m(\text{std})} \right) = 0.0087$$

where  $V_w(\text{std})$ : 3.854 scf  
 $V_m(\text{std})$ : 437.226 dscf

$$6) \% H_2O = Bws \times 100 = 0.87 \%v$$

$$7) V_m(\text{actual}) = \left( \frac{Y \times V_m}{(1 - Bws)} \right) \left( \frac{T_s}{T_m} \right) \left( \frac{P_m}{P_s} \right) = 443.258 \text{ awcf}$$

where  $Y$ : 0.9743  
 $V_m$ : 435.8140 dcf  
 $Bws$ : 0.0087  
 $T_s$ : 533.5 °A  
 $T_m$ : 518.8 °A  
 $P_m$ : 30.284 "Hg  
 $P_s$ : 30.094 "Hg

$$8) M_d = 0.44(CO_2) + 0.32(O_2) + 0.28(N_2 + CO) = 28.84 \text{ lb/lb-mole}$$

where  $CO_2$ : 0.00 %vd  
 $O_2$ : 21.02 %vd  
 $N_2 + CO = (100 - (O_2 + CO_2))$ : 78.98 %vd

**Client: Columbia Steel Casting**  
**Source: Baghouse 1**

**Run: 1**  
**Date: 12/10/20**

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- 9)  $M_s = M_d(1 - Bws) + (18 \times Bws) =$  28.75 lb/lb-mole  
where  $M_d$ : 28.84 lb/lb-mole  
Bws: 0.0087
- 10) Stack Area(cir.) =  $3.1416 (\text{stack diameter}/24)^2 =$  11.541 sq. ft.  
where Stack ID: 46 inches
- Stack Area(rect.) =  $\text{stack width}/12 \times \text{stack length}/12 =$  NA sq. ft.  
where Stack Width: 0.000 inches  
Stack Length: 0.000 inches
- 11) Velocity,  $V_s = 85.49(Cp)(\text{Ave. Sqrt } \Delta P) \left( \sqrt{\frac{T_s}{(P_s \times M_s)}} \right) =$  58.14 fps  
where Cp: 0.84  
Ave. Sqrt  $\Delta P$ : 1.0311  
Ts: 533.5 °A  
Ps: 30.094 "Hg  
Ms: 28.75 lb/lb-mole
- 12) ACFM =  $(V_s)(\text{stack area})(60 \text{ sec/min}) =$  40,259.6 ACFM  
where  $V_s$ : 58.14 ft/sec  
Stack Area: 11.541 sq. ft
- 13) ADCFM =  $(ACFM)(1-Bws) =$  39,909.3 ADCFM  
where ACFM: 40,259.6  
Bws: 0.0087
- 14)  $Q_{sw} = 3600(V_s)(\text{stack area}) \left( \frac{528^\circ A}{T_s} \right) \left( \frac{P_s}{29.92 \text{ "Hg}} \right) =$  2,404,577.6 wscf/hr  
where  $V_s$ : 58.14 ft/sec  
Stack Area: 11.5410 sq. ft.  
Ts: 533.5 °A  
Ps: 30.094 "Hg
- 15)  $Q_{sd} = (\text{wscf/hr})(1-Bws) =$  2,383,657.8 dscf/hr  
where wscf/hr: 2,404,577.6  
Bws: 0.0087
- 16) DSCFM =  $(\text{dscf/hr})/60 \text{ mins/hr} =$  39,727.6 DSCFM  
where dscf/hr: 2,383,657.8
- 17) Nozzle Area =  $3.1416 (\text{Nozzle Size}/24)^2 =$  0.000265 sq. ft.  
where Nozzle Size: 0.2203 inches

**Client: Columbia Steel Casting**  
**Source: Baghouse 1**

**Run: 1**  
**Date: 12/10/20**

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18) Isokinetic % =  $\left( \frac{0.0945(Ts)(Vm(std))}{Ps(Vs)(nozzle\ area)(sampling\ time)(1-Bws)} \right) =$  99.9 %

where Ts: 533.5 °A  
Vm(Std): 437.226 dscf  
Ps: 30.094 "Hg  
Vs: 58.14 ft/sec  
Nozzle Area: 0.000265 sq. ft.  
Sampling Time: 480 min.  
Bws: 0.0087

**EPA Method 29:**  
**Chromium**

19) Cr Laboratory Results (blank corrected)

Front half (FH): 22.666 µg/sample  
Back half (BH): 0.398 µg/sample  
Total (FH + BH): 23.064 µg/sample

20) Cs = µg/Vm(std) = 1.863 µg/dscm  
where Run 1 Total: 23.064 µg/sample  
Vm(std): 12.381 dscm

21) Emission Rate = (Cs) $\left(\frac{0.0283168\ m^3}{ft^3}\right)$ (stack flow) $\left(\frac{2.2046E-9\ lb}{\mu g}\right) =$  2.77E-04 lb/hr

where Cs: 1.863 µg/dscm  
Stack Flow: 2,383,657.8 dscf/hr

**Isokinetic Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** Baghouse 1  
**EPA Method:** 29  
**Box Operator:** JCR  
**Technician(s):** JCR

**Environmental Conditions/Test Notes:**  
Mostly cloudy and 40s  
Run ended at 271 minutes and 22 seconds

**Run: 1 (High Chromium)**  
**Start Date/Time:** 12/17/2020 21:06  
**End Date/Time:** 12/18/2020 2:08

**Stack Dimensional Data:**

Circular  
Diameter 46.000 in  
Rectangular  
Width in  
Length in  
Stack Area 11.541 sq.ft.

**Equipment:**

Meterbox ID 9  
Y factor 0.9743  
 $\Delta H@$  1.792  
Probe ID 6E  
Nozzle ID 0.22  
Hot box ID HB3  
Pitot Cp 0.84  
Pitot ID 6E  
Liner type glass  
Nozzle size 0.2203 inches  
Nozzle area 0.000265 sq.ft.  
Probe heat 250 F  
Filter heat 250 F

**Source Information:**

Barometric Pressure 30.18 "Hg  
Static Pressure 0.05 "H<sub>2</sub>O  
Ave.  $\Delta P$  1.2 "H<sub>2</sub>O  
Stack Temperature 73 F  
Assumed moisture 1 %  
Assumed meter temp. 65 F  
Total number of points 24  
Time per point 20  
Total run time 271.4 min  
O<sub>2</sub> 20.90 %  
CO<sub>2</sub> 0.00 %  
Rec. Nz. 0.195 inches

**Leak Checks:**

|                        | Pre-test | Post-test |
|------------------------|----------|-----------|
| Pitot                  | x        | x         |
| Train leak rate, dcf   | 0.000    | 0.000     |
| Leak check vacuum, "Hg | 10       | 14        |

**Nozzle check for roundness:**

| 1           | 2     | 3            |
|-------------|-------|--------------|
| 0.221       | 0.220 | 0.220 inches |
| Caliper ID# | ws2   |              |

**Post Test Calculations:**

Sample volume 266.717 dcf  
Wet mol. weight 28.73 M<sub>s</sub> (actual)  
Actual H<sub>2</sub>O 0.98 %  
Std. meter vol. 271.599 dscf  
Isokinetic Average 101.2 %  
Ave.  $\Delta P$  1.246 "H<sub>2</sub>O  
Ave.  $\sqrt{\Delta P}$  1.1131 "H<sub>2</sub>O  
Ave.  $\Delta H$  3.086 "H<sub>2</sub>O  
Ave. T<sub>s</sub> 68.8 °F  
Ave. T<sub>m</sub> 53.2 °F

**Moisture/Lab:**

|                   | Filter  |        | NA # | Gain |
|-------------------|---------|--------|------|------|
|                   | Initial | Final  |      |      |
| Impingers, g      | 2210.0  | 2219.1 |      | 9.1  |
| Silica gel, g     | 1741.8  | 1789.8 |      | 48.0 |
| Total water gain: |         |        |      | 57.1 |

| Traverse Point | Time (min.) | Meter Volume (dcf) | Velocity P ("H <sub>2</sub> O) | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum ("Hg) | Filter Box (°F) | Condenser Temp F | Mid-run restart vol. (dcf) | Mid-run Leak check vol. |
|----------------|-------------|--------------------|--------------------------------|------------------|------------------|---------|-------|--------------|-----------------|------------------|----------------------------|-------------------------|
| 1              | 20.0        | 86.029             | 1.10                           | 61               | 48               | 2.73    | 2.75  | 4.5          | 250             | 47               |                            |                         |
| 2              | 40.0        | 105.110            | 1.15                           | 63               | 50               | 2.85    | 2.85  | 4.5          | 250             | 49               |                            |                         |
| 3              | 60.0        | 142.850            | 1.10                           | 64               | 53               | 2.74    | 2.75  | 4.5          | 250             | 51               |                            |                         |
| 4              | 80.0        | 161.430            | 1.10                           | 66               | 54               | 2.73    | 2.75  | 4.5          | 250             | 50               |                            |                         |
| 5              | 100.0       | 180.200            | 1.10                           | 72               | 55               | 2.71    | 2.70  | 5            | 250             | 50               |                            |                         |
| 6              | 120.0       | 198.500            | 1.10                           | 70               | 51               | 2.69    | 2.70  | 5            | 250             | 47               |                            |                         |
| 7              | 140.0       | 217.650            | 1.20                           | 68               | 53               | 2.96    | 3.00  | 5            | 251             | 51               |                            |                         |
| 8              | 160.0       | 238.990            | 1.40                           | 69               | 54               | 3.46    | 3.50  | 5.5          | 254             | 45               |                            |                         |
| 9              | 180.0       | 261.180            | 1.60                           | 70               | 55               | 3.95    | 3.95  | 6            | 249             | 45               | 261.937                    | 0.757                   |
| 10             | 200.0       | 283.390            | 1.60                           | 73               | 55               | 3.93    | 3.95  | 6            | 250             | 46               |                            |                         |
| 11             | 220.0       | 305.400            | 1.60                           | 70               | 53               | 3.93    | 3.95  | 7.5          | 250             | 46               |                            |                         |
| 12             | 240.0       | 324.500            | 1.20                           | 70               | 54               | 2.96    | 2.95  | 6            | 251             | 48               |                            |                         |
| 13             | 260.0       | 343.100            | 1.10                           | 71               | 55               | 2.71    | 2.70  | 6            | 250             | 50               |                            |                         |
| 14             | 271.4       | 353.503            | 1.10                           | 76               | 55               | 2.69    | 2.70  | 6            | 250             | 50               |                            |                         |

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** Baghouse 1  
**Method:** 29

**Run:** 1 Hig Chromium  
**Start Date/Time:** 12/17/2020 21:06  
**End Date/Time:** 12/18/2020 2:08

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 86.029                   |                                 |                            |                   |                         |                            |             |
| 20.0          | 105.110                  | 2.75                            | 48                         | 1                 | 1.10                    | 61                         | 1.0488      |
| 40.0          | 124.130                  | 2.85                            | 50                         | 2                 | 1.15                    | 63                         | 1.0724      |
| 60.0          | 142.850                  | 2.75                            | 53                         | 3                 | 1.10                    | 64                         | 1.0488      |
| 80.0          | 161.430                  | 2.75                            | 54                         | 4                 | 1.10                    | 66                         | 1.0488      |
| 100.0         | 180.200                  | 2.70                            | 55                         | 5                 | 1.10                    | 72                         | 1.0488      |
| 120.0         | 198.500                  | 2.70                            | 51                         | 6                 | 1.10                    | 70                         | 1.0488      |
| 140.0         | 217.650                  | 3.00                            | 53                         | 7                 | 1.20                    | 68                         | 1.0954      |
| 160.0         | 238.990                  | 3.50                            | 54                         | 8                 | 1.40                    | 69                         | 1.1832      |
| 180.0         | 261.180                  | 3.95                            | 55                         | 9                 | 1.60                    | 70                         | 1.2649      |
| 200.0         | 283.390                  | 3.95                            | 55                         | 10                | 1.60                    | 73                         | 1.2649      |
| 220.0         | 305.400                  | 3.95                            | 53                         | 11                | 1.60                    | 70                         | 1.2649      |
| 240.0         | 324.500                  | 2.95                            | 54                         | 12                | 1.20                    | 70                         | 1.0954      |
| 260.0         | 343.100                  | 2.70                            | 55                         | 13                | 1.10                    | 71                         | 1.0488      |
| 271.4         | 353.503                  | 2.70                            | 55                         | 14                | 1.10                    | 76                         | 1.0488      |

Mid-run leak check vol. = 0.757 dcf

**Client: Columbia Steel Casting****Source: Baghouse 1****Run: 1 Hig Chromium****Dates: 12/17/20-12/18/20****Field Data Input Continued**Moisture Data

Total Test Time 271.4 min  
 Sample Time Interval 20.0 min  
 Meter Volume,  $V_m$  266.717 dcf  
 Water Volume 57.1 g  
 Nozzle Diameter,  $N_z$  0.2203 in.  
 Nozzle Area 0.000265 sq.ft.

Stack Dimensional Data:

Circular  
 Diameter 46.000 in  
 Rectangular  
 Width in  
 Length in  
 Stack Area 11.541 sq.ft.

Traverse Data

Barometric Pressure,  $P_b$  30.18 "Hg  
 Static Pressure 0.05 "H<sub>2</sub>O  
 Pitot Factor, cp 0.84  
 Meter Cal Factor 0.9743 Y

Molecular Weight:

CO<sub>2</sub> Average 0.00 %vd  
 O<sub>2</sub> Average 20.90 %vd

**Field Data Averages**Meter

$\Delta H$  3.086 "H<sub>2</sub>O  
 Temperature,  $T_m$  53.2 °F  
 Temperature,  $T_m$  513.2 °A (°R)  
 Pressure Meter,  $P_m$  30.407 "Hg

Stack

$\sqrt{Dp}$  1.1131 "H<sub>2</sub>O  
 Temperature,  $T_s$  68.8 °F  
 Temperature,  $T_s$  528.8 °A (°R)  
 Pressure Stack,  $P_s$  30.184 "Hg

**Field Data Calculations**Meter Box Capture

Standard Volume,  $V_{m(std)}$  271.599 dscf  
 7.691 dscm  
 Actual Volume,  $V_{m(actual)}$  272.409 awcf

Gas Stream Moisture

Moisture Vapor,  $V_{w(std)}$  2.687 scf  
 Moisture,  $B_{ws}$  0.0098  
 Moisture EPA M4 0.98 %v

EPA Method 3 Gas Density

Dry,  $M_d$  28.84 lb/lb-mole  
 Wet,  $M_s$  28.73 lb/lb-mole

Percent Isokinetic 101.2 %

EPA Method 2 Stack Gas Flowrate:

Velocity,  $V_s$  62.42 fps  
 Volume (actual) 43,223.4 acfm  
 42,799.8 adcfm  
 Volume (standard) 2,612,326.1 wscf/hr  
 2,586,725.3 dscf/hr  
 43,112.1 dscf/min

Source: Baghouse 1 Sample Date: 12/17-18/2020

Run: 1 Hig Chromium

Filter +

| Client ID:     | Front Half |               | Back Half |               |               |               |              |
|----------------|------------|---------------|-----------|---------------|---------------|---------------|--------------|
| <u>Analyte</u> | <          | <u>Result</u> | <         | <u>Result</u> | <u>FH MDL</u> | <u>BH MDL</u> | <u>Units</u> |
| Aluminum       |            | 112           |           | 18.1          | 3.75          | 1.50          | µg/sample    |
| Antimony       | <          | MDL           | <         | MDL           | 1.25          | 0.500         | µg/sample    |
| Arsenic        |            | 6.04          | <         | MDL           | 1.75          | 0.700         | µg/sample    |
| Barium         |            | 2.02          |           | 1.39          | 0.125         | 0.050         | µg/sample    |
| Beryllium      | <          | MDL           | <         | MDL           | 0.050         | 0.020         | µg/sample    |
| Cadmium        |            | 0.152         | <         | MDL           | 0.100         | 0.040         | µg/sample    |
| Chromium       |            | 18.7          |           | 0.780         | 0.200         | 0.080         | µg/sample    |
| Cobalt         | <          | MDL           |           | 0.265         | 0.125         | 0.050         | µg/sample    |
| Copper         |            | 3.32          |           | 2.79          | 1.25          | 0.500         | µg/sample    |
| Lead           |            | 3.73          |           | 0.961         | 1.25          | 0.500         | µg/sample    |
| Manganese      |            | 69.9          |           | 6.32          | 0.075         | 0.030         | µg/sample    |
| Nickel         |            | 6.96          |           | 0.651         | 0.750         | 0.300         | µg/sample    |
| Phosphorus     |            | 15.7          |           | 2.72          | 5.00          | 2.00          | µg/sample    |
| Selenium       | <          | MDL           | <         | MDL           | 3.75          | 1.50          | µg/sample    |
| Silver         | <          | MDL           | <         | MDL           | 0.500         | 0.200         | µg/sample    |
| Thallium       | <          | MDL           | <         | MDL           | 2.50          | 1.00          | µg/sample    |
| Vanadium       |            | 0.259         | <         | MDL           | 0.250         | 0.100         | µg/sample    |
| Zinc           |            | 7.77          |           | 8.46          | 0.750         | 0.300         | µg/sample    |

Lab ID: 20-S2354 20-S2355

Sample Vol: 250 100 mL

**Source: Baghouse 1**  
**Blank Values**

| Client ID:      | Filter             | MDL              | BH Capture Soln.                                           | MDL                                                        | FH/BH Rinse            | MDL                    |
|-----------------|--------------------|------------------|------------------------------------------------------------|------------------------------------------------------------|------------------------|------------------------|
|                 |                    |                  | 5% HNO <sub>3</sub> /<br>10% H <sub>2</sub> O <sub>2</sub> | 5% HNO <sub>3</sub> / 10%<br>H <sub>2</sub> O <sub>2</sub> | 0.1 N HNO <sub>3</sub> | 0.1 N HNO <sub>3</sub> |
|                 |                    | Filter MDL       |                                                            | MDL                                                        |                        | MDL                    |
| <u>Analyte</u>  | < <u>µg/sample</u> | <u>µg/sample</u> | < <u>µg/sample</u>                                         | <u>µg/sample</u>                                           | < <u>µg/sample</u>     | <u>µg/sample</u>       |
| Aluminum        | 95.7               | 3.75             | 6.36                                                       | 1.50                                                       | MDL                    | 3.75                   |
| Antimony        | < MDL              | 1.25             | MDL                                                        | 0.500                                                      | MDL                    | 1.25                   |
| Arsenic         | 3.58               | 1.75             | MDL                                                        | 0.700                                                      | MDL                    | 1.75                   |
| Barium          | 0.917              | 0.125            | 0.586                                                      | 0.050                                                      | 0.282                  | 0.125                  |
| Beryllium       | < MDL              | 0.050            | MDL                                                        | 0.020                                                      | MDL                    | 0.050                  |
| Cadmium         | 0.358              | 0.100            | MDL                                                        | 0.040                                                      | MDL                    | 0.100                  |
| Chromium        | 0.934              | 0.200            | 0.377                                                      | 0.080                                                      | MDL                    | 0.200                  |
| Cobalt          | < MDL              | 0.125            | MDL                                                        | 0.050                                                      | MDL                    | 0.125                  |
| Copper          | < MDL              | 1.25             | 1.91                                                       | 0.500                                                      | MDL                    | 1.25                   |
| Lead            | < MDL              | 1.25             | 0.814                                                      | 0.500                                                      | 1.57                   | 1.25                   |
| Manganese       | 1.27               | 0.075            | 0.2560                                                     | 0.030                                                      | 0.077                  | 0.075                  |
| Nickel          | < MDL              | 0.750            | MDL                                                        | 0.300                                                      | MDL                    | 0.750                  |
| Phosphorus      | 13.8               | 5.00             | MDL                                                        | 2.00                                                       | MDL                    | 5.00                   |
| Selenium        | < MDL              | 3.75             | MDL                                                        | 1.50                                                       | MDL                    | 3.75                   |
| Silver          | < MDL              | 0.500            | MDL                                                        | 0.200                                                      | MDL                    | 0.500                  |
| Thallium        | < MDL              | 2.50             | MDL                                                        | 1.00                                                       | MDL                    | 2.50                   |
| Vanadium        | < MDL              | 0.250            | MDL                                                        | 0.100                                                      | MDL                    | 0.250                  |
| Zinc            | 2.33               | 0.750            | 0.541                                                      | 0.300                                                      | MDL                    | 0.750                  |
| Lab ID:         | 20-S2357           |                  | 20-S2358                                                   |                                                            | 20-S2356               |                        |
| Sample Vol, ml: | 250                |                  | 250                                                        |                                                            | 100                    |                        |

Columbia Steel Casting  
Baghouse 1  
12/17-18/2020

Method 29 Metals Blank Calculations

Run: 1 Hig Chromium  
1 of 3

|           | I                                 |   | II                   |   | III                  |   | IV                                                                 |   | V                                |   | VI                               |   | VII                  |  | VIII      |            |
|-----------|-----------------------------------|---|----------------------|---|----------------------|---|--------------------------------------------------------------------|---|----------------------------------|---|----------------------------------|---|----------------------|--|-----------|------------|
|           | Sample*                           |   | Blank*               |   | Blank*               |   | Sample*                                                            |   | Blank*                           |   | BH Blank*                        |   | BH Blank*            |  | Allowable |            |
|           | FH                                |   | FH                   |   | FH                   |   | BH                                                                 |   | BH                               |   | Corrected                        |   | Corrected            |  | BH        |            |
| Species   | Wash+Filter                       |   | Wash, µg             |   | Filter, µg           |   | Cap.Sol.                                                           |   | Cap.Sol.                         |   | Cap.Sol.                         |   | Wash, µg             |  | Blank, µg |            |
| Volume ml | 100                               |   | 100                  |   | N/A                  |   | 100                                                                |   | µg/mL                            |   | 200                              |   | 100                  |  |           |            |
| Al        | 112.000                           | < | 3.7500               |   | 95.700               |   | 18.100                                                             |   | 0.0254                           |   | 5.088                            | < | 3.7500               |  | 5.088     | Aluminum   |
| Sb <      | 1.250                             | < | 1.2500               | < | 1.250                | < | 0.500                                                              | < | 0.0020                           | < | 0.400                            | < | 1.2500               |  | 0.000     | Antimony   |
| As        | 6.040                             | < | 1.7500               |   | 3.580                | < | 0.700                                                              | < | 0.0028                           | < | 0.560                            | < | 1.7500               |  | 0.000     | Arsenic    |
| Ba        | 2.020                             |   | 0.2820               |   | 0.917                |   | 1.390                                                              |   | 0.0023                           |   | 0.469                            |   | 0.2820               |  | 0.751     | Barium     |
| Be <      | 0.050                             | < | 0.0500               | < | 0.050                | < | 0.020                                                              | < | 0.0001                           | < | 0.016                            | < | 0.0500               |  | 0.000     | Beryllium  |
| Cd        | 0.152                             | < | 0.1000               |   | 0.358                | < | 0.040                                                              | < | 0.0002                           | < | 0.032                            | < | 0.1000               |  | 0.000     | Cadmium    |
| Cr        | 18.700                            | < | 0.2000               |   | 0.934                |   | 0.780                                                              |   | 0.0015                           |   | 0.302                            | < | 0.2000               |  | 0.302     | Chromium   |
| Co <      | 0.125                             | < | 0.1250               | < | 0.125                |   | 0.265                                                              | < | 0.0002                           | < | 0.040                            | < | 0.1250               |  | 0.000     | Cobalt     |
| Cu        | 3.320                             | < | 1.2500               | < | 1.250                |   | 2.790                                                              |   | 0.0076                           |   | 1.528                            | < | 1.2500               |  | 1.528     | Copper     |
| Pb        | 3.730                             |   | 1.5700               | < | 1.250                |   | 0.961                                                              |   | 0.0033                           |   | 0.651                            |   | 1.5700               |  | 2.221     | Lead       |
| Mn        | 69.900                            |   | 0.0770               |   | 1.270                |   | 6.320                                                              |   | 0.0010                           |   | 0.205                            |   | 0.0770               |  | 0.282     | Manganese  |
| Ni        | 6.960                             | < | 0.7500               | < | 0.750                |   | 0.651                                                              | < | 0.0012                           | < | 0.240                            | < | 0.7500               |  | 0.000     | Nickel     |
| P         | 15.700                            | < | 5.0000               |   | 13.800               |   | 2.720                                                              | < | 0.0080                           | < | 1.600                            | < | 5.0000               |  | 0.000     | Phosphorus |
| Se <      | 3.750                             | < | 3.7500               | < | 3.750                | < | 1.500                                                              | < | 0.0060                           | < | 1.200                            | < | 3.7500               |  | 0.000     | Selenium   |
| Ag <      | 0.500                             | < | 0.5000               | < | 0.500                | < | 0.200                                                              | < | 0.0008                           | < | 0.160                            | < | 0.5000               |  | 0.000     | Silver     |
| Tl <      | 2.500                             | < | 2.5000               | < | 2.500                | < | 1.000                                                              | < | 0.0040                           | < | 0.800                            | < | 2.5000               |  | 0.000     | Thallium   |
| V         | 0.259                             | < | 0.2500               | < | 0.250                | < | 0.100                                                              | < | 0.0004                           | < | 0.080                            | < | 0.2500               |  | 0.000     | Vanadium   |
| Zn        | 7.770                             | < | 0.7500               |   | 2.330                |   | 8.460                                                              |   | 0.0022                           |   | 0.433                            | < | 0.7500               |  | 0.433     | Zinc       |
| Lab ID:   | 20-S2354                          |   | 20-S2356             |   | 20-S2357             |   | 20-S2355                                                           |   | 20-S2358                         |   |                                  |   |                      |  |           |            |
| Content:  | 0.1NHNO <sub>3</sub>              |   | 0.1NHNO <sub>3</sub> |   | 0.1NHNO <sub>3</sub> |   | 5%HNO <sub>3</sub> /                                               |   | 5%HNO <sub>3</sub> /             |   | 5%HNO <sub>3</sub> /             |   | 0.1NHNO <sub>3</sub> |  |           |            |
|           | FH Filter & Probe Rinse           |   |                      |   |                      |   | 10%H <sub>2</sub> O <sub>2</sub>                                   |   | 10%H <sub>2</sub> O <sub>2</sub> |   | 10%H <sub>2</sub> O <sub>2</sub> |   |                      |  |           |            |
|           | 100ml 0.1N HNO <sub>3</sub> rinse |   |                      |   |                      |   | BH Imps 1&2                                                        |   |                                  |   |                                  |   |                      |  |           |            |
|           |                                   |   | Same as BH           |   |                      |   | 100ml .1N HNO <sub>3</sub> rinse                                   |   |                                  |   |                                  |   | Same as FH           |  |           |            |
|           |                                   |   | Blank Wash           |   |                      |   | 200ml 5%HNO <sub>3</sub> /10%H <sub>2</sub> O <sub>2</sub> reagent |   |                                  |   |                                  |   | Blank Wash           |  |           |            |

Blanks are prorated to reflect 100ml for HNO<sub>3</sub> and 200ml for HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>

\* Blank Rules:

"<" indicates value is below the minimum detection limit (MDL)

If Blank is a "<" value it is treated as zero.

If Sample is a "<" it used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

Baghouse 1  
12/17-18/2020

Method 29 Metals Blank Calculations

Run: 1 Hig Chromium  
2 of 3

| Species         | X<br>Allowable<br>FH<br>Blank, $\mu g$ | XI<br>FH Blank<br>Corrected<br>$\mu g$ | XII<br>5% of FH<br>Sample, $\mu g$ | XIII<br>Lessor of<br>XI or XII | XIV<br>Greater of<br>A or XIII | XV<br>FH<br>Net<br>Sample, $\mu g$ | Species               |
|-----------------|----------------------------------------|----------------------------------------|------------------------------------|--------------------------------|--------------------------------|------------------------------------|-----------------------|
| Al <sup>†</sup> | 95.700                                 | 95.700                                 | 5.600                              | 5.600                          | 11.63                          | 16.300                             | Aluminum <sup>†</sup> |
| Sb              | 0.000                                  | 0.000 <                                | 0.063                              | 0.000                          | 11.63 <                        | 1.250                              | Antimony              |
| As              | 3.580                                  | 3.580                                  | 0.302                              | 0.302                          | 11.63                          | 2.460                              | Arsenic               |
| Ba              | 1.199                                  | 1.199                                  | 0.101                              | 0.101                          | 11.63                          | 0.821                              | Barium                |
| Be              | 0.000                                  | 0.000 <                                | 0.003                              | 0.000                          | 11.63 <                        | 0.050                              | Beryllium             |
| Cd              | 0.358                                  | 0.358                                  | 0.008                              | 0.008                          | 11.63                          | -0.206                             | Cadmium               |
| Cr              | 0.934                                  | 0.934                                  | 0.935                              | 0.934                          | 11.63                          | 17.766                             | Chromium              |
| Co              | 0.000                                  | 0.000 <                                | 0.006                              | 0.000                          | 11.63 <                        | 0.125                              | Cobalt                |
| Cu              | 0.000                                  | 0.000                                  | 0.166                              | 0.000                          | 11.63                          | 3.320                              | Copper                |
| Pb              | 1.570                                  | 1.570                                  | 0.187                              | 0.187                          | 11.63                          | 2.160                              | Lead                  |
| Mn              | 1.347                                  | 1.347                                  | 3.495                              | 1.347                          | 11.63                          | 68.553                             | Manganese             |
| Ni              | 0.000                                  | 0.000                                  | 0.348                              | 0.000                          | 11.63                          | 6.960                              | Nickel                |
| P               | 11.630                                 | 13.800                                 | 0.785                              | 0.785                          | 11.63                          | 4.070                              | Phosphorus            |
| Se              | 0.000                                  | 0.000 <                                | 0.188                              | 0.000                          | 11.63 <                        | 3.750                              | Selenium              |
| Ag              | 0.000                                  | 0.000 <                                | 0.025                              | 0.000                          | 11.63 <                        | 0.500                              | Silver                |
| Tl              | 0.000                                  | 0.000 <                                | 0.125                              | 0.000                          | 11.63 <                        | 2.500                              | Thallium              |
| V               | 0.000                                  | 0.000                                  | 0.013                              | 0.000                          | 11.63                          | 0.259                              | Vanadium              |
| Zn              | 2.330                                  | 2.330                                  | 0.389                              | 0.389                          | 11.63                          | 5.440                              | Zinc                  |

† The value shown for "allowable FH blank" for aluminum is the actual filter blank mass, not the max allowable blank as calculated by Method 29.

Allowable FH Blank Calculation:

$A = (\text{area of filter, sq. in.}) \times (1.4 \mu g/\text{sq. in.}) = \mu g$        $A = 11.63 \mu g$

if  $A > \text{blank} > 0$ , use blank derived

if blank  $> A$ , use greater of A or 5% of sample  $\mu g$  or FH blank whichever is lessor.

**\* Blank Rules:**

"<" indicates value is below the minimum detection limit (MDL)

If Blank is a "<" value it is treated as zero.

If Sample is a "<" it used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

Baghouse 1  
12/17-18/2020

Method 29 Metals Blank Calculations

Run: 1 Hig Chromium

3 of 3

| Species | XVI<br>Allowable<br>BH<br>Blank, $\mu\text{g}$ | XVII<br>Blank BH<br>Total | XVIII<br>5% of BH<br>sample, $\mu\text{g}$ | XIX<br>Lessor of<br>XVII or XVIII | XX<br>Greater of<br>1 $\mu\text{g}$ or XIX | XXI<br>BH<br>Net<br>Sample, $\mu\text{g}$ | XXII<br>FH<br>Net<br>Sample, $\mu\text{g}$ | XXIII<br>FH+BH<br>Total Net<br>Sample, $\mu\text{g}$ | Species    |
|---------|------------------------------------------------|---------------------------|--------------------------------------------|-----------------------------------|--------------------------------------------|-------------------------------------------|--------------------------------------------|------------------------------------------------------|------------|
| Al      | 1.000                                          | 5.088                     | 0.905                                      | 0.905                             | 1.000                                      | 17.100                                    | 16.300                                     | 33.400                                               | Aluminum   |
| Sb      | 0.000                                          | 0.000 <                   | 0.025                                      | 0.000                             | 1.000 <                                    | 0.500 <                                   | 1.250 <                                    | 1.750                                                | Antimony   |
| As      | 0.000                                          | 0.000 <                   | 0.035                                      | 0.000                             | 1.000 <                                    | 0.700                                     | 2.460 <                                    | 3.160                                                | Arsenic    |
| Ba      | 0.751                                          | 0.751                     | 0.070                                      | 0.070                             | 1.000                                      | 0.639                                     | 0.821                                      | 1.460                                                | Barium     |
| Be      | 0.000                                          | 0.000 <                   | 0.001                                      | 0.000                             | 1.000 <                                    | 0.020 <                                   | 0.050 <                                    | 0.070                                                | Beryllium  |
| Cd      | 0.000                                          | 0.000 <                   | 0.002                                      | 0.000                             | 1.000 <                                    | 0.040                                     | 0.000 <                                    | 0.040                                                | Cadmium    |
| Cr      | 0.302                                          | 0.302                     | 0.039                                      | 0.039                             | 1.000                                      | 0.478                                     | 17.766                                     | 18.244                                               | Chromium   |
| Co      | 0.000                                          | 0.000                     | 0.013                                      | 0.000                             | 1.000                                      | 0.265 <                                   | 0.125 <                                    | 0.390                                                | Cobalt     |
| Cu      | 1.000                                          | 1.528                     | 0.140                                      | 0.140                             | 1.000                                      | 1.790                                     | 3.320                                      | 5.110                                                | Copper     |
| Pb      | 1.000                                          | 2.221                     | 0.048                                      | 0.048                             | 1.000                                      | 0.000                                     | 2.160                                      | 2.160                                                | Lead       |
| Mn      | 0.282                                          | 0.282                     | 0.316                                      | 0.282                             | 1.000                                      | 6.038                                     | 68.553                                     | 74.591                                               | Manganese  |
| Ni      | 0.000                                          | 0.000                     | 0.033                                      | 0.000                             | 1.000                                      | 0.651                                     | 6.960                                      | 7.611                                                | Nickel     |
| P       | 0.000                                          | 0.000                     | 0.136                                      | 0.000                             | 1.000                                      | 2.720                                     | 4.070                                      | 6.790                                                | Phosphorus |
| Se      | 0.000                                          | 0.000 <                   | 0.075                                      | 0.000                             | 1.000 <                                    | 1.500 <                                   | 3.750 <                                    | 5.250                                                | Selenium   |
| Ag      | 0.000                                          | 0.000 <                   | 0.010                                      | 0.000                             | 1.000 <                                    | 0.200 <                                   | 0.500 <                                    | 0.700                                                | Silver     |
| Tl      | 0.000                                          | 0.000 <                   | 0.050                                      | 0.000                             | 1.000 <                                    | 1.000 <                                   | 2.500 <                                    | 3.500                                                | Thallium   |
| V       | 0.000                                          | 0.000 <                   | 0.005                                      | 0.000                             | 1.000 <                                    | 0.100                                     | 0.259 <                                    | 0.359                                                | Vanadium   |
| Zn      | 0.433                                          | 0.433                     | 0.423                                      | 0.423                             | 1.000                                      | 8.027                                     | 5.440                                      | 13.467                                               | Zinc       |

Allowable BH Blank Calculation:

if  $1.00\mu\text{g} > \text{blank} > 0$ , use blank derived

if blank  $> 1.00\mu\text{g}$ , use greater of 1.00 or 5% of sample ug or BH blank whichever is lessor

\* Blank Rules:

"<" indicates value is below the minimum detection limit (MDL)

If Blank is a "<" value it is treated as zero.

If Sample is a "<" it used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

**EPA Method 29**  
**Gas Stream Characteristics**  
**Test Summary**

**Client:** Columbia Steel Casting  
**Source:** Baghouse 1  
**Location:** Portland, OR

| Run                              | 1 High Chromium      |
|----------------------------------|----------------------|
| Run Start Date                   | 12/17/2020           |
| Run Start Time                   | 21:06                |
| Run End Date                     | 12/18/2020           |
| Run End Time                     | 2:08                 |
| Duration, min.                   | 271.4                |
| Barometric Pressure, "Hg         | 30.18                |
| Nozzle Dia., in.                 | 0.2203               |
| Isokinetic Average, %            | 101.2                |
| Sample Volume, dscf              | 271.599              |
| Sample Volume, dscm              | 7.691                |
| Stack Diameter, in.              | 46.00                |
| Stack Area, sq.ft.               | 11.541               |
| CO <sub>2</sub> %vd              | 0.00                 |
| O <sub>2</sub> %vd               | 20.90                |
| Static Press., "H <sub>2</sub> O | 0.05                 |
| H <sub>2</sub> O %v              | 0.98                 |
| Wet Molecular Weight, lb/lb-mole | 28.73                |
| Velocity, FPS                    | 62.42                |
| ADCFM                            | 42,799.8             |
| ACFM                             | 43,223.4             |
| DSCFM                            | 43,112.1             |
| Stack Temperature, °F            | 68.8                 |
| Production Data                  | Tons steel melted/hr |
|                                  | 2.19                 |

Columbia Steel Casting  
Baghouse 1  
Metals Results Summary

Test: M29

| Run 1 Hig Chromium |          |         |            |                     |          |         |            |                     |         |         |            |                     |    |
|--------------------|----------|---------|------------|---------------------|----------|---------|------------|---------------------|---------|---------|------------|---------------------|----|
| Total              |          |         |            |                     | FH Net   |         |            |                     |         | BH Net  |            |                     |    |
| Species            | µg       | µg/dscm | lb/hr      | lb/ton steel melted | µg       | µg/dscm | lb/hr      | lb/ton steel melted | µg      | µg/dscm | lb/hr      | lb/ton steel melted |    |
| Aluminum           | 33.400   | 4.343   | 7.01E-04   | 3.20E-04            | 16.300   | 2.119   | 3.42E-04   | 1.56E-04            | 17.100  | 2.223   | 3.59E-04   | 1.64E-04            | Al |
| Antimony           | < 1.750  | < 0.228 | < 3.67E-05 | < 1.68E-05          | < 1.250  | < 0.163 | < 2.62E-05 | < 1.20E-05          | < 0.500 | < 0.065 | < 1.05E-05 | < 4.79E-06          | Sb |
| Arsenic            | < 3.160  | < 0.411 | < 6.63E-05 | < 3.03E-05          | 2.460    | 0.320   | 5.17E-05   | 2.36E-05            | < 0.700 | < 0.091 | < 1.47E-05 | < 6.71E-06          | As |
| Barium             | 1.460    | 0.190   | 3.07E-05   | 1.40E-05            | 0.821    | 0.107   | 1.72E-05   | 7.87E-06            | 0.639   | 0.083   | 1.34E-05   | 6.13E-06            | Ba |
| Beryllium          | < 0.070  | < 0.009 | < 1.47E-06 | < 6.71E-07          | < 0.050  | < 0.007 | < 1.05E-06 | < 4.79E-07          | < 0.020 | < 0.003 | < 4.20E-07 | < 1.92E-07          | Be |
| Cadmium            | < 0.040  | < 0.005 | < 8.40E-07 | < 3.84E-07          | 0.000    | 0.000   | 0.00E+00   | 0.00E+00            | < 0.040 | < 0.005 | < 8.40E-07 | < 3.84E-07          | Cd |
| Chromium           | 18.244   | 2.372   | 3.83E-04   | 1.75E-04            | 17.766   | 2.310   | 3.73E-04   | 1.70E-04            | 0.478   | 0.062   | 1.00E-05   | 4.58E-06            | Cr |
| Cobalt             | < 0.390  | < 0.051 | < 8.19E-06 | < 3.74E-06          | < 0.125  | < 0.016 | < 2.63E-06 | < 1.20E-06          | 0.265   | 0.034   | 5.56E-06   | 2.54E-06            | Co |
| Copper             | 5.110    | 0.664   | 1.07E-04   | 4.90E-05            | 3.320    | 0.432   | 6.97E-05   | 3.18E-05            | 1.790   | 0.233   | 3.76E-05   | 1.72E-05            | Cu |
| Lead               | 2.160    | 0.281   | 4.54E-05   | 2.07E-05            | 2.160    | 0.281   | 4.54E-05   | 2.07E-05            | 0.000   | 0.000   | 0.00E+00   | 0.00E+00            | Pb |
| Manganese          | 74.591   | 9.698   | 1.57E-03   | 7.15E-04            | 68.553   | 8.913   | 1.44E-03   | 6.57E-04            | 6.038   | 0.785   | 1.27E-04   | 5.79E-05            | Mn |
| Nickel             | 7.611    | 0.990   | 1.60E-04   | 7.30E-05            | 6.960    | 0.905   | 1.46E-04   | 6.67E-05            | 0.651   | 0.085   | 1.37E-05   | 6.24E-06            | Ni |
| Phosphorus         | 6.790    | 0.883   | 1.43E-04   | 6.51E-05            | 4.070    | 0.529   | 8.55E-05   | 3.90E-05            | 2.720   | 0.354   | 5.71E-05   | 2.61E-05            | P  |
| Selenium           | < 5.250  | < 0.683 | < 1.10E-04 | < 5.03E-05          | < 3.750  | < 0.488 | < 7.87E-05 | < 3.60E-05          | < 1.500 | < 0.195 | < 3.15E-05 | < 1.44E-05          | Se |
| Silver             | < 0.700  | < 0.091 | < 1.47E-05 | < 6.71E-06          | < 0.500  | < 0.065 | < 1.05E-05 | < 4.79E-06          | < 0.200 | < 0.026 | < 4.20E-06 | < 1.92E-06          | Ag |
| Thallium           | < 3.500  | < 0.455 | < 7.35E-05 | < 3.36E-05          | < 2.500  | < 0.325 | < 5.25E-05 | < 2.40E-05          | < 1.000 | < 0.130 | < 2.10E-05 | < 9.59E-06          | Tl |
| Vanadium           | < 0.359  | < 0.047 | < 7.54E-06 | < 3.44E-06          | 0.259    | 0.034   | 5.44E-06   | 2.48E-06            | < 0.100 | < 0.013 | < 2.10E-06 | < 9.59E-07          | V  |
| Zinc               | 13.467   | 1.751   | 2.83E-04   | 1.29E-04            | 5.440    | 0.707   | 1.14E-04   | 5.22E-05            | 8.027   | 1.044   | 1.69E-04   | 7.70E-05            | Zn |
| TSM:               | < 178.05 | < 23.15 | < 3.74E-03 | < 1.71E-03          | < 136.28 | < 17.72 | < 2.86E-03 | < 1.31E-03          | < 41.77 | < 5.43  | < 8.77E-04 | < 4.00E-04          |    |

'<' denotes results which were calculated using the minimum detection limit for front half or back half results that were non-detect.



|           |                         |
|-----------|-------------------------|
| COMPANY   | Columbia Steel Casting  |
| FACILITY  | Steel Foundry           |
| LOCATION  | Portland, Oregon        |
| SOURCE    | BH 1                    |
| DATES     | 12/10/2020 - 12/16/2020 |
| METHOD    | 0061                    |
| POLLUTANT | Cr <sub>6</sub>         |

**Isokinetic Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 1  
**EPA Method:** 0061  
**Box Operator:** JMK  
**Technician(s):** JMK

**Run:** 1  
**Start Date/Time:** 12/10/2020 21:25  
**End Date/Time:** 12/11/2020 6:00  
**Environmental Conditions/Test Notes:**  
Overcast and 40 degrees F.

**Stack Dimensional Data:**

Circular  
Diameter 46.000 in  
Rectangular  
Width in  
Length in  
Stack Area 11.541 sq.ft.

**Equipment:**

Meterbox ID 12  
Y factor 1.0005  
ΔH@ 1.927  
Probe ID 5C  
Nozzle ID 0.207  
Hot box ID NA  
Pitot Cp 0.84  
Pitot ID 5C  
Liner type glass  
Nozzle size 0.2073 inches  
Nozzle area 0.000234 sq.ft.  
Probe heat 250 F  
Filter heat NA F

**Source Information:**

Barometric Pressure 30.08 "Hg  
Static Pressure 0.05 "H<sub>2</sub>O  
Ave. ΔP 1.1 "H<sub>2</sub>O  
Stack Temperature 55 F  
Assumed moisture 1 %  
Assumed meter temp. 45 F  
Total number of points 24  
Time per point 20  
Total run time 480  
O<sub>2</sub> 20.90 %  
CO<sub>2</sub> 0.00 %  
Rec. Nz. 0.202 inches

**Leak Checks:**

|                        | Pre-test | Post-test |
|------------------------|----------|-----------|
| Pitot                  | x        | x         |
| Train leak rate, dcf   | 0.000    | 0.000     |
| Leak check vacuum, "Hg | 7        | 8         |

**Nozzle check for roundness:**

| 1           | 2     | 3            |
|-------------|-------|--------------|
| 0.207       | 0.208 | 0.207 inches |
| Caliper ID# | ws2   |              |

**Post Test Calculations:**

Sample volume 403.843 dcf  
Wet mol. weight 28.75 M<sub>s</sub> (actual)  
Actual H<sub>2</sub>O 0.85 %  
Std. meter vol. 425.659 dscf  
Isokinetic Average 100.5 %  
Ave. ΔP 1.271 "H<sub>2</sub>O  
Ave. √ΔP 1.1232 "H<sub>2</sub>O  
Ave. ΔH 2.623 "H<sub>2</sub>O  
Ave. T<sub>s</sub> 67.1 °F  
Ave. T<sub>m</sub> 46.9 °F

**Moisture/Lab:**

| Filter            | NA #   | Initial | Final | Gain  |
|-------------------|--------|---------|-------|-------|
| Impingers, g      | 308.5  | 291.8   |       | -16.7 |
| Silica gel, g     | 1819.7 | 1913.6  |       | 93.9  |
| Total water gain: |        |         |       | 77.2  |

| Traverse Point | Time (min.) | Meter Volume (dcf) | Velocity P ("H <sub>2</sub> O) | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum ("Hg) | Filter Box (°F) | Condenser Temp F | Mid-run restart vol. (dcf) | Mid-run Leak check |
|----------------|-------------|--------------------|--------------------------------|------------------|------------------|---------|-------|--------------|-----------------|------------------|----------------------------|--------------------|
| 1              | 20.0        | 16.980             | 1.30                           | 51               | 41               | 2.73    | 2.70  | 6            | NA              | 39               |                            |                    |
| 2              | 40.0        | 32.970             | 1.10                           | 57               | 42               | 2.29    | 2.30  | 5.5          | NA              | 40               |                            |                    |
| 3              | 60.0        | 48.760             | 1.10                           | 59               | 45               | 2.29    | 2.30  | 5.5          | NA              | 37               |                            |                    |
| 4              | 80.0        | 64.590             | 1.10                           | 62               | 49               | 2.30    | 2.30  | 5.5          | NA              | 39               |                            |                    |
| 5              | 100.0       | 82.020             | 1.20                           | 68               | 48               | 2.47    | 2.50  | 6            | NA              | 39               |                            |                    |
| 6              | 120.0       | 97.170             | 1.20                           | 70               | 50               | 2.47    | 2.45  | 6            | NA              | 41               |                            |                    |
| 7              | 140.0       | 112.010            | 0.97                           | 76               | 48               | 1.97    | 2.00  | 5.5          | NA              | 38               |                            |                    |
| 8              | 160.0       | 126.970            | 1.00                           | 66               | 48               | 2.07    | 2.10  | 5            | NA              | 40               |                            |                    |
| 9              | 180.0       | 142.040            | 0.96                           | 65               | 48               | 1.99    | 2.00  | 5            | NA              | 40               |                            |                    |
| 10             | 200.0       | 157.830            | 1.10                           | 65               | 47               | 2.28    | 2.30  | 5            | NA              | 40               |                            |                    |
| 11             | 220.0       | 173.300            | 1.00                           | 64               | 47               | 2.07    | 2.10  | 5            | NA              | 40               |                            |                    |
| 12             | 240.0       | 188.408            | 0.98                           | 70               | 48               | 2.01    | 2.00  | 5            | NA              | 41               |                            |                    |
| 13             | 260.0       | 203.597            | 1.10                           | 73               | 48               | 2.25    | 2.25  | 5            | NA              | 41               | 203.615                    | 0.018              |
| 14             | 280.0       | 221.570            | 1.50                           | 76               | 45               | 3.03    | 3.00  | 5.5          | NA              | 40               |                            |                    |
| 15             | 300.0       | 239.360            | 1.40                           | 66               | 47               | 2.89    | 2.90  | 5.5          | NA              | 38               |                            |                    |
| 16             | 320.0       | 257.610            | 1.50                           | 66               | 46               | 3.09    | 3.10  | 5.5          | NA              | 38               |                            |                    |
| 17             | 340.0       | 276.590            | 1.60                           | 66               | 47               | 3.30    | 3.30  | 6            | NA              | 39               |                            |                    |
| 18             | 360.0       | 294.830            | 1.50                           | 67               | 48               | 3.10    | 3.10  | 5.5          | NA              | 39               |                            |                    |
| 19             | 380.0       | 312.570            | 1.40                           | 74               | 47               | 2.85    | 2.80  | 5.5          | NA              | 40               |                            |                    |
| 20             | 400.0       | 330.890            | 1.50                           | 76               | 48               | 3.05    | 3.05  | 5.5          | NA              | 40               |                            |                    |
| 21             | 420.0       | 348.970            | 1.40                           | 69               | 47               | 2.87    | 2.90  | 6.5          | NA              | 40               |                            |                    |
| 22             | 440.0       | 366.840            | 1.40                           | 67               | 46               | 2.88    | 2.90  | 6.5          | NA              | 40               |                            |                    |
| 23             | 460.0       | 384.740            | 1.60                           | 69               | 47               | 3.28    | 3.30  | 6.5          | NA              | 41               |                            |                    |
| 24             | 480.0       | 403.861            | 1.60                           | 68               | 48               | 3.30    | 3.30  | 6.5          | NA              | 42               |                            |                    |

Pause 12:15  
start 12:24

Pause 4:16

**Isokinetic Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 1  
**EPA Method:** 0061  
**Box Operator:** JMK  
**Technician(s):** JMK

**Environmental Conditions/Test Notes:**

Overcast and 40 degrees F.  
Batch process ended mid-way through point 16 and run was stopped.  
Test run ended after 5 hours 9 minutes and 14 seconds.

**Run:** 2  
**Start Date/Time:** 12/14/2020 22:15  
**End Date/Time:** 12/15/2020 3:55

**Stack Dimensional Data:**

Circular  
Diameter 46.000 in  
Rectangular  
Width in  
Length in  
Stack Area 11.541 sq.ft.

**Equipment:**

Meterbox ID 12 Probe ID 5C Liner type: glass  
Y factor 1.0005 Nozzle ID 0.207 Nozzle size: 0.2073 inches  
 $\Delta H@$  1.927 Hot box ID NA Nozzle area: 0.000234 sq.ft.  
Pitot Cp 0.84 Probe heat: 250 F  
Pitot ID 5C Filter heat: NA F

**Source Information:**

Barometric Pressure 30.27 "Hg O<sub>2</sub> 20.9 %  
Static Pressure 0.05 "H<sub>2</sub>O CO<sub>2</sub> 0.0 %  
Ave.  $\Delta P$  1.1 "H<sub>2</sub>O Rec. Nz. 0.201 inches  
Stack Temperature 55 F  
Assumed moisture 0.85 %  
Assumed meter temp. 46.9 F  
Total number of points 24  
Time per point 20  
Total run time 309

**Leak Checks:**

|                         | Pre-test | Post-test |
|-------------------------|----------|-----------|
| Pitot:                  | x        | x         |
| Train leak rate, dcf:   | 0.000    | 0.000     |
| Leak check vacuum, "Hg: | 12       | 12        |

**Nozzle check for roundness:**

| 1           | 2     | 3            |
|-------------|-------|--------------|
| 0.207       | 0.208 | 0.207 inches |
| Caliper ID# |       | ws2          |

**Post Test Calculations:**

Sample volume 247.590 dcf Ave.  $\Delta P$  1.125 "H<sub>2</sub>O  
Wet mol. weight 28.76 M<sub>s</sub> (actual) Ave.  $\sqrt{\Delta P}$  1.0598 "H<sub>2</sub>O  
Actual H<sub>2</sub>O 0.73 % Ave.  $\Delta H$  2.328 "H<sub>2</sub>O  
Std. meter vol. 261.896 dscf Ave. T<sub>s</sub> 65.8 °F  
Isokinetic Average 101.3 % Ave. T<sub>m</sub> 47.9 °F

**Moisture/Lab:**

| Filter            | NA # | Initial | Final  | Gain  |
|-------------------|------|---------|--------|-------|
| Impingers, g      |      | 297.9   | 282.5  | -15.4 |
| Silica gel, g     |      | 1893.3  | 1949.5 | 56.2  |
| Total water gain: |      |         |        | 40.8  |

| Traverse Point | Time (min.) | Meter Volume (dcf) | Velocity P ("H <sub>2</sub> O) | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum ("Hg) | Filter Box (°F) | Condenser Temp F |
|----------------|-------------|--------------------|--------------------------------|------------------|------------------|---------|-------|--------------|-----------------|------------------|
| 1              | 20.0        | 16.000             | 1.30                           | 55               | 43               | 2.73    | 2.70  | 5            | NA              | 41               |
| 2              | 40.0        | 32.570             | 1.20                           | 56               | 44               | 2.52    | 2.50  | 5.5          | NA              | 39               |
| 3              | 60.0        | 48.760             | 1.10                           | 57               | 47               | 2.32    | 2.30  | 5.5          | NA              | 41               |
| 4              | 80.0        | 65.500             | 1.20                           | 59               | 48               | 2.52    | 2.50  | 5            | NA              | 41               |
| 5              | 100.0       | 82.360             | 1.20                           | 62               | 49               | 2.51    | 2.50  | 5            | NA              | 44               |
| 6              | 120.0       | 98.560             | 1.10                           | 68               | 49               | 2.28    | 2.30  | 5            | NA              | 43               |
| 7              | 140.0       | 114.260            | 1.10                           | 63               | 50               | 2.30    | 2.30  | 5            | NA              | 43               |
| 8              | 160.0       | 128.960            | 0.90                           | 65               | 48               | 1.87    | 1.90  | 4.5          | NA              | 42               |
| 9              | 180.0       | 145.100            | 1.10                           | 65               | 50               | 2.30    | 2.30  | 5            | NA              | 43               |
| 10             | 200.0       | 160.620            | 1.10                           | 68               | 49               | 2.28    | 2.30  | 5            | NA              | 44               |
| 11             | 220.0       | 175.780            | 1.00                           | 79               | 49               | 2.03    | 2.00  | 5            | NA              | 44               |
| 12             | 240.0       | 191.738            | 1.10                           | 67               | 48               | 2.28    | 2.25  | 5            | NA              | 44               |
| 13             | 260.0       | 207.990            | 1.20                           | 68               | 48               | 2.48    | 2.50  | 5.5          | NA              | 42               |
| 14             | 280.0       | 224.620            | 1.20                           | 68               | 48               | 2.48    | 2.50  | 5.5          | NA              | 43               |
| 15             | 300.0       | 240.370            | 1.10                           | 78               | 48               | 2.23    | 2.20  | 5            | NA              | 44               |
| 16             | 309.2       | 247.590            | 1.10                           | 75               | 48               | 2.24    | 2.20  | 5            | NA              | 44               |

Pause 12:14  
Start 12:29

**Isokinetic Field Data**
**Field Data Entry**

|                       |                               |                                                      |                         |
|-----------------------|-------------------------------|------------------------------------------------------|-------------------------|
| <b>Client:</b>        | <b>Columbia Steel Casting</b> | <b>Run:</b>                                          | <b>3</b>                |
| <b>Location:</b>      | <b>Portland, Oregon</b>       | <b>Start Date/Time:</b>                              | <b>12/15/2020 21:20</b> |
| <b>Source:</b>        | <b>BH 1</b>                   | <b>End Date/Time:</b>                                | <b>12/16/2020 3:11</b>  |
| <b>EPA Method:</b>    | <b>0061</b>                   | <b>Environmental Conditions/Test Notes:</b>          |                         |
| <b>Box Operator:</b>  | <b>JMK</b>                    | Overcast and 40 degrees F.                           |                         |
| <b>Technician(s):</b> | <b>JMK</b>                    | Batch process ended at 5 hours 3 minutes 50 seconds. |                         |
|                       |                               | Run was stopped midway through point 16.             |                         |

**Stack Dimensional Data:**

|             |               |             |        |            |       |              |                 |
|-------------|---------------|-------------|--------|------------|-------|--------------|-----------------|
| Circular    |               | Meterbox ID | 12     | Probe ID   | 5C    | Liner type:  | glass           |
| Diameter    | 46.000 in     | Y factor    | 1.0005 | Nozzle ID  | 0.207 | Nozzle size: | 0.2073 inches   |
| Rectangular |               | $\Delta H@$ | 1.927  | Hot box ID | NA    | Nozzle area: | 0.000234 sq.ft. |
| Width       | in            |             |        | Pitot Cp   | 0.84  | Probe heat:  | 250 F           |
| Length      | in            |             |        | Pitot ID   | 5C    | Filter heat: | NA F            |
| Stack Area  | 11.541 sq.ft. |             |        |            |       |              |                 |

**Source Information:**

|                        |                        |                 |              |
|------------------------|------------------------|-----------------|--------------|
| Barometric Pressure    | 30.18 "Hg              | O <sub>2</sub>  | 20.9 %       |
| Static Pressure        | 0.05 "H <sub>2</sub> O | CO <sub>2</sub> | 0.0 %        |
| Ave. $\Delta P$        | 1.1 "H <sub>2</sub> O  | Rec. Nz.        | 0.201 inches |
| Stack Temperature      | 55 F                   |                 |              |
| Assumed moisture       | 0.73 %                 |                 |              |
| Assumed meter temp.    | 47.9 F                 |                 |              |
| Total number of points | 24                     |                 |              |
| Time per point         | 20                     |                 |              |
| Total run time         | 304                    |                 |              |

**Leak Checks:**

|                         | Pre-test | Post-test |
|-------------------------|----------|-----------|
| Pitot:                  | x        | x         |
| Train leak rate, dcf:   | 0.000    | 0.000     |
| Leak check vacuum, "Hg: | 12       | 11        |

**Nozzle check for roundness:**

| 1           | 2     | 3            |
|-------------|-------|--------------|
| 0.207       | 0.208 | 0.207 inches |
| Caliper ID# |       | ws2          |

**Post Test Calculations:**

|                         |                               |                     |                          |
|-------------------------|-------------------------------|---------------------|--------------------------|
| Sample volume           | 251.731 dcf                   | Ave. $\Delta P$     | 1.187 "H <sub>2</sub> O  |
| Wet mol. weight         | 28.71 M <sub>s</sub> (actual) | Ave. $\Delta P$     | 1.0863 "H <sub>2</sub> O |
| Actual H <sub>2</sub> O | 1.19 %                        | Ave. $\Delta H$     | 2.475 "H <sub>2</sub> O  |
| Std. meter vol.         | 263.048 dscf                  | Ave. T <sub>s</sub> | 73.2 °F                  |
| Isokinetic Average      | 102.1 %                       | Ave. T <sub>m</sub> | 52.8 °F                  |

**Moisture/Lab:**

| Filter            | NA #    |       |      |
|-------------------|---------|-------|------|
|                   | Initial | Final | Gain |
| Impingers, g      | 300.8   | 304.9 | 4.1  |
| Silica gel, g     | 1864.9  | 1928  | 63.1 |
| Total water gain: |         |       | 67.2 |

| Traverse Point | Time (min.) | Meter Volume (dcf) | Velocity P ("H <sub>2</sub> O) | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum ("Hg) | Filter Box (°F) | Condenser Temp F | Mid-run restart vol. (dcf) | Mid-run Leak check Vol. |
|----------------|-------------|--------------------|--------------------------------|------------------|------------------|---------|-------|--------------|-----------------|------------------|----------------------------|-------------------------|
|                |             | 0.000              |                                |                  |                  |         |       |              |                 |                  |                            |                         |
| 1              | 20.0        | 18.310             | 1.50                           | 63               | 48               | 3.14    | 3.10  | 4            | NA              | 44               |                            |                         |
| 2              | 40.0        | 37.570             | 1.60                           | 64               | 49               | 3.35    | 3.40  | 4            | NA              | 45               |                            |                         |
| 3              | 60.0        | 55.490             | 1.40                           | 68               | 51               | 2.92    | 2.90  | 3.5          | NA              | 46               |                            |                         |
| 4              | 80.0        | 72.920             | 1.30                           | 69               | 52               | 2.71    | 2.70  | 3            | NA              | 47               |                            |                         |
| 5              | 100.0       | 89.610             | 1.20                           | 81               | 55               | 2.46    | 2.50  | 3            | NA              | 49               |                            |                         |
| 6              | 120.0       | 105.940            | 1.10                           | 75               | 55               | 2.28    | 2.30  | 3            | NA              | 49               |                            |                         |
| 7              | 140.0       | 122.610            | 1.10                           | 70               | 52               | 2.29    | 2.30  | 3            | NA              | 47               |                            |                         |
| 8              | 160.0       | 137.520            | 0.94                           | 70               | 53               | 1.96    | 2.00  | 3            | NA              | 50               |                            |                         |
| 9              | 180.0       | 152.130            | 0.95                           | 70               | 53               | 1.98    | 2.00  | 3            | NA              | 50               |                            |                         |
| 10             | 200.0       | 168.110            | 1.10                           | 73               | 54               | 2.28    | 2.30  | 3.5          | NA              | 53               |                            |                         |
| 11             | 220.0       | 184.120            | 1.10                           | 79               | 54               | 2.26    | 2.30  | 3.5          | NA              | 54               |                            |                         |
| 12             | 240.0       | 200.765            | 1.20                           | 74               | 53               | 2.48    | 2.50  | 3.5          | NA              | 56               | 200.979                    | 0.214                   |
| 13             | 260.0       | 215.890            | 1.00                           | 70               | 53               | 2.08    | 2.10  | 3.5          | NA              | 53               |                            |                         |
| 14             | 280.0       | 233.020            | 1.30                           | 73               | 53               | 2.69    | 2.70  | 4.5          | NA              | 47               |                            |                         |
| 15             | 300.0       | 248.930            | 1.10                           | 94               | 55               | 2.20    | 2.20  | 4            | NA              | 45               |                            |                         |
| 16             | 303.8       | 251.945            | 1.10                           | 78               | 55               | 2.27    | 2.30  | 4.5          | NA              | 45               |                            |                         |

Pause  
Start 11:31

Pause 1:12am  
Start 1:27

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Emissions and Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 1  
**Method:** 0061

**Run: 1**  
**Start Date/Time:** 12/10/2020 21:25  
**End Date/Time:** 12/11/2020 6:00

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 0.000                    |                                 |                            |                   |                         |                            |             |
| 20            | 16.980                   | 2.70                            | 41                         | 1                 | 1.30                    | 51                         | 1.1402      |
| 40            | 32.970                   | 2.30                            | 42                         | 2                 | 1.10                    | 57                         | 1.0488      |
| 60            | 48.760                   | 2.30                            | 45                         | 3                 | 1.10                    | 59                         | 1.0488      |
| 80            | 64.590                   | 2.30                            | 49                         | 4                 | 1.10                    | 62                         | 1.0488      |
| 100           | 82.020                   | 2.50                            | 48                         | 5                 | 1.20                    | 68                         | 1.0954      |
| 120           | 97.170                   | 2.45                            | 50                         | 6                 | 1.20                    | 70                         | 1.0954      |
| 140           | 112.010                  | 2.00                            | 48                         | 7                 | 0.97                    | 76                         | 0.9849      |
| 160           | 126.970                  | 2.10                            | 48                         | 8                 | 1.00                    | 66                         | 1.0000      |
| 180           | 142.040                  | 2.00                            | 48                         | 9                 | 0.96                    | 65                         | 0.9798      |
| 200           | 157.830                  | 2.30                            | 47                         | 10                | 1.10                    | 65                         | 1.0488      |
| 220           | 173.300                  | 2.10                            | 47                         | 11                | 1.00                    | 64                         | 1.0000      |
| 240           | 188.408                  | 2.00                            | 48                         | 12                | 0.98                    | 70                         | 0.9899      |
| 260           | 203.597                  | 2.25                            | 48                         | 13                | 1.10                    | 73                         | 1.0488      |
| 280           | 221.570                  | 3.00                            | 45                         | 14                | 1.50                    | 76                         | 1.2247      |
| 300           | 239.360                  | 2.90                            | 47                         | 15                | 1.40                    | 66                         | 1.1832      |
| 320           | 257.610                  | 3.10                            | 46                         | 16                | 1.50                    | 66                         | 1.2247      |
| 340           | 276.590                  | 3.30                            | 47                         | 17                | 1.60                    | 66                         | 1.2649      |
| 360           | 294.830                  | 3.10                            | 48                         | 18                | 1.50                    | 67                         | 1.2247      |
| 380           | 312.570                  | 2.80                            | 47                         | 19                | 1.40                    | 74                         | 1.1832      |
| 400           | 330.890                  | 3.05                            | 48                         | 20                | 1.50                    | 76                         | 1.2247      |
| 420           | 348.970                  | 2.90                            | 47                         | 21                | 1.40                    | 69                         | 1.1832      |
| 440           | 366.840                  | 2.90                            | 46                         | 22                | 1.40                    | 67                         | 1.1832      |
| 460           | 384.740                  | 3.30                            | 47                         | 23                | 1.60                    | 69                         | 1.2649      |
| 480           | 403.861                  | 3.30                            | 48                         | 24                | 1.60                    | 68                         | 1.2649      |

Mid-run leak check volume: 0.018 dcf

**Client: Columbia Steel Casting****Run: 1****Source: BH 1****Dates: 12/10/20-12/11/20****Field Data Input Continued**Moisture Data

Total Test Time 480.0 min  
 Sample Time Interval 20.0 min  
 Meter Volume,  $V_m$  403.843 dcf  
 Water Volume 77.2 g  
 Nozzle Diameter,  $N_z$  0.2073 in.  
 Nozzle Area 0.000234 sq.ft.

Stack Dimensional Data:

Circular  
 Diameter 46.000 in  
 Rectangular  
 Width in  
 Length in  
 Stack Area 11.541 sq.ft.

Traverse Data

Barometric Pressure,  $P_b$  30.08 "Hg  
 Static Pressure 0.05 "H<sub>2</sub>O  
 Pitot Factor, cp 0.84  
 Meter Cal Factor 1.0005 Y

Molecular Weight:

CO<sub>2</sub> Average 0.00 %vd  
 O<sub>2</sub> Average 21.02 %vd

**Field Data Averages**Meter

$\Delta H$  2.623 "H<sub>2</sub>O  
 Temperature,  $T_m$  46.9 °F  
 Temperature,  $T_m$  506.9 °A (°R)  
 Pressure Meter,  $P_m$  30.273 "Hg

Stack

$\sqrt{Dp}$  1.1232 "H<sub>2</sub>O  
 Temperature,  $T_s$  67.1 °F  
 Temperature,  $T_s$  527.1 °A (R)  
 Pressure Stack,  $P_s$  30.084 "Hg

**Field Data Calculations**Meter Box Capture

Standard Volume,  $V_{m(std)}$  425.659 dscf  
 12.053 dscm  
 Actual Volume,  $V_{m(actual)}$  426.410 awcf

EPA Method 2 Stack Gas Flowrate:

Velocity,  $V_s$  62.97 fps  
 Volume (actual) 43,604.2 acfm  
 43,233.6 adcfm  
 Volume (standard) 2,635,084.4 wscf/hr  
 2,612,686.2 dscf/hr  
 43,544.8 dscf/min

Gas Stream Moisture

Moisture Vapor,  $V_{w(std)}$  3.633 scf  
 Moisture,  $B_{ws}$  0.0085  
 Moisture EPA M4 0.85 %v

EPA Method 3 Gas Density

Dry,  $M_d$  28.84 lb/lb-mole  
 Wet,  $M_s$  28.75 lb/lb-mole

Volume/Mole,  $V/M$  382.515

Percent Isokinetic 100.5 %

**Laboratory Results**

Cr VI 0.982 µg/sample  
 Cr VI 9.82E-07 grams

**Emissions:**

Concentration Cr VI,  $C_s$  3.56E-08 gr/dscf  
 0.081 µg/dscm  
 Mass Emissions Cr VI 1.33E-05 lb/hr

"<" represents MDL value

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Emissions and Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 1  
**Method:** 0061

**Run: 2**  
**Start Date/Time:** 12/14/2020 22:15  
**End Date/Time:** 12/15/2020 3:55

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 0.000                    |                                 |                            |                   |                         |                            |             |
| 20            | 16.000                   | 2.70                            | 43                         | 1                 | 1.30                    | 55                         | 1.1402      |
| 40            | 32.570                   | 2.50                            | 44                         | 2                 | 1.20                    | 56                         | 1.0954      |
| 60            | 48.760                   | 2.30                            | 47                         | 3                 | 1.10                    | 57                         | 1.0488      |
| 80            | 65.500                   | 2.50                            | 48                         | 4                 | 1.20                    | 59                         | 1.0954      |
| 100           | 82.360                   | 2.50                            | 49                         | 5                 | 1.20                    | 62                         | 1.0954      |
| 120           | 98.560                   | 2.30                            | 49                         | 6                 | 1.10                    | 68                         | 1.0488      |
| 140           | 114.260                  | 2.30                            | 50                         | 7                 | 1.10                    | 63                         | 1.0488      |
| 160           | 128.960                  | 1.90                            | 48                         | 8                 | 0.90                    | 65                         | 0.9487      |
| 180           | 145.100                  | 2.30                            | 50                         | 9                 | 1.10                    | 65                         | 1.0488      |
| 200           | 160.620                  | 2.30                            | 49                         | 10                | 1.10                    | 68                         | 1.0488      |
| 220           | 175.780                  | 2.00                            | 49                         | 11                | 1.00                    | 79                         | 1.0000      |
| 240           | 191.738                  | 2.25                            | 48                         | 12                | 1.10                    | 67                         | 1.0488      |
| 260           | 207.990                  | 2.50                            | 48                         | 13                | 1.20                    | 68                         | 1.0954      |
| 280           | 224.620                  | 2.50                            | 48                         | 14                | 1.20                    | 68                         | 1.0954      |
| 300           | 240.370                  | 2.20                            | 48                         | 15                | 1.10                    | 78                         | 1.0488      |
| 309           | 247.590                  | 2.20                            | 48                         | 16                | 1.10                    | 75                         | 1.0488      |

**Client: Columbia Steel Casting****Run: 2****Source: BH 1****Dates: 12/14/20-12/15/20****Field Data Input Continued**Moisture Data

Total Test Time 309.0 min  
 Sample Time Interval 20.0 min  
 Meter Volume,  $V_m$  247.590 dcf  
 Water Volume 40.8 g  
 Nozzle Diameter,  $N_z$  0.2073 in.  
 Nozzle Area 0.000234 sq.ft.

Stack Dimensional Data:

Circular  
 Diameter 46.000 in  
 Rectangular  
 Width in  
 Length in  
 Stack Area 11.541 sq.ft.

Traverse Data

Barometric Pressure,  $P_b$  30.27 "Hg  
 Static Pressure 0.05 "H<sub>2</sub>O  
 Pitot Factor, cp 0.84  
 Meter Cal Factor 1.0005 Y

Molecular Weight:

CO<sub>2</sub> Average 0.03 %vd  
 O<sub>2</sub> Average 21.00 %vd

**Field Data Averages**Meter

$\Delta H$  2.328 "H<sub>2</sub>O  
 Temperature,  $T_m$  47.9 °F  
 Temperature,  $T_m$  507.9 °A (°R)  
 Pressure Meter,  $P_m$  30.441 "Hg

Stack

$\sqrt{D_p}$  1.0598 "H<sub>2</sub>O  
 Temperature,  $T_s$  65.8 °F  
 Temperature,  $T_s$  525.8 °A (R)  
 Pressure Stack,  $P_s$  30.274 "Hg

**Field Data Calculations**Meter Box Capture

Standard Volume,  $V_{m(std)}$  261.896 dscf  
 7.416 dscm  
 Actual Volume,  $V_{m(actual)}$  259.755 awcf

EPA Method 2 Stack Gas Flowrate:

Velocity,  $V_s$  59.14 fps  
 Volume (actual) 40,952.1 acfm  
 40,653.1 adcfm  
 Volume (standard) 2,496,599.2 wscf/hr  
 2,478,374.0 dscf/hr  
 41,306.2 dscf/min

Gas Stream Moisture

Moisture Vapor,  $V_{w(std)}$  1.920 scf  
 Moisture,  $B_{ws}$  0.0073  
 Moisture EPA M4 0.73 %v

EPA Method 3 Gas Density

Dry,  $M_d$  28.84 lb/lb-mole  
 Wet,  $M_s$  28.76 lb/lb-mole

Volume/Mole,  $V/M$  379.177

Percent Isokinetic 101.3 %

**Laboratory Results**

Cr VI 0.405 µg/sample  
 Cr VI 4.05E-07 grams

**Emissions:**

Concentration Cr VI,  $C_s$  2.39E-08 gr/dscf  
 0.055 µg/dscm  
 Mass Emissions Cr VI 8.45E-06 lb/hr

"<" represents MDL value

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Emissions and Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 1  
**Method:** 0061

**Run: 3**  
**Start Date/Time:** 12/15/2020 21:20  
**End Date/Time:** 12/16/2020 3:11

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 0.000                    |                                 |                            |                   |                         |                            |             |
| 20            | 18.310                   | 3.10                            | 48                         | 1                 | 1.50                    | 63                         | 1.2247      |
| 40            | 37.570                   | 3.40                            | 49                         | 2                 | 1.60                    | 64                         | 1.2649      |
| 60            | 55.490                   | 2.90                            | 51                         | 3                 | 1.40                    | 68                         | 1.1832      |
| 80            | 72.920                   | 2.70                            | 52                         | 4                 | 1.30                    | 69                         | 1.1402      |
| 100           | 89.610                   | 2.50                            | 55                         | 5                 | 1.20                    | 81                         | 1.0954      |
| 120           | 105.940                  | 2.30                            | 55                         | 6                 | 1.10                    | 75                         | 1.0488      |
| 140           | 122.610                  | 2.30                            | 52                         | 7                 | 1.10                    | 70                         | 1.0488      |
| 160           | 137.520                  | 2.00                            | 53                         | 8                 | 0.94                    | 70                         | 0.9695      |
| 180           | 152.130                  | 2.00                            | 53                         | 9                 | 0.95                    | 70                         | 0.9747      |
| 200           | 168.110                  | 2.30                            | 54                         | 10                | 1.10                    | 73                         | 1.0488      |
| 220           | 184.120                  | 2.30                            | 54                         | 11                | 1.10                    | 79                         | 1.0488      |
| 240           | 200.765                  | 2.50                            | 53                         | 12                | 1.20                    | 74                         | 1.0954      |
| 260           | 215.890                  | 2.10                            | 53                         | 13                | 1.00                    | 70                         | 1.0000      |
| 280           | 233.020                  | 2.70                            | 53                         | 14                | 1.30                    | 73                         | 1.1402      |
| 300           | 248.930                  | 2.20                            | 55                         | 15                | 1.10                    | 94                         | 1.0488      |
| 304           | 251.945                  | 2.30                            | 55                         | 16                | 1.10                    | 78                         | 1.0488      |

Mid-run leak check volume: 0.214 dcf

Client: Columbia Steel Casting

Run: 3

Source: BH 1

Dates: 12/15/20-12/16/20

**Field Data Input Continued**Moisture Data

|                                 |                 |
|---------------------------------|-----------------|
| Total Test Time                 | 304.0 min       |
| Sample Time Interval            | 20.0 min        |
| Meter Volume, V <sub>m</sub>    | 251.731 dcf     |
| Water Volume                    | 67.2 g          |
| Nozzle Diameter, N <sub>z</sub> | 0.2073 in.      |
| Nozzle Area                     | 0.000234 sq.ft. |

Stack Dimensional Data:

|             |               |
|-------------|---------------|
| Circular    |               |
| Diameter    | 46.000 in     |
| Rectangular |               |
| Width       | in            |
| Length      | in            |
| Stack Area  | 11.541 sq.ft. |

Traverse Data

|                                     |                        |
|-------------------------------------|------------------------|
| Barometric Pressure, P <sub>b</sub> | 30.18 "Hg              |
| Static Pressure                     | 0.05 "H <sub>2</sub> O |
| Pitot Factor, cp                    | 0.84                   |
| Meter Cal Factor                    | 1.0005 Y               |

Molecular Weight:

|                         |           |
|-------------------------|-----------|
| CO <sub>2</sub> Average | 0.00 %vd  |
| O <sub>2</sub> Average  | 21.06 %vd |

**Field Data Averages**Meter

|                                |                         |
|--------------------------------|-------------------------|
| ΔH                             | 2.475 "H <sub>2</sub> O |
| Temperature, T <sub>m</sub>    | 52.8 °F                 |
| Temperature, T <sub>m</sub>    | 512.8 °A (°R)           |
| Pressure Meter, P <sub>m</sub> | 30.362 "Hg              |

Stack

|                                |                          |
|--------------------------------|--------------------------|
| √Dp                            | 1.0863 "H <sub>2</sub> O |
| Temperature, T <sub>s</sub>    | 73.2 °F                  |
| Temperature, T <sub>s</sub>    | 533.2 °A (R)             |
| Pressure Stack, P <sub>s</sub> | 30.184 "Hg               |

**Field Data Calculations**Meter Box Capture

|                                       |              |
|---------------------------------------|--------------|
| Standard Volume, V <sub>m(std)</sub>  | 263.048 dscf |
|                                       | 7.449 dscm   |
| Actual Volume, V <sub>m(actual)</sub> | 266.593 awcf |

EPA Method 2 Stack Gas Flowrate:

|                          |                     |
|--------------------------|---------------------|
| Velocity, V <sub>s</sub> | 61.19 fps           |
| Volume (actual)          | 42,371.6 acfm       |
|                          | 41,867.4 adcfm      |
| Volume (standard)        | 2,539,717.3 wscf/hr |
|                          | 2,509,494.7 dscf/hr |
|                          | 41,824.9 dscf/min   |

Gas Stream Moisture

|                                     |           |
|-------------------------------------|-----------|
| Moisture Vapor, Vw <sub>(std)</sub> | 3.162 scf |
| Moisture, B <sub>ws</sub>           | 0.0119    |
| Moisture EPA M4                     | 1.19 %v   |

EPA Method 3 Gas Density

|                     |                  |
|---------------------|------------------|
| Dry, M <sub>d</sub> | 28.84 lb/lb-mole |
| Wet, M <sub>s</sub> | 28.71 lb/lb-mole |

|                  |        |
|------------------|--------|
| Volume/Mole, V/M | 385.66 |
|------------------|--------|

|                    |         |
|--------------------|---------|
| Percent Isokinetic | 102.1 % |
|--------------------|---------|

**Laboratory Results**

|       |          |           |
|-------|----------|-----------|
| Cr VI | 0.817    | μg/sample |
| Cr VI | 8.17E-07 | grams     |

**Emissions:**

|                                     |          |         |
|-------------------------------------|----------|---------|
| Concentration Cr VI, C <sub>s</sub> | 4.79E-08 | gr/dscf |
|                                     | 0.110    | μg/dscm |
| Mass Emissions Cr VI                | 1.72E-05 | lb/hr   |

" &lt; " represents MDL value

**Method 0061**  
**Laboratory Results**  
**Cr VI**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 1

| Lab ID   | Sample ID                       | Sample Date | < | Result<br>(µg/sample) | MDL<br>(µg/sample) | Sample<br>Vol. (ml) | Blank Correction<br>(ug) | Blank Corrected<br>Results (µg/sample) |
|----------|---------------------------------|-------------|---|-----------------------|--------------------|---------------------|--------------------------|----------------------------------------|
| 20-S2279 | Run 1 Cont. #1                  | 12/11/2020  |   | 1.01                  | 0.0048             | 475                 | 0.028                    | 0.982                                  |
| 20-S2311 | Run 2 Cont. #1                  | 12/14/2020  |   | 0.433                 | 0.0205             | 410                 | 0.028                    | 0.405                                  |
| 20-S2312 | Run 3 Cont. #1                  | 12/15/2020  |   | 0.845                 | 0.0234             | 467                 | 0.028                    | 0.817                                  |
| 20-S2283 | KOH Blank                       | 12/9/2020   |   | 0.027                 | 0.0029             | 293                 | 9.28E-05                 | µg/ml                                  |
| 20-S2284 | H <sub>2</sub> O Blank          | 12/9/2020   | < | MDL                   | 0.0021             | 213                 | 0.00                     | µg/ml                                  |
| 20-S2282 | Field Train Blank (Arc Furnace) | 12/11/2020  |   | 0.031                 | 0.0043             | 433                 | 7.21E-05                 | µg/ml                                  |

\*A "<" sign designates a result less than the minimum detection limit (MDL). If sample results are below MDL, the MDL value is used for calculations.  
If blank value(s) are below MDL, no blank correction is performed.

**Method 0061****Results Summary****Client:** Columbia Steel Casting**Location:** Portland, Oregon**Source:** BH 1

| Run                                |                               |                     | 1          | 2          | 3          |          |
|------------------------------------|-------------------------------|---------------------|------------|------------|------------|----------|
| Run Start Date                     |                               |                     | 12/10/2020 | 12/14/2020 | 12/15/2020 |          |
| Run Start Time                     |                               |                     | 21:25      | 22:15      | 21:20      |          |
| Run End Date                       |                               |                     | 12/11/2020 | 12/15/2020 | 12/16/2020 |          |
| Run End Time                       |                               |                     | 6:00       | 3:55       | 3:11       | Average  |
| Duration, min.                     |                               |                     | 480        | 309        | 304        | 364      |
| Barometric Pressure, "Hg           |                               |                     | 30.08      | 30.27      | 30.18      | 30.18    |
| Nozzle Dia., in.                   |                               |                     | 0.2073     | 0.2073     | 0.2073     | 0.2073   |
| Isokinetic Average, %              |                               |                     | 100.5      | 101.3      | 102.1      | 101.3    |
| Sample Volume, dscf                |                               |                     | 425.659    | 261.896    | 263.048    | 316.868  |
| Sample Volume, dscm                |                               |                     | 12.053     | 7.416      | 7.449      | 8.973    |
| Stack Diameter, in.                |                               |                     | 46.000     | 46.000     | 46.000     | 46.000   |
| Stack Area, sq.ft.                 |                               |                     | 11.541     | 11.541     | 11.541     | 11.541   |
| CO <sub>2</sub> %vd                |                               |                     | 0.00       | 0.03       | 0.00       | 0.01     |
| O <sub>2</sub> %vd                 |                               |                     | 21.02      | 21.00      | 21.06      | 21.03    |
| Static Pressure, "H <sub>2</sub> O |                               |                     | 0.05       | 0.05       | 0.05       | 0.05     |
| H <sub>2</sub> O %v                |                               |                     | 0.85       | 0.73       | 1.19       | 0.92     |
| Wet Molecular Weight, lb/lb-mole   |                               |                     | 28.75      | 28.76      | 28.71      | 28.74    |
| Velocity, FPS                      |                               |                     | 62.97      | 59.14      | 61.19      | 61.10    |
| ADCFM                              |                               |                     | 43,233.6   | 40,653.1   | 41,867.4   | 41,918.0 |
| ACFM                               |                               |                     | 43,604.2   | 40,952.1   | 42,371.6   | 42,309.3 |
| DSCFM                              |                               |                     | 43,544.8   | 41,306.2   | 41,824.9   | 42,225.3 |
| Stack Temperature, °F              |                               |                     | 67.1       | 65.8       | 73.2       | 68.7     |
| Cr VI                              | Concentration, C <sub>s</sub> | gr/dscf             | 3.56E-08   | 2.39E-08   | 4.79E-08   | 3.58E-08 |
|                                    |                               | µg/dscm             | 0.081      | 0.055      | 0.110      | 0.082    |
|                                    | Mass                          | lb/hr               | 1.33E-05   | 8.45E-06   | 1.72E-05   | 1.30E-05 |
|                                    |                               | lb/ton steel melted | 7.51E-06   | 4.16E-06   | 8.11E-06   | 6.59E-06 |
| Production Data                    | tons steel melted/hr          |                     | 1.77       | 2.03       | 2.12       | 1.97E+00 |

**Methods 1-4, 0061**  
**Example Calculations**

**Client: Columbia Steel Casting**  
**Location: Portland, Oregon**  
**Source: BH 1**  
**Method: 0061**

**Run: 1**  
**Start Date/Time: 12/10/2020 21:25**  
**End Date/Time: 12/11/2020 6:00**

**EPA Methods 1-4:**

$$1) P_m = P_b + (\Delta H/13.6) = 30.273 \text{ "Hg}$$

where  $P_b$ : 30.08 "Hg  
 $\Delta H$ : 2.623 "H<sub>2</sub>O

$$2) P_s = P_b + (\text{Static Press.}/13.6) = 30.084 \text{ "Hg}$$

where  $P_b$ : 30.08 "Hg  
Static Press.: 0.05 "H<sub>2</sub>O

$$3) V_m(\text{std}) = V_m(17.64)(Y)\left(\frac{P_m}{T_m}\right) = 425.659 \text{ dscf}$$

where  $V_m$ : 403.843 dcf  
 $Y$ : 1.0005  
 $P_m$ : 30.273 "Hg  
 $T_m$ : 506.9 °A

$$4) V_w(\text{std}) = (0.04706)(H_2O) = 3.633 \text{ scf}$$

where  $H_2O$ : 77.20 g

$$5) Bws = \left( \frac{Vw(\text{std})}{Vw(\text{std}) + Vm(\text{std})} \right) = 0.0085$$

where  $Vw(\text{std})$ : 3.633 scf  
 $Vm(\text{std})$ : 425.659 dscf

$$6) \% H_2O = Bws \times 100 = 0.85 \%v$$

$$7) V_m(\text{actual}) = \left( \frac{Y \times Vm}{(1 - Bws)} \right) \left( \frac{T_s}{T_m} \right) \left( \frac{P_m}{P_s} \right) = 426.410 \text{ awcf}$$

where  $Y$ : 1.0005  
 $Vm$ : 403.8430 dcf  
 $Bws$ : 0.0085  
 $T_s$ : 527.1 °A  
 $T_m$ : 506.9 °A  
 $P_m$ : 30.273 "Hg  
 $P_s$ : 30.084 "Hg

$$8) M_d = 0.44(CO_2) + 0.32(O_2) + 0.28(N_2 + CO) = 28.84 \text{ lb/lb-mole}$$

where  $CO_2$ : 0.00 %vd  
 $O_2$ : 21.02 %vd  
 $N_2 + CO = (100 - (O_2 + CO_2))$ : 78.98 %vd

9)  $M_s = M_d(1 - Bws) + (18 \times Bws) =$  28.75 lb/lb-mole  
where  $M_d$ : 28.84 lb/lb-mole  
Bws: 0.0085

10) Stack Area(cir.) =  $3.1416 (\text{stack diameter}/24)^2 =$  11.541 sq. ft.  
where Stack ID: 46 inches

Stack Area(rect.) =  $\text{stack width}/12 \times \text{stack length}/12 =$  NA sq. ft.  
where Stack Width: 0.000 inches  
Stack Length: 0.000 inches

11) Velocity,  $V_s = 85.49(Cp)(\text{Ave. Sqrt } \Delta P) \left( \sqrt{\frac{T_s}{(P_s \times M_s)}} \right) =$  62.97 fps  
where Cp: 0.84  
Ave. Sqrt  $\Delta P$ : 1.1232  
Ts: 527.1 °A  
Ps: 30.084 "Hg  
Ms: 28.75 lb/lb-mole

12) ACFM =  $(V_s)(\text{stack area})(60 \text{ sec/min}) =$  43,604.2 ACFM  
where  $V_s$ : 62.97 ft/sec  
Stack Area: 11.541 sq. ft

13) ADCFM =  $(ACFM)(1-Bws) =$  43,233.6 ADCFM  
where ACFM: 43,604.2  
Bws: 0.0085

14)  $Q_{sw} = 3600(V_s)(\text{stack area}) \left( \frac{528^\circ A}{T_s} \right) \left( \frac{P_s}{29.92 \text{ "Hg}} \right) =$  2,635,084.4 wscf/hr  
where  $V_s$ : 62.97 ft/sec  
Stack Area: 11.5410 sq. ft.  
Ts: 527.1 °A  
Ps: 30.084 "Hg

15)  $Q_{sd} = (\text{wscf/hr})(1-Bws) =$  2,612,686.2 dscf/hr  
where wscf/hr: 2,635,084.4  
Bws: 0.0085

16) DSCFM =  $(\text{dscf/hr})/60 \text{ mins/hr} =$  43,544.8 DSCFM  
where dscf/hr: 2,612,686.2

17) Nozzle Area =  $3.1416 (\text{Nozzle Size}/24)^2 =$  0.000234 sq. ft.  
where Nozzle Size: 0.2073 inches

Client: Columbia Steel Casting  
Source: BH 1

Run: 1  
Date: 12/10/20-12/11/20

$$18) \text{ Isokinetic \%} = \left( \frac{0.0945(Ts)(Vm(std))}{Ps(Vs)(nozzle\ area)(sampling\ time)(1-Bws)} \right) = 100.5 \%$$

where Ts: 527.1 °A  
Vm(Std): 425.659 dscf  
Ps: 30.084 "Hg  
Vs: 62.97 ft/sec  
Nozzle Area: 0.000234 sq. ft.  
Sampling Time: 480 min.  
Bws: 0.0085

**Method 0061:**

19) Laboratory Result Cr VI 1.01 µg/sample

20) Blank Correction

Blank concentration = Result (µg/sample)\*Volume (ml) =

KOH blank concentration: 9.28E-05 µg/ml

H<sub>2</sub>O blank concentration: 0.00E+00 µg/ml

Blank correction = [KOH blank (µg/ml)\*300(ml)]+[H<sub>2</sub>O  
blank (µg/ml)\*(sample vol.-300(ml))] = 0.028 µg/sample

where sample volume: 475 ml

21) Blank corrected result = Lab result - blank correction = 0.982 µg/sample

where lab result: 1.01

blank correction: 0.028

20) Cs = (Sample grams/Vm(Std))(15.43grains/gram) = 3.56E-08 gr/dscf

where sample: 9.82E-07 grams

Vm(std) 425.659 dscf

21) Cs = (Sample grams\*1,000,000 µg/gram)/Vm(std) = 0.081 µg/dscm

where sample: 9.82E-07 grams

Vm(std) 12.053 dscm

22) Mass Emission Rate = (Cs)(Stack flow)/7000gr/lb = 1.33E-05 lb/hr

where Cs: 3.56E-08 gr/dscf

Stack Flow: 2,612,686.2 dscf/hr

**Isokinetic Field Data**  
**Field Data Entry**

Client: Columbia Steel Casting  
Location: Portland, OR  
Source: BH 1  
EPA Method: 0061  
Box Operator: JMK  
Technician(s): JMK

Run: 1  
Start Date/Time: 12/17/2020 21:06  
End Date/Time: 12/18/2020 2:07

Environmental Conditions/Test Notes:  
Mostly cloudy and 40 degrees F.  
Batch process ended at 4 hours, 30 minutes 43 seconds.

**Stack Dimensional Data:**

Circular  
Diameter 46.000 in  
Rectangular  
Width in  
Length in  
Stack Area 11.541 sq.ft.

**Equipment:**

Meterbox ID 12  
Y factor 1.0005  
ΔH@ 1.927  
Probe ID 5C  
Nozzle ID 0.207  
Hot box ID NA  
Pitot Cp 0.84  
Pitot ID 5C  
Liner type glass  
Nozzle size 0.2073 inches  
Nozzle area 0.000234 sq.ft.  
Probe heat 250 F  
Filter heat NA F

**Source Information:**

Barometric Pressure 30.15 "Hg  
Static Pressure 0.05 "H<sub>2</sub>O  
Ave. ΔP 1.1 "H<sub>2</sub>O  
Stack Temperature 73 F  
Assumed moisture 1 %  
Assumed meter temp. 55 F  
Total number of points 14  
Time per point 20  
Total run time 271

O<sub>2</sub> 20.90 %  
CO<sub>2</sub> 0.00 %  
Rec. Nz. 0.202 inches

**Leak Checks:**

|                        | Pre-test | Post-test |
|------------------------|----------|-----------|
| Pitot                  | x        | x         |
| Train leak rate, dcf   | 0.000    | 0.000     |
| Leak check vacuum, "Hg | 10       | 12        |

**Nozzle check for roundness:**

| 1           | 2     | 3            |
|-------------|-------|--------------|
| 0.207       | 0.208 | 0.207 inches |
| Caliper ID# | ws2   |              |

**Post Test Calculations:**

Sample volume 231.681 dcf  
Wet mol. weight 28.68 M<sub>s</sub> (actual)  
Actual H<sub>2</sub>O 1.52 %  
Std. meter vol. 243.975 dscf  
Isokinetic Average 101.7 %

Ave. ΔP 1.286 "H<sub>2</sub>O  
Ave. √ΔP 1.1319 "H<sub>2</sub>O  
Ave. ΔH 2.675 "H<sub>2</sub>O  
Ave. T<sub>s</sub> 66.2 °F  
Ave. T<sub>m</sub> 48.6 °F

**Moisture/Lab:**

|                   | Filter  |        | Gain |
|-------------------|---------|--------|------|
|                   | Initial | Final  |      |
| Impingers, g      | 2619.3  | 2657.8 | 38.5 |
| Silica gel, g     | 1702.4  | 1744.0 | 41.6 |
| Total water gain: |         |        | 80.1 |

| Traverse Point | Time (min.) | Meter Volume (dcf) | Velocity P ("H <sub>2</sub> O) | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum ("Hg) | Filter Box (°F) | Condenser Temp F | Mid-run restart vol. (dcf) | Mid-run Leak check vol. |
|----------------|-------------|--------------------|--------------------------------|------------------|------------------|---------|-------|--------------|-----------------|------------------|----------------------------|-------------------------|
| 1              | 20.0        | 19.600             | 1.60                           | 59               | 45               | 3.33    | 3.35  | 6            | NA              | 39               |                            |                         |
| 2              | 40.0        | 37.180             | 1.40                           | 62               | 45               | 2.90    | 2.90  | 5.5          | NA              | 41               |                            |                         |
| 3              | 60.0        | 54.980             | 1.40                           | 62               | 47               | 2.91    | 2.90  | 5.5          | NA              | 41               |                            |                         |
| 4              | 80.0        | 72.200             | 1.30                           | 64               | 49               | 2.71    | 2.70  | 5.5          | NA              | 39               |                            |                         |
| 5              | 100.0       | 88.870             | 1.20                           | 70               | 50               | 2.47    | 2.50  | 5            | NA              | 40               |                            |                         |
| 6              | 120.0       | 105.570            | 1.30                           | 69               | 49               | 2.68    | 2.70  | 5.5          | NA              | 38               |                            |                         |
| 7              | 140.0       | 122.240            | 1.20                           | 65               | 49               | 2.49    | 2.50  | 5            | NA              | 41               |                            |                         |
| 8              | 160.0       | 138.710            | 1.20                           | 65               | 49               | 2.49    | 2.50  | 5            | NA              | 41               |                            |                         |
| 9              | 180.0       | 154.283            | 1.00                           | 67               | 50               | 2.07    | 2.10  | 4.5          | NA              | 42               | 154.357                    | 0.074                   |
| 10             | 200.0       | 172.710            | 1.50                           | 69               | 50               | 3.10    | 3.10  | 5            | NA              | 42               |                            |                         |
| 11             | 220.0       | 188.570            | 1.10                           | 67               | 48               | 2.27    | 2.30  | 4.5          | NA              | 40               |                            |                         |
| 12             | 240.0       | 205.120            | 1.20                           | 67               | 50               | 2.49    | 2.50  | 5            | NA              | 41               |                            |                         |
| 13             | 260.0       | 222.510            | 1.30                           | 68               | 49               | 2.68    | 2.70  | 5.5          | NA              | 41               |                            |                         |
| 14             | 270.7       | 231.755            | 1.30                           | 73               | 50               | 2.66    | 2.70  | 5.5          | NA              | 42               |                            |                         |

Pause 10:36  
Start 10:53

Pause 12:22  
Start 12:37

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Emissions and Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** BH 1  
**Method:** 0061

**Run: 1**  
**Start Date/Time:** 12/17/2020 21:06  
**End Date/Time:** 12/18/2020 2:07

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 0.000                    |                                 |                            |                   |                         |                            |             |
| 20            | 19.600                   | 3.35                            | 45                         | 1                 | 1.60                    | 59                         | 1.2649      |
| 40            | 37.180                   | 2.90                            | 45                         | 2                 | 1.40                    | 62                         | 1.1832      |
| 60            | 54.980                   | 2.90                            | 47                         | 3                 | 1.40                    | 62                         | 1.1832      |
| 80            | 72.200                   | 2.70                            | 49                         | 4                 | 1.30                    | 64                         | 1.1402      |
| 100           | 88.870                   | 2.50                            | 50                         | 5                 | 1.20                    | 70                         | 1.0954      |
| 120           | 105.570                  | 2.70                            | 49                         | 6                 | 1.30                    | 69                         | 1.1402      |
| 140           | 122.240                  | 2.50                            | 49                         | 7                 | 1.20                    | 65                         | 1.0954      |
| 160           | 138.710                  | 2.50                            | 49                         | 8                 | 1.20                    | 65                         | 1.0954      |
| 180           | 154.283                  | 2.10                            | 50                         | 9                 | 1.00                    | 67                         | 1.0000      |
| 200           | 172.710                  | 3.10                            | 50                         | 10                | 1.50                    | 69                         | 1.2247      |
| 220           | 188.570                  | 2.30                            | 48                         | 11                | 1.10                    | 67                         | 1.0488      |
| 240           | 205.120                  | 2.50                            | 50                         | 12                | 1.20                    | 67                         | 1.0954      |
| 260           | 222.510                  | 2.70                            | 49                         | 13                | 1.30                    | 68                         | 1.1402      |
| 271           | 231.755                  | 2.70                            | 50                         | 14                | 1.30                    | 73                         | 1.1402      |

Mid-run leak check volume: 0.074 dcf

**Client: Columbia Steel Casting****Run: 1****Source: BH 1****Dates: 12/17/2020-12/18/2020****Field Data Input Continued**Moisture Data

Total Test Time 270.7 min  
 Sample Time Interval 20.0 min  
 Meter Volume,  $V_m$  231.681 dcf  
 Water Volume 80.1 g  
 Nozzle Diameter,  $N_z$  0.2073 in.  
 Nozzle Area 0.000234 sq.ft.

Stack Dimensional Data:

Circular  
 Diameter 46.000 in  
 Rectangular  
 Width in  
 Length in  
 Stack Area 11.541 sq.ft.

Traverse Data

Barometric Pressure,  $P_b$  30.15 "Hg  
 Static Pressure 0.05 "H<sub>2</sub>O  
 Pitot Factor, cp 0.84  
 Meter Cal Factor 1.0005 Y

Molecular Weight:

CO<sub>2</sub> Average 0.00 %vd  
 O<sub>2</sub> Average 20.90 %vd

**Field Data Averages**Meter

$\Delta H$  2.675 "H<sub>2</sub>O  
 Temperature,  $T_m$  48.6 °F  
 Temperature,  $T_m$  508.6 °A (°R)  
 Pressure Meter,  $P_m$  30.347 "Hg

Stack

$\sqrt{Dp}$  1.1319 "H<sub>2</sub>O  
 Temperature,  $T_s$  66.2 °F  
 Temperature,  $T_s$  526.2 °A (R)  
 Pressure Stack,  $P_s$  30.154 "Hg

**Field Data Calculations**Meter Box Capture

Standard Volume,  $V_{m(std)}$  243.975 dscf  
 6.909 dscm  
 Actual Volume,  $V_{m(actual)}$  245.078 awcf

EPA Method 2 Stack Gas Flowrate:

Velocity,  $V_s$  63.40 fps  
 Volume (actual) 43,902.0 acfm  
 43,234.7 adcfm  
 Volume (standard) 2,663,800.0 wscf/hr  
 2,623,310.2 dscf/hr  
 43,721.8 dscf/min

Gas Stream Moisture

Moisture Vapor,  $V_{w(std)}$  3.770 scf  
 Moisture,  $B_{ws}$  0.0152  
 Moisture EPA M4 1.52 %v

EPA Method 3 Gas Density

Dry,  $M_d$  28.84 lb/lb-mole  
 Wet,  $M_s$  28.68 lb/lb-mole

Volume/Mole,  $V/M$  380.975

Percent Isokinetic 101.7 %

**Laboratory Results**

Cr VI 0.887 µg/sample  
 Cr VI 8.87E-07 grams

**Emissions:**

Concentration Cr VI,  $C_s$  5.61E-08 gr/dscf  
 0.128 µg/dscm  
 Mass Emissions Cr VI 2.10E-05 lb/hr

"<" represents MDL value

**Method 0061**  
**Laboratory Results**  
**Cr VI**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** BH 1

| Lab ID   | Sample ID                       | Sample Date | < | Result<br>(µg/sample) | MDL<br>(µg/sample) | Sample<br>Vol. (ml) | Blank Correction<br>(ug) | Blank Corrected<br>Results (µg/sample) |
|----------|---------------------------------|-------------|---|-----------------------|--------------------|---------------------|--------------------------|----------------------------------------|
| 20-S2315 | Stainless Cont. 1               | 12/17/2020  |   | 0.915                 | 0.0054             | 540                 | 0.028                    | 0.887                                  |
| 20-S2283 | KOH Blank                       | 12/9/2020   |   | 0.0272                | 0.0029             | 293                 | 9.28E-05                 | µg/ml                                  |
| 20-S2284 | H <sub>2</sub> O Blank          | 12/9/2020   | < | MDL                   | 0.0021             | 213                 | 0.00                     | µg/ml                                  |
| 20-S2282 | Field Train Blank (Arc Furnace) | 12/11/2020  |   | 0.0312                | 0.0043             | 433                 | 7.21E-05                 | µg/ml                                  |

\*A "<" sign designates a result less than the minimum detection limit (MDL). If sample results are below MDL, the MDL value is used for calculations.  
If blank value(s) are below MDL, no blank correction is performed.

**Method 0061**  
**Results Summary**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** BH 1

|                                         |                                     |                            |            |
|-----------------------------------------|-------------------------------------|----------------------------|------------|
| <b>Run</b>                              |                                     |                            | <b>1</b>   |
| <b>Start Date</b>                       |                                     |                            | 12/17/2020 |
| <b>Start Time</b>                       |                                     |                            | 21:06      |
| <b>End Time</b>                         |                                     |                            | 2:07       |
| <b>Duration, min.</b>                   |                                     |                            | 271        |
| <b>Barometric Pressure, "Hg</b>         |                                     |                            | 30.15      |
| <b>Nozzle Dia., in.</b>                 |                                     |                            | 0.2073     |
| <b>Isokinetic Average, %</b>            |                                     |                            | 101.7      |
| <b>Sample Volume, dscf</b>              |                                     |                            | 243.975    |
| <b>Sample Volume, dscm</b>              |                                     |                            | 6.909      |
| <b>Stack Diameter, in.</b>              |                                     |                            | 46.000     |
| <b>Stack Area, sq.ft.</b>               |                                     |                            | 11.541     |
| <b>CO<sub>2</sub> %vd</b>               |                                     |                            | 0.00       |
| <b>O<sub>2</sub> %vd</b>                |                                     |                            | 20.90      |
| <b>Static Pressure, "H<sub>2</sub>O</b> |                                     |                            | 0.05       |
| <b>H<sub>2</sub>O %v</b>                |                                     |                            | 1.52       |
| <b>Wet Molecular Weight, lb/lb-mole</b> |                                     |                            | 28.68      |
| <b>Velocity, FPS</b>                    |                                     |                            | 63.40      |
| <b>ADCFM</b>                            |                                     |                            | 43,234.7   |
| <b>ACFM</b>                             |                                     |                            | 43,902.0   |
| <b>DSCFM</b>                            |                                     |                            | 43,721.8   |
| <b>Stack Temperature, °F</b>            |                                     |                            | 66.2       |
| <b>Cr VI</b>                            | <b>Concentration, C<sub>s</sub></b> | <b>gr/dscf</b>             | 5.61E-08   |
|                                         |                                     | <b>µg/dscm</b>             | 0.128      |
|                                         | <b>Mass</b>                         | <b>lb/hr</b>               | 2.10E-05   |
|                                         |                                     | <b>lb/ton steel melted</b> | 9.60E-06   |
| <b>Production Data</b>                  | <b>tons steel melted/hr</b>         |                            | 2.19       |



|           |                        |
|-----------|------------------------|
| COMPANY   | Columbia Steel Casting |
| FACILITY  | Steel Foundry          |
| LOCATION  | Portland, OR           |
| SOURCE    | Baghouse 1             |
| DATE      | 12/16-17/2020          |
| METHOD    | 201A                   |
| POLLUTANT | PM                     |

**201A Pre Test Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** Baghouse 1  
**EPA Method:** 201A  
**Box Operator:** JCR  
**Technician(s):** JCR

**Environmental Conditions/Test Notes:**  
 Overcast and 40s F with rain.

**Run: Pre Traverse**  
**Start Time:** -  
**End Time:** -  
**Date:** 12/16/2020

**Stack Dimensional Data:**

Circular  
 Diameter 46.000 in  
 Rectangular  
 Width in  
 Length in  
 Stack Area 11.541 sq.ft.  
 Stack Area 1661.904 sq.in.

**Equipment:**

Meterbox ID 12  
 Y factor 1.0005  
 ΔH@ 1.927  
 Probe ID 5C  
 Nozzle ID 3  
 Pitot Cp' 0.84  
 Pitot Cp 0.84  
 Liner type ss  
 Nozzle Dia: 0.150 inches  
 Nozzle Area: 0.00012 ft<sup>2</sup>

**Source Information:**

Barometric Pressure 29.65 "Hg  
 Static Pressure 0.05 "H<sub>2</sub>O  
 Stack Temperature 76.0 F  
 Assumed moisture 1 %  
 Assumed meter temp. 65 F  
 Total number of points 12  
 Stack Temperature 534.1 R  
 Stack Pressure (P<sub>s</sub>) 29.65 "H<sub>2</sub>O  
 Meter temp. 525 R

**Leak Checks:**

Pre-test Post-test  
 Pitot x x

**Pre Test Calculations:**

Estimated Q<sub>s</sub> 0.4107 acfm  
 Estimated N<sub>re</sub> 3048  
 Estimated ΔH 0.543 in. H<sub>2</sub>O  
 Viscosity (μ) 185.69 micropoise

Cunningham 1.0686  
 D<sub>50LL</sub> 10.64 μm  
 [Nre>3162] D<sub>50LL</sub> - μm  
 D<sub>50T</sub> 10.82 μm

| Preliminary Traverse |                                   |                                    |                |                 |                  |
|----------------------|-----------------------------------|------------------------------------|----------------|-----------------|------------------|
| Traverse Point       | Cyclonic Flow Check<br>Null Angle | Preliminary P in. H <sub>2</sub> O |                |                 | Stack Temp. (°F) |
|                      |                                   | P <sub>m</sub>                     | P <sub>s</sub> | P <sub>s2</sub> |                  |
| 1                    | 0.0                               | 1.00                               | 1.00           | -               | 77               |
| 2                    | 0.0                               | 1.10                               | 1.10           | -               | 78               |
| 3                    | 5.0                               | 1.10                               | 1.10           | -               | 73               |
| 4                    | 5.0                               | 1.20                               | 1.20           | -               | 74               |
| 5                    | 0.0                               | 1.30                               | 1.30           | -               | 74               |
| 6                    | 5.0                               | 1.30                               | 1.30           | -               | 74               |
| 7                    | 5.0                               | 1.40                               | 1.40           | -               | 79               |
| 8                    | 5.0                               | 1.20                               | 1.20           | -               | 78               |
| 9                    | 0.0                               | 1.10                               | 1.10           | -               | 71               |
| 10                   | 0.0                               | 1.10                               | 1.10           | -               | 70               |
| 11                   | 0.0                               | 1.10                               | 1.10           | -               | 70               |
| 12                   | 0.0                               | 1.00                               | 1.00           | -               | 71               |

| Nozzle Selection |         |                |                  |                  |                       |                       |
|------------------|---------|----------------|------------------|------------------|-----------------------|-----------------------|
| Nozzle           | Diam.   | V <sub>n</sub> | V <sub>min</sub> | V <sub>max</sub> | P <sub>min</sub>      | P <sub>max</sub>      |
| ID               | Dn (in) | (fps)          | (fps)            | (fps)            | (in H <sub>2</sub> O) | (in H <sub>2</sub> O) |
| 1                | 0.125   | 80.31          | 61.01            | 98.63            | 1.15                  | 3.01                  |
| 2                | 0.136   | 67.85          | 50.71            | 83.85            | 0.80                  | 2.18                  |
| 3                | 0.150   | 55.77          | 40.62            | 69.59            | 0.51                  | 1.50                  |
| 4                | 0.164   | 46.66          | 32.85            | 58.88            | 0.33                  | 1.07                  |
| 5                | 0.180   | 38.73          | 25.89            | 49.61            | 0.21                  | 0.76                  |
| 6                | 0.197   | 32.34          | 19.99            | 42.18            | 0.12                  | 0.55                  |
| 7                | 0.215   | 27.15          | 14.73            | 36.20            | 0.07                  | 0.41                  |
| 8                | 0.233   | 23.11          | 9.58             | 31.58            | 0.03                  | 0.31                  |
| 9                | 0.264   | 18.01          | 9.00             | 25.80            | 0.03                  | 0.21                  |
| 10               | 0.300   | 13.94          | 6.97             | 20.91            | 0.02                  | 0.14                  |
| 11               | 0.342   | 10.73          | 5.36             | 16.09            | 0.01                  | 0.08                  |
| 12               | 0.390   | 8.25           | 4.13             | 12.38            | 0.01                  | 0.05                  |

Average

| sqrt P <sub>m</sub> | Absolute Null Angle | R <sub>(min)</sub> | R <sub>(max)</sub> |
|---------------------|---------------------|--------------------|--------------------|
| 1.000               | 0.0                 | 0.75967            | 1.22803            |
| 1.049               | 0.0                 | 0.74747            | 1.23591            |
| 1.049               | 5.0                 | 0.72823            | 1.24780            |
| 1.095               | 5.0                 | 0.70397            | 1.26191            |
| 1.140               | 0.0                 | 0.66842            | 1.28087            |
| 1.140               | 5.0                 | 0.61818            | 1.30445            |
| 1.183               | 5.0                 | 0.54271            | 1.33338            |
| 1.095               | 5.0                 | 0.41447            | 1.36642            |
| 1.049               | 0.0                 | 0.50000            | 1.43283            |
| 1.049               | 0.0                 | 0.50000            | 1.50000            |
| 1.049               | 0.0                 | 0.50000            | 1.50000            |
| 1.000               | 0.0                 | 0.50000            | 1.50000            |
| -                   | -                   | -                  | -                  |

1.075 2.08

201A Field Data  
Field Data Entry

Page 1 of 2

Client: Columbia Steel Casting  
Location: Portland, OR  
Source: Baghouse 1  
EPA Method: 201A  
Box Operator: JCR  
Technician(s): JCR

Environmental Conditions/Test Notes:  
Overcast and 40s F with rain.

Run: 1  
Start Time: 21:13  
End Time: 23:07  
Date: 12/16/2020  
Filter: U442

Stack Dimensional Data:

|             |                 |
|-------------|-----------------|
| Circular    |                 |
| Diameter    | 46.000 in       |
| Rectangular |                 |
| Width       | - in            |
| Length      | - in            |
| Stack Area  | 11.541 sq.ft.   |
| Stack Area  | 1661.904 sq.in. |

Equipment:

|                     |        |           |      |             |                |
|---------------------|--------|-----------|------|-------------|----------------|
| Meterbox ID         | 12     | Probe ID  | 5C   | Liner type  | ss             |
| Y factor            | 1.0005 | Nozzle ID | 3    | Nozzle size | 0.1500 inches  |
| $\Delta H(\bar{q})$ | 1.927  | Pitot Cp' | 0.84 | Nozzle area | 0.00012 sq.ft. |
|                     |        | Pitot Cp  | 0.84 | Probe heat  | 250 F          |

Source Information:

|                                  |        |                   |                                        |       |            |
|----------------------------------|--------|-------------------|----------------------------------------|-------|------------|
| Barometric Pressure              | 29.65  | "Hg               | O <sub>2</sub>                         | 21.31 | %          |
| Static Pressure                  | 0.05   | "H <sub>2</sub> O | CO <sub>2</sub>                        | 0.01  | %          |
| Stack Temperature                | 76     | F                 |                                        |       |            |
| Assumed moisture                 | 1      | %                 | Dry mol. weight (M <sub>d</sub> )      | 28.85 | lb/lb-mole |
| Assumed meter temp.              | 65     | F                 | Est. Wet mol. weight (M <sub>w</sub> ) | 28.75 | lb/lb-mole |
| Total number of points           | 12     |                   |                                        |       |            |
| Total projected run time         | 120.0  |                   |                                        |       |            |
| Stack Temperature                | 536.00 | R                 |                                        |       |            |
| Stack Pressure (P <sub>s</sub> ) | 29.65  | "H <sub>2</sub> O |                                        |       |            |
| Meter temp.                      | 525    | R                 |                                        |       |            |
| Meter Pressure (P <sub>m</sub> ) | 29.69  |                   |                                        |       |            |

Leak Checks:

|                        | Pre-test | Post-test |
|------------------------|----------|-----------|
| Pitot                  | x        | x         |
| Train leak rate, dcf   | 0.000    | 0.000     |
| Leak check vacuum, "Hg | 12       | 11        |

Moisture/Lab:

|                                     | Initial | Final  | Gain   |
|-------------------------------------|---------|--------|--------|
| Impingers, g                        | 2329.5  | 2336.8 | 7.3    |
| Silica gel, g                       | 895.2   | 904.1  | 8.9    |
| Total water gain:                   |         |        | 16.2   |
| Moisture Vapor, V <sub>w(Std)</sub> |         |        | 0.762  |
| Moisture, B <sub>ws</sub>           |         |        | 0.0164 |

Pre Test Calculations:

|                          |        | Ts - °F 50 | Ts + °F 50 |                      |
|--------------------------|--------|------------|------------|----------------------|
| Estimates                |        | 26         | 126        | Ts (°F)              |
| Estimated Q <sub>s</sub> | 0.4107 | 0.4464     | 0.4717     | cfm                  |
| Estimated $\Delta H$     | 0.543  | 0.6561     | 0.4513     | in. H <sub>2</sub> O |
| Viscosity ( $\mu$ )      | 185.69 | 162.05     | 186.07     | micropoise           |

Post Test Calculations:

|                         |        |                         |                        |        |                   |
|-------------------------|--------|-------------------------|------------------------|--------|-------------------|
| Sample volume           | 45.012 | dcf                     | Ave. $\Delta P$        | 1.236  | "H <sub>2</sub> O |
| Wet mol. weight         | 28.68  | M <sub>w</sub> (actual) | Ave. $\sqrt{\Delta P}$ | 1.1112 | "H <sub>2</sub> O |
| Actual H <sub>2</sub> O | 1.64   | %                       | Ave. $\Delta H$        | 0.560  | "H <sub>2</sub> O |
| Std. meter vol.         | 45.702 | dscf                    | Ave. T <sub>s</sub>    | 78.6   | °F                |
| Std. meter vol.         | 1.294  | dscm                    | Ave. T <sub>m</sub>    | 56.1   | °F                |
| Isokinetic Average      | 90.1   | %                       |                        |        |                   |

Stack:

|                          |          |       |              |             |          |
|--------------------------|----------|-------|--------------|-------------|----------|
| Velocity, V <sub>s</sub> | 63.50    | fps   | Volume (std) | 2,563,328.1 | wscf/hr  |
| Volume (actual)          | 43,971.2 | acfm  |              | 2,521,289.5 | dscf/hr  |
|                          | 43,250.1 | adcfm |              | 42,021.5    | dscf/min |

| Traverse Point | Time (mm:ss) | Meter Volume (dcf) | Velocit | P "H <sub>2</sub> O | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum "Hg | Probe Temp (°F) | Condenser Temp F | CPM Filter Temp >65°F <85°F | %I w/ est. Moisture |
|----------------|--------------|--------------------|---------|---------------------|------------------|------------------|---------|-------|------------|-----------------|------------------|-----------------------------|---------------------|
| 1              | 0:10:30      | 4.120              | 1.30    |                     | 60               | 51               | 0.558   | 0.56  | 1          | 254             | 34               | -                           | 85.6                |
| 2              | 0:21:00      | 8.240              | 1.30    |                     | 79               | 53               | 0.521   | 0.56  | 1          | 256             | 36               | -                           | 86.8                |
| 3              | 0:32:00      | 12.550             | 1.40    |                     | 80               | 53               | 0.519   | 0.56  | 1.5        | 257             | 37               | -                           | 83.6                |
| 4              | 0:42:15      | 16.600             | 1.20    |                     | 80               | 54               | 0.520   | 0.56  | 1.5        | 256             | 38               | -                           | 90.9                |
| 5              | 0:52:30      | 20.700             | 1.20    |                     | 80               | 56               | 0.522   | 0.56  | 1.5        | 257             | 38               | -                           | 91.7                |
| 6              | 1:02:45      | 24.800             | 1.20    |                     | 82               | 57               | 0.519   | 0.56  | 1.5        | 257             | 39               | -                           | 91.7                |
| 7              | 1:12:30      | 28.730             | 1.10    |                     | 82               | 59               | 0.522   | 0.56  | 1.5        | 256             | 40               | -                           | 96.1                |
| 8              | 1:22:15      | 32.650             | 1.10    |                     | 79               | 59               | 0.527   | 0.56  | 1.5        | 255             | 40               | -                           | 95.6                |
| 9              | 1:32:30      | 36.720             | 1.20    |                     | 80               | 58               | 0.524   | 0.56  | 1.5        | 256             | 40               | -                           | 90.7                |
| 10             | 1:43:00      | 40.860             | 1.30    |                     | 82               | 58               | 0.520   | 0.56  | 1.5        | 256             | 41               | -                           | 86.7                |
| 11             | 1:53:30      | 45.012             | 1.30    |                     | 81               | 59               | 0.523   | 0.56  | 1.5        | 257             | 41               | -                           | 86.7                |

| Qs (acfm) | D <sub>50</sub><br>(10 μm) | Z (10<br>μm) | D <sub>50</sub><br>(2.5 μm) | Z (2.5 μm) | Sqrt P<br>(in. H2O) | V <sub>s</sub><br>(fps) | Std vol per<br>pt. | V <sub>m</sub><br>(dscfm) | Q <sub>Std</sub><br>(dscfm) | Viscosity<br>(μm) | N <sub>re</sub> Actual | Re-estim.<br>C <sub>re</sub> 50 | P min<br>(in H <sub>2</sub> O) | P ma<br>(in H <sub>2</sub> O) | Vn<br>(fps) | Vmin<br>(fps) | Vmax<br>(fps) | Rmin | Rmax |
|-----------|----------------------------|--------------|-----------------------------|------------|---------------------|-------------------------|--------------------|---------------------------|-----------------------------|-------------------|------------------------|---------------------------------|--------------------------------|-------------------------------|-------------|---------------|---------------|------|------|
| 0.4040    | 10.75                      | -            | 2.27                        | -          | 1.140               | 63.95                   | 4.225              | 4.2266                    | 0.4025                      | 182.54            | 3134.85                | 1.066                           | 0.508                          | 1.491                         | 54.87       | 39.96         | 68.47         | 0.73 | 1.25 |
| 0.4172    | 10.78                      | 1.00         | 2.31                        | 0.99       | 1.140               | 65.11                   | 4.208              | 4.2101                    | 0.4010                      | 187.11            | 3046.32                | 1.068                           | 0.523                          | 1.532                         | 56.66       | 41.29         | 70.67         | 0.73 | 1.25 |
| 0.4173    | 10.79                      | 1.00         | 2.31                        | 1.00       | 1.183               | 67.63                   | 4.403              | 4.4043                    | 0.4004                      | 187.36            | 3038.05                | 1.068                           | 0.522                          | 1.531                         | 56.68       | 41.31         | 70.71         | 0.73 | 1.25 |
| 0.4200    | 10.74                      | 1.00         | 2.29                        | 1.01       | 1.095               | 62.61                   | 4.129              | 4.1306                    | 0.4030                      | 187.36            | 3057.70                | 1.068                           | 0.530                          | 1.550                         | 57.05       | 41.60         | 71.15         | 0.73 | 1.25 |
| 0.4236    | 10.68                      | 1.01         | 2.27                        | 1.01       | 1.095               | 62.61                   | 4.164              | 4.1653                    | 0.4064                      | 187.36            | 3083.45                | 1.069                           | 0.540                          | 1.575                         | 57.53       | 41.99         | 71.72         | 0.73 | 1.25 |
| 0.4243    | 10.69                      | 1.00         | 2.28                        | 1.00       | 1.095               | 62.73                   | 4.156              | 4.1573                    | 0.4056                      | 187.84            | 3069.60                | 1.069                           | 0.539                          | 1.575                         | 57.63       | 42.06         | 71.85         | 0.73 | 1.25 |
| 0.4259    | 10.66                      | 1.00         | 2.27                        | 1.00       | 1.049               | 60.06                   | 3.968              | 3.9696                    | 0.4071                      | 187.84            | 3081.29                | 1.069                           | 0.544                          | 1.586                         | 57.85       | 42.24         | 72.12         | 0.73 | 1.25 |
| 0.4225    | 10.68                      | 1.00         | 2.27                        | 1.00       | 1.049               | 59.89                   | 3.958              | 3.9595                    | 0.4061                      | 187.11            | 3085.32                | 1.069                           | 0.538                          | 1.570                         | 57.38       | 41.88         | 71.55         | 0.73 | 1.25 |
| 0.4189    | 10.76                      | 0.99         | 2.30                        | 0.99       | 1.095               | 62.61                   | 4.117              | 4.1189                    | 0.4018                      | 187.36            | 3049.07                | 1.068                           | 0.526                          | 1.541                         | 56.89       | 41.47         | 70.95         | 0.73 | 1.25 |
| 0.4175    | 10.82                      | 1.00         | 2.32                        | 0.99       | 1.140               | 65.29                   | 4.188              | 4.1897                    | 0.3990                      | 187.84            | 3019.91                | 1.068                           | 0.520                          | 1.526                         | 56.70       | 41.31         | 70.73         | 0.73 | 1.25 |
| 0.4171    | 10.81                      | 1.00         | 2.32                        | 1.00       | 1.140               | 65.23                   | 4.192              | 4.1938                    | 0.3994                      | 187.60            | 3026.70                | 1.068                           | 0.520                          | 1.526                         | 56.65       | 41.27         | 70.67         | 0.73 | 1.25 |

201A Field Data  
Field Data Entry

Page 1 of 2

Client: Columbia Steel Casting  
Location: Portland, OR  
Source: Baghouse 1  
EPA Method: 201A  
Box Operator: JCR  
Technician(s): JK

Environmental Conditions/Test Notes:  
Overcast and 40s F with rain.

Run: 2  
Start Date/Time: 12/16/2020 23:47  
End Date/Time: 12/17/2020 1:39  
Filter: U443

Stack Dimensional Data:

|             |          |        |
|-------------|----------|--------|
| Circular    |          |        |
| Diameter    | 46.000   | in     |
| Rectangular |          |        |
| Width       |          | in     |
| Length      |          | in     |
| Stack Area  | 11.541   | sq.ft. |
| Stack Area  | 1661.904 | sq.in. |

Equipment:

|             |        |           |      |             |                |
|-------------|--------|-----------|------|-------------|----------------|
| Meterbox ID | 12     | Probe ID  | 5C   | Liner type  | ss             |
| Y factor    | 1.0005 | Nozzle ID | 3    | Nozzle size | 0.1500 inches  |
| ΔH@         | 1.927  | Pitot Cp' | 0.84 | Nozzle area | 0.00012 sq.ft. |
|             |        | Pitot Cp  | 0.84 | Probe heat  | 250 F          |

Source Information:

|                                  |        |                   |                                        |       |            |
|----------------------------------|--------|-------------------|----------------------------------------|-------|------------|
| Barometric Pressure              | 29.73  | "Hg               | O <sub>2</sub>                         | 21.36 | %          |
| Static Pressure                  | 0.05   | "H <sub>2</sub> O | CO <sub>2</sub>                        | 0.00  | %          |
| Stack Temperature                | 79     | F                 |                                        |       |            |
| Assumed moisture                 | 1.64   | %                 | Dry mol. weight (M <sub>d</sub> )      | 28.85 | lb/lb-mole |
| Assumed meter temp.              | 65     | F                 | Est. Wet mol. weight (M <sub>w</sub> ) | 28.68 | lb/lb-mole |
| Total number of points           | 12     |                   |                                        |       |            |
| Total projected run time         | 120.0  |                   |                                        |       |            |
| Stack Temperature                | 538.60 | R                 |                                        |       |            |
| Stack Pressure (P <sub>s</sub> ) | 29.73  | "H <sub>2</sub> O |                                        |       |            |
| Meter temp.                      | 525    | R                 |                                        |       |            |
| Meter Pressure (P <sub>m</sub> ) | 29.77  |                   |                                        |       |            |

Leak Checks:

|                        | Pre-test | Post-test |
|------------------------|----------|-----------|
| Pitot                  | x        | x         |
| Train leak rate, dcf   | 0.000    | 0.000     |
| Leak check vacuum, "Hg | 11       | 10        |

Moisture/Lab:

|                                     | Initial | Final  | Gain   |
|-------------------------------------|---------|--------|--------|
| Impingers, g                        | 2123.8  | 2130.6 | 6.8    |
| Silica gel, g                       | 832.6   | 842.7  | 10.1   |
| Total water gain:                   |         |        | 16.9   |
| Moisture Vapor, V <sub>w(std)</sub> |         |        | 0.795  |
| Moisture, B <sub>wes</sub>          |         |        | 0.0176 |

Pre Test Calculations:

|                          |        | Ts - °F 50 | Ts + °F 50 |                      |
|--------------------------|--------|------------|------------|----------------------|
| Estimates                |        | 28.6       | 128.6      | Ts (°F)              |
| Estimated Q <sub>s</sub> | 0.4107 | 0.4470     | 0.4723     | cfm                  |
| Estimated ΔH             | 0.543  | 0.6425     | 0.4427     | in. H <sub>2</sub> O |
| Viscosity (μ)            | 185.69 | 162.11     | 186.14     | micropoise           |

Post Test Calculations:

|                         |        |                         |                     |        |                   |
|-------------------------|--------|-------------------------|---------------------|--------|-------------------|
| Sample volume           | 44.123 | dcf                     | Ave. ΔP             | 1.191  | "H <sub>2</sub> O |
| Wet mol. weight         | 28.66  | M <sub>w</sub> (actual) | Ave. √ΔP            | 1.0909 | "H <sub>2</sub> O |
| Actual H <sub>2</sub> O | 1.76   | %                       | Ave. ΔH             | 0.530  | "H <sub>2</sub> O |
| Std. meter vol.         | 44.274 | dscf                    | Ave. T <sub>s</sub> | 76.6   | °F                |
| Std. meter vol.         | 1.254  | dscm                    | Ave. T <sub>m</sub> | 63.6   | °F                |
| Isokinetic Average      | 90.0   | %                       |                     |        |                   |

Stack:

|                          |          |       |              |             |          |
|--------------------------|----------|-------|--------------|-------------|----------|
| Velocity, V <sub>s</sub> | 62.16    | fps   | Volume (std) | 2,525,382.8 | wscf/hr  |
| Volume (actual)          | 43,043.3 | acfm  |              | 2,480,936.1 | dscf/hr  |
|                          | 42,285.7 | adcfm |              | 41,348.9    | dscf/min |

| Traverse Point | Time (mm:ss) | Meter Volume (dcf) | Velocit | P | "H <sub>2</sub> O) | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum "Hg | Probe Temp (°F) | Condenser Temp F | CPM Filter Temp >65°F <85°F | %I w/ est. Moisture |
|----------------|--------------|--------------------|---------|---|--------------------|------------------|------------------|---------|-------|------------|-----------------|------------------|-----------------------------|---------------------|
| 1              | 0:10:30      | 4.120              | 1.30    |   |                    | 73               | 56               | 0.531   | 0.53  | 1          | 252             | 41               | -                           | 86.4                |
| 2              | 0:21:00      | 8.240              | 1.30    |   |                    | 73               | 57               | 0.532   | 0.53  | 1          | 255             | 48               | -                           | 86.2                |
| 3              | 0:31:15      | 12.270             | 1.20    |   |                    | 72               | 63               | 0.540   | 0.53  | 1.5        | 255             | 50               | -                           | 88.8                |
| 4              | 0:41:30      | 16.340             | 1.20    |   |                    | 72               | 64               | 0.541   | 0.53  | 1.5        | 255             | 50               | -                           | 89.5                |
| 5              | 0:51:15      | 20.200             | 1.10    |   |                    | 73               | 64               | 0.539   | 0.53  | 1.5        | 255             | 49               | -                           | 93.3                |
| 6              | 1:01:00      | 24.030             | 1.10    |   |                    | 75               | 65               | 0.536   | 0.53  | 1.5        | 255             | 47               | -                           | 92.6                |
| 7              | 1:10:45      | 27.880             | 1.10    |   |                    | 76               | 66               | 0.535   | 0.53  | 1.5        | 256             | 47               | -                           | 93.0                |
| 8              | 1:21:00      | 31.960             | 1.20    |   |                    | 77               | 67               | 0.534   | 0.53  | 1.5        | 254             | 48               | -                           | 89.7                |
| 9              | 1:31:15      | 35.990             | 1.20    |   |                    | 79               | 66               | 0.529   | 0.53  | 1.5        | 257             | 47               | -                           | 88.9                |
| 10             | 1:41:30      | 40.050             | 1.20    |   |                    | 89               | 66               | 0.510   | 0.53  | 1.5        | 257             | 47               | -                           | 90.4                |
| 11             | 1:51:45      | 44.123             | 1.20    |   |                    | 84               | 66               | 0.519   | 0.53  | 1.5        | 256             | 47               | -                           | 90.3                |

201A Field Data  
Field Data Entry

Run: 2  
Page 2 of 2

| Qs (acfm) | D <sub>50</sub><br>(10 μm) | Z<br>(10 μm) | D <sub>50</sub><br>(2.5 μm) | Z<br>(2.5 μm) | Sqrt P<br>(in. H <sub>2</sub> O) | V <sub>s</sub><br>(fps) | Std vol<br>per pt. | V <sub>ms</sub><br>(dscfm) | Q <sub>Std</sub><br>(dscfm) | Viscosity<br>(μm) | N <sub>re Actual</sub> | Re-estim.<br>C <sub>r50</sub> | P min<br>(in H <sub>2</sub> O) | P ma<br>(in H <sub>2</sub> O) | Vn<br>(fps) | Vmin<br>(fps) | Vmax<br>(fps) | Rmin | Rmax |
|-----------|----------------------------|--------------|-----------------------------|---------------|----------------------------------|-------------------------|--------------------|----------------------------|-----------------------------|-------------------|------------------------|-------------------------------|--------------------------------|-------------------------------|-------------|---------------|---------------|------|------|
| 0.4128    | 10.75                      | -            | 2.29                        | -             | 1.140                            | 64.74                   | 4.195              | 4.1966                     | 0.3997                      | 185.06            | 3082.85                | 1.067                         | 0.518                          | 1.517                         | 56.06       | 40.86         | 69.93         | 0.73 | 1.25 |
| 0.4120    | 10.76                      | 1.00         | 2.29                        | 1.00          | 1.140                            | 64.74                   | 4.187              | 4.1885                     | 0.3989                      | 185.06            | 3076.89                | 1.067                         | 0.516                          | 1.512                         | 55.95       | 40.77         | 69.80         | 0.73 | 1.25 |
| 0.4073    | 10.84                      | 0.99         | 2.32                        | 0.99          | 1.095                            | 62.14                   | 4.048              | 4.0500                     | 0.3951                      | 184.82            | 3051.68                | 1.066                         | 0.504                          | 1.481                         | 55.32       | 40.27         | 69.03         | 0.73 | 1.25 |
| 0.4105    | 10.78                      | 1.01         | 2.30                        | 1.01          | 1.095                            | 62.14                   | 4.081              | 4.0824                     | 0.3983                      | 184.82            | 3076.09                | 1.067                         | 0.513                          | 1.504                         | 55.76       | 40.62         | 69.56         | 0.73 | 1.25 |
| 0.4101    | 10.80                      | 1.00         | 2.31                        | 1.00          | 1.049                            | 59.55                   | 3.870              | 3.8718                     | 0.3971                      | 185.06            | 3062.99                | 1.067                         | 0.510                          | 1.498                         | 55.70       | 40.57         | 69.49         | 0.73 | 1.25 |
| 0.4077    | 10.87                      | 0.99         | 2.34                        | 0.99          | 1.049                            | 59.66                   | 3.833              | 3.8344                     | 0.3933                      | 185.54            | 3025.52                | 1.066                         | 0.502                          | 1.476                         | 55.37       | 40.29         | 69.10         | 0.73 | 1.25 |
| 0.4098    | 10.85                      | 1.00         | 2.33                        | 1.00          | 1.049                            | 59.72                   | 3.846              | 3.8471                     | 0.3946                      | 185.78            | 3031.61                | 1.066                         | 0.506                          | 1.488                         | 55.65       | 40.52         | 69.45         | 0.73 | 1.25 |
| 0.4131    | 10.80                      | 1.00         | 2.31                        | 1.01          | 1.095                            | 62.43                   | 4.068              | 4.0691                     | 0.3970                      | 186.02            | 3046.25                | 1.067                         | 0.514                          | 1.509                         | 56.10       | 40.87         | 69.99         | 0.73 | 1.25 |
| 0.4103    | 10.88                      | 0.99         | 2.34                        | 0.99          | 1.095                            | 62.55                   | 4.025              | 4.0269                     | 0.3929                      | 186.50            | 3006.85                | 1.066                         | 0.504                          | 1.484                         | 55.72       | 40.56         | 69.55         | 0.73 | 1.25 |
| 0.4210    | 10.82                      | 1.01         | 2.34                        | 1.00          | 1.095                            | 63.12                   | 4.055              | 4.0569                     | 0.3958                      | 188.91            | 2990.61                | 1.068                         | 0.523                          | 1.533                         | 57.18       | 41.67         | 71.33         | 0.73 | 1.25 |
| 0.4185    | 10.80                      | 1.00         | 2.32                        | 1.01          | 1.095                            | 62.83                   | 4.068              | 4.0699                     | 0.3971                      | 187.71            | 3019.43                | 1.068                         | 0.522                          | 1.528                         | 56.84       | 41.43         | 70.90         | 0.73 | 1.25 |

201A Field Data  
Field Data Entry

Page 1 of 2

Client: Columbia Steel Casting  
Location: Portland, OR  
Source: Baghouse 1  
EPA Method: 201A  
Box Operator: JCR  
Technician(s): JCR

Environmental Conditions/Test Notes:  
Overcast and 40s F with rain.

Run: 3  
Start Time: 2:10  
End Time: 3:53  
Date: 12/17/2020  
Filter: U444

Stack Dimensional Data:

|             |                 |
|-------------|-----------------|
| Circular    |                 |
| Diameter    | 46.000 in       |
| Rectangular |                 |
| Width       | in              |
| Length      | in              |
| Stack Area  | 11.541 sq.ft.   |
| Stack Area  | 1661.904 sq.in. |

Equipment:

|             |        |           |      |             |                |
|-------------|--------|-----------|------|-------------|----------------|
| Meterbox ID | 12     | Probe ID  | 5C   | Liner type  | ss             |
| Y factor    | 1.0005 | Nozzle ID | 3    | Nozzle size | 0.1500 inches  |
| ΔH@         | 1.927  | Pitot Cp  | 0.84 | Nozzle area | 0.00012 sq.ft. |
|             |        | Pitot Cp  | 0.84 | Probe heat  | 250 F          |

Source Information:

|                                   |                         |                                        |                  |
|-----------------------------------|-------------------------|----------------------------------------|------------------|
| Barometric Pressure               | 29.65 "Hg               | O <sub>2</sub>                         | 21.41 %          |
| Static Pressure                   | 0.05 "H <sub>2</sub> O  | CO <sub>2</sub>                        | 0.00 %           |
| Stack Temperature                 | 77 F                    |                                        |                  |
| Assumed moisture                  | 1.76 %                  | Dry mol. weight (M <sub>d</sub> )      | 28.86 lb/lb-mole |
| Assumed meter temp.               | 65 F                    | Est. Wet mol. weight (M <sub>w</sub> ) | 28.67 lb/lb-mole |
| Total number of points            | 12                      |                                        |                  |
| Total projected run time          | 120.0                   |                                        |                  |
| Stack Temperature                 | 536.60 R                |                                        |                  |
| Stack Pressure (P <sub>s</sub> )  | 29.65 "H <sub>2</sub> O |                                        |                  |
| Meter temp.                       | 525 R                   |                                        |                  |
| Meter Pressure, (P <sub>m</sub> ) | 29.69                   |                                        |                  |

Leak Checks:

|                        | Pre-test | Post-test |
|------------------------|----------|-----------|
| Pitot                  | x        | x         |
| Train leak rate, dcf   | 0.000    | 0.000     |
| Leak check vacuum, "Hg | 10       | 10        |

Moisture/Lab:

|                                   | Initial | Final  | Gain   |
|-----------------------------------|---------|--------|--------|
| Impingers, g                      | 2130.6  | 2126.8 | -3.8   |
| Silica gel, g                     | 842.7   | 849.4  | 6.7    |
| Total water gain:                 |         |        | 2.9    |
| Moisture Vapor, Vw <sub>add</sub> |         |        | 0.136  |
| Moisture, B <sub>ws</sub>         |         |        | 0.0033 |

Pre Test Calculations:

|                          | Ts - °F 50 | Ts + °F 50 |                      |
|--------------------------|------------|------------|----------------------|
| Estimates                | 26.6       | 126.6      | Ts (°F)              |
| Estimated Q <sub>s</sub> | 0.4107     | 0.4469     | cfm                  |
| Estimated ΔH             | 0.543      | 0.6445     | in. H <sub>2</sub> O |
| Viscosity (μ)            | 185.69     | 161.52     | micropoise           |

Post Test Calculations:

|                         |        |                         |                     |        |                   |
|-------------------------|--------|-------------------------|---------------------|--------|-------------------|
| Sample volume           | 40.240 | dcf                     | Ave. ΔP             | 1.24   | "H <sub>2</sub> O |
| Wet mol. weight         | 28.82  | M <sub>w</sub> (actual) | Ave. √ΔP            | 1.1131 | "H <sub>2</sub> O |
| Actual H <sub>2</sub> O | 0.33   | %                       | Ave. ΔH             | 0.520  | "H <sub>2</sub> O |
| Std. meter vol.         | 40.586 | dscf                    | Ave. T <sub>s</sub> | 76.9   | °F                |
| Std. meter vol.         | 1.149  | dscm                    | Ave. T <sub>m</sub> | 59.5   | °F                |
| Isokinetic Average      | 86.4   | %                       |                     |        |                   |

Stack:

|                          |                |              |                     |
|--------------------------|----------------|--------------|---------------------|
| Velocity, V <sub>s</sub> | 63.36 ips      | Volume (std) | 2,565,775.1 wscf/hr |
| Volume (actual)          | 43,874.3 acfm  |              | 2,557,308.0 dscf/hr |
|                          | 43,729.5 adcfm |              | 42,621.8 dscf/min   |

| Traverse Point | Time (mm:ss) | Meter Volume (dcf) | Velocit | P "H <sub>2</sub> O | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum "Hg | Probe Temp (°F) | Condenser Temp F | CPM Filter Temp >65°F | %I w/ est. Moisture |
|----------------|--------------|--------------------|---------|---------------------|------------------|------------------|---------|-------|------------|-----------------|------------------|-----------------------|---------------------|
| 1              | 0:10:30      | 4.060              | 1.30    |                     | 78               | 55               | 0.517   | 0.52  | 1          | 254             | 48               | -                     | 85.7                |
| 2              | 0:21:00      | 8.140              | 1.30    |                     | 76               | 55               | 0.521   | 0.52  | 1.5        | 257             | 49               | -                     | 86.0                |
| 3              | 0:31:30      | 12.200             | 1.30    |                     | 74               | 58               | 0.528   | 0.52  | 1.5        | 257             | 50               | -                     | 84.9                |
| 4              | 0:42:00      | 16.270             | 1.30    |                     | 73               | 59               | 0.531   | 0.52  | 1.5        | 254             | 51               | -                     | 84.8                |
| 5              | 0:52:15      | 20.310             | 1.20    |                     | 75               | 61               | 0.529   | 0.52  | 1.5        | 256             | 53               | -                     | 89.6                |
| 6              | 1:02:45      | 24.430             | 1.30    |                     | 75               | 61               | 0.529   | 0.52  | 1.5        | 256             | 53               | -                     | 85.7                |
| 7              | 1:13:00      | 28.430             | 1.20    |                     | 76               | 61               | 0.527   | 0.52  | 1.5        | 256             | 53               | -                     | 88.8                |
| 8              | 1:23:15      | 32.430             | 1.20    |                     | 78               | 61               | 0.523   | 0.52  | 1.5        | 256             | 53               | -                     | 89.0                |
| 9              | 1:33:30      | 36.440             | 1.20    |                     | 83               | 62               | 0.515   | 0.52  | 1.5        | 256             | 53               | -                     | 89.4                |
| 10             | 1:43:15      | 40.240             | 1.10    |                     | 81               | 62               | 0.518   | 0.52  | 1.5        | 256             | 54               | -                     | 92.9                |

201A Field Data  
Field Data Entry

Run: 3  
Page 2 of 2

| Qs (acfm) | D <sub>50</sub><br>(10 µm) | Z (10<br>µm) | D <sub>50</sub><br>(2.5 µm) | Z<br>(2.5 µm) | Sqrt P<br>(in. H <sub>2</sub> O) | V <sub>s</sub><br>(fps) | Std vol<br>per pt. | V <sub>m</sub><br>(dscfm) | Q <sub>Set</sub><br>(dscfm) | Viscosity<br>(µm) | N <sub>TE Actual</sub> | Re-estim.<br>C <sub>25</sub> | P min<br>(in H <sub>2</sub> O) | P ma<br>(in H <sub>2</sub> O) | Vn<br>(fps) | Vmin<br>(fps) | Vmax<br>(fps) | Rmin | Rmax |
|-----------|----------------------------|--------------|-----------------------------|---------------|----------------------------------|-------------------------|--------------------|---------------------------|-----------------------------|-------------------|------------------------|------------------------------|--------------------------------|-------------------------------|-------------|---------------|---------------|------|------|
| 0.4118    | 10.84                      | -            | 2.33                        | -             | 1.140                            | 65.14                   | 4.13               | 4.1322                    | 0.3935                      | 186.17            | 3019.90                | 1.067                        | 0.508                          | 1.493                         | 55.93       | 40.73         | 69.79         | 0.73 | 1.25 |
| 0.4123    | 10.80                      | 1.00         | 2.31                        | 1.01          | 1.140                            | 65.02                   | 4.15               | 4.1527                    | 0.3955                      | 185.69            | 3042.72                | 1.067                        | 0.512                          | 1.502                         | 56.00       | 40.80         | 69.87         | 0.73 | 1.25 |
| 0.4064    | 10.89                      | 0.99         | 2.34                        | 0.99          | 1.140                            | 64.90                   | 4.11               | 4.1084                    | 0.3913                      | 185.21            | 3018.10                | 1.066                        | 0.498                          | 1.466                         | 55.20       | 40.16         | 68.90         | 0.73 | 1.25 |
| 0.4059    | 10.88                      | 1.00         | 2.34                        | 1.00          | 1.140                            | 64.84                   | 4.11               | 4.1106                    | 0.3915                      | 184.97            | 3023.64                | 1.066                        | 0.497                          | 1.464                         | 55.12       | 40.11         | 68.80         | 0.73 | 1.25 |
| 0.4127    | 10.78                      | 1.01         | 2.31                        | 1.01          | 1.095                            | 62.41                   | 4.06               | 4.0646                    | 0.3965                      | 185.45            | 3054.80                | 1.067                        | 0.514                          | 1.507                         | 56.05       | 40.84         | 69.92         | 0.73 | 1.25 |
| 0.4108    | 10.82                      | 1.00         | 2.32                        | 0.99          | 1.140                            | 64.96                   | 4.14               | 4.1451                    | 0.3948                      | 185.45            | 3041.11                | 1.067                        | 0.509                          | 1.494                         | 55.80       | 40.64         | 69.62         | 0.73 | 1.25 |
| 0.4094    | 10.86                      | 1.00         | 2.33                        | 0.99          | 1.095                            | 62.47                   | 4.02               | 4.0244                    | 0.3926                      | 185.69            | 3020.63                | 1.066                        | 0.504                          | 1.481                         | 55.60       | 40.47         | 69.38         | 0.73 | 1.25 |
| 0.4109    | 10.86                      | 1.00         | 2.34                        | 1.00          | 1.095                            | 62.58                   | 4.02               | 4.0244                    | 0.3926                      | 186.17            | 3012.81                | 1.067                        | 0.506                          | 1.486                         | 55.80       | 40.63         | 69.64         | 0.73 | 1.25 |
| 0.4149    | 10.85                      | 1.00         | 2.34                        | 1.00          | 1.095                            | 62.87                   | 4.03               | 4.0267                    | 0.3928                      | 187.37            | 2995.18                | 1.067                        | 0.511                          | 1.501                         | 56.35       | 41.04         | 70.31         | 0.73 | 1.25 |
| 0.4119    | 10.88                      | 1.00         | 2.35                        | 1.00          | 1.049                            | 60.09                   | 3.81               | 3.8158                    | 0.3914                      | 186.89            | 2991.57                | 1.067                        | 0.505                          | 1.485                         | 55.93       | 40.72         | 69.80         | 0.73 | 1.25 |

EPA Method 201A  
Filterable Particulate  
Laboratory Gravimetric Data

Client: Columbia Steel Casting  
Location: Portland, OR  
Source: Baghouse 1

| Run | Sample Description            | mls soln./<br>Filter # | Initial<br>(grams) | Final<br>(grams) | Net Gain | Blank<br>Correction | Corrected<br>Gain (grams) |
|-----|-------------------------------|------------------------|--------------------|------------------|----------|---------------------|---------------------------|
| 1   | PM 2.5 Acetone (Container #4) | 75                     | 7.70901            | 7.71113          | 0.00212  | 1.99E-04            | 0.00192                   |
|     | PM 2.5 Filter (Container #1)  | U442                   | 0.13432            | 0.13441          | 0.00009  |                     | 0.00009                   |
|     | PM 10 Acetone (Container #3)  | 89                     | 7.62628            | 7.62716          | 0.00088  | 2.36E-04            | 0.00064                   |
|     | <b>Total PM 10</b>            |                        |                    |                  |          |                     | 0.00265                   |
| 2   | PM 2.5 Acetone (Container #4) | 74                     | 7.89311            | 7.89372          | 0.00061  | 1.96E-04            | 0.00041                   |
|     | PM 2.5 Filter (Container #1)  | U443                   | 0.14349            | 0.14371          | 0.00022  |                     | 0.00022                   |
|     | PM 10 Acetone (Container #3)  | 64                     | 7.90585            | 7.90654          | 0.00069  | 1.69E-04            | 0.00052                   |
|     | <b>Total PM 10</b>            |                        |                    |                  |          |                     | 0.00115                   |
|     | <b>*Total PM 10 &lt;</b>      |                        |                    |                  |          |                     | 0.00144                   |
| 3   | PM 2.5 Acetone (Container #4) | 72                     | 7.58749            | 7.58889          | 0.00140  | 1.91E-04            | 0.00121                   |
|     | PM 2.5 Filter (Container #1)  | U444                   | 0.13420            | 0.13441          | 0.00021  |                     | 0.00021                   |
|     | PM 10 Acetone (Container #3)  | 68                     | 7.69640            | 7.69661          | 0.00021  | 1.80E-04            | 0.00003                   |
|     | <b>Total PM 10</b>            |                        |                    |                  |          |                     | 0.00145                   |
|     | Acetone Blank                 | 170                    | 102.30054          | 102.30099        | 0.00045  | 2.65E-06            | g/ml                      |

\*Results are below minimum detection limits (MDL) for the method. Results are reported as less than the MDL.

Gas Stream Characteristics  
Columbia Steel Casting  
Portland, OR  
Baghouse 1  
12/16-17/2020

| Run                              |                               |                         | 1                 | 2                 | 3                 | Average    |
|----------------------------------|-------------------------------|-------------------------|-------------------|-------------------|-------------------|------------|
| Start Date                       |                               |                         | 12/16/2020        | 12/16/2020        | 12/17/2020        |            |
| Run Start Time                   |                               |                         | 21:13             | 23:47             | 2:10              |            |
| Run End Date                     |                               |                         | 12/16/2020        | 12/17/2020        | 12/17/2020        |            |
| Run End Time                     |                               |                         | 23:07             | 1:39              | 3:53              |            |
| Duration, min.:sec.              |                               |                         | 113 min<br>30 sec | 111 min<br>45 sec | 103 min<br>15 sec | Average    |
| Barometric Pressure, "Hg         |                               |                         | 29.65             | 29.73             | 29.65             |            |
| Nozzle Dia., in.                 |                               |                         | 0.150             | 0.150             | 0.150             | 0.150      |
| Isokinetic average, %            |                               |                         | 90.0              | 90.0              | 86.3              | 88.8       |
| Meter Volume, dscf               |                               |                         | 45.692            | 44.264            | 40.576            | 43.511     |
| Meter Volume, dscm               |                               |                         | 1.294             | 1.253             | 1.149             | 1.232      |
| Stack Area, sq.ft.               |                               |                         | 11.541            | 11.541            | 11.541            | 11.541     |
| CO <sub>2</sub> %vd              |                               |                         | 0.01              | 0.00              | 0.00              | 0.00       |
| O <sub>2</sub> %vd               |                               |                         | 21.31             | 21.36             | 21.41             | 21.36      |
| Static Press., "H <sub>2</sub> O |                               |                         | 0.05              | 0.05              | 0.05              | 0.05       |
| H <sub>2</sub> O %v              |                               |                         | 1.64              | 1.77              | 0.34              | 1.25       |
| Velocity, FPS                    |                               |                         | 63.43             | 62.15             | 63.53             | 63.03      |
| DSCFM                            |                               |                         | 42,021.5          | 41,344.7          | 42,617.5          | 41,994.6   |
| Stack Temp, °F                   |                               |                         | 78.6              | 76.6              | 76.9              | 77.4       |
| Total PM 2.5                     | Concentration, C <sub>s</sub> | gr/dscf                 | 6.79E-04          | < 4.71E-04        | 5.40E-04          | < 5.63E-04 |
|                                  | Mass                          | lb/hr                   | 0.24              | < 0.17            | 0.20              | < 0.20     |
|                                  |                               | lb/tons steel melted/hr | 0.1336            | < 0.0855          | 0.1114            | < 0.1102   |
| Total PM 10                      | Concentration, C <sub>s</sub> | gr/dscf                 | 8.95E-04          | < 5.02E-04        | 5.51E-04          | < 6.49E-04 |
|                                  | Mass                          | lb/hr                   | 0.32              | < 0.18            | 0.20              | < 0.23     |
|                                  |                               | lb/tons steel melted    | 0.1761            | < 0.0912          | 0.1138            | < 0.1271   |
| Production Data                  |                               | tons steel melted/hr    | 1.83              | 1.95              | 1.77              | 1.85       |



|           |                         |
|-----------|-------------------------|
| COMPANY   | Columbia Steel Casting  |
| FACILITY  | Steel Foundry           |
| LOCATION  | Portland, Oregon        |
| SOURCE    | BH 1                    |
| DATE      | 12/16/2020 - 12/17/2020 |
| METHOD    | ODEQ M5                 |
| POLLUTANT | PM                      |

**Isokinetic Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 1  
**EPA Method:** ODEQ M5  
**Box Operator:** AB  
**Technician(s):** JMK

**Environmental Conditions/Test Notes:**  
Overcast/rainy/cool  
Process ended with 5 min. remaining in test.

**Run:** 1  
**Start Time:** 21:13  
**End Time:** 23:09  
**Date:** 12/16/2020

**Stack Dimensional Data:**

Circular  
Diameter 46.000 in  
Rectangular  
Width in  
Length in  
Stack Area 11.541 sq.ft.

**Equipment:**

|             |        |            |      |             |                 |
|-------------|--------|------------|------|-------------|-----------------|
| Meterbox ID | 9      | Probe ID   | 6E   | Liner type  | ss              |
| Y factor    | 0.9743 | Nozzle ID  | 0.22 | Nozzle size | 0.2203 inches   |
| ΔH@         | 1.792  | Hot box ID | hb3  | Nozzle area | 0.000265 sq.ft. |
|             |        | Pitot Cp   | 0.84 | Probe heat  | 250 F           |
|             |        | Pitot ID   | 6E   | Filter heat | 250 F           |

**Source Information:**

|                        |                        |                 |            |
|------------------------|------------------------|-----------------|------------|
| Barometric Pressure    | 29.65 "Hg              | O <sub>2</sub>  | 20.90 %    |
| Static Pressure        | 0.05 "H <sub>2</sub> O | CO <sub>2</sub> | 0.00 %     |
| Ave. ΔP                | 1.1 "H <sub>2</sub> O  | Rec. Nz.        | 0.2 inches |
| Stack Temperature      | 75 F                   |                 |            |
| Assumed moisture       | 1 %                    |                 |            |
| Assumed meter temp.    | 60 F                   |                 |            |
| Total number of points | 24                     |                 |            |
| Time per point         | 5                      |                 |            |
| Total run time         | 115                    |                 |            |

**Leak Checks:**

|                        | Pre-test | Post-test |
|------------------------|----------|-----------|
| Pitot                  | x        | x         |
| Train leak rate, dcf   | 0.000    | 0.000     |
| Leak check vacuum, "Hg | 12       | 11        |

**Nozzle check for roundness:**

|             |       |              |
|-------------|-------|--------------|
| 1           | 2     | 3            |
| 0.221       | 0.220 | 0.220 inches |
| Caliper ID# | WS2   |              |

**Post Test Calculations:**

|                         |                               |                     |                          |
|-------------------------|-------------------------------|---------------------|--------------------------|
| Sample volume           | 114.537 dcf                   | Ave. ΔP             | 1.27 "H <sub>2</sub> O   |
| Wet mol. weight         | 28.69 M <sub>s</sub> (actual) | Ave. √ΔP            | 1.1251 "H <sub>2</sub> O |
| Actual H <sub>2</sub> O | 1.40 %                        | Ave. ΔH             | 3.146 "H <sub>2</sub> O  |
| Std. meter vol.         | 111.615 dscf                  | Ave. T <sub>s</sub> | 80.2 °F                  |
| Isokinetic Average      | 99.3 %                        | Ave. T <sub>m</sub> | 67 °F                    |

**Moisture/Lab:**

| Filter        | U209 # | Initial           | Final  | Gain |
|---------------|--------|-------------------|--------|------|
| Impingers, g  |        | 2192.8            | 2198.9 | 6.1  |
| Silica gel, g |        | 883.5             | 911    | 27.5 |
|               |        | Total water gain: |        | 33.6 |

| Traverse Point | Time (min.) | Meter Volume (dcf) | Velocity P ("H <sub>2</sub> O) | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum ("Hg) | Filter Box (°F) | Condenser Temp F |
|----------------|-------------|--------------------|--------------------------------|------------------|------------------|---------|-------|--------------|-----------------|------------------|
| 1              | 5.0         | 763.784            | 1.20                           | 73               | 63               | 2.99    | 3.00  | 4.5          | 250             | 58               |
| 2              | 10.0        | 773.150            | 1.10                           | 79               | 64               | 2.72    | 2.70  | 4.5          | 250             | 59               |
| 3              | 15.0        | 777.900            | 1.10                           | 77               | 66               | 2.74    | 2.75  | 4.5          | 251             | 63               |
| 4              | 20.0        | 782.850            | 1.20                           | 80               | 67               | 2.98    | 3.00  | 4.5          | 256             | 59               |
| 5              | 25.0        | 787.690            | 1.20                           | 80               | 67               | 2.98    | 3.00  | 4.5          | 248             | 57               |
| 6              | 30.0        | 792.690            | 1.30                           | 80               | 65               | 3.21    | 3.20  | 4.5          | 250             | 57               |
| 7              | 35.0        | 797.710            | 1.30                           | 80               | 64               | 3.21    | 3.20  | 4.5          | 253             | 58               |
| 8              | 40.0        | 803.040            | 1.50                           | 80               | 63               | 3.69    | 3.70  | 5            | 248             | 56               |
| 9              | 45.0        | 808.450            | 1.50                           | 80               | 66               | 3.71    | 3.70  | 5            | 250             | 55               |
| 10             | 50.0        | 813.730            | 1.40                           | 82               | 67               | 3.46    | 3.50  | 5            | 250             | 54               |
| 11             | 55.0        | 819.000            | 1.40                           | 82               | 67               | 3.46    | 3.50  | 5            | 251             | 53               |
| 12             | 60.0        | 824.002            | 1.30                           | 82               | 68               | 3.22    | 3.20  | 4.5          | 251             | 55               |
| 13             | 65.0        | 829.230            | 1.40                           | 82               | 69               | 3.47    | 3.50  | 5            | 252             | 54               |
| 14             | 70.0        | 834.500            | 1.40                           | 82               | 70               | 3.48    | 3.50  | 5            | 250             | 55               |
| 15             | 75.0        | 839.840            | 1.50                           | 79               | 69               | 3.74    | 3.70  | 5            | 250             | 46               |
| 16             | 80.0        | 844.940            | 1.30                           | 79               | 69               | 3.24    | 3.20  | 4.5          | 249             | 46               |
| 17             | 85.0        | 849.790            | 1.20                           | 80               | 68               | 2.98    | 3.00  | 4.5          | 256             | 46               |
| 18             | 90.0        | 854.750            | 1.20                           | 82               | 68               | 2.97    | 3.00  | 4.5          | 252             | 46               |
| 19             | 95.0        | 859.420            | 1.10                           | 82               | 68               | 2.72    | 2.70  | 4            | 249             | 46               |
| 20             | 100.0       | 864.000            | 1.10                           | 82               | 69               | 2.73    | 2.70  | 4            | 250             | 46               |
| 21             | 105.0       | 868.620            | 1.10                           | 81               | 69               | 2.73    | 2.70  | 4            | 249             | 46               |
| 22             | 110.0       | 873.240            | 1.10                           | 81               | 68               | 2.73    | 2.70  | 4            | 250             | 46               |
| 23             | 115.0       | 878.321            | 1.30                           | 79               | 68               | 3.24    | 3.20  | 4.5          | 250             | 46               |

**Isokinetic Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 1  
**EPA Method:** ODEQ M5  
**Box Operator:** AB  
**Technician(s):** JMK

**Run:** 2  
**Start Date/Time:** 12/16/2020 23:47  
**End Date/Time:** 12/17/2020 1:40

**Environmental Conditions/Test Notes:**  
Overcast/rainy/cool  
Process ended with 10 min. remaining in test.

**Stack Dimensional Data:**

Circular  
Diameter 46.000 in  
Rectangular  
Width in  
Length in  
Stack Area 11.541 sq.ft.

**Equipment:**

Meterbox ID 9  
Y factor 0.9743  
 $\Delta H@$  1.792  
Probe ID 6E  
Nozzle ID 0.22  
Hot box ID hb3  
Pitot Cp 0.84  
Pitot ID 6E  
Liner type: ss  
Nozzle size: 0.2203 inches  
Nozzle area: 0.000265 sq.ft.  
Probe heat: 250 F  
Filter heat: 250 F

**Source Information:**

Barometric Pressure 29.65 "Hg  
Static Pressure 0.05 "H<sub>2</sub>O  
Ave.  $\Delta P$  1.1 "H<sub>2</sub>O  
Stack Temperature 75 F  
Assumed moisture 1.4 %  
Assumed meter temp. 67 F  
Total number of points 24  
Time per point 5  
Total run time 110  
O<sub>2</sub> 20.9 %  
CO<sub>2</sub> 0.0 %  
Rec. Nz. 0.199 inches

**Leak Checks:**

|                         | Pre-test | Post-test |
|-------------------------|----------|-----------|
| Pitot:                  | x        | x         |
| Train leak rate, dcf:   | 0.000    | 0.000     |
| Leak check vacuum, "Hg: | 12       | 13        |

**Nozzle check for roundness:**

| 1           | 2     | 3            |
|-------------|-------|--------------|
| 0.221       | 0.220 | 0.220 inches |
| Caliper ID# |       | WS2          |

**Post Test Calculations:**

Sample volume 108.758 dcf  
Wet mol. weight 28.71 M<sub>s</sub> (actual)  
Actual H<sub>2</sub>O 1.2 %  
Std. meter vol. 106.538 dscf  
Isokinetic Average 100.5 %  
Ave.  $\Delta P$  1.223 "H<sub>2</sub>O  
Ave.  $\sqrt{\Delta P}$  1.1034 "H<sub>2</sub>O  
Ave.  $\Delta H$  3.025 "H<sub>2</sub>O  
Ave. T<sub>s</sub> 76 °F  
Ave. T<sub>m</sub> 64.1 °F

**Moisture/Lab:**

|                   | Filter U210 # |        | Gain |
|-------------------|---------------|--------|------|
|                   | Initial       | Final  |      |
| Impingers, g      | 2176.0        | 2176.7 | 0.7  |
| Silica gel, g     | 879.0         | 905.9  | 26.9 |
| Total water gain: |               |        | 27.6 |

| Traverse Point | Time (min.) | Meter Volume (dcf) | Velocity P ("H <sub>2</sub> O) | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum ("Hg) | Filter Box (°F) | Condenser Temp F |
|----------------|-------------|--------------------|--------------------------------|------------------|------------------|---------|-------|--------------|-----------------|------------------|
| 1              | 5.0         | 883.110            | 1.20                           | 73               | 56               | 2.93    | 2.90  | 4            | 249             | 49               |
| 2              | 10.0        | 887.700            | 1.10                           | 73               | 57               | 2.69    | 2.70  | 5.5          | 257             | 44               |
| 3              | 15.0        | 892.680            | 1.10                           | 73               | 57               | 2.69    | 2.70  | 5.5          | 253             | 48               |
| 4              | 20.0        | 897.540            | 1.20                           | 73               | 61               | 2.96    | 2.95  | 5.5          | 251             | 49               |
| 5              | 25.0        | 902.300            | 1.10                           | 72               | 63               | 2.73    | 2.75  | 5.5          | 251             | 50               |
| 6              | 30.0        | 907.030            | 1.10                           | 73               | 63               | 2.73    | 2.75  | 5.5          | 250             | 50               |
| 7              | 35.0        | 911.770            | 1.10                           | 72               | 64               | 2.74    | 2.75  | 5.5          | 249             | 50               |
| 8              | 40.0        | 916.590            | 1.10                           | 73               | 64               | 2.73    | 2.75  | 5.5          | 252             | 49               |
| 9              | 45.0        | 921.190            | 1.10                           | 73               | 64               | 2.73    | 2.75  | 5.5          | 250             | 48               |
| 10             | 50.0        | 926.300            | 1.30                           | 75               | 65               | 3.22    | 3.20  | 5.5          | 250             | 47               |
| 11             | 55.0        | 931.550            | 1.40                           | 75               | 65               | 3.47    | 3.50  | 6            | 250             | 47               |
| 12             | 60.0        | 936.894            | 1.40                           | 76               | 66               | 3.47    | 3.50  | 6            | 250             | 47               |
| 13             | 65.0        | 942.420            | 1.50                           | 76               | 67               | 3.72    | 3.70  | 6.5          | 250             | 48               |
| 14             | 70.0        | 947.970            | 1.50                           | 76               | 67               | 3.72    | 3.70  | 6.5          | 251             | 48               |
| 15             | 75.0        | 953.550            | 1.50                           | 77               | 67               | 3.72    | 3.70  | 6.5          | 249             | 48               |
| 16             | 80.0        | 958.780            | 1.40                           | 77               | 67               | 3.47    | 3.50  | 6            | 251             | 48               |
| 17             | 85.0        | 963.880            | 1.30                           | 79               | 66               | 3.20    | 3.20  | 6            | 250             | 48               |
| 18             | 90.0        | 968.580            | 1.10                           | 82               | 66               | 2.70    | 2.70  | 5.5          | 250             | 47               |
| 19             | 95.0        | 973.280            | 1.10                           | 81               | 66               | 2.70    | 2.70  | 5.5          | 250             | 47               |
| 20             | 100.0       | 977.720            | 1.00                           | 82               | 66               | 2.45    | 2.45  | 5            | 250             | 47               |
| 21             | 105.0       | 982.250            | 1.00                           | 82               | 66               | 2.45    | 2.50  | 5            | 249             | 47               |
| 22             | 110.0       | 987.256            | 1.30                           | 80               | 67               | 3.20    | 3.20  | 5.5          | 250             | 48               |

**Isokinetic Field Data**  
**Field Data Entry**

|                       |                               |                                               |                   |
|-----------------------|-------------------------------|-----------------------------------------------|-------------------|
| <b>Client:</b>        | <b>Columbia Steel Casting</b> | <b>Run:</b>                                   | <b>3</b>          |
| <b>Location:</b>      | <b>Portland, Oregon</b>       | <b>Start Time:</b>                            | <b>2:10</b>       |
| <b>Source:</b>        | <b>BH 1</b>                   | <b>End Time:</b>                              | <b>3:55</b>       |
| <b>EPA Method:</b>    | <b>ODEQ M5</b>                | <b>Date:</b>                                  | <b>12/17/2020</b> |
| <b>Box Operator:</b>  | <b>AB</b>                     | <b>Environmental Conditions/Test Notes:</b>   |                   |
| <b>Technician(s):</b> | <b>JMK</b>                    | Overcast/rainy/cool                           |                   |
|                       |                               | Process ended with 15 min. remaining in test. |                   |

| Stack Dimensional Data: |               | Equipment:  |        |              |                 |
|-------------------------|---------------|-------------|--------|--------------|-----------------|
| Circular                |               | Meterbox ID | 9      | Probe ID     | 6E              |
| Diameter                | 46.000 in     | Y factor    | 0.9743 | Liner type:  | ss              |
| Rectangular             |               | ΔH@         | 1.792  | Nozzle ID    | 0.22            |
| Width                   | in            |             |        | Nozzle size: | 0.2203 inches   |
| Length                  | in            |             |        | Hot box ID   | hb3             |
| Stack Area              | 11.541 sq.ft. |             |        | Nozzle area: | 0.000265 sq.ft. |
|                         |               |             |        | Pitot Cp     | 0.84            |
|                         |               |             |        | Probe heat:  | 250 F           |
|                         |               |             |        | Pitot ID     | 6E              |
|                         |               |             |        | Filter heat: | 250 F           |

| Source Information:    |                        |                 |              | Leak Checks:                |           |              |
|------------------------|------------------------|-----------------|--------------|-----------------------------|-----------|--------------|
| Barometric Pressure    | 29.65 "Hg              | O <sub>2</sub>  | 20.9 %       | Pre-test                    | Post-test |              |
| Static Pressure        | 0.05 "H <sub>2</sub> O | CO <sub>2</sub> | 0.0 %        | Pitot:                      | x         | x            |
| Ave. ΔP                | 1.1 "H <sub>2</sub> O  | Rec. Nz.        | 0.199 inches | Train leak rate, dcf:       | 0.000     | 0.000        |
| Stack Temperature      | 75 F                   |                 |              | Leak check vacuum, "Hg:     | 14        | 14           |
| Assumed moisture       | 1.2 %                  |                 |              |                             |           |              |
| Assumed meter temp.    | 64.1 F                 |                 |              | Nozzle check for roundness: |           |              |
| Total number of points | 24                     |                 |              | 1                           | 2         | 3            |
| Time per point         | 5                      |                 |              | 0.221                       | 0.220     | 0.220 inches |
| Total run time         | 105                    |                 |              | Caliper ID#                 | WS2       |              |

| Post Test Calculations: |                              |                     |                          | Moisture/Lab: |                   |        |      |
|-------------------------|------------------------------|---------------------|--------------------------|---------------|-------------------|--------|------|
| Sample volume           | 98.222 dcf                   | Ave. ΔP             | 1.11 "H <sub>2</sub> O   | Filter        | U211 #            |        |      |
| Wet mol. weight         | 28.7 M <sub>s</sub> (actual) | Ave. √ΔP            | 1.0523 "H <sub>2</sub> O |               | Initial           | Final  | Gain |
| Actual H <sub>2</sub> O | 1.3 %                        | Ave. ΔH             | 2.724 "H <sub>2</sub> O  | Impingers, g  | 2152.1            | 2151.9 | -0.2 |
| Std. meter vol.         | 96.978 dscf                  | Ave. T <sub>s</sub> | 77.1 °F                  | Silica gel, g | 902.6             | 929.9  | 27.3 |
| Isokinetic Average      | 100.7 %                      | Ave. T <sub>m</sub> | 59.6 °F                  |               | Total water gain: |        | 27.1 |

| Traverse Point | Time (min.) | Meter Volume (dcf) | Velocity P ("H <sub>2</sub> O) | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum ("Hg) | Filter Box (°F) | Condenser Temp F |
|----------------|-------------|--------------------|--------------------------------|------------------|------------------|---------|-------|--------------|-----------------|------------------|
| 1              | 5.0         | 987.495            | 1.10                           | 78               | 55               | 2.67    | 2.65  | 4.5          | 250             | 48               |
| 2              | 10.0        | 992.100            | 1.10                           | 76               | 54               | 2.67    | 2.65  | 4.5          | 256             | 45               |
| 3              | 15.0        | 996.730            | 1.05                           | 76               | 55               | 2.56    | 2.55  | 4.5          | 254             | 49               |
| 4              | 20.0        | 1001.280           | 1.10                           | 74               | 56               | 2.69    | 2.70  | 4.5          | 251             | 50               |
| 5              | 25.0        | 1005.910           | 1.10                           | 74               | 58               | 2.70    | 2.70  | 4.5          | 251             | 50               |
| 6              | 30.0        | 1010.550           | 1.10                           | 74               | 54               | 2.68    | 2.70  | 4.5          | 250             | 51               |
| 7              | 35.0        | 1015.180           | 1.30                           | 73               | 59               | 3.21    | 3.20  | 5.5          | 250             | 51               |
| 8              | 40.0        | 1020.270           | 1.20                           | 74               | 61               | 2.97    | 3.00  | 5.5          | 251             | 52               |
| 9              | 45.0        | 1025.100           | 1.30                           | 75               | 61               | 3.21    | 3.20  | 5.5          | 250             | 53               |
| 10             | 50.0        | 1030.200           | 1.30                           | 75               | 62               | 3.21    | 3.20  | 5.5          | 249             | 53               |
| 11             | 55.0        | 1035.330           | 1.00                           | 75               | 61               | 2.47    | 2.50  | 5            | 251             | 53               |
| 12             | 60.0        | 1039.800           | 1.00                           | 76               | 61               | 2.46    | 2.50  | 5            | 250             | 53               |
| 13             | 65.0        | 1044.345           | 1.00                           | 76               | 61               | 2.46    | 2.46  | 5            | 249             | 53               |
| 14             | 70.0        | 1048.890           | 1.00                           | 78               | 61               | 2.45    | 2.50  | 5            | 251             | 52               |
| 15             | 75.0        | 1053.260           | 0.95                           | 78               | 61               | 2.33    | 2.30  | 4.5          | 250             | 53               |
| 16             | 80.0        | 1057.510           | 1.10                           | 81               | 61               | 2.68    | 2.70  | 4.5          | 250             | 53               |
| 17             | 85.0        | 1062.190           | 1.20                           | 83               | 62               | 2.92    | 2.90  | 5            | 250             | 53               |
| 18             | 90.0        | 1067.000           | 1.10                           | 82               | 62               | 2.68    | 2.70  | 4.5          | 250             | 54               |
| 19             | 95.0        | 1071.590           | 1.10                           | 81               | 62               | 2.69    | 2.70  | 4.5          | 251             | 54               |
| 20             | 100.0       | 1076.390           | 1.10                           | 80               | 62               | 2.69    | 2.70  | 4.5          | 248             | 54               |
| 21             | 105.0       | 1081.080           | 1.10                           | 80               | 62               | 2.69    | 2.70  | 4.5          | 249             | 54               |
|                |             | 1085.717           |                                |                  |                  |         |       |              |                 |                  |

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Particulate Emissions and Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 1  
**Method:** ODEQ 5

**Run:** 1  
**Start Time:** 21:13  
**End Time:** 23:09  
**Date:** 12/16/2020

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 763.784                  |                                 |                            |                   |                         |                            |             |
| 5             | 768.520                  | 3.00                            | 63                         | 1                 | 1.20                    | 73                         | 1.0954      |
| 10            | 773.150                  | 2.70                            | 64                         | 2                 | 1.10                    | 79                         | 1.0488      |
| 15            | 777.900                  | 2.75                            | 66                         | 3                 | 1.10                    | 77                         | 1.0488      |
| 20            | 782.850                  | 3.00                            | 67                         | 4                 | 1.20                    | 80                         | 1.0954      |
| 25            | 787.690                  | 3.00                            | 67                         | 5                 | 1.20                    | 80                         | 1.0954      |
| 30            | 792.690                  | 3.20                            | 65                         | 6                 | 1.30                    | 80                         | 1.1402      |
| 35            | 797.710                  | 3.20                            | 64                         | 7                 | 1.30                    | 80                         | 1.1402      |
| 40            | 803.040                  | 3.70                            | 63                         | 8                 | 1.50                    | 80                         | 1.2247      |
| 45            | 808.450                  | 3.70                            | 66                         | 9                 | 1.50                    | 80                         | 1.2247      |
| 50            | 813.730                  | 3.50                            | 67                         | 10                | 1.40                    | 82                         | 1.1832      |
| 55            | 819.000                  | 3.50                            | 67                         | 11                | 1.40                    | 82                         | 1.1832      |
| 60            | 824.002                  | 3.20                            | 68                         | 12                | 1.30                    | 82                         | 1.1402      |
| 65            | 829.230                  | 3.50                            | 69                         | 13                | 1.40                    | 82                         | 1.1832      |
| 70            | 834.500                  | 3.50                            | 70                         | 14                | 1.40                    | 82                         | 1.1832      |
| 75            | 839.840                  | 3.70                            | 69                         | 15                | 1.50                    | 79                         | 1.2247      |
| 80            | 844.940                  | 3.20                            | 69                         | 16                | 1.30                    | 79                         | 1.1402      |
| 85            | 849.790                  | 3.00                            | 68                         | 17                | 1.20                    | 80                         | 1.0954      |
| 90            | 854.750                  | 3.00                            | 68                         | 18                | 1.20                    | 82                         | 1.0954      |
| 95            | 859.420                  | 2.70                            | 68                         | 19                | 1.10                    | 82                         | 1.0488      |
| 100           | 864.000                  | 2.70                            | 69                         | 20                | 1.10                    | 82                         | 1.0488      |
| 105           | 868.620                  | 2.70                            | 69                         | 21                | 1.10                    | 81                         | 1.0488      |
| 110           | 873.240                  | 2.70                            | 68                         | 22                | 1.10                    | 81                         | 1.0488      |
| 115           | 878.321                  | 3.20                            | 68                         | 23                | 1.30                    | 79                         | 1.1402      |

**Client:** Columbia Steel Casting  
**Source:** BH 1

**Run:** 1  
**Date:** 12/16/20

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**Field Data Input Continued**Moisture Data

Total Test Time 115.0 min  
Sample Time Interval 5.0 min  
Meter Volume,  $V_m$  114.537 dcf  
Water Volume 33.6 g  
Nozzle Diameter,  $N_z$  0.2203 in.  
Nozzle Area 0.000265 sq.ft.

Stack Dimensional Data:

Circular  
Diameter 46.000 in  
Rectangular  
Width in  
Length in  
Stack Area 11.541 sq.ft.

Traverse Data

Barometric Pressure,  $P_b$  29.65 "Hg  
Static Pressure 0.05 "H<sub>2</sub>O  
Pitot Factor, cp 0.84  
Meter Cal Factor 0.9743 Y

Molecular Weight:

CO<sub>2</sub> Average 0.01 %vd  
O<sub>2</sub> Average 21.31 %vd

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**Field Data Averages**Meter

$\Delta H$  3.146 "H<sub>2</sub>O  
Temperature,  $T_m$  67.0 °F  
Temperature,  $T_m$  527.0 °A (°R)  
Pressure Meter,  $P_m$  29.881 "Hg

Stack

$\sqrt{Dp}$  1.1251 "H<sub>2</sub>O  
Temperature,  $T_s$  80.2 °F  
Temperature,  $T_s$  540.2 °A (R)  
Pressure Stack,  $P_s$  29.654 "Hg

**Field Data Calculations**Meter Box Capture

Standard Volume,  $V_{m(std)}$  111.615 dscf  
3.161 dscm  
Actual Volume,  $V_{m(actual)}$  116.901 awcf

EPA Method 2 Stack Gas Flowrate:

Velocity,  $V_s$  64.37 fps  
Volume (actual) 44,573.7 acfm  
43,949.7 adcfm  
Volume (standard) 2,590,779.7 wscf/hr  
2,554,508.8 dscf/hr  
42,575.1 dscf/min

Gas Stream Moisture

Moisture Vapor,  $V_{w(std)}$  1.581 scf  
Moisture,  $B_{ws}$  0.0140  
Moisture EPA M4 1.40 %v

EPA Method 3 Gas Density

Dry,  $M_d$  28.85 lb/lb-mole  
Wet,  $M_s$  28.70 lb/lb-mole

Percent Isokinetic 99.3 %

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**Laboratory Results****EPA Method 5**

Filterable PM 0.00121 grams

**Emissions:**

Concentration,  $C_s$  1.67E-04 gr/dscf  
382 µg/dscm  
Mass Emissions 0.06 lb/hr

**Back Half:**

Inorganic CPM 4.74E-03 grams  
Inorganic CPM,  $C_s$  6.55E-04 gr/dscf  
1,499 µg/dscm  
Mass Emissions 0.24 lb/hr

Organic CPM 1.37E-03 grams  
Organic CPM,  $C_s$  1.90E-04 gr/dscf  
434 µg/dscm  
Mass Emissions 0.07 lb/hr

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Particulate Emissions and Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 1  
**Method:** ODEQ 5

**Run:** 2  
**Start Date/Time:** 12/16/2020 23:47  
**End Date/Time:** 12/17/2020 1:40

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 878.498                  |                                 |                            |                   |                         |                            |             |
| 5             | 883.110                  | 2.90                            | 56                         | 1                 | 1.20                    | 73                         | 1.0954      |
| 10            | 887.700                  | 2.70                            | 57                         | 2                 | 1.10                    | 73                         | 1.0488      |
| 15            | 892.680                  | 2.70                            | 57                         | 3                 | 1.10                    | 73                         | 1.0488      |
| 20            | 897.540                  | 2.95                            | 61                         | 4                 | 1.20                    | 73                         | 1.0954      |
| 25            | 902.300                  | 2.75                            | 63                         | 5                 | 1.10                    | 72                         | 1.0488      |
| 30            | 907.030                  | 2.75                            | 63                         | 6                 | 1.10                    | 73                         | 1.0488      |
| 35            | 911.770                  | 2.75                            | 64                         | 7                 | 1.10                    | 72                         | 1.0488      |
| 40            | 916.590                  | 2.75                            | 64                         | 8                 | 1.10                    | 73                         | 1.0488      |
| 45            | 921.190                  | 2.75                            | 64                         | 9                 | 1.10                    | 73                         | 1.0488      |
| 50            | 926.300                  | 3.20                            | 65                         | 10                | 1.30                    | 75                         | 1.1402      |
| 55            | 931.550                  | 3.50                            | 65                         | 11                | 1.40                    | 75                         | 1.1832      |
| 60            | 936.894                  | 3.50                            | 66                         | 12                | 1.40                    | 76                         | 1.1832      |
| 65            | 942.420                  | 3.70                            | 67                         | 13                | 1.50                    | 76                         | 1.2247      |
| 70            | 947.970                  | 3.70                            | 67                         | 14                | 1.50                    | 76                         | 1.2247      |
| 75            | 953.550                  | 3.70                            | 67                         | 15                | 1.50                    | 77                         | 1.2247      |
| 80            | 958.780                  | 3.50                            | 67                         | 16                | 1.40                    | 77                         | 1.1832      |
| 85            | 963.880                  | 3.20                            | 66                         | 17                | 1.30                    | 79                         | 1.1402      |
| 90            | 968.580                  | 2.70                            | 66                         | 18                | 1.10                    | 82                         | 1.0488      |
| 95            | 973.280                  | 2.70                            | 66                         | 19                | 1.10                    | 81                         | 1.0488      |
| 100           | 977.720                  | 2.45                            | 66                         | 20                | 1.00                    | 82                         | 1.0000      |
| 105           | 982.250                  | 2.50                            | 66                         | 21                | 1.00                    | 82                         | 1.0000      |
| 110           | 987.256                  | 3.20                            | 67                         | 22                | 1.30                    | 80                         | 1.1402      |

**Client:** Columbia Steel Casting  
**Source:** BH 1

**Run:** 2  
**Dates:** 12/16/2020-12/17/2020

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**Field Data Input Continued**

Moisture Data

Total Test Time 110.0 min  
Sample Time Interval 5.0 min  
Meter Volume,  $V_m$  108.758 dcf  
Water Volume 27.6 g  
Nozzle Diameter,  $N_z$  0.2203 in.  
Nozzle Area 0.000265 sq.ft.

Stack Dimensional Data:

Circular  
Diameter 46.000 in  
Rectangular  
Width in  
Length in  
Stack Area 11.541 sq.ft.

Traverse Data

Barometric Pressure,  $P_b$  29.65 "Hg  
Static Pressure 0.05 "H<sub>2</sub>O  
Pitot Factor, cp 0.84  
Meter Cal Factor 0.9743 Y

Molecular Weight:

CO<sub>2</sub> Average 0.00 %vd  
O<sub>2</sub> Average 21.36 %vd

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**Field Data Averages**

Meter

$\Delta H$  3.025 "H<sub>2</sub>O  
Temperature,  $T_m$  64.1 °F  
Temperature,  $T_m$  524.1 °A (°R)  
Pressure Meter,  $P_m$  29.872 "Hg

Stack

$\sqrt{Dp}$  1.1034 "H<sub>2</sub>O  
Temperature,  $T_s$  76.0 °F  
Temperature,  $T_s$  536.0 °A (R)  
Pressure Stack,  $P_s$  29.654 "Hg

**Field Data Calculations**

Meter Box Capture

Standard Volume,  $V_{m(std)}$  106.538 dscf  
3.017 dscm  
Actual Volume,  $V_{m(actual)}$  110.491 awcf

EPA Method 2 Stack Gas Flowrate:

Velocity,  $V_s$  62.86 fps  
Volume (actual) 43,528.0 acfm  
43,005.7 adcfm  
Volume (standard) 2,549,829.5 wscf/hr  
2,519,231.5 dscf/hr  
41,987.2 dscf/min

Gas Stream Moisture

Moisture Vapor,  $V_{w(std)}$  1.299 scf  
Moisture,  $B_{ws}$  0.0120  
Moisture EPA M4 1.20 %v

EPA Method 3 Gas Density

Dry,  $M_d$  28.85 lb/lb-mole  
Wet,  $M_s$  28.72 lb/lb-mole

Percent Isokinetic 100.5 %

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**Laboratory Results**

**Front Half:**

Filterable PM 0.00052 grams

**Emissions:**

Concentration,  $C_s$  7.51E-05 gr/dscf  
172 µg/dscm  
Mass Emissions 0.03 lb/hr

**Back Half:**

Inorganic CPM 3.44E-03 grams  
Inorganic CPM,  $C_s$  4.98E-04 gr/dscf  
1,139 µg/dscm  
Mass Emissions 0.18 lb/hr

Organic CPM 1.42E-03 grams  
Organic CPM,  $C_s$  2.06E-04 gr/dscf  
472 µg/dscm  
Mass Emissions 0.07 lb/hr

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Particulate Emissions and Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 1  
**Method:** ODEQ 5

**Run:** 3  
**Start Time:** 2:10  
**End Time:** 3:55  
**Date:** 12/17/20

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 987.495                  |                                 |                            |                   |                         |                            |             |
| 5             | 992.100                  | 2.65                            | 55                         | 1                 | 1.10                    | 78                         | 1.0488      |
| 10            | 996.730                  | 2.65                            | 54                         | 2                 | 1.10                    | 76                         | 1.0488      |
| 15            | 1001.280                 | 2.55                            | 55                         | 3                 | 1.05                    | 76                         | 1.0247      |
| 20            | 1005.910                 | 2.70                            | 56                         | 4                 | 1.10                    | 74                         | 1.0488      |
| 25            | 1010.550                 | 2.70                            | 58                         | 5                 | 1.10                    | 74                         | 1.0488      |
| 30            | 1015.180                 | 2.70                            | 54                         | 6                 | 1.10                    | 74                         | 1.0488      |
| 35            | 1020.270                 | 3.20                            | 59                         | 7                 | 1.30                    | 73                         | 1.1402      |
| 40            | 1025.100                 | 3.00                            | 61                         | 8                 | 1.20                    | 74                         | 1.0954      |
| 45            | 1030.200                 | 3.20                            | 61                         | 9                 | 1.30                    | 75                         | 1.1402      |
| 50            | 1035.330                 | 3.20                            | 62                         | 10                | 1.30                    | 75                         | 1.1402      |
| 55            | 1039.800                 | 2.50                            | 61                         | 11                | 1.00                    | 75                         | 1.0000      |
| 60            | 1044.345                 | 2.50                            | 61                         | 12                | 1.00                    | 76                         | 1.0000      |
| 65            | 1048.890                 | 2.46                            | 61                         | 13                | 1.00                    | 76                         | 1.0000      |
| 70            | 1053.260                 | 2.50                            | 61                         | 14                | 1.00                    | 78                         | 1.0000      |
| 75            | 1057.510                 | 2.30                            | 61                         | 15                | 0.95                    | 78                         | 0.9747      |
| 80            | 1062.190                 | 2.70                            | 61                         | 16                | 1.10                    | 81                         | 1.0488      |
| 85            | 1067.000                 | 2.90                            | 62                         | 17                | 1.20                    | 83                         | 1.0954      |
| 90            | 1071.590                 | 2.70                            | 62                         | 18                | 1.10                    | 82                         | 1.0488      |
| 95            | 1076.390                 | 2.70                            | 62                         | 19                | 1.10                    | 81                         | 1.0488      |
| 100           | 1081.080                 | 2.70                            | 62                         | 20                | 1.10                    | 80                         | 1.0488      |
| 105           | 1085.717                 | 2.70                            | 62                         | 21                | 1.10                    | 80                         | 1.0488      |

|                |                               |              |                 |
|----------------|-------------------------------|--------------|-----------------|
| <b>Client:</b> | <b>Columbia Steel Casting</b> | <b>Run:</b>  | <b>3</b>        |
| <b>Source:</b> | <b>BH 1</b>                   | <b>Date:</b> | <b>12/17/20</b> |

### Field Data Input Continued

#### Moisture Data

|                                 |                 |
|---------------------------------|-----------------|
| Total Test Time                 | 105.0 min       |
| Sample Time Interval            | 5.0 min         |
| Meter Volume, V <sub>m</sub>    | 98.222 dcf      |
| Water Volume                    | 27.1 g          |
| Nozzle Diameter, N <sub>z</sub> | 0.2203 in.      |
| Nozzle Area                     | 0.000265 sq.ft. |

#### Stack Dimensional Data:

|             |               |
|-------------|---------------|
| Circular    |               |
| Diameter    | 46.000 in     |
| Rectangular |               |
| Width       | in            |
| Length      | in            |
| Stack Area  | 11.541 sq.ft. |

#### Traverse Data

|                                     |                        |
|-------------------------------------|------------------------|
| Barometric Pressure, P <sub>b</sub> | 29.65 "Hg              |
| Static Pressure                     | 0.05 "H <sub>2</sub> O |
| Pitot Factor, cp                    | 0.84                   |
| Meter Cal Factor                    | 0.9743 Y               |

#### Molecular Weight:

|                         |           |
|-------------------------|-----------|
| CO <sub>2</sub> Average | 0.00 %vd  |
| O <sub>2</sub> Average  | 21.41 %vd |

### Field Data Averages

#### Meter

|                                |                         |
|--------------------------------|-------------------------|
| ΔH                             | 2.724 "H <sub>2</sub> O |
| Temperature, T <sub>m</sub>    | 59.6 °F                 |
| Temperature, T <sub>m</sub>    | 519.6 °A (°R)           |
| Pressure Meter, P <sub>m</sub> | 29.850 "Hg              |

#### Stack

|                                |                          |
|--------------------------------|--------------------------|
| √Dp                            | 1.0523 "H <sub>2</sub> O |
| Temperature, T <sub>s</sub>    | 77.1 °F                  |
| Temperature, T <sub>s</sub>    | 537.1 °A (R)             |
| Pressure Stack, P <sub>s</sub> | 29.654 "Hg               |

### Field Data Calculations

#### Meter Box Capture

|                                       |              |
|---------------------------------------|--------------|
| Standard Volume, V <sub>m(std)</sub>  | 96.978 dscf  |
|                                       | 2.746 dscm   |
| Actual Volume, V <sub>m(actual)</sub> | 100.886 awcf |

#### EPA Method 2 Stack Gas Flowrate:

|                          |                     |
|--------------------------|---------------------|
| Velocity, V <sub>s</sub> | 60.01 fps           |
| Volume (actual)          | 41,554.5 acfm       |
|                          | 41,014.3 adcfm      |
| Volume (standard)        | 2,429,237.8 wscf/hr |
|                          | 2,397,657.7 dscf/hr |
|                          | 39,961.0 dscf/min   |

#### Gas Stream Moisture

|                                     |           |
|-------------------------------------|-----------|
| Moisture Vapor, V <sub>w(std)</sub> | 1.275 scf |
| Moisture, B <sub>ws</sub>           | 0.0130    |
| Moisture EPA M4                     | 1.30 %v   |

#### EPA Method 3 Gas Density

|                     |                  |
|---------------------|------------------|
| Dry, M <sub>d</sub> | 28.86 lb/lb-mole |
| Wet, M <sub>s</sub> | 28.72 lb/lb-mole |

|                    |         |
|--------------------|---------|
| Percent Isokinetic | 100.7 % |
|--------------------|---------|

### Laboratory Results

#### Front Half:

|               |               |
|---------------|---------------|
| Filterable PM | 0.00000 grams |
|---------------|---------------|

#### Emissions:

|                               |                  |
|-------------------------------|------------------|
| Concentration, C <sub>s</sub> | 0.00E+00 gr/dscf |
|                               | 0 μg/dscm        |
| Mass Emissions                | 0.00 lb/hr       |

#### Back Half:

|                               |                  |                             |                  |
|-------------------------------|------------------|-----------------------------|------------------|
| Inorganic CPM                 | 4.96E-03 grams   | Organic CPM                 | 7.02E-04 grams   |
| Inorganic CPM, C <sub>s</sub> | 7.88E-04 gr/dscf | Organic CPM, C <sub>s</sub> | 1.12E-04 gr/dscf |
|                               | 1,805 μg/dscm    |                             | 256 μg/dscm      |
| Mass Emissions                | 0.27 lb/hr       | Mass Emissions              | 0.04 lb/hr       |

**Oregon Method 5**  
**Filterable and Condensable Particulate**  
**Laboratory Gravimetric Data**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 1

| Run                                                                                              | Sample Description                   | ml,# | Initial<br>(grams) | Final<br>(grams) | Net Gain<br>(grams)       | Blank<br>Correction<br>(grams) | Corrected<br>Gain (grams) |
|--------------------------------------------------------------------------------------------------|--------------------------------------|------|--------------------|------------------|---------------------------|--------------------------------|---------------------------|
| 1                                                                                                | CPM Organics (Acetone BH)            | 116  | 100.70289          | 100.70427        | 0.00138                   | 0.00031                        | <b>0.00107</b>            |
|                                                                                                  | Probe Rinse (Acetone FH)             | 95   | 100.90700          | 100.90846        | 0.00146                   | 0.00025                        | <b>0.00121</b>            |
|                                                                                                  | Filter                               | U209 | 0.47707            | 0.47635          | -0.00072                  |                                | <b>0.00000</b>            |
|                                                                                                  | CPM Inorganics (Water)*              | 225  | 102.50948          | 102.51449        | 0.00501                   | 0.00027                        | <b>0.00474</b>            |
|                                                                                                  | CPM Organics (Methylene Chloride BH) | 150  | 118.01218          | 118.01261        | 0.00043                   | 0.00013                        | <b>0.00030</b>            |
|                                                                                                  | Impinger H <sub>2</sub> O Gain, g    |      |                    |                  | 6.1                       |                                |                           |
|                                                                                                  |                                      |      |                    |                  | <b>Filterable PM (mg)</b> |                                | <b>1.21</b>               |
|                                                                                                  |                                      |      |                    |                  | <b>Total PM (mg)</b>      |                                | <b>7.32</b>               |
| *Approx. 54 mL of this sample fraction was spilled during MC extraction. See note in lab report. |                                      |      |                    |                  |                           |                                |                           |
| 2                                                                                                | CPM Organics (Acetone BH)            | 161  | 100.81418          | 100.81529        | 0.00111                   | 0.00043                        | <b>0.00068</b>            |
|                                                                                                  | Probe Rinse (Acetone FH)             | 114  | 101.39209          | 101.39291        | 0.00082                   | 0.00030                        | <b>0.00052</b>            |
|                                                                                                  | Filter                               | U210 | 0.47734            | 0.47659          | -0.00075                  |                                | <b>0.00000</b>            |
|                                                                                                  | CPM Inorganics (Water)               | 302  | 101.61642          | 101.62022        | 0.00380                   | 0.00036                        | <b>0.00344</b>            |
|                                                                                                  | CPM Organics (Methylene Chloride BH) | 150  | 101.65152          | 101.65239        | 0.00087                   | 0.00013                        | <b>0.00074</b>            |
|                                                                                                  | Impinger H <sub>2</sub> O Gain, g    |      |                    |                  | 0.7                       |                                |                           |
|                                                                                                  |                                      |      |                    |                  | <b>Filterable PM (mg)</b> |                                | <b>0.52</b>               |
|                                                                                                  |                                      |      |                    |                  | <b>Total PM (mg)</b>      |                                | <b>5.38 ND</b>            |
| 3                                                                                                | CPM Organics (Acetone BH)            | 139  | 100.66699          | 100.66775        | 0.00076                   | 0.00037                        | <b>0.00039</b>            |
|                                                                                                  | Probe Rinse (Acetone FH)             | 119  | 100.38576          | 100.38605        | 0.00029                   | 0.00032                        | <b>0.00000</b>            |
|                                                                                                  | Filter                               | U211 | 0.47046            | 0.46972          | -0.00074                  |                                | <b>0.00000</b>            |
|                                                                                                  | CPM Inorganics (Water)               | 286  | 102.17471          | 102.18001        | 0.00530                   | 0.00034                        | <b>0.00496</b>            |
|                                                                                                  | CPM Organics (Methylene Chloride BH) | 150  | 102.32790          | 102.32834        | 0.00044                   | 0.00013                        | <b>0.00031</b>            |
|                                                                                                  | Impinger H <sub>2</sub> O Gain, g    |      |                    |                  | -0.2                      |                                |                           |
|                                                                                                  |                                      |      |                    |                  | <b>Filterable PM (mg)</b> |                                | <b>0.00</b>               |
|                                                                                                  |                                      |      |                    |                  | <b>Total PM (mg)</b>      |                                | <b>5.66 ND</b>            |
|                                                                                                  | Acetone Blank                        | 170  | 102.30054          | 102.30099        | 0.00045                   | 2.65E-06                       | g/ml                      |
|                                                                                                  | Water Blank                          | 216  | 99.57033           | 99.57059         | 0.00026                   | 1.20E-06                       | g/ml                      |
|                                                                                                  | Methylene Chloride Blank             | 150  | 101.38136          | 101.38149        | 0.00013                   | 8.67E-07                       | g/ml                      |

ND = Non-Detect. Values are below the method detection limit (7 mg). Emission rates were calculated using these results, rather than the 7 mg detection limit, as this testing was conducted for emission factor verification purposes.

**Oregon Methods 1-5**  
**Filterable and Condensable Particulate**  
**Results Summary**

**Client:** Columbia Steel Casting  
**Source:** BH 1  
**Location:** Portland, Oregon

| Run                              |                               |                     | 1          | 2          | 3          | Average    |
|----------------------------------|-------------------------------|---------------------|------------|------------|------------|------------|
| Start Date                       |                               |                     | 12/16/2020 | 12/16/2020 | 12/17/2020 |            |
| Run Start Time                   |                               |                     | 21:13      | 23:47      | 2:10       |            |
| Run End Date                     |                               |                     | 12/16/2020 | 12/17/2020 | 12/17/2020 |            |
| Run End Time                     |                               |                     | 23:09      | 1:40       | 3:55       |            |
| Duration, min.                   |                               |                     | 115        | 110        | 105        |            |
| Barometric Pressure, "Hg         |                               |                     | 29.65      | 29.65      | 29.65      | 29.65      |
| Nozzle Dia., in.                 |                               |                     | 0.2203     | 0.2203     | 0.2203     | 0.2203     |
| Isokinetic Average, %            |                               |                     | 99.3       | 100.5      | 100.7      | 100.2      |
| Sample Volume, dscf              |                               |                     | 111.589    | 106.513    | 96.956     | 105.019    |
| Sample Volume, dscm              |                               |                     | 3.160      | 3.016      | 2.745      | 2.974      |
| Stack Diameter, in.              |                               |                     | 46.00      | 46.00      | 46.00      | 46.00      |
| Stack Area, sq.ft.               |                               |                     | 11.541     | 11.541     | 11.541     | 11.541     |
| CO <sub>2</sub> %vd              |                               |                     | 0.01       | 0.00       | 0.00       | 0.00       |
| O <sub>2</sub> %vd               |                               |                     | 21.31      | 21.36      | 21.41      | 21.36      |
| Static Press., "H <sub>2</sub> O |                               |                     | 0.05       | 0.05       | 0.05       | 0.05       |
| H <sub>2</sub> O %v              |                               |                     | 1.40       | 1.21       | 1.30       | 1.30       |
| Wet Molecular Weight, lb/lb-mole |                               |                     | 28.70      | 28.72      | 28.72      | 28.71      |
| Velocity, FPS                    |                               |                     | 64.37      | 62.86      | 60.01      | 62.41      |
| ADCFM                            |                               |                     | 43,949.7   | 43,001.3   | 41,014.3   | 42,655.1   |
| ACFM                             |                               |                     | 44,573.7   | 43,528.0   | 41,554.5   | 43,218.7   |
| DSCFM                            |                               |                     | 42,575.1   | 41,982.9   | 39,961.0   | 41,506.4   |
| Stack Temperature, °F            |                               |                     | 80.2       | 76.0       | 77.1       | 77.8       |
| Filterable Particulate           | Concentration, C <sub>s</sub> | gr/dscf             | 1.67E-04   | 7.51E-05   | 0.00E+00   | 8.07E-05   |
|                                  |                               | µg/dscm             | 382        | 172        | 0          | 185        |
|                                  | Mass                          | lb/hr               | 0.06       | 0.03       | 0.00       | 0.03       |
| Inorganic CPM                    | Concentration, C <sub>s</sub> | gr/dscf             | 6.55E-04   | 4.98E-04   | 7.89E-04   | 6.47E-04   |
|                                  |                               | µg/dscm             | 1,500      | 1,139      | 1,805      | 1,481      |
|                                  | Mass                          | lb/hr               | 0.24       | 0.18       | 0.27       | 0.23       |
| Organic CPM                      | Concentration, C <sub>s</sub> | gr/dscf             | 1.90E-04   | 2.06E-04   | 1.12E-04   | 1.69E-04   |
|                                  |                               | µg/dscm             | 434        | 472        | 256        | 387        |
|                                  | Mass                          | lb/hr               | 0.07       | 0.07       | 0.04       | 0.06       |
| Total PM                         | Concentration, C <sub>s</sub> | gr/dscf             | 1.01E-03   | 7.79E-04   | 9.00E-04   | 8.97E-04   |
|                                  |                               | µg/dscm             | 2,317      | 1,783      | 2,061      | 2,054      |
|                                  | Mass                          | lb/hr               | 0.37       | 0.28       | 0.31       | 0.32       |
|                                  |                               | lb/ton steel melted | 0.2019     | 0.1438     | 0.1742     | 0.1733     |
| *Total PM                        | Concentration, C <sub>s</sub> | gr/dscf             | NA         | < 1.01E-03 | < 1.11E-03 | < 1.05E-03 |
|                                  |                               | µg/dscm             | NA         | < 2,321    | < 2,550    | < 2,396    |
|                                  | Mass                          | lb/hr               | NA         | < 0.36     | < 0.38     | < 0.37     |
|                                  |                               | lb/ton steel melted | NA         | < 0.1871   | < 0.2156   | < 0.2015   |
| Production Data                  | Steel Melted                  | tons/hr             | 1.83       | 1.95       | 1.77       | 1.85       |

\*Results are below method detection limit. Results are calculated using the method detection limit of 7 mg.

**Oregon Methods 1-5**  
**Example Calculations**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 1  
**Method:** ODEQ 5

**Run:** 1  
**Start Time:** 21:13  
**End Time:** 23:09  
**Date:** 12/16/2020

**EPA Methods 1-4:**

$$1) P_m = P_b + (\Delta H/13.6) = 29.881 \text{ "Hg}$$

where  $P_b$ : 29.65 "Hg  
 $\Delta H$ : 3.146 "H<sub>2</sub>O

$$2) P_s = P_b + (\text{Static Press.}/13.6) = 29.654 \text{ "Hg}$$

where  $P_b$ : 29.65 "Hg  
 Static Press.: 0.05 "H<sub>2</sub>O

$$3) V_m(\text{std}) = V_m(17.64)(Y)\left(\frac{P_m}{T_m}\right) = 111.615 \text{ dscf}$$

where  $V_m$ : 114.537 dcf  
 $Y$ : 0.9743  
 $P_m$ : 29.881 "Hg  
 $T_m$ : 527.0 °A

$$4) V_w(\text{std}) = (0.04706)(H_2O) = 1.581 \text{ scf}$$

where  $H_2O$ : 33.60 g

$$5) B_{ws} = \left( \frac{V_w(\text{std})}{V_w(\text{std}) + V_m(\text{std})} \right) = 0.0140$$

where  $V_w(\text{std})$ : 1.581 scf  
 $V_m(\text{std})$ : 111.615 dscf

$$6) \% H_2O = B_{ws} \times 100 = 1.40 \%v$$

$$7) V_m(\text{actual}) = \left( \frac{Y \times V_m}{(1 - B_{ws})} \right) \left( \frac{T_s}{T_m} \right) \left( \frac{P_m}{P_s} \right) = 116.901 \text{ awcf}$$

where  $Y$ : 0.9743  
 $V_m$ : 114.5370 dcf  
 $B_{ws}$ : 0.0140  
 $T_s$ : 540.2 °A  
 $T_m$ : 527.0 °A  
 $P_m$ : 29.881 "Hg  
 $P_s$ : 29.654 "Hg

$$8) M_d = 0.44(CO_2) + 0.32(O_2) + 0.28(N_2 + CO) = 28.85 \text{ lb/lb-mole}$$

where  $CO_2$ : 0.01 %vd  
 $O_2$ : 21.31 %vd  
 $N_2 + CO = (100 - (O_2 + CO_2))$ : 78.68 %vd

- 9)  $M_s = M_d(1 - Bws) + (18 \times Bws) =$  28.70 lb/lb-mole  
     where  $M_d$ : 28.85 lb/lb-mole  
     Bws: 0.0140
- 10) Stack Area(cir.) =  $3.1416 (\text{stack diameter}/24)^2 =$  11.541 sq. ft.  
     where Stack ID: 46 inches
- Stack Area(rect.) =  $\text{stack width}/12 \times \text{stack length}/12 =$  NA sq. ft.  
     where Stack Width: 0.000 inches  
     Stack Length: 0.000 inches
- 11) Velocity,  $V_s = 85.49(Cp)(\text{Ave. Sqrt } \Delta P) \left( \sqrt{\frac{T_s}{(P_s \times M_s)}} \right) =$  64.37 fps  
     where Cp: 0.84  
     Ave. Sqrt  $\Delta P$ : 1.1251  
     Ts: 540.2 °A  
     Ps: 29.654 "Hg  
     Ms: 28.70 lb/lb-mole
- 12) ACFM =  $(V_s)(\text{stack area})(60 \text{ sec/min}) =$  44,573.7 ACFM  
     where  $V_s$ : 64.37 ft/sec  
     Stack Area: 11.541 sq. ft
- 13) ADCFM =  $(ACFM)(1-Bws) =$  43,949.7 ADCFM  
     where ACFM: 44,573.7  
     Bws: 0.0140
- 14)  $Q_{sw} = 3600(V_s)(\text{stack area}) \left( \frac{528^\circ A}{T_s} \right) \left( \frac{P_s}{29.92 \text{ "Hg}} \right) =$  2,590,779.7 wscf/hr  
     where  $V_s$ : 64.37 ft/sec  
     Stack Area: 11.5410 sq. ft.  
     Ts: 540.2 °A  
     Ps: 29.654 "Hg
- 15)  $Q_{sd} = (\text{wscf/hr})(1-Bws) =$  2,554,508.8 dscf/hr  
     where wscf/hr: 2,590,779.7  
     Bws: 0.0140
- 16) DSCFM =  $(\text{dscf/hr})/60 \text{ mins/hr} =$  42,575.1 DSCFM  
     where dscf/hr: 2,554,508.8
- 17) Nozzle Area =  $3.1416 (\text{Nozzle Size}/24)^2 =$  0.000265 sq. ft.  
     where Nozzle Size: 0.2203 inches

**Client: Columbia Steel Casting**  
**Source: BH 1**

**Run: 1**  
**Date: 12/16/2020**

---

$$18) \text{ Isokinetic \%} = \left( \frac{0.0945(T_s)(V_m(std))}{P_s(V_s)(\text{nozzle area})(\text{sampling time})(1-Bws)} \right) = 99.3 \%$$

where  $T_s$ : 540.2 °A  
 $V_m(std)$ : 111.615 dscf  
 $P_s$ : 29.654 "Hg  
 $V_s$ : 64.37 ft/sec  
Nozzle Area: 0.000265 sq. ft.  
Sampling Time: 115 min.  
 $Bws$ : 0.0140

#### ODEQ Method 5:

##### Front Half:

$$19) \text{ Filterable PM} = \text{filter gain} + \text{probe rinse gain} = 0.00121 \text{ grams}$$

where Filter Gain: 0.00000 grams  
Probe Rinse: 0.00121 grams

$$20) C_s = (\text{Sample grams}/V_m(std))(15.43\text{grains/gram}) = 1.67\text{E-}04 \text{ gr/dscf}$$

where Sample: 0.00121 grams  
 $V_m(std)$ : 111.615 dscf

$$21) C_s = (\text{Sample grams} \times 1,000,000 \mu\text{g/gram})/V_m(std) = 382.3 \mu\text{g/dscm}$$

where Sample: 0.00121 grams  
 $V_m(std)$ : 3.161 dscm

$$22) \text{ Mass Emission Rate} = (C_s)(\text{Stack flow})/7000\text{gr/lb} = 0.061 \text{ lb/hr}$$

where  $C_s$ : 1.67E-04 gr/dscf  
Stack Flow: 2,554,508.8 dscf/hr

##### Back Half:

$$23) \text{ Inorganic CPM} = \text{water fraction} = 0.00474 \text{ grams}$$

$$\text{Organic CPM} = \text{acetone BH} + \text{hexane BH} = 0.00137 \text{ grams}$$

Back-half concentrations and mass rates are calculated as front-half examples.

## **APPENDIX C: BAGHOUSE #2 TEST DATA**

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# BISON

## RING, INC.

|           |                         |
|-----------|-------------------------|
| COMPANY   | Columbia Steel Casting  |
| FACILITY  | Steel Foundry           |
| LOCATION  | Portland, Oregon        |
| SOURCE    | BH 2                    |
| DATE      | 12/10/2020 - 12/16/2020 |
| METHOD    | 29                      |
| POLLUTANT | TSM                     |

**EPA Method 1**  
**Stack Parameters and Traverse Points**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 2  
**Facility:** Steel Foundry

Type of Testing: p (P for Particulate; V for Velocity/Nonparticulate)  
Type of Duct: c (C for circular; R for rectangular)

Number of ports available: 2  
Number of ports to be used: 2  
Port diameter: 6 inches

Circular ID (Rectangular Depth): 46.50 inches  
Port depth and/or wall thickness: 4.00 inches  
Stack width (Rectangular only): inches

Equivalent Diameter  
If rectangular =  $\frac{2 * \text{Depth} * \text{Width}}{\text{Depth} + \text{Width}} = 46.50$  inches (If circular = duct ID)

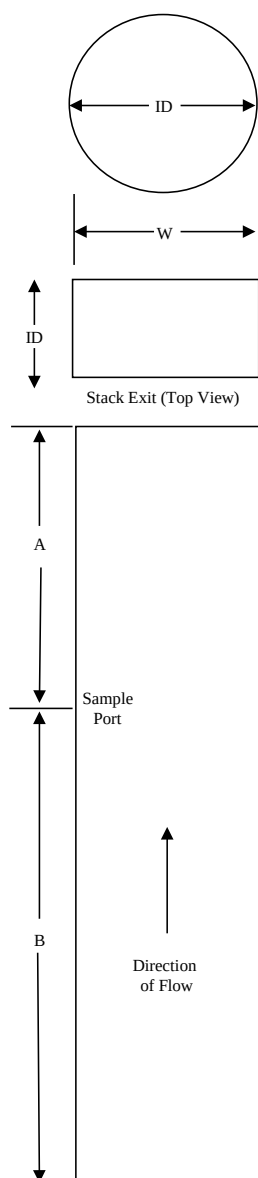
Stack/duct area = 11.793 sq.feet 1698.2 sq.inches

|                       |                                  |                                |
|-----------------------|----------------------------------|--------------------------------|
| Sample Port Location: | Downstream from flow disturbance | Upstream from flow disturbance |
|                       | <u>from process</u>              | <u>toward exit</u>             |
|                       | B                                | A                              |
| Number of Inches:     | 324.00                           | 84.00                          |
| Number of Diameters:  | 6.97                             | 1.81                           |

Minimum Number of Traverse Points: 16

| Points | % of diameter | Distance from inside wall (in.) | Distance including port (in.) |
|--------|---------------|---------------------------------|-------------------------------|
| 1      | 3.2           | 1.49                            | 5 1/2                         |
| 2      | 10.5          | 4.88                            | 8 7/8                         |
| 3      | 19.4          | 9.02                            | 13                            |
| 4      | 32.3          | 15.02                           | 19                            |
| 5      | 67.7          | 31.48                           | 35 1/2                        |
| 6      | 80.6          | 37.48                           | 41 1/2                        |
| 7      | 89.5          | 41.62                           | 45 5/8                        |
| 8      | 96.8          | 45.01                           | 49                            |

**Reference Diagram**



Drawing NOT to scale and  
NOT an accurate representation of stack.

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 2

| Traverse Point | Velocity P "H <sub>2</sub> O) | Null Angle |
|----------------|-------------------------------|------------|
| 1              | 0.74                          | 5.0        |
| 2              | 0.73                          | 5.0        |
| 3              | 0.70                          | 0.0        |
| 4              | 0.67                          | 5.0        |
| 5              | 0.66                          | 0.0        |
| 6              | 0.67                          | 5.0        |
| 7              | 0.65                          | 5.0        |
| 8              | 0.67                          | 10.0       |
| 9              | 0.66                          | 10.0       |
| 10             | 0.67                          | 5.0        |
| 11             | 0.70                          | 5.0        |
| 12             | 0.68                          | 0.0        |
| 13             | 0.62                          | 5.0        |
| 14             | 0.71                          | 0.0        |
| 15             | 0.68                          | 5.0        |
| 16             | 0.71                          | 0.0        |

Flow is found to be:

|              |   |
|--------------|---|
| Non-cyclonic | x |
| Cyclonic     |   |

**Isokinetic Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 2  
**EPA Method:** 29  
**Box Operator:** RTM  
**Tec nician s** RTM

**Environmental Conditions/Test Notes:**

Rain, 40 deg F  
6:13:21 Total run time  
198.122 End volume between point 12 and 13

**Run:** 1  
**Start Date/Time:** 12/10/2020 22:20  
**End Date/Time:** 12/11/2020 5:10

**Stack Dimensional Data:**

Circular  
Diameter 46.500 in  
Rectangular  
Width in  
Length in  
Stack Area 11.793 sq.ft.

**Equipment:**

|             |        |            |      |             |                 |
|-------------|--------|------------|------|-------------|-----------------|
| Meterbox ID | Box 13 | Probe ID   | 5B   | Liner type  | glass           |
| Y factor    | 0.9956 | Nozzle ID  | 0.19 | Nozzle size | 0.1930 inches   |
| ΔH@         | 1.861  | Hot box ID | HB2  | Nozzle area | 0.000203 sq.ft. |
|             |        | Pitot Cp   | 0.84 | Probe heat  | 250 F           |
|             |        | Pitot ID   | 5B   | Filter heat | 250 F           |

**Source Information:**

|                        |                        |                 |              |
|------------------------|------------------------|-----------------|--------------|
| Barometric Pressure    | 30.09 "Hg              | O <sub>2</sub>  | 20.90 %      |
| Static Pressure        | 0.95 "H <sub>2</sub> O | CO <sub>2</sub> | 0.00 %       |
| Ave. ΔP                | 1.2 "H <sub>2</sub> O  | Rec. Nz.        | 0.196 inches |
| Stack Temperature      | 75 F                   |                 |              |
| Assumed moisture       | 0.5 %                  |                 |              |
| Assumed meter temp.    | 60 F                   |                 |              |
| Total number of points | 16                     |                 |              |
| Time per point         | 30                     |                 |              |
| Total run time         | 373.4 minutes          |                 |              |

**Leak Checks:**

|                        | Pre-test | Post-test |
|------------------------|----------|-----------|
| Pitot                  | x        | x         |
| Train leak rate, dcf   | 0.000    | 0.000     |
| Leak check vacuum, "Hg | 14       | 15        |

**Nozzle check for roundness:**

|             |       |              |
|-------------|-------|--------------|
| 1           | 2     | 3            |
| 0.193       | 0.193 | 0.193 inches |
| Caliper ID# | WS1   |              |

**Post Test Calculations:**

|                         |                               |                     |                          |
|-------------------------|-------------------------------|---------------------|--------------------------|
| Sample volume           | 198.122 dcf                   | Ave. ΔP             | 0.62 "H <sub>2</sub> O   |
| Wet mol. weight         | 28.72 M <sub>s</sub> (actual) | Ave. √ΔP            | 0.7838 "H <sub>2</sub> O |
| Actual H <sub>2</sub> O | 1.10 %                        | Ave. ΔH             | 0.954 "H <sub>2</sub> O  |
| Std. meter vol.         | 200.768 dscf                  | Ave. T <sub>s</sub> | 69.6 °F                  |
| Isokinetic Average      | 101.0 %                       | Ave. T <sub>m</sub> | 62.7 °F                  |

**Moisture/Lab:**

| Filter        | NA # | Initial           | Final  | Gain |
|---------------|------|-------------------|--------|------|
| Impingers, g  |      | 206.7             | 226.2  | 19.5 |
| Silica gel, g |      | 1813.4            | 1841.5 | 28.1 |
|               |      | Total water gain: |        | 47.6 |

| Traverse Point | Time min. | Meter Volume dcf | Velocity P "H <sub>2</sub> O) | Stack Temp. F | Meter Temp. F | Calc. H | Run H | Vacuum "Hg | Filter Box F | Condenser Temp F |
|----------------|-----------|------------------|-------------------------------|---------------|---------------|---------|-------|------------|--------------|------------------|
| 1              | 30.0      | 14.832           | 0.52                          | 49            | 60            | 0.83    | 0.80  | 1          | 250          | 32               |
| 2              | 60.0      | 27.697           | 0.40                          | 60            | 61            | 0.63    | 0.60  | 1          | 251          | 33               |
| 3              | 90.0      | 41.703           | 0.47                          | 61            | 63            | 0.74    | 0.70  | 1          | 251          | 34               |
| 4              | 120.0     | 58.000           | 0.64                          | 67            | 65            | 1.00    | 1.00  | 1          | 252          | 34               |
| 5              | 150.0     | 76.108           | 0.79                          | 67            | 65            | 1.24    | 1.20  | 1          | 254          | 35               |
| 6              | 180.0     | 94.578           | 0.83                          | 66            | 64            | 1.30    | 1.30  | 1          | 252          | 35               |
| 7              | 210.0     | 111.429          | 0.69                          | 69            | 63            | 1.07    | 1.10  | 1          | 251          | 35               |
| 8              | 240.0     | 126.548          | 0.57                          | 74            | 63            | 0.88    | 0.90  | 1          | 251          | 35               |
| 9              | 270.0     | 141.715          | 0.58                          | 77            | 63            | 0.89    | 0.90  | 1          | 252          | 36               |
| 10             | 300.0     | 158.731          | 0.71                          | 72            | 62            | 1.09    | 1.10  | 1          | 252          | 35               |
| 11             | 330.0     | 175.158          | 0.68                          | 82            | 62            | 1.03    | 1.00  | 1          | 250          | 35               |
| 12             | 360.0     | 191.102          | 0.63                          | 81            | 62            | 0.95    | 1.00  | 1          | 250          | 36               |
| 13             | 373.4     | 198.122          | 0.55                          | 80            | 62            | 0.83    | 0.80  | 1          | 252          | 36               |

**Isokinetic Field Data  
Field Data Entry**

|                      |                               |                                             |                                       |
|----------------------|-------------------------------|---------------------------------------------|---------------------------------------|
| <b>Client:</b>       | <b>Columbia Steel Casting</b> | <b>Run:</b>                                 | <b>2</b>                              |
| <b>Location:</b>     | <b>Portland, Oregon</b>       | <b>Start Date/Time:</b>                     | <b>12/1 /2020 22 1</b>                |
| <b>Source:</b>       | <b>BH 2</b>                   | <b>Environmental Conditions/Test Notes:</b> | <b>End Date/Time:</b> 12/15/2020 2:55 |
| <b>EPA Method:</b>   | <b>29</b>                     | Rain, 40 deg F                              |                                       |
| <b>Box Operator:</b> | <b>RTM</b>                    | 4:01:17 Total run time                      |                                       |
| <b>Tec nician s</b>  | <b>RTM</b>                    | 218.343 Final meter volume                  |                                       |

**Stack Dimensional Data:**

Circular  
Diameter 46.500 in  
Rectangular  
Width in  
Length in  
Stack Area 11.793 sq.ft.

**Equipment:**

|             |        |            |      |              |                 |
|-------------|--------|------------|------|--------------|-----------------|
| Meterbox ID | Box 13 | Probe ID   | 5B   | Liner type:  | glass           |
| Y factor    | 0.9956 | Nozzle ID  | 0.26 | Nozzle size: | 0.2613 inches   |
| ΔH@         | 1.861  | Hot box ID | HB2  | Nozzle area: | 0.000372 sq.ft. |
|             |        | Pitot Cp   | 0.84 | Probe heat:  | 250 F           |
|             |        | Pitot ID   | 5B   | Filter heat: | 250 F           |

**Source Information:**

|                        |                        |                 |              |
|------------------------|------------------------|-----------------|--------------|
| Barometric Pressure    | 30.27 "Hg              | O <sub>2</sub>  | 20.9 %       |
| Static Pressure        | 0.95 "H <sub>2</sub> O | CO <sub>2</sub> | 0.0 %        |
| Ave. ΔP                | 1.2 "H <sub>2</sub> O  | Rec. Nz.        | 0.196 inches |
| Stack Temperature      | 75 F                   |                 |              |
| Assumed moisture       | 1.1 %                  |                 |              |
| Assumed meter temp.    | 62.7 F                 |                 |              |
| Total number of points | 16                     |                 |              |
| Time per point         | 30                     |                 |              |
| Total run time         | 241.3 minutes          |                 |              |

**Leak Checks:**

|                         |          |           |
|-------------------------|----------|-----------|
|                         | Pre-test | Post-test |
| Pitot:                  | x        | x         |
| Train leak rate, dcf:   | 0.000    | 0.000     |
| Leak check vacuum, "Hg: | 15       | 11        |

**Nozzle check for roundness:**

|             |       |              |
|-------------|-------|--------------|
| 1           | 2     | 3            |
| 0.262       | 0.261 | 0.261 inches |
| Caliper ID# |       | WS2          |

**Post Test Calculations:**

|                         |                               |                     |                          |
|-------------------------|-------------------------------|---------------------|--------------------------|
| Sample volume           | 218.343 dcf                   | Ave. ΔP             | 0.54 "H <sub>2</sub> O   |
| Wet mol. weight         | 28.72 M <sub>s</sub> (actual) | Ave. √ΔP            | 0.7343 "H <sub>2</sub> O |
| Actual H <sub>2</sub> O | 1.12 %                        | Ave. ΔH             | 2.806 "H <sub>2</sub> O  |
| Std. meter vol.         | 224.264 dscf                  | Ave. T <sub>s</sub> | 66.6 °F                  |
| Isokinetic Average      | 101.1 %                       | Ave. T <sub>m</sub> | 61.1 °F                  |

**Moisture/Lab:**

|                   |         |       |      |
|-------------------|---------|-------|------|
| Filter            | n/a #   |       |      |
|                   | Initial | Final | Gain |
| Impingers, g      | 226.0   | 240.2 | 14.2 |
| Silica gel, g     | 892.4   | 932.1 | 39.7 |
| Total water gain: |         |       | 53.9 |

| Traverse Point | Time min. | Meter Volume dcf | Velocity P "H <sub>2</sub> O) | Stack Temp. F | Meter Temp. F | Calc. H | Run H | Vacuum "Hg | Filter Box F | Condenser Temp F |
|----------------|-----------|------------------|-------------------------------|---------------|---------------|---------|-------|------------|--------------|------------------|
| 1              | 30.0      | 28.214           | 0.56                          | 51            | 63            | 3.00    | 3.00  | 2          | 251          | 33               |
| 2              | 60.0      | 53.209           | 0.45                          | 57            | 61            | 2.37    | 2.40  | 2          | 252          | 47               |
| 3              | 90.0      | 79.975           | 0.52                          | 62            | 60            | 2.71    | 2.70  | 3          | 253          | 47               |
| 4              | 120.0     | 106.999          | 0.53                          | 65            | 61            | 2.75    | 2.80  | 3          | 251          | 47               |
| 5              | 150.0     | 133.641          | 0.52                          | 65            | 61            | 2.70    | 2.70  | 3          | 252          | 44               |
| 6              | 180.0     | 161.117          | 0.56                          | 75            | 61            | 2.85    | 2.90  | 3          | 253          | 40               |
| 7              | 210.0     | 189.648          | 0.61                          | 75            | 61            | 3.11    | 3.10  | 3          | 252          | 42               |
| 8              | 240.0     | 217.042          | 0.55                          | 74            | 61            | 2.81    | 2.80  | 3          | 252          | 43               |
| 9              | 241.3     | 218.343          | 0.56                          | 75            | 61            | 2.85    | 2.85  | 3          | 252          | 44               |

**Isokinetic Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 2  
**EPA Method:** 29  
**Box Operator:** RTM  
**Tec nician s** RTM

**Environmental Conditions/Test Notes:**  
Rain, 40 deg F  
5:35:22 Total run time  
341.372 Final meter volume

**Run:** 3  
**Start Date/Time:** 12/15/2020 22:02  
**End Date/Time:** 12/16/2020 4:13

**Stack Dimensional Data:**

Circular  
Diameter 46.500 in  
Rectangular  
Width in  
Length in  
Stack Area 11.793 sq.ft.

**Equipment:**

Meterbox ID Box 13 Probe ID 5B Liner type: glass  
Y factor 0.9956 Nozzle ID 0.26 Nozzle size: 0.2613 inches  
 $\Delta H@$  1.861 Hot box ID HB2 Nozzle area: 0.000372 sq.ft.  
Pitot Cp 0.84 Probe heat: 250 F  
Pitot ID 5B Filter heat: 250 F

**Source Information:**

Barometric Pressure 30.18 "Hg O<sub>2</sub> 20.9 %  
Static Pressure 0.95 "H<sub>2</sub>O CO<sub>2</sub> 0.0 %  
Ave.  $\Delta P$  1.2 "H<sub>2</sub>O Rec. Nz. 0.196 inches  
Stack Temperature 75 F  
Assumed moisture 1.12 %  
Assumed meter temp. 61.1 F  
Total number of points 16  
Time per point 30  
Total run time 335.4 minutes

**Leak Checks:**

|                         | Pre-test | Post-test |
|-------------------------|----------|-----------|
| Pitot:                  | x        | x         |
| Train leak rate, dcf:   | 0.000    | 0.000     |
| Leak check vacuum, "Hg: | 20       | 20        |

**Nozzle check for roundness:**

| 1           | 2     | 3            |
|-------------|-------|--------------|
| 0.262       | 0.261 | 0.261 inches |
| Caliper ID# |       | WS2          |

**Post Test Calculations:**

Sample volume 341.372 dcf Ave.  $\Delta P$  0.713 "H<sub>2</sub>O  
Wet mol. weight 28.71 M<sub>s</sub> (actual) Ave.  $\sqrt{\Delta P}$  0.8403 "H<sub>2</sub>O  
Actual H<sub>2</sub>O 1.17 % Ave.  $\Delta H$  3.617 "H<sub>2</sub>O  
Std. meter vol. 347.947 dscf Ave. T<sub>s</sub> 76.9 °F  
Isokinetic Average 99.7 % Ave. T<sub>m</sub> 64.6 °F

**Moisture/Lab:**

| Filter            | n/a # | Initial | Final | Gain |
|-------------------|-------|---------|-------|------|
| Impingers, g      |       | 206.7   | 239.3 | 32.6 |
| Silica gel, g     |       | 1807.3  | 1862  | 54.7 |
| Total water gain: |       |         |       | 87.3 |

| Traverse Point | Time min. | Meter Volume dcf | Velocity P "H <sub>2</sub> O | Stack Temp. F | Meter Temp. F | Calc. H | Run H | Vacuum "Hg | Filter Box F | Condenser Temp F |
|----------------|-----------|------------------|------------------------------|---------------|---------------|---------|-------|------------|--------------|------------------|
|                |           | 0.000            |                              |               |               |         |       |            |              |                  |
| 1              | 30.0      | 27.999           | 0.55                         | 55            | 67            | 2.94    | 2.90  | 5          | 247          | 40               |
| 2              | 60.0      | 54.116           | 0.50                         | 61            | 65            | 2.63    | 2.60  | 5          | 252          | 38               |
| 3              | 90.0      | 80.478           | 0.50                         | 61            | 65            | 2.63    | 2.60  | 5          | 253          | 40               |
| 4              | 120.0     | 109.984          | 0.64                         | 73            | 65            | 3.29    | 3.30  | 6          | 251          | 40               |
| 5              | 150.0     | 141.928          | 0.77                         | 86            | 65            | 3.87    | 3.90  | 7          | 252          | 40               |
| 6              | 180.0     | 176.004          | 0.86                         | 74            | 64            | 4.41    | 4.40  | 8          | 251          | 44               |
| 7              | 210.0     | 209.415          | 0.85                         | 76            | 64            | 4.34    | 4.30  | 8          | 253          | 49               |
| 8              | 240.0     | 241.555          | 0.78                         | 86            | 64            | 3.91    | 3.90  | 8          | 252          | 51               |
| 9              | 270.0     | 272.381          | 0.74                         | 102           | 65            | 3.61    | 3.60  | 5          | 251          | 39               |
| 10             | 300.0     | 302.214          | 0.67                         | 83            | 64            | 3.38    | 3.40  | 4          | 252          | 43               |
| 11             | 330.0     | 335.905          | 0.85                         | 83            | 64            | 4.29    | 4.30  | 4          | 250          | 43               |
| 12             | 335.4     | 341.372          | 0.84                         | 83            | 63            | 4.23    | 4.20  | 5          | 252          | 47               |

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 2  
**Method:** 29

**Run:** 1  
**Start Date/Time:** 12/10/2020 22:20  
**End Date/Time:** 12/11/2020 5:10

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 0.000                    |                                 |                            |                   |                         |                            |             |
| 30.0          | 14.832                   | 0.80                            | 60                         | 1                 | 0.52                    | 49                         | 0.7211      |
| 60.0          | 27.697                   | 0.60                            | 61                         | 2                 | 0.40                    | 60                         | 0.6325      |
| 90.0          | 41.703                   | 0.70                            | 63                         | 3                 | 0.47                    | 61                         | 0.6856      |
| 120.0         | 58.000                   | 1.00                            | 65                         | 4                 | 0.64                    | 67                         | 0.8000      |
| 150.0         | 76.108                   | 1.20                            | 65                         | 5                 | 0.79                    | 67                         | 0.8888      |
| 180.0         | 94.578                   | 1.30                            | 64                         | 6                 | 0.83                    | 66                         | 0.9110      |
| 210.0         | 111.429                  | 1.10                            | 63                         | 7                 | 0.69                    | 69                         | 0.8307      |
| 240.0         | 126.548                  | 0.90                            | 63                         | 8                 | 0.57                    | 74                         | 0.7550      |
| 270.0         | 141.715                  | 0.90                            | 63                         | 9                 | 0.58                    | 77                         | 0.7616      |
| 300.0         | 158.731                  | 1.10                            | 62                         | 10                | 0.71                    | 72                         | 0.8426      |
| 330.0         | 175.158                  | 1.00                            | 62                         | 11                | 0.68                    | 82                         | 0.8246      |
| 360.0         | 191.102                  | 1.00                            | 62                         | 12                | 0.63                    | 81                         | 0.7937      |
| 373.4         | 198.122                  | 0.80                            | 62                         | 13                | 0.55                    | 80                         | 0.7416      |

**Client: Columbia Steel Casting****Run:****1****Source: BH 2****Dates:****12/10/21-12/11/20****Field Data Input Continued**Moisture Data

Total Test Time 373.4 min  
 Sample Time Interval 30.0 min  
 Meter Volume,  $V_m$  198.122 dcf  
 Water Volume 47.6 g  
 Nozzle Diameter,  $N_z$  0.1930 in.  
 Nozzle Area 0.000203 sq.ft.

Stack Dimensional Data:

Circular  
 Diameter 46.500 in  
 Rectangular  
 Width in  
 Length in  
 Stack Area 11.793 sq.ft.

Traverse Data

Barometric Pressure,  $P_b$  30.09 "Hg  
 Static Pressure 0.95 "H<sub>2</sub>O  
 Pitot Factor, cp 0.84  
 Meter Cal Factor 0.9956 Y

Molecular Weight:

CO<sub>2</sub> Average 0.13 %vd  
 O<sub>2</sub> Average 20.76 %vd

**Field Data Averages**Meter

$\Delta H$  0.954 "H<sub>2</sub>O  
 Temperature,  $T_m$  62.7 °F  
 Temperature,  $T_m$  522.7 °A (°R)  
 Pressure Meter,  $P_m$  30.160 "Hg

Stack

$\sqrt{D_p}$  0.7838 "H<sub>2</sub>O  
 Temperature,  $T_s$  69.6 °F  
 Temperature,  $T_s$  529.6 °A (°R)  
 Pressure Stack,  $P_s$  30.160 "Hg

**Field Data Calculations**Meter Box Capture

Standard Volume,  $V_{m(std)}$  200.768 dscf  
 5.685 dscm  
 Actual Volume,  $V_{m(actual)}$  202.077 awcf

Gas Stream Moisture

Moisture Vapor,  $V_{w(std)}$  2.240 scf  
 Moisture,  $B_{ws}$  0.0110  
 Moisture EPA M4 1.10 %v

EPA Method 3 Gas Density

Dry,  $M_d$  28.85 lb/lb-mole  
 Wet,  $M_s$  28.73 lb/lb-mole

Percent Isokinetic 101.0 %

EPA Method 2 Stack Gas Flowrate:

Velocity,  $V_s$  44.00 fps  
 Volume (actual) 31,133.5 acfm  
 30,791.0 adcfm  
 Volume (standard) 1,877,306.4 wscf/hr  
 1,856,656.0 dscf/hr  
 30,944.3 dscf/min

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 2  
**Method:** 29

**Run:** 2  
**Start Date/Time:** 12/14/2020 22:18  
**End Date/Time:** 12/15/2020 2:55

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 0.000                    |                                 |                            |                   |                         |                            |             |
| 30.0          | 28.214                   | 3.00                            | 63                         | 1                 | 0.56                    | 51                         | 0.7483      |
| 60.0          | 53.209                   | 2.40                            | 61                         | 2                 | 0.45                    | 57                         | 0.6708      |
| 90.0          | 79.975                   | 2.70                            | 60                         | 3                 | 0.52                    | 62                         | 0.7211      |
| 120.0         | 106.999                  | 2.80                            | 61                         | 4                 | 0.53                    | 65                         | 0.7280      |
| 150.0         | 133.641                  | 2.70                            | 61                         | 5                 | 0.52                    | 65                         | 0.7211      |
| 180.0         | 161.117                  | 2.90                            | 61                         | 6                 | 0.56                    | 75                         | 0.7483      |
| 210.0         | 189.648                  | 3.10                            | 61                         | 7                 | 0.61                    | 75                         | 0.7810      |
| 240.0         | 217.042                  | 2.80                            | 61                         | 8                 | 0.55                    | 74                         | 0.7416      |
| 241.3         | 218.343                  | 2.85                            | 61                         | 9                 | 0.56                    | 75                         | 0.7483      |

**Client: Columbia Steel Casting****Run:****2****Source: BH 2****Dates:****12/14/20-12/15/20****Field Data Input Continued**Moisture Data

Total Test Time 241.3 min  
 Sample Time Interval 30.0 min  
 Meter Volume,  $V_m$  218.343 dcf  
 Water Volume 53.9 g  
 Nozzle Diameter,  $N_z$  0.2613 in.  
 Nozzle Area 0.000372 sq.ft.

Stack Dimensional Data:

Circular  
 Diameter 46.500 in  
 Rectangular  
 Width in  
 Length in  
 Stack Area 11.793 sq.ft.

Traverse Data

Barometric Pressure,  $P_b$  30.27 "Hg  
 Static Pressure 0.95 "H<sub>2</sub>O  
 Pitot Factor, cp 0.84  
 Meter Cal Factor 0.9956 Y

Molecular Weight:

CO<sub>2</sub> Average 0.13 %vd  
 O<sub>2</sub> Average 20.77 %vd

**Field Data Averages**Meter

$\Delta H$  2.806 "H<sub>2</sub>O  
 Temperature,  $T_m$  61.1 °F  
 Temperature,  $T_m$  521.1 °A (°R)  
 Pressure Meter,  $P_m$  30.476 "Hg

Stack

$\sqrt{Dp}$  0.7343 "H<sub>2</sub>O  
 Temperature,  $T_s$  66.6 °F  
 Temperature,  $T_s$  526.6 °A (°R)  
 Pressure Stack,  $P_s$  30.340 "Hg

**Field Data Calculations**Meter Box Capture

Standard Volume,  $V_{m(std)}$  224.264 dscf  
 6.350 dscm  
 Actual Volume,  $V_{m(actual)}$  223.161 awcf

Gas Stream Moisture

Moisture Vapor,  $V_{w(std)}$  2.537 scf  
 Moisture,  $B_{ws}$  0.0112  
 Moisture EPA M4 1.12 %v

EPA Method 3 Gas Density

Dry,  $M_d$  28.85 lb/lb-mole  
 Wet,  $M_s$  28.73 lb/lb-mole

Percent Isokinetic 101.1 %

EPA Method 2 Stack Gas Flowrate:

Velocity,  $V_s$  40.99 fps  
 Volume (actual) 29,003.7 acfm  
 28,678.9 adcfm  
 Volume (standard) 1,769,341.9 wscf/hr  
 1,749,525.3 dscf/hr  
 29,158.8 dscf/min

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 2  
**Method:** 29

**Run:** 3  
**Start Date/Time:** 12/15/2020 22:02  
**End Date/Time:** 12/16/2020 4:13

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 0.000                    |                                 |                            |                   |                         |                            |             |
| 30.0          | 27.999                   | 2.90                            | 67                         | 1                 | 0.55                    | 55                         | 0.7416      |
| 60.0          | 54.116                   | 2.60                            | 65                         | 2                 | 0.50                    | 61                         | 0.7071      |
| 90.0          | 80.478                   | 2.60                            | 65                         | 3                 | 0.50                    | 61                         | 0.7071      |
| 120.0         | 109.984                  | 3.30                            | 65                         | 4                 | 0.64                    | 73                         | 0.8000      |
| 150.0         | 141.928                  | 3.90                            | 65                         | 5                 | 0.77                    | 86                         | 0.8775      |
| 180.0         | 176.004                  | 4.40                            | 64                         | 6                 | 0.86                    | 74                         | 0.9274      |
| 210.0         | 209.415                  | 4.30                            | 64                         | 7                 | 0.85                    | 76                         | 0.9220      |
| 240.0         | 241.555                  | 3.90                            | 64                         | 8                 | 0.78                    | 86                         | 0.8832      |
| 270.0         | 272.381                  | 3.60                            | 65                         | 9                 | 0.74                    | 102                        | 0.8602      |
| 300.0         | 302.214                  | 3.40                            | 64                         | 10                | 0.67                    | 83                         | 0.8185      |
| 330.0         | 335.905                  | 4.30                            | 64                         | 11                | 0.85                    | 83                         | 0.9220      |
| 335.4         | 341.372                  | 4.20                            | 63                         | 12                | 0.84                    | 83                         | 0.9165      |

**Client: Columbia Steel Casting****Run:****3****Source: BH 2****Dates:****12/15/20-12/16/20****Field Data Input Continued**Moisture Data

Total Test Time 335.4 min  
 Sample Time Interval 30.0 min  
 Meter Volume,  $V_m$  341.372 dcf  
 Water Volume 87.3 g  
 Nozzle Diameter,  $N_z$  0.2613 in.  
 Nozzle Area 0.000372 sq.ft.

Stack Dimensional Data:

Circular  
 Diameter 46.500 in  
 Rectangular  
 Width in  
 Length in  
 Stack Area 11.793 sq.ft.

Traverse Data

Barometric Pressure,  $P_b$  30.18 "Hg  
 Static Pressure 0.95 "H<sub>2</sub>O  
 Pitot Factor, cp 0.84  
 Meter Cal Factor 0.9956 Y

Molecular Weight:

CO<sub>2</sub> Average 0.00 %vd  
 O<sub>2</sub> Average 20.65 %vd

**Field Data Averages**Meter

$\Delta H$  3.617 "H<sub>2</sub>O  
 Temperature,  $T_m$  64.6 °F  
 Temperature,  $T_m$  524.6 °A (°R)  
 Pressure Meter,  $P_m$  30.446 "Hg

Stack

$\sqrt{D_p}$  0.8403 "H<sub>2</sub>O  
 Temperature,  $T_s$  76.9 °F  
 Temperature,  $T_s$  536.9 °A (°R)  
 Pressure Stack,  $P_s$  30.250 "Hg

**Field Data Calculations**Meter Box Capture

Standard Volume,  $V_{m(std)}$  347.947 dscf  
 9.853 dscm  
 Actual Volume,  $V_{m(actual)}$  354.237 awcf

EPA Method 2 Stack Gas Flowrate:

Velocity,  $V_s$  47.45 fps  
 Volume (actual) 33,574.7 acfm  
 33,181.9 adcfm  
 Volume (standard) 2,002,937.2 wscf/hr  
 1,979,502.8 dscf/hr  
 32,991.7 dscf/min

Gas Stream Moisture

Moisture Vapor,  $V_{w(std)}$  4.108 scf  
 Moisture,  $B_{ws}$  0.0117  
 Moisture EPA M4 1.17 %v

EPA Method 3 Gas Density

Dry,  $M_d$  28.83 lb/lb-mole  
 Wet,  $M_s$  28.70 lb/lb-mole

Percent Isokinetic 99.7 %

|             |            |           |                            |        |           |  |
|-------------|------------|-----------|----------------------------|--------|-----------|--|
| Source:     | BH 2       |           | Sample Date: 12/10-11/2020 |        |           |  |
| Run:        | 1          |           |                            |        |           |  |
|             | Filter +   |           |                            |        |           |  |
| Client ID:  | Front Half | Back Half |                            |        |           |  |
| Analyte     | < Result   | < Result  | FH MDL                     | BH MDL | Units     |  |
| Aluminum    | 122        | 35.1      | 3.75                       | 1.50   | µg/sample |  |
| Antimony    | < MDL      | 1.040     | 1.25                       | 0.500  | µg/sample |  |
| Arsenic     | 3.05       | < MDL     | 1.75                       | 0.700  | µg/sample |  |
| Barium      | 2.18       | 1.44      | 0.125                      | 0.050  | µg/sample |  |
| Beryllium   | < MDL      | < MDL     | 0.050                      | 0.020  | µg/sample |  |
| Cadmium     | 0.486      | < MDL     | 0.100                      | 0.040  | µg/sample |  |
| Chromium    | 2.82       | 0.783     | 0.200                      | 0.080  | µg/sample |  |
| Cobalt      | < MDL      | 0.778     | 0.125                      | 0.050  | µg/sample |  |
| Copper      | 3.43       | 5.47      | 1.25                       | 0.500  | µg/sample |  |
| Lead        | 1.88       | 1.170     | 1.25                       | 0.500  | µg/sample |  |
| Manganese   | 150        | 3.41      | 0.075                      | 0.030  | µg/sample |  |
| Nickel      | 0.922      | 0.428     | 0.750                      | 0.300  | µg/sample |  |
| Phosphorus  | 12.6       | < MDL     | 5.00                       | 2.00   | µg/sample |  |
| Selenium    | < MDL      | < MDL     | 3.75                       | 1.50   | µg/sample |  |
| Silver      | < MDL      | < MDL     | 0.500                      | 0.200  | µg/sample |  |
| Thallium    | < MDL      | < MDL     | 2.50                       | 1.00   | µg/sample |  |
| Vanadium    | < MDL      | < MDL     | 0.250                      | 0.100  | µg/sample |  |
| Zinc        | 9.29       | 5.36      | 0.750                      | 0.300  | µg/sample |  |
| Lab ID:     | 20-S2359   | 20-S2360  |                            |        |           |  |
| Sample Vol: | 250        | 100       | mL                         |        |           |  |

|             |            |           |                            |        |           |  |
|-------------|------------|-----------|----------------------------|--------|-----------|--|
| Source:     | BH 2       |           | Sample Date: 12/14-15/2020 |        |           |  |
| Run:        | 2          |           |                            |        |           |  |
|             | Filter +   |           |                            |        |           |  |
| Client ID:  | Front Half | Back Half |                            |        |           |  |
| Analyte     | < Result   | < Result  | FH MDL                     | BH MDL | Units     |  |
| Aluminum    | 182        | 24.4      | 3.75                       | 1.50   | µg/sample |  |
| Antimony    | < MDL      | < MDL     | 1.25                       | 0.500  | µg/sample |  |
| Arsenic     | 5.24       | < MDL     | 1.75                       | 0.700  | µg/sample |  |
| Barium      | 3.42       | 2.010     | 0.125                      | 0.050  | µg/sample |  |
| Beryllium   | < MDL      | < MDL     | 0.050                      | 0.020  | µg/sample |  |
| Cadmium     | 0.434      | < MDL     | 0.100                      | 0.040  | µg/sample |  |
| Chromium    | 2.94       | 0.688     | 0.200                      | 0.080  | µg/sample |  |
| Cobalt      | < MDL      | 0.629     | 0.125                      | 0.050  | µg/sample |  |
| Copper      | 3.41       | 2.970     | 1.25                       | 0.500  | µg/sample |  |
| Lead        | 2.46       | 0.681     | 1.25                       | 0.500  | µg/sample |  |
| Manganese   | 137        | 3.560     | 0.075                      | 0.030  | µg/sample |  |
| Nickel      | 0.991      | 0.666     | 0.750                      | 0.300  | µg/sample |  |
| Phosphorus  | 15.6       | < MDL     | 5.00                       | 2.00   | µg/sample |  |
| Selenium    | 6.04       | < MDL     | 3.75                       | 1.50   | µg/sample |  |
| Silver      | < MDL      | < MDL     | 0.500                      | 0.200  | µg/sample |  |
| Thallium    | < MDL      | < MDL     | 2.50                       | 1.00   | µg/sample |  |
| Vanadium    | < MDL      | < MDL     | 0.250                      | 0.100  | µg/sample |  |
| Zinc        | 16.7       | 6.530     | 0.750                      | 0.300  | µg/sample |  |
| Lab ID:     | 20-S2361   | 20-S2362  |                            |        |           |  |
| Sample Vol: | 250        | 100       | mL                         |        |           |  |

**Source:** BH 2**Sample Date:** 12/15-16/2020**Run:** 3

|                   |   | <b>Filter +</b>   |   |                  |               |               |              |
|-------------------|---|-------------------|---|------------------|---------------|---------------|--------------|
| <b>Client ID:</b> |   | <b>Front Half</b> |   | <b>Back Half</b> |               |               |              |
| <b>Analyte</b>    | < | <b>Result</b>     | < | <b>Result</b>    | <b>FH MDL</b> | <b>BH MDL</b> | <b>Units</b> |
| Aluminum          |   | 115               |   | 39.9             | 3.75          | 1.50          | µg/sample    |
| Antimony          | < | MDL               |   | 0.742            | 1.25          | 0.500         | µg/sample    |
| Arsenic           |   | 3.06              | < | MDL              | 1.75          | 0.700         | µg/sample    |
| Barium            |   | 1.48              |   | 0.976            | 0.125         | 0.050         | µg/sample    |
| Beryllium         | < | MDL               | < | MDL              | 0.050         | 0.020         | µg/sample    |
| Cadmium           |   | 0.292             | < | MDL              | 0.100         | 0.040         | µg/sample    |
| Chromium          |   | 2.31              |   | 0.600            | 0.200         | 0.080         | µg/sample    |
| Cobalt            | < | MDL               | < | MDL              | 0.125         | 0.050         | µg/sample    |
| Copper            |   | 3.05              |   | 3.26             | 1.25          | 0.500         | µg/sample    |
| Lead              |   | 1.44              |   | 0.823            | 1.25          | 0.500         | µg/sample    |
| Manganese         |   | 104               |   | 2.26             | 0.075         | 0.030         | µg/sample    |
| Nickel            |   | 0.772             |   | 0.352            | 0.750         | 0.300         | µg/sample    |
| Phosphorus        |   | 13.8              | < | MDL              | 5.00          | 2.00          | µg/sample    |
| Selenium          | < | MDL               | < | MDL              | 3.75          | 1.50          | µg/sample    |
| Silver            | < | MDL               | < | MDL              | 0.500         | 0.200         | µg/sample    |
| Thallium          | < | MDL               | < | MDL              | 2.50          | 1.00          | µg/sample    |
| Vanadium          | < | MDL               | < | MDL              | 0.250         | 0.100         | µg/sample    |
| Zinc              |   | 11.9              |   | 9.37             | 0.750         | 0.300         | µg/sample    |
| Lab ID:           |   | 20-S2363          |   | 20-S2364         |               |               |              |
| Sample Vol:       |   | 250               |   | 100              |               |               | mL           |

**Source: BH 2**  
**Blank Values**

| Client ID:      | Filter             | MDL              | BH Capture Soln.                                           | MDL                                                        | FH/BH Rinse            | MDL                    |
|-----------------|--------------------|------------------|------------------------------------------------------------|------------------------------------------------------------|------------------------|------------------------|
|                 |                    |                  | 5% HNO <sub>3</sub> /<br>10% H <sub>2</sub> O <sub>2</sub> | 5% HNO <sub>3</sub> / 10%<br>H <sub>2</sub> O <sub>2</sub> | 0.1 N HNO <sub>3</sub> | 0.1 N HNO <sub>3</sub> |
|                 |                    | Filter MDL       |                                                            | MDL                                                        |                        | MDL                    |
| <u>Analyte</u>  | < <u>µg/sample</u> | <u>µg/sample</u> | < <u>µg/sample</u>                                         | <u>µg/sample</u>                                           | < <u>µg/sample</u>     | <u>µg/sample</u>       |
| Aluminum        | 95.7               | 3.75             | 6.36                                                       | 1.50                                                       | < MDL                  | 3.75                   |
| Antimony        | < MDL              | 1.25             | < MDL                                                      | 0.500                                                      | < MDL                  | 1.25                   |
| Arsenic         | 3.58               | 1.75             | < MDL                                                      | 0.700                                                      | < MDL                  | 1.75                   |
| Barium          | 0.917              | 0.125            | 0.586                                                      | 0.050                                                      | 0.282                  | 0.125                  |
| Beryllium       | < MDL              | 0.050            | < MDL                                                      | 0.020                                                      | < MDL                  | 0.050                  |
| Cadmium         | 0.358              | 0.100            | < MDL                                                      | 0.040                                                      | < MDL                  | 0.100                  |
| Chromium        | 0.934              | 0.200            | 0.377                                                      | 0.080                                                      | < MDL                  | 0.200                  |
| Cobalt          | < MDL              | 0.125            | < MDL                                                      | 0.050                                                      | < MDL                  | 0.125                  |
| Copper          | < MDL              | 1.25             | 1.91                                                       | 0.500                                                      | < MDL                  | 1.25                   |
| Lead            | < MDL              | 1.25             | 0.814                                                      | 0.500                                                      | 1.57                   | 1.25                   |
| Manganese       | 1.27               | 0.075            | 0.2560                                                     | 0.030                                                      | 0.077                  | 0.075                  |
| Nickel          | < MDL              | 0.750            | < MDL                                                      | 0.300                                                      | < MDL                  | 0.750                  |
| Phosphorus      | 13.8               | 5.00             | < MDL                                                      | 2.00                                                       | < MDL                  | 5.00                   |
| Selenium        | < MDL              | 3.75             | < MDL                                                      | 1.50                                                       | < MDL                  | 3.75                   |
| Silver          | < MDL              | 0.500            | < MDL                                                      | 0.200                                                      | < MDL                  | 0.500                  |
| Thallium        | < MDL              | 2.50             | < MDL                                                      | 1.00                                                       | < MDL                  | 2.50                   |
| Vanadium        | < MDL              | 0.250            | < MDL                                                      | 0.100                                                      | < MDL                  | 0.250                  |
| Zinc            | 2.33               | 0.750            | 0.541                                                      | 0.300                                                      | < MDL                  | 0.750                  |
| Lab ID:         | 20-S2357           |                  | 20-S2358                                                   |                                                            | 20-S2356               |                        |
| Sample Vol, ml: | 250                |                  | 250                                                        |                                                            | 100                    |                        |

## Columbia Steel Casting

BH 2

12/10-11/2020

## Method 29 Metals Blank Calculations

Run: 1

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|            | I                                 |   | II                   |   | III                  |   | IV                                                                 |   | V                                |   | VI                               |   | VII                  |  | VIII      |            |
|------------|-----------------------------------|---|----------------------|---|----------------------|---|--------------------------------------------------------------------|---|----------------------------------|---|----------------------------------|---|----------------------|--|-----------|------------|
|            | Sample*                           |   | Blank*               |   | Blank*               |   | Sample*                                                            |   | Blank*                           |   | BH Blank*                        |   | BH Blank*            |  | Allowable |            |
|            | FH                                |   | FH                   |   | FH                   |   | BH                                                                 |   | BH                               |   | Corrected                        |   | Corrected            |  | BH        |            |
| Species    | Wash+Filter                       |   | Wash, µg             |   | Filter, µg           |   | Cap.Sol.                                                           |   | Cap.Sol.                         |   | Cap.Sol.                         |   | Wash, µg             |  | Blank, µg | Species    |
| Volume(ml) | 100                               |   | 100                  |   | N/A                  |   | 100                                                                |   | µg/mL                            |   | 200                              |   | 100                  |  |           |            |
| Al         | 122.000                           | < | 3.7500               |   | 95.700               |   | 35.100                                                             |   | 0.0254                           |   | 5.088                            | < | 3.7500               |  | 5.088     | Aluminum   |
| Sb         | < 1.250                           | < | 1.2500               | < | 1.250                |   | 1.040                                                              | < | 0.0020                           | < | 0.400                            | < | 1.2500               |  | 0.000     | Antimony   |
| As         | 3.050                             | < | 1.7500               |   | 3.580                | < | 0.700                                                              | < | 0.0028                           | < | 0.560                            | < | 1.7500               |  | 0.000     | Arsenic    |
| Ba         | 2.180                             |   | 0.2820               |   | 0.917                |   | 1.440                                                              |   | 0.0023                           |   | 0.469                            |   | 0.2820               |  | 0.751     | Barium     |
| Be         | < 0.050                           | < | 0.0500               | < | 0.050                | < | 0.020                                                              | < | 0.0001                           | < | 0.016                            | < | 0.0500               |  | 0.000     | Beryllium  |
| Cd         | 0.486                             | < | 0.1000               |   | 0.358                | < | 0.040                                                              | < | 0.0002                           | < | 0.032                            | < | 0.1000               |  | 0.000     | Cadmium    |
| Cr         | 2.820                             | < | 0.2000               |   | 0.934                |   | 0.783                                                              |   | 0.0015                           |   | 0.302                            | < | 0.2000               |  | 0.302     | Chromium   |
| Co         | < 0.125                           | < | 0.1250               | < | 0.125                |   | 0.778                                                              | < | 0.0002                           | < | 0.040                            | < | 0.1250               |  | 0.000     | Cobalt     |
| Cu         | 3.430                             | < | 1.2500               | < | 1.250                |   | 5.470                                                              |   | 0.0076                           |   | 1.528                            | < | 1.2500               |  | 1.528     | Copper     |
| Pb         | 1.880                             |   | 1.5700               | < | 1.250                |   | 1.170                                                              |   | 0.0033                           |   | 0.651                            |   | 1.5700               |  | 2.221     | Lead       |
| Mn         | 150.000                           |   | 0.0770               |   | 1.270                |   | 3.410                                                              |   | 0.0010                           |   | 0.205                            |   | 0.0770               |  | 0.282     | Manganese  |
| Ni         | 0.922                             | < | 0.7500               | < | 0.750                |   | 0.428                                                              | < | 0.0012                           | < | 0.240                            | < | 0.7500               |  | 0.000     | Nickel     |
| P          | 12.600                            | < | 5.0000               |   | 13.800               | < | 2.000                                                              | < | 0.0080                           | < | 1.600                            | < | 5.0000               |  | 0.000     | Phosphorus |
| Se         | < 3.750                           | < | 3.7500               | < | 3.750                | < | 1.500                                                              | < | 0.0060                           | < | 1.200                            | < | 3.7500               |  | 0.000     | Selenium   |
| Ag         | < 0.500                           | < | 0.5000               | < | 0.500                | < | 0.200                                                              | < | 0.0008                           | < | 0.160                            | < | 0.5000               |  | 0.000     | Silver     |
| Tl         | < 2.500                           | < | 2.5000               | < | 2.500                | < | 1.000                                                              | < | 0.0040                           | < | 0.800                            | < | 2.5000               |  | 0.000     | Thallium   |
| V          | < 0.250                           | < | 0.2500               | < | 0.250                | < | 0.100                                                              | < | 0.0004                           | < | 0.080                            | < | 0.2500               |  | 0.000     | Vanadium   |
| Zn         | 9.290                             | < | 0.7500               |   | 2.330                |   | 5.360                                                              |   | 0.0022                           |   | 0.433                            | < | 0.7500               |  | 0.433     | Zinc       |
| Lab ID:    | 20-S2359                          |   | 20-S2356             |   | 20-S2357             |   | 20-S2360                                                           |   | 20-S2358                         |   |                                  |   |                      |  |           |            |
| Content:   | 0.1NHNO <sub>3</sub>              |   | 0.1NHNO <sub>3</sub> |   | 0.1NHNO <sub>3</sub> |   | 5%HNO <sub>3</sub> /                                               |   | 5%HNO <sub>3</sub> /             |   | 5%HNO <sub>3</sub> /             |   | 0.1NHNO <sub>3</sub> |  |           |            |
|            | FH Filter & Probe Rinse           |   |                      |   |                      |   | 10%H <sub>2</sub> O <sub>2</sub>                                   |   | 10%H <sub>2</sub> O <sub>2</sub> |   | 10%H <sub>2</sub> O <sub>2</sub> |   |                      |  |           |            |
|            | 100ml 0.1N HNO <sub>3</sub> rinse |   |                      |   |                      |   | BH Imps 1&2                                                        |   |                                  |   |                                  |   |                      |  |           |            |
|            |                                   |   | Same as BH           |   |                      |   | 100ml .1N HNO <sub>3</sub> rinse                                   |   |                                  |   |                                  |   | Same as FH           |  |           |            |
|            |                                   |   | Blank Wash           |   |                      |   | 200ml 5%HNO <sub>3</sub> /10%H <sub>2</sub> O <sub>2</sub> reagent |   |                                  |   |                                  |   | Blank Wash           |  |           |            |

Blanks are prorated to reflect 100ml for HNO<sub>3</sub> and 200ml for HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>

## \* Blank Rules:

"&lt;" indicates value is below the minimum detection limit (MDL)

If Blank is a "&lt;" value it is treated as zero.

If Sample is a "&lt;" it used for emission rate calculations but the final answer contains a "&lt;" to demonstrate the value is unknown

BH 2  
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Method 29 Metals Blank Calculations

Run: 1

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| Species         | X<br>Allowable<br>FH<br>Blank, $\mu g$ | XI<br>FH Blank<br>Corrected<br>$\mu g$ | XII<br>5% of FH<br>Sample, $\mu g$ | XIII<br>Lessor of<br>XI or XII | XIV<br>Greater of<br>A or XIII | XV<br>FH<br>Net<br>Sample, $\mu g$ | Species               |
|-----------------|----------------------------------------|----------------------------------------|------------------------------------|--------------------------------|--------------------------------|------------------------------------|-----------------------|
| Al <sup>†</sup> | 95.700                                 | 95.700                                 | 6.100                              | 6.100                          | 11.63                          | 26.300                             | Aluminum <sup>†</sup> |
| Sb              | 0.000                                  | 0.000 <                                | 0.063                              | 0.000                          | 11.63 <                        | 1.250                              | Antimony              |
| As              | 3.580                                  | 3.580                                  | 0.153                              | 0.153                          | 11.63                          | -0.530                             | Arsenic               |
| Ba              | 1.199                                  | 1.199                                  | 0.109                              | 0.109                          | 11.63                          | 0.981                              | Barium                |
| Be              | 0.000                                  | 0.000 <                                | 0.003                              | 0.000                          | 11.63 <                        | 0.050                              | Beryllium             |
| Cd              | 0.358                                  | 0.358                                  | 0.024                              | 0.024                          | 11.63                          | 0.128                              | Cadmium               |
| Cr              | 0.934                                  | 0.934                                  | 0.141                              | 0.141                          | 11.63                          | 1.886                              | Chromium              |
| Co              | 0.000                                  | 0.000 <                                | 0.006                              | 0.000                          | 11.63 <                        | 0.125                              | Cobalt                |
| Cu              | 0.000                                  | 0.000                                  | 0.172                              | 0.000                          | 11.63                          | 3.430                              | Copper                |
| Pb              | 1.570                                  | 1.570                                  | 0.094                              | 0.094                          | 11.63                          | 0.310                              | Lead                  |
| Mn              | 1.347                                  | 1.347                                  | 7.500                              | 1.347                          | 11.63                          | 148.653                            | Manganese             |
| Ni              | 0.000                                  | 0.000                                  | 0.046                              | 0.000                          | 11.63                          | 0.922                              | Nickel                |
| P               | 11.630                                 | 13.800                                 | 0.630                              | 0.630                          | 11.63                          | 0.970                              | Phosphorus            |
| Se              | 0.000                                  | 0.000 <                                | 0.188                              | 0.000                          | 11.63 <                        | 3.750                              | Selenium              |
| Ag              | 0.000                                  | 0.000 <                                | 0.025                              | 0.000                          | 11.63 <                        | 0.500                              | Silver                |
| Tl              | 0.000                                  | 0.000 <                                | 0.125                              | 0.000                          | 11.63 <                        | 2.500                              | Thallium              |
| V               | 0.000                                  | 0.000 <                                | 0.013                              | 0.000                          | 11.63 <                        | 0.250                              | Vanadium              |
| Zn              | 2.330                                  | 2.330                                  | 0.465                              | 0.465                          | 11.63                          | 6.960                              | Zinc                  |

† The value shown for "allowable FH blank" for aluminum is the actual filter blank mass, not the max allowable blank as calculated by Method 29.

Allowable FH Blank Calculation:

A = (area of filter, sq. in.)\*(1.4  $\mu g/sq.in.$ )=  $\mu g$  A= 11.63  $\mu g$

if A>blank>0, use blank derived

if blank > A, use greater of A or 5% of sample  $\mu g$  or FH blank whichever is lessor.

**\* Blank Rules:**

"<" indicates value is below the minimum detection limit (MDL)

If Blank is a "<" value it is treated as zero.

If Sample is a "<" it used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

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Method 29 Metals Blank Calculations

Run: 1

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| Species | XVI<br>Allowable<br>BH<br>Blank, $\mu g$ | XVII<br>Blank BH<br>Total | XVIII<br>5% of BH<br>sample, $\mu g$ | XIX<br>Lessor of<br>XVII or XVIII | XX<br>Greater of<br>1 $\mu g$ or XIX | XXI<br>BH<br>Net<br>Sample, $\mu g$ | XXII<br>FH<br>Net<br>Sample, $\mu g$ | XXIII<br>FH+BH<br>Total Net<br>Sample, $\mu g$ | Species    |
|---------|------------------------------------------|---------------------------|--------------------------------------|-----------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|------------------------------------------------|------------|
| Al      | 1.755                                    | 5.088                     | 1.755                                | 1.755                             | 1.755                                | 33.345                              | 26.300                               | 59.645                                         | Aluminum   |
| Sb      | 0.000                                    | 0.000                     | 0.052                                | 0.000                             | 1.000                                | 1.040 <                             | 1.250 <                              | 2.290                                          | Antimony   |
| As      | 0.000                                    | 0.000 <                   | 0.035                                | 0.000                             | 1.000 <                              | 0.700                               | 0.000 <                              | 0.700                                          | Arsenic    |
| Ba      | 0.751                                    | 0.751                     | 0.072                                | 0.072                             | 1.000                                | 0.689                               | 0.981                                | 1.670                                          | Barium     |
| Be      | 0.000                                    | 0.000 <                   | 0.001                                | 0.000                             | 1.000 <                              | 0.020 <                             | 0.050 <                              | 0.070                                          | Beryllium  |
| Cd      | 0.000                                    | 0.000 <                   | 0.002                                | 0.000                             | 1.000 <                              | 0.040                               | 0.128 <                              | 0.168                                          | Cadmium    |
| Cr      | 0.302                                    | 0.302                     | 0.039                                | 0.039                             | 1.000                                | 0.481                               | 1.886                                | 2.367                                          | Chromium   |
| Co      | 0.000                                    | 0.000                     | 0.039                                | 0.000                             | 1.000                                | 0.778 <                             | 0.125 <                              | 0.903                                          | Cobalt     |
| Cu      | 1.000                                    | 1.528                     | 0.274                                | 0.274                             | 1.000                                | 4.470                               | 3.430                                | 7.900                                          | Copper     |
| Pb      | 1.000                                    | 2.221                     | 0.059                                | 0.059                             | 1.000                                | 0.170                               | 0.310                                | 0.480                                          | Lead       |
| Mn      | 0.282                                    | 0.282                     | 0.171                                | 0.171                             | 1.000                                | 3.128                               | 148.653                              | 151.781                                        | Manganese  |
| Ni      | 0.000                                    | 0.000                     | 0.021                                | 0.000                             | 1.000                                | 0.428                               | 0.922                                | 1.350                                          | Nickel     |
| P       | 0.000                                    | 0.000 <                   | 0.100                                | 0.000                             | 1.000 <                              | 2.000                               | 0.970 <                              | 2.970                                          | Phosphorus |
| Se      | 0.000                                    | 0.000 <                   | 0.075                                | 0.000                             | 1.000 <                              | 1.500 <                             | 3.750 <                              | 5.250                                          | Selenium   |
| Ag      | 0.000                                    | 0.000 <                   | 0.010                                | 0.000                             | 1.000 <                              | 0.200 <                             | 0.500 <                              | 0.700                                          | Silver     |
| Tl      | 0.000                                    | 0.000 <                   | 0.050                                | 0.000                             | 1.000 <                              | 1.000 <                             | 2.500 <                              | 3.500                                          | Thallium   |
| V       | 0.000                                    | 0.000 <                   | 0.005                                | 0.000                             | 1.000 <                              | 0.100 <                             | 0.250 <                              | 0.350                                          | Vanadium   |
| Zn      | 0.433                                    | 0.433                     | 0.268                                | 0.268                             | 1.000                                | 4.927                               | 6.960                                | 11.887                                         | Zinc       |

Allowable BH Blank Calculation:

if  $1.00\mu g > \text{blank} > 0$ , use blank derived

if blank  $> 1.00\mu g$ , use greater of 1.00 or 5% of sample ug or BH blank whichever is lessor

**\* Blank Rules:**

"<" indicates value is below the minimum detection limit (MDL)

If Blank is a "<" value it is treated as zero.

If Sample is a "<" it is used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

Columbia Steel Casting

BH 2

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## Method 29 Metals Blank Calculations

Run: 2

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|            | I                                 | II                   | III                  | IV                                                                 | V                                | VI                               | VII                  | VIII      |            |
|------------|-----------------------------------|----------------------|----------------------|--------------------------------------------------------------------|----------------------------------|----------------------------------|----------------------|-----------|------------|
|            | Sample*                           | Blank*               | Blank*               | Sample*                                                            | Blank*                           | BH Blank*                        | BH Blank*            | Allowable |            |
|            | FH                                | FH                   | FH                   | BH                                                                 | BH                               | Corrected                        | Corrected            | BH        |            |
| Species    | Wash+Filter                       | Wash, µg             | Filter, µg           | Cap.Sol.                                                           | Cap.Sol.                         | Cap.Sol.                         | Wash, µg             | Blank, µg | Species    |
| Volume(ml) | 100                               | 100                  | N/A                  | 100                                                                | µg/mL                            | 200                              | 100                  |           |            |
| Al         | 182.000 <                         | 3.7500               | 95.700               | 24.400                                                             | 0.0254                           | 5.088 <                          | 3.7500               | 5.088     | Aluminum   |
| Sb <       | 1.250 <                           | 1.2500 <             | 1.250 <              | 0.500 <                                                            | 0.0020 <                         | 0.400 <                          | 1.2500               | 0.000     | Antimony   |
| As         | 5.240 <                           | 1.7500               | 3.580 <              | 0.700 <                                                            | 0.0028 <                         | 0.560 <                          | 1.7500               | 0.000     | Arsenic    |
| Ba         | 3.420                             | 0.2820               | 0.917                | 2.010                                                              | 0.0023                           | 0.469                            | 0.2820               | 0.751     | Barium     |
| Be <       | 0.050 <                           | 0.0500 <             | 0.050 <              | 0.020 <                                                            | 0.0001 <                         | 0.016 <                          | 0.0500               | 0.000     | Beryllium  |
| Cd         | 0.434 <                           | 0.1000               | 0.358 <              | 0.040 <                                                            | 0.0002 <                         | 0.032 <                          | 0.1000               | 0.000     | Cadmium    |
| Cr         | 2.940 <                           | 0.2000               | 0.934                | 0.688                                                              | 0.0015                           | 0.302 <                          | 0.2000               | 0.302     | Chromium   |
| Co <       | 0.125 <                           | 0.1250 <             | 0.125                | 0.629 <                                                            | 0.0002 <                         | 0.040 <                          | 0.1250               | 0.000     | Cobalt     |
| Cu         | 3.410 <                           | 1.2500 <             | 1.250                | 2.970                                                              | 0.0076                           | 1.528 <                          | 1.2500               | 1.528     | Copper     |
| Pb         | 2.460                             | 1.5700 <             | 1.250                | 0.681                                                              | 0.0033                           | 0.651                            | 1.5700               | 2.221     | Lead       |
| Mn         | 137.000                           | 0.0770               | 1.270                | 3.560                                                              | 0.0010                           | 0.205                            | 0.0770               | 0.282     | Manganese  |
| Ni         | 0.991 <                           | 0.7500 <             | 0.750                | 0.666 <                                                            | 0.0012 <                         | 0.240 <                          | 0.7500               | 0.000     | Nickel     |
| P          | 15.600 <                          | 5.0000               | 13.800 <             | 2.000 <                                                            | 0.0080 <                         | 1.600 <                          | 5.0000               | 0.000     | Phosphorus |
| Se         | 6.040 <                           | 3.7500 <             | 3.750 <              | 1.500 <                                                            | 0.0060 <                         | 1.200 <                          | 3.7500               | 0.000     | Selenium   |
| Ag <       | 0.500 <                           | 0.5000 <             | 0.500 <              | 0.200 <                                                            | 0.0008 <                         | 0.160 <                          | 0.5000               | 0.000     | Silver     |
| Tl <       | 2.500 <                           | 2.5000 <             | 2.500 <              | 1.000 <                                                            | 0.0040 <                         | 0.800 <                          | 2.5000               | 0.000     | Thallium   |
| V <        | 0.250 <                           | 0.2500 <             | 0.250 <              | 0.100 <                                                            | 0.0004 <                         | 0.080 <                          | 0.2500               | 0.000     | Vanadium   |
| Zn         | 16.700 <                          | 0.7500               | 2.330                | 6.530                                                              | 0.0022                           | 0.433 <                          | 0.7500               | 0.433     | Zinc       |
| Lab:       | 20-S2361                          | 20-S2356             | 20-S2357             | 20-S2362                                                           | 20-S2358                         |                                  |                      |           |            |
| Content:   | 0.1NHNO <sub>3</sub>              | 0.1NHNO <sub>3</sub> | 0.1NHNO <sub>3</sub> | 5%HNO <sub>3</sub> /                                               | 5%HNO <sub>3</sub> /             | 5%HNO <sub>3</sub> /             | 0.1NHNO <sub>3</sub> |           |            |
|            | FH Filter & Probe Rinse           |                      |                      | 10%H <sub>2</sub> O <sub>2</sub>                                   | 10%H <sub>2</sub> O <sub>2</sub> | 10%H <sub>2</sub> O <sub>2</sub> |                      |           |            |
|            | 100ml 0.1N HNO <sub>3</sub> rinse |                      |                      | BH Imps 1&2                                                        |                                  |                                  |                      |           |            |
|            |                                   | Same as BH           |                      | 100ml .1N HNO <sub>3</sub> rinse                                   |                                  |                                  | Same as FH           |           |            |
|            |                                   | Blank Wash           |                      | 200ml 5%HNO <sub>3</sub> /10%H <sub>2</sub> O <sub>2</sub> reagent |                                  |                                  | Blank Wash           |           |            |

Blanks are prorated to reflect 100ml for HNO<sub>3</sub> and 200ml for HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>

## \* Blank Rules:

"&lt;" indicates value is below the minimum detection limit (MDL)

If Blank is a "&lt;" value it is treated as zero.

If Sample is a "&lt;" it is used for emission rate calculations but the final answer contains a "&lt;" to demonstrate the value is unknown

BH 2  
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Method 29 Metals Blank Calculations

Run: 2

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| Species         | X<br>Allowable<br>FH<br>Blank, $\mu g$ | XI<br>FH Blank<br>Corrected<br>$\mu g$ | XII<br>5% of FH<br>Sample, $\mu g$ | XIII<br>Lessor of<br>XI or XII | XIV<br>Greater of<br>A or XIII | XV<br>FH<br>Net<br>Sample, $\mu g$ | Species               |
|-----------------|----------------------------------------|----------------------------------------|------------------------------------|--------------------------------|--------------------------------|------------------------------------|-----------------------|
| Al <sup>†</sup> | 95.700                                 | 95.700                                 | 9.100                              | 9.100                          | 11.63                          | 86.300                             | Aluminum <sup>†</sup> |
| Sb              | 0.000                                  | 0.000 <                                | 0.063                              | 0.000                          | 11.63 <                        | 1.250                              | Antimony              |
| As              | 3.580                                  | 3.580                                  | 0.262                              | 0.262                          | 11.63                          | 1.660                              | Arsenic               |
| Ba              | 1.199                                  | 1.199                                  | 0.171                              | 0.171                          | 11.63                          | 2.221                              | Barium                |
| Be              | 0.000                                  | 0.000 <                                | 0.003                              | 0.000                          | 11.63 <                        | 0.050                              | Beryllium             |
| Cd              | 0.358                                  | 0.358                                  | 0.022                              | 0.022                          | 11.63                          | 0.076                              | Cadmium               |
| Cr              | 0.934                                  | 0.934                                  | 0.147                              | 0.147                          | 11.63                          | 2.006                              | Chromium              |
| Co              | 0.000                                  | 0.000 <                                | 0.006                              | 0.000                          | 11.63 <                        | 0.125                              | Cobalt                |
| Cu              | 0.000                                  | 0.000                                  | 0.171                              | 0.000                          | 11.63                          | 3.410                              | Copper                |
| Pb              | 1.570                                  | 1.570                                  | 0.123                              | 0.123                          | 11.63                          | 0.890                              | Lead                  |
| Mn              | 1.347                                  | 1.347                                  | 6.850                              | 1.347                          | 11.63                          | 135.653                            | Manganese             |
| Ni              | 0.000                                  | 0.000                                  | 0.050                              | 0.000                          | 11.63                          | 0.991                              | Nickel                |
| P               | 11.630                                 | 13.800                                 | 0.780                              | 0.780                          | 11.63                          | 3.970                              | Phosphorus            |
| Se              | 0.000                                  | 0.000                                  | 0.302                              | 0.000                          | 11.63                          | 6.040                              | Selenium              |
| Ag              | 0.000                                  | 0.000 <                                | 0.025                              | 0.000                          | 11.63 <                        | 0.500                              | Silver                |
| Tl              | 0.000                                  | 0.000 <                                | 0.125                              | 0.000                          | 11.63 <                        | 2.500                              | Thallium              |
| V               | 0.000                                  | 0.000 <                                | 0.013                              | 0.000                          | 11.63 <                        | 0.250                              | Vanadium              |
| Zn              | 2.330                                  | 2.330                                  | 0.835                              | 0.835                          | 11.63                          | 14.370                             | Zinc                  |

† The value shown for "allowable FH blank" for aluminum is the actual filter blank mass, not the max allowable blank as calculated by Method 29.

Allowable FH Blank Calculation:

$$A = (\text{area of filter, sq. in.}) \times (1.4 \mu g/\text{sq. in.}) = \mu g \quad A = 11.63 \mu g$$

if  $A > \text{blank} > 0$ , use blank derived

if blank > A, use greater of A or 5% of sample  $\mu g$  or FH blank whichever is lessor.

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If Blank is a "<" value it is treated as zero.

If Sample is a "<" it used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

BH 2  
12/14-15/2020

Method 29 Metals Blank Calculations

Run: 2

3 of 3

| Species | XVI<br>Allowable<br>BH<br>Blank, $\mu g$ | XVII<br>Blank BH<br>Total | XVIII<br>5% of BH<br>sample, $\mu g$ | XIX<br>Lessor of<br>XVII or XVIII | XX<br>Greater of<br>1 $\mu g$ or XIX | XXI<br>BH<br>Net<br>Sample, $\mu g$ | XXII<br>FH<br>Net<br>Sample, $\mu g$ | XXIII<br>FH+BH<br>Total Net<br>Sample, $\mu g$ | Species    |
|---------|------------------------------------------|---------------------------|--------------------------------------|-----------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|------------------------------------------------|------------|
| Al      | 1.220                                    | 5.088                     | 1.220                                | 1.220                             | 1.220                                | 23.180                              | 86.300                               | 109.480                                        | Aluminum   |
| Sb      | 0.000                                    | 0.000 <                   | 0.025                                | 0.000                             | 1.000 <                              | 0.500 <                             | 1.250 <                              | 1.750                                          | Antimony   |
| As      | 0.000                                    | 0.000 <                   | 0.035                                | 0.000                             | 1.000 <                              | 0.700                               | 1.660 <                              | 2.360                                          | Arsenic    |
| Ba      | 0.751                                    | 0.751                     | 0.101                                | 0.101                             | 1.000                                | 1.259                               | 2.221                                | 3.480                                          | Barium     |
| Be      | 0.000                                    | 0.000 <                   | 0.001                                | 0.000                             | 1.000 <                              | 0.020 <                             | 0.050 <                              | 0.070                                          | Beryllium  |
| Cd      | 0.000                                    | 0.000 <                   | 0.002                                | 0.000                             | 1.000 <                              | 0.040                               | 0.076 <                              | 0.116                                          | Cadmium    |
| Cr      | 0.302                                    | 0.302                     | 0.034                                | 0.034                             | 1.000                                | 0.386                               | 2.006                                | 2.392                                          | Chromium   |
| Co      | 0.000                                    | 0.000                     | 0.031                                | 0.000                             | 1.000                                | 0.629 <                             | 0.125 <                              | 0.754                                          | Cobalt     |
| Cu      | 1.000                                    | 1.528                     | 0.149                                | 0.149                             | 1.000                                | 1.970                               | 3.410                                | 5.380                                          | Copper     |
| Pb      | 1.000                                    | 2.221                     | 0.034                                | 0.034                             | 1.000                                | 0.000                               | 0.890                                | 0.890                                          | Lead       |
| Mn      | 0.282                                    | 0.282                     | 0.178                                | 0.178                             | 1.000                                | 3.278                               | 135.653                              | 138.931                                        | Manganese  |
| Ni      | 0.000                                    | 0.000                     | 0.033                                | 0.000                             | 1.000                                | 0.666                               | 0.991                                | 1.657                                          | Nickel     |
| P       | 0.000                                    | 0.000 <                   | 0.100                                | 0.000                             | 1.000 <                              | 2.000                               | 3.970 <                              | 5.970                                          | Phosphorus |
| Se      | 0.000                                    | 0.000 <                   | 0.075                                | 0.000                             | 1.000 <                              | 1.500                               | 6.040 <                              | 7.540                                          | Selenium   |
| Ag      | 0.000                                    | 0.000 <                   | 0.010                                | 0.000                             | 1.000 <                              | 0.200 <                             | 0.500 <                              | 0.700                                          | Silver     |
| Tl      | 0.000                                    | 0.000 <                   | 0.050                                | 0.000                             | 1.000 <                              | 1.000 <                             | 2.500 <                              | 3.500                                          | Thallium   |
| V       | 0.000                                    | 0.000 <                   | 0.005                                | 0.000                             | 1.000 <                              | 0.100 <                             | 0.250 <                              | 0.350                                          | Vanadium   |
| Zn      | 0.433                                    | 0.433                     | 0.327                                | 0.327                             | 1.000                                | 6.097                               | 14.370                               | 20.467                                         | Zinc       |

Allowable BH Blank Calculation:

if 1.00 $\mu g$  > blank > 0, use blank derived

if blank > 1.00 $\mu g$ , use greater of 1.00 or 5% of sample ug or BH blank whichever is lessor

**\* Blank Rules:**

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Columbia Steel Casting

BH 2

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## Method 29 Metals Blank Calculations

Run: 3

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| Species<br>Volume(ml) | I<br>Sample*<br>FH                |   | II<br>Blank*<br>FH   |   | III<br>Blank*<br>FH  |   | IV<br>Sample*<br>BH                                                |   | V<br>Blank*<br>BH                |   | VI<br>BH Blank*<br>Corrected     |   | VII<br>BH Blank*<br>Corrected |  | VIII<br>Allowable<br>BH |  | Species    |
|-----------------------|-----------------------------------|---|----------------------|---|----------------------|---|--------------------------------------------------------------------|---|----------------------------------|---|----------------------------------|---|-------------------------------|--|-------------------------|--|------------|
|                       | Wash+Filter<br>100                |   | Wash, µg<br>100      |   | Filter, µg<br>N/A    |   | Cap.Sol.<br>100                                                    |   | Cap.Sol.<br>µg/mL                |   | Cap.Sol.<br>200                  |   | Wash, µg<br>100               |  | Blank, µg               |  |            |
| Al                    | 115.000                           | < | 3.7500               |   | 95.700               |   | 39.900                                                             |   | 0.0254                           |   | 5.088                            | < | 3.7500                        |  | 5.088                   |  | Aluminum   |
| Sb                    | < 1.250                           | < | 1.2500               | < | 1.250                |   | 0.742                                                              | < | 0.0020                           | < | 0.400                            | < | 1.2500                        |  | 0.000                   |  | Antimony   |
| As                    | 3.060                             | < | 1.7500               |   | 3.580                | < | 0.700                                                              | < | 0.0028                           | < | 0.560                            | < | 1.7500                        |  | 0.000                   |  | Arsenic    |
| Ba                    | 1.480                             |   | 0.2820               |   | 0.917                |   | 0.976                                                              |   | 0.0023                           |   | 0.469                            |   | 0.2820                        |  | 0.751                   |  | Barium     |
| Be                    | < 0.050                           | < | 0.0500               | < | 0.050                | < | 0.020                                                              | < | 0.0001                           | < | 0.016                            | < | 0.0500                        |  | 0.000                   |  | Beryllium  |
| Cd                    | 0.292                             | < | 0.1000               |   | 0.358                | < | 0.040                                                              | < | 0.0002                           | < | 0.032                            | < | 0.1000                        |  | 0.000                   |  | Cadmium    |
| Cr                    | 2.310                             | < | 0.2000               |   | 0.934                |   | 0.600                                                              |   | 0.0015                           |   | 0.302                            | < | 0.2000                        |  | 0.302                   |  | Chromium   |
| Co                    | < 0.125                           | < | 0.1250               | < | 0.125                | < | 0.050                                                              | < | 0.0002                           | < | 0.040                            | < | 0.1250                        |  | 0.000                   |  | Cobalt     |
| Cu                    | 3.050                             | < | 1.2500               | < | 1.250                |   | 3.260                                                              |   | 0.0076                           |   | 1.528                            | < | 1.2500                        |  | 1.528                   |  | Copper     |
| Pb                    | 1.440                             |   | 1.5700               | < | 1.250                |   | 0.823                                                              |   | 0.0033                           |   | 0.651                            |   | 1.5700                        |  | 2.221                   |  | Lead       |
| Mn                    | 104.000                           |   | 0.0770               |   | 1.270                |   | 2.260                                                              |   | 0.0010                           |   | 0.205                            |   | 0.0770                        |  | 0.282                   |  | Manganese  |
| Ni                    | 0.772                             | < | 0.7500               | < | 0.750                |   | 0.352                                                              | < | 0.0012                           | < | 0.240                            | < | 0.7500                        |  | 0.000                   |  | Nickel     |
| P                     | 13.800                            | < | 5.0000               |   | 13.800               | < | 2.000                                                              | < | 0.0080                           | < | 1.600                            | < | 5.0000                        |  | 0.000                   |  | Phosphorus |
| Se                    | < 3.750                           | < | 3.7500               | < | 3.750                | < | 1.500                                                              | < | 0.0060                           | < | 1.200                            | < | 3.7500                        |  | 0.000                   |  | Selenium   |
| Ag                    | < 0.500                           | < | 0.5000               | < | 0.500                | < | 0.200                                                              | < | 0.0008                           | < | 0.160                            | < | 0.5000                        |  | 0.000                   |  | Silver     |
| Tl                    | < 2.500                           | < | 2.5000               | < | 2.500                | < | 1.000                                                              | < | 0.0040                           | < | 0.800                            | < | 2.5000                        |  | 0.000                   |  | Thallium   |
| V                     | < 0.250                           | < | 0.2500               | < | 0.250                | < | 0.100                                                              | < | 0.0004                           | < | 0.080                            | < | 0.2500                        |  | 0.000                   |  | Vanadium   |
| Zn                    | 11.900                            | < | 0.7500               |   | 2.330                |   | 9.370                                                              |   | 0.0022                           |   | 0.433                            | < | 0.7500                        |  | 0.433                   |  | Zinc       |
| Lab:                  | 20-S2363                          |   | 20-S2356             |   | 20-S2357             |   | 20-S2364                                                           |   | 20-S2358                         |   |                                  |   |                               |  |                         |  |            |
| Content:              | 0.1NHNO <sub>3</sub>              |   | 0.1NHNO <sub>3</sub> |   | 0.1NHNO <sub>3</sub> |   | 5%HNO <sub>3</sub> /                                               |   | 5%HNO <sub>3</sub> /             |   | 5%HNO <sub>3</sub> /             |   | 0.1NHNO <sub>3</sub>          |  |                         |  |            |
|                       | FH Filter & Probe Rinse           |   |                      |   |                      |   | 10%H <sub>2</sub> O <sub>2</sub>                                   |   | 10%H <sub>2</sub> O <sub>2</sub> |   | 10%H <sub>2</sub> O <sub>2</sub> |   |                               |  |                         |  |            |
|                       | 100ml 0.1N HNO <sub>3</sub> rinse |   |                      |   |                      |   | BH Imps 1&2                                                        |   |                                  |   |                                  |   |                               |  |                         |  |            |
|                       |                                   |   | Same as BH           |   |                      |   | 100ml .1N HNO <sub>3</sub> rinse                                   |   |                                  |   |                                  |   | Same as FH                    |  |                         |  |            |
|                       |                                   |   | Blank Wash           |   |                      |   | 200ml 5%HNO <sub>3</sub> /10%H <sub>2</sub> O <sub>2</sub> reagent |   |                                  |   |                                  |   | Blank Wash                    |  |                         |  |            |

Blanks are prorated to reflect 100ml for HNO<sub>3</sub> and 200ml for HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>

## \* Blank Rules:

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BH 2  
12/15-16/2020

Method 29 Metals Blank Calculations

Run: 3

2 of 3

| Species         | X<br>Allowable<br>FH<br>Blank, $\mu g$ | XI<br>FH Blank<br>Corrected<br>$\mu g$ | XII<br>5% of FH<br>Sample, $\mu g$ | XIII<br>Lessor of<br>XI or XII | XIV<br>Greater of<br>A or XIII | XV<br>FH<br>Net<br>Sample, $\mu g$ | Species               |
|-----------------|----------------------------------------|----------------------------------------|------------------------------------|--------------------------------|--------------------------------|------------------------------------|-----------------------|
| Al <sup>†</sup> | 95.700                                 | 95.700                                 | 5.750                              | 5.750                          | 11.63                          | 19.300                             | Aluminum <sup>†</sup> |
| Sb              | 0.000                                  | 0.000 <                                | 0.063                              | 0.000                          | 11.63 <                        | 1.250                              | Antimony              |
| As              | 3.580                                  | 3.580                                  | 0.153                              | 0.153                          | 11.63                          | -0.520                             | Arsenic               |
| Ba              | 1.199                                  | 1.199                                  | 0.074                              | 0.074                          | 11.63                          | 0.281                              | Barium                |
| Be              | 0.000                                  | 0.000 <                                | 0.003                              | 0.000                          | 11.63 <                        | 0.050                              | Beryllium             |
| Cd              | 0.358                                  | 0.358                                  | 0.015                              | 0.015                          | 11.63                          | -0.066                             | Cadmium               |
| Cr              | 0.934                                  | 0.934                                  | 0.116                              | 0.116                          | 11.63                          | 1.376                              | Chromium              |
| Co              | 0.000                                  | 0.000 <                                | 0.006                              | 0.000                          | 11.63 <                        | 0.125                              | Cobalt                |
| Cu              | 0.000                                  | 0.000                                  | 0.153                              | 0.000                          | 11.63                          | 3.050                              | Copper                |
| Pb              | 1.570                                  | 1.570                                  | 0.072                              | 0.072                          | 11.63                          | -0.130                             | Lead                  |
| Mn              | 1.347                                  | 1.347                                  | 5.200                              | 1.347                          | 11.63                          | 102.653                            | Manganese             |
| Ni              | 0.000                                  | 0.000                                  | 0.039                              | 0.000                          | 11.63                          | 0.772                              | Nickel                |
| P               | 11.630                                 | 13.800                                 | 0.690                              | 0.690                          | 11.63                          | 2.170                              | Phosphorus            |
| Se              | 0.000                                  | 0.000 <                                | 0.188                              | 0.000                          | 11.63 <                        | 3.750                              | Selenium              |
| Ag              | 0.000                                  | 0.000 <                                | 0.025                              | 0.000                          | 11.63 <                        | 0.500                              | Silver                |
| Tl              | 0.000                                  | 0.000 <                                | 0.125                              | 0.000                          | 11.63 <                        | 2.500                              | Thallium              |
| V               | 0.000                                  | 0.000 <                                | 0.013                              | 0.000                          | 11.63 <                        | 0.250                              | Vanadium              |
| Zn              | 2.330                                  | 2.330                                  | 0.595                              | 0.595                          | 11.63                          | 9.570                              | Zinc                  |

† The value shown for "allowable FH blank" for aluminum is the actual filter blank mass, not the max allowable blank as calculated by Method 29.

Allowable FH Blank Calculation:

$A = (\text{area of filter, sq. in.}) \times (1.4 \mu g/\text{sq.in.}) = \mu g$                        $A = 11.63 \mu g$

if  $A > \text{blank} > 0$ , use blank derived

if blank > A, use greater of A or 5% of sample  $\mu g$  or FH blank whichever is lessor.

**\* Blank Rules:**

"<" indicates value is below the minimum detection limit (MDL)

If Blank is a "<" value it is treated as zero.

If Sample is a "<" it used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

BH 2  
12/15-16/2020

Method 29 Metals Blank Calculations

Run: 3

3 of 3

| Species | XVI<br>Allowable<br>BH<br>Blank, $\mu g$ | XVII<br>Blank BH<br>Total | XVIII<br>5% of BH<br>sample, $\mu g$ | XIX<br>Lessor of<br>XVII or XVIII | XX<br>Greater of<br>1 $\mu g$ or XIX | XXI<br>BH<br>Net<br>Sample, $\mu g$ | XXII<br>FH<br>Net<br>Sample, $\mu g$ | XXIII<br>FH+BH<br>Total Net<br>Sample, $\mu g$ | Species    |
|---------|------------------------------------------|---------------------------|--------------------------------------|-----------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|------------------------------------------------|------------|
| Al      | 1.995                                    | 5.088                     | 1.995                                | 1.995                             | 1.995                                | 37.905                              | 19.300                               | 57.205                                         | Aluminum   |
| Sb      | 0.000                                    | 0.000                     | 0.037                                | 0.000                             | 1.000                                | 0.742 <                             | 1.250 <                              | 1.992                                          | Antimony   |
| As      | 0.000                                    | 0.000 <                   | 0.035                                | 0.000                             | 1.000 <                              | 0.700                               | 0.000 <                              | 0.700                                          | Arsenic    |
| Ba      | 0.751                                    | 0.751                     | 0.049                                | 0.049                             | 1.000                                | 0.225                               | 0.281                                | 0.506                                          | Barium     |
| Be      | 0.000                                    | 0.000 <                   | 0.001                                | 0.000                             | 1.000 <                              | 0.020 <                             | 0.050 <                              | 0.070                                          | Beryllium  |
| Cd      | 0.000                                    | 0.000 <                   | 0.002                                | 0.000                             | 1.000 <                              | 0.040                               | 0.000 <                              | 0.040                                          | Cadmium    |
| Cr      | 0.302                                    | 0.302                     | 0.030                                | 0.030                             | 1.000                                | 0.298                               | 1.376                                | 1.674                                          | Chromium   |
| Co      | 0.000                                    | 0.000 <                   | 0.003                                | 0.000                             | 1.000 <                              | 0.050 <                             | 0.125 <                              | 0.175                                          | Cobalt     |
| Cu      | 1.000                                    | 1.528                     | 0.163                                | 0.163                             | 1.000                                | 2.260                               | 3.050                                | 5.310                                          | Copper     |
| Pb      | 1.000                                    | 2.221                     | 0.041                                | 0.041                             | 1.000                                | 0.000                               | 0.000                                | 0.000                                          | Lead       |
| Mn      | 0.282                                    | 0.282                     | 0.113                                | 0.113                             | 1.000                                | 1.978                               | 102.653                              | 104.631                                        | Manganese  |
| Ni      | 0.000                                    | 0.000                     | 0.018                                | 0.000                             | 1.000                                | 0.352                               | 0.772                                | 1.124                                          | Nickel     |
| P       | 0.000                                    | 0.000 <                   | 0.100                                | 0.000                             | 1.000 <                              | 2.000                               | 2.170 <                              | 4.170                                          | Phosphorus |
| Se      | 0.000                                    | 0.000 <                   | 0.075                                | 0.000                             | 1.000 <                              | 1.500 <                             | 3.750 <                              | 5.250                                          | Selenium   |
| Ag      | 0.000                                    | 0.000 <                   | 0.010                                | 0.000                             | 1.000 <                              | 0.200 <                             | 0.500 <                              | 0.700                                          | Silver     |
| Tl      | 0.000                                    | 0.000 <                   | 0.050                                | 0.000                             | 1.000 <                              | 1.000 <                             | 2.500 <                              | 3.500                                          | Thallium   |
| V       | 0.000                                    | 0.000 <                   | 0.005                                | 0.000                             | 1.000 <                              | 0.100 <                             | 0.250 <                              | 0.350                                          | Vanadium   |
| Zn      | 0.433                                    | 0.433                     | 0.469                                | 0.433                             | 1.000                                | 8.937                               | 9.570                                | 18.507                                         | Zinc       |

Allowable BH Blank Calculation:

if 1.00 $\mu g$  > blank > 0, use blank derived

if blank > 1.00 $\mu g$ , use greater of 1.00 or 5% of sample ug or BH blank whichever is lessor

**\* Blank Rules:**

"<" indicates value is below the minimum detection limit (MDL)

If Blank is a "<" value it is treated as zero.

If Sample is a "<" it used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

**EPA Method 29**  
**Gas Stream Characteristics**  
**Test Summary**

**Client:** Columbia Steel Casting  
**Source:** BH 2  
**Location:** Portland, Oregon

| Run                              | 1                      | 2          | 3          |                 |
|----------------------------------|------------------------|------------|------------|-----------------|
| Run Start Date                   | 12/10/2020             | 12/14/2020 | 12/15/2020 |                 |
| Run Start Time                   | 22:20                  | 22:18      | 22:02      |                 |
| Run End Date                     | 12/11/2020             | 12/15/2020 | 12/16/2020 |                 |
| Run End Time                     | 5:10                   | 2:55       | 4:13       |                 |
| Duration, min.                   | 373                    | 241        | 335        | <b>Average</b>  |
| Barometric Pressure, "Hg         | 30.09                  | 30.27      | 30.18      | <b>30.18</b>    |
| Nozzle Dia., in.                 | 0.1930                 | 0.2613     | 0.2613     | <b>0.2386</b>   |
| Isokinetic Average, %            | 101.0                  | 101.1      | 99.7       | <b>100.6</b>    |
| Sample Volume, dscf              | 200.768                | 224.264    | 347.947    | <b>257.660</b>  |
| Sample Volume, dscm              | 5.685                  | 6.350      | 9.853      | <b>7.296</b>    |
| Stack Diameter, in.              | 46.50                  | 46.50      | 46.50      | <b>46.50</b>    |
| Stack Area, sq.ft.               | 11.793                 | 11.793     | 11.793     | <b>11.793</b>   |
| CO <sub>2</sub> %vd              | 0.13                   | 0.13       | 0.00       | <b>0.09</b>     |
| O <sub>2</sub> %vd               | 20.76                  | 20.77      | 20.65      | <b>20.73</b>    |
| Static Press., "H <sub>2</sub> O | 0.95                   | 0.95       | 0.95       | <b>0.95</b>     |
| H <sub>2</sub> O %v              | 1.10                   | 1.12       | 1.17       | <b>1.13</b>     |
| Wet Molecular Weight, lb/lb-mole | 28.73                  | 28.73      | 28.70      | <b>28.72</b>    |
| Velocity, FPS                    | 44.00                  | 40.99      | 47.45      | <b>44.15</b>    |
| ADCFM                            | 30,791.0               | 28,678.9   | 33,181.9   | <b>30,883.9</b> |
| ACFM                             | 31,133.5               | 29,003.7   | 33,574.7   | <b>31,237.3</b> |
| DSCFM                            | 30,944.3               | 29,158.8   | 32,991.7   | <b>31,031.6</b> |
| Stack Temperature, °F            | 69.6                   | 66.6       | 76.9       | <b>71.0</b>     |
| Production Data                  | Tons steel melted/hour | 4.96       | 4.30       | 6.21            |
|                                  |                        |            |            | <b>5.20</b>     |

Columbia Steel Casting  
BH 2  
Metals Results Summary

Test: M29

| Run 1      |         |         |            |                     |         |         |            |                     |         |         |            |                     |    |
|------------|---------|---------|------------|---------------------|---------|---------|------------|---------------------|---------|---------|------------|---------------------|----|
| Total      |         |         |            |                     | FH Net  |         |            |                     | BH Net  |         |            |                     |    |
| Species    | µg      | µg/dscm | lb/hr      | lb/ton steel melted | µg      | µg/dscm | lb/hr      | lb/ton steel melted | µg      | µg/dscm | lb/hr      | lb/ton steel melted |    |
| Aluminum   | 59.645  | 10.492  | 1.22E-03   | 2.45E-04            | 26.300  | 4.626   | 5.36E-04   | 1.08E-04            | 33.345  | 5.865   | 6.80E-04   | 1.37E-04            | Al |
| Antimony   | < 2.290 | < 0.403 | < 4.67E-05 | < 9.41E-06          | < 1.250 | < 0.220 | < 2.55E-05 | < 5.14E-06          | 1.040   | 0.183   | 2.12E-05   | 4.28E-06            | Sb |
| Arsenic    | < 0.700 | < 0.123 | < 1.43E-05 | < 2.88E-06          | 0.000   | 0.000   | 0.00E+00   | 0.00E+00            | < 0.700 | < 0.123 | < 1.43E-05 | < 2.88E-06          | As |
| Barium     | 1.670   | 0.294   | 3.40E-05   | 6.86E-06            | 0.981   | 0.173   | 2.00E-05   | 4.03E-06            | 0.689   | 0.121   | 1.40E-05   | 2.83E-06            | Ba |
| Beryllium  | < 0.070 | < 0.012 | < 1.43E-06 | < 2.88E-07          | < 0.050 | < 0.009 | < 1.02E-06 | < 2.05E-07          | < 0.020 | < 0.004 | < 4.08E-07 | < 8.23E-08          | Be |
| Cadmium    | < 0.168 | < 0.030 | < 3.43E-06 | < 6.91E-07          | 0.128   | 0.023   | 2.61E-06   | 5.26E-07            | < 0.040 | < 0.007 | < 8.16E-07 | < 1.65E-07          | Cd |
| Chromium   | 2.367   | 0.416   | 4.83E-05   | 9.73E-06            | 1.886   | 0.332   | 3.85E-05   | 7.75E-06            | 0.481   | 0.085   | 9.81E-06   | 1.98E-06            | Cr |
| Cobalt     | < 0.903 | < 0.159 | < 1.84E-05 | < 3.71E-06          | < 0.125 | < 0.022 | < 2.55E-06 | < 5.14E-07          | 0.778   | 0.137   | 1.59E-05   | 3.20E-06            | Co |
| Copper     | 7.900   | 1.390   | 1.61E-04   | 3.25E-05            | 3.430   | 0.603   | 6.99E-05   | 1.41E-05            | 4.470   | 0.786   | 9.11E-05   | 1.84E-05            | Cu |
| Lead       | 0.480   | 0.084   | 9.79E-06   | 1.97E-06            | 0.310   | 0.055   | 6.32E-06   | 1.27E-06            | 0.170   | 0.030   | 3.47E-06   | 6.99E-07            | Pb |
| Manganese  | 151.781 | 26.699  | 3.09E-03   | 6.24E-04            | 148.653 | 26.148  | 3.03E-03   | 6.11E-04            | 3.128   | 0.550   | 6.38E-05   | 1.29E-05            | Mn |
| Nickel     | 1.350   | 0.237   | 2.75E-05   | 5.55E-06            | 0.922   | 0.162   | 1.88E-05   | 3.79E-06            | 0.428   | 0.075   | 8.73E-06   | 1.76E-06            | Ni |
| Phosphorus | < 2.970 | < 0.522 | < 6.06E-05 | < 1.22E-05          | 0.970   | 0.171   | 1.98E-05   | 3.99E-06            | < 2.000 | < 0.352 | < 4.08E-05 | < 8.22E-06          | P  |
| Selenium   | < 5.250 | < 0.923 | < 1.07E-04 | < 2.16E-05          | < 3.750 | < 0.660 | < 7.65E-05 | < 1.54E-05          | < 1.500 | < 0.264 | < 3.06E-05 | < 6.17E-06          | Se |
| Silver     | < 0.700 | < 0.123 | < 1.43E-05 | < 2.88E-06          | < 0.500 | < 0.088 | < 1.02E-05 | < 2.06E-06          | < 0.200 | < 0.035 | < 4.08E-06 | < 8.22E-07          | Ag |
| Thallium   | < 3.500 | < 0.616 | < 7.14E-05 | < 1.44E-05          | < 2.500 | < 0.440 | < 5.10E-05 | < 1.03E-05          | < 1.000 | < 0.176 | < 2.04E-05 | < 4.11E-06          | Tl |
| Vanadium   | < 0.350 | < 0.062 | < 7.14E-06 | < 1.44E-06          | < 0.250 | < 0.044 | < 5.10E-06 | < 1.03E-06          | < 0.100 | < 0.018 | < 2.04E-06 | < 4.11E-07          | V  |
| Zinc       | 11.887  | 2.091   | 2.42E-04   | 4.89E-05            | 6.960   | 1.224   | 1.42E-04   | 2.86E-05            | 4.927   | 0.867   | 1.00E-04   | 2.03E-05            | Zn |
| TSM        |         |         | < 5.18E-03 | < 1.04E-03          |         |         |            |                     |         |         |            |                     |    |

| Run 2      |         |         |            |                     |         |         |            |                     |         |         |            |                     |    |
|------------|---------|---------|------------|---------------------|---------|---------|------------|---------------------|---------|---------|------------|---------------------|----|
| Total      |         |         |            |                     | FH Net  |         |            |                     | BH Net  |         |            |                     |    |
| Species    | µg      | µg/dscm | lb/hr      | lb/ton steel melted | µg      | µg/dscm | lb/hr      | lb/ton steel melted | µg      | µg/dscm | lb/hr      | lb/ton steel melted |    |
| Aluminum   | 109.480 | 17.241  | 1.88E-03   | 4.38E-04            | 86.300  | 13.591  | 1.48E-03   | 3.45E-04            | 23.180  | 3.650   | 3.99E-04   | 9.27E-05            | Al |
| Antimony   | < 1.750 | < 0.276 | < 3.01E-05 | < 7.00E-06          | < 1.250 | < 0.197 | < 2.15E-05 | < 5.00E-06          | < 0.500 | < 0.079 | < 8.60E-06 | < 2.00E-06          | Sb |
| Arsenic    | < 2.360 | < 0.372 | < 4.06E-05 | < 9.44E-06          | 1.660   | 0.261   | 2.86E-05   | 6.64E-06            | < 0.700 | < 0.110 | < 1.20E-05 | < 2.80E-06          | As |
| Barium     | 3.480   | 0.548   | 5.99E-05   | 1.39E-05            | 2.221   | 0.350   | 3.82E-05   | 8.88E-06            | 1.259   | 0.198   | 2.17E-05   | 5.04E-06            | Ba |
| Beryllium  | < 0.070 | < 0.011 | < 1.20E-06 | < 2.80E-07          | < 0.050 | < 0.008 | < 8.60E-07 | < 2.00E-07          | < 0.020 | < 0.003 | < 3.44E-07 | < 8.00E-08          | Be |
| Cadmium    | < 0.116 | < 0.018 | < 2.00E-06 | < 4.64E-07          | 0.076   | 0.012   | 1.31E-06   | 3.04E-07            | < 0.040 | < 0.006 | < 6.88E-07 | < 1.60E-07          | Cd |
| Chromium   | 2.392   | 0.377   | 4.11E-05   | 9.57E-06            | 2.006   | 0.316   | 3.45E-05   | 8.02E-06            | 0.386   | 0.061   | 6.64E-06   | 1.54E-06            | Cr |
| Cobalt     | < 0.754 | < 0.119 | < 1.30E-05 | < 3.02E-06          | < 0.125 | < 0.020 | < 2.15E-06 | < 5.00E-07          | 0.629   | 0.099   | 1.08E-05   | 2.52E-06            | Co |
| Copper     | 5.380   | 0.847   | 9.25E-05   | 2.15E-05            | 3.410   | 0.537   | 5.87E-05   | 1.36E-05            | 1.970   | 0.310   | 3.39E-05   | 7.88E-06            | Cu |
| Lead       | 0.890   | 0.140   | 1.53E-05   | 3.56E-06            | 0.890   | 0.140   | 1.53E-05   | 3.56E-06            | 0.000   | 0.000   | 0.00E+00   | 0.00E+00            | Pb |
| Manganese  | 138.931 | 21.879  | 2.39E-03   | 5.56E-04            | 135.653 | 21.363  | 2.33E-03   | 5.43E-04            | 3.278   | 0.516   | 5.64E-05   | 1.31E-05            | Mn |
| Nickel     | 1.657   | 0.261   | 2.85E-05   | 6.63E-06            | 0.991   | 0.156   | 1.70E-05   | 3.96E-06            | 0.666   | 0.105   | 1.15E-05   | 2.66E-06            | Ni |
| Phosphorus | < 5.970 | < 0.940 | < 1.03E-04 | < 2.39E-05          | 3.970   | 0.625   | 6.83E-05   | 1.59E-05            | < 2.000 | < 0.315 | < 3.44E-05 | 8.00E-06            | P  |
| Selenium   | < 7.540 | < 1.187 | < 1.30E-04 | < 3.02E-05          | 6.040   | 0.951   | 1.04E-04   | 2.42E-05            | < 1.500 | < 0.236 | < 2.58E-05 | 6.00E-06            | Se |
| Silver     | < 0.700 | < 0.110 | < 1.20E-05 | < 2.80E-06          | < 0.500 | < 0.079 | < 8.60E-06 | < 2.00E-06          | < 0.200 | < 0.031 | < 3.44E-06 | 8.00E-07            | Ag |
| Thallium   | < 3.500 | < 0.551 | < 6.02E-05 | < 1.40E-05          | < 2.500 | < 0.394 | < 4.30E-05 | < 1.00E-05          | < 1.000 | < 0.157 | < 1.72E-05 | 4.00E-06            | Tl |
| Vanadium   | < 0.350 | < 0.055 | < 6.02E-06 | < 1.40E-06          | < 0.250 | < 0.039 | < 4.30E-06 | < 1.00E-06          | < 0.100 | < 0.016 | < 1.72E-06 | 4.00E-07            | V  |
| Zinc       | 20.467  | 3.223   | 3.52E-04   | 8.19E-05            | 14.370  | 2.263   | 2.47E-04   | 5.75E-05            | 6.097   | 0.960   | 1.05E-04   | 2.44E-05            | Zn |
| TSM        |         |         | < 5.26E-03 | < 1.22E-03          |         |         |            |                     |         |         |            |                     |    |

Columbia Steel Casting  
BH 2  
Metals Results Summary

Test: M29

| Run 3      |         |         |            |                     |         |         |            |                     |         |         |            |                     |    |
|------------|---------|---------|------------|---------------------|---------|---------|------------|---------------------|---------|---------|------------|---------------------|----|
| Total      |         |         |            |                     | FH Net  |         |            |                     | BH Net  |         |            |                     |    |
| Species    | µg      | µg/dscm | lb/hr      | lb/ton steel melted | µg      | µg/dscm | lb/hr      | lb/ton steel melted | µg      | µg/dscm | lb/hr      | lb/ton steel melted |    |
| Aluminum   | 57.205  | 5.806   | 7.17E-04   | 1.16E-04            | 19.300  | 1.959   | 2.42E-04   | 3.90E-05            | 37.905  | 3.847   | 4.75E-04   | 7.66E-05            | Al |
| Antimony   | < 1.992 | < 0.202 | < 2.50E-05 | < 4.02E-06          | < 1.250 | < 0.127 | < 1.57E-05 | < 2.52E-06          | 0.742   | 0.075   | 9.31E-06   | 1.50E-06            | Sb |
| Arsenic    | < 0.700 | < 0.071 | < 8.78E-06 | < 1.41E-06          | 0.000   | 0.000   | 0.00E+00   | 0.00E+00            | < 0.700 | < 0.071 | < 8.78E-06 | < 1.41E-06          | As |
| Barium     | 0.506   | 0.051   | 6.35E-06   | 1.02E-06            | 0.281   | 0.029   | 3.52E-06   | 5.67E-07            | 0.225   | 0.023   | 2.82E-06   | 4.54E-07            | Ba |
| Beryllium  | < 0.070 | < 0.007 | < 8.78E-07 | < 1.41E-07          | < 0.050 | < 0.005 | < 6.27E-07 | < 1.01E-07          | < 0.020 | < 0.002 | < 2.51E-07 | < 4.04E-08          | Be |
| Cadmium    | < 0.040 | < 0.004 | < 5.02E-07 | < 8.08E-08          | 0.000   | 0.000   | 0.00E+00   | 0.00E+00            | < 0.040 | < 0.004 | < 5.02E-07 | < 8.08E-08          | Cd |
| Chromium   | 1.674   | 0.170   | 2.10E-05   | 3.38E-06            | 1.376   | 0.140   | 1.73E-05   | 2.78E-06            | 0.298   | 0.030   | 3.74E-06   | 6.02E-07            | Cr |
| Cobalt     | < 0.175 | < 0.018 | < 2.20E-06 | < 3.53E-07          | < 0.125 | < 0.013 | < 1.57E-06 | < 2.52E-07          | < 0.050 | < 0.005 | < 6.27E-07 | < 1.01E-07          | Co |
| Copper     | 5.310   | 0.539   | 6.66E-05   | 1.07E-05            | 3.050   | 0.310   | 3.83E-05   | 6.16E-06            | 2.260   | 0.229   | 2.83E-05   | 4.56E-06            | Cu |
| Lead       | 0.000   | 0.000   | 0.00E+00   | 0.00E+00            | 0.000   | 0.000   | 0.00E+00   | 0.00E+00            | 0.000   | 0.000   | 0.00E+00   | 0.00E+00            | Pb |
| Manganese  | 104.631 | 10.619  | 1.31E-03   | 2.11E-04            | 102.653 | 10.418  | 1.29E-03   | 2.07E-04            | 1.978   | 0.201   | 2.48E-05   | 3.99E-06            | Mn |
| Nickel     | 1.124   | 0.114   | 1.41E-05   | 2.27E-06            | 0.772   | 0.078   | 9.68E-06   | 1.56E-06            | 0.352   | 0.036   | 4.42E-06   | 7.11E-07            | Ni |
| Phosphorus | < 4.170 | < 0.423 | < 5.23E-05 | < 8.42E-06          | 2.170   | 0.220   | 2.72E-05   | 4.38E-06            | < 2.000 | < 0.203 | < 2.51E-05 | 4.04E-06            | P  |
| Selenium   | < 5.250 | < 0.533 | < 6.58E-05 | < 1.06E-05          | < 3.750 | < 0.381 | < 4.70E-05 | < 7.57E-06          | < 1.500 | < 0.152 | < 1.88E-05 | 3.03E-06            | Se |
| Silver     | < 0.700 | < 0.071 | < 8.78E-06 | < 1.41E-06          | < 0.500 | < 0.051 | < 6.27E-06 | < 1.01E-06          | < 0.200 | < 0.020 | < 2.51E-06 | 4.04E-07            | Ag |
| Thallium   | < 3.500 | < 0.355 | < 4.39E-05 | < 7.07E-06          | < 2.500 | < 0.254 | < 3.14E-05 | < 5.05E-06          | < 1.000 | < 0.101 | < 1.25E-05 | 2.02E-06            | Tl |
| Vanadium   | < 0.350 | < 0.036 | < 4.39E-06 | < 7.07E-07          | < 0.250 | < 0.025 | < 3.14E-06 | < 5.05E-07          | < 0.100 | < 0.010 | < 1.25E-06 | 2.02E-07            | V  |
| Zinc       | 18.507  | 1.878   | 2.32E-04   | 3.74E-05            | 9.570   | 0.971   | 1.20E-04   | 1.93E-05            | 8.937   | 0.907   | 1.12E-04   | 1.80E-05            | Zn |
| TSM        |         |         | < 2.58E-03 | < 4.16E-04          |         |         |            |                     |         |         |            |                     |    |

| Mean Runs 1-3 |          |         |            |                     |          |         |            |                     |         |         |            |                     |    |
|---------------|----------|---------|------------|---------------------|----------|---------|------------|---------------------|---------|---------|------------|---------------------|----|
| Total         |          |         |            |                     | FH Net   |         |            |                     | BH Net  |         |            |                     |    |
| Species       | µg       | µg/dscm | lb/hr      | lb/ton steel melted | µg       | µg/dscm | lb/hr      | lb/ton steel melted | µg      | µg/dscm | lb/hr      | lb/ton steel melted |    |
| Aluminum      | 75.443   | 11.179  | 1.27E-03   | 2.66E-04            | 43.967   | 6.725   | 7.54E-04   | 1.64E-04            | 31.477  | 4.454   | 5.18E-04   | 1.02E-04            | Al |
| Antimony      | < 2.011  | < 0.294 | < 3.39E-05 | < 6.81E-06          | < 1.250  | < 0.181 | < 2.09E-05 | < 4.22E-06          | < 0.761 | < 0.112 | < 1.30E-05 | < 2.59E-06          | Sb |
| Arsenic       | < 1.253  | < 0.189 | < 2.12E-05 | < 4.58E-06          | 0.553    | 0.087   | 9.52E-06   | 2.21E-06            | < 0.700 | < 0.101 | < 1.17E-05 | < 2.36E-06          | As |
| Barium        | 1.885    | 0.298   | 3.34E-05   | 7.27E-06            | 1.161    | 0.184   | 2.06E-05   | 4.49E-06            | 0.724   | 0.114   | 1.28E-05   | 2.77E-06            | Ba |
| Beryllium     | < 0.070  | < 0.010 | < 1.17E-06 | < 2.36E-07          | < 0.050  | < 0.007 | < 8.35E-07 | < 1.69E-07          | < 0.020 | < 0.003 | < 3.34E-07 | < 6.76E-08          | Be |
| Cadmium       | < 0.108  | < 0.017 | < 1.97E-06 | < 4.12E-07          | 0.068    | 0.011   | 1.31E-06   | 2.77E-07            | < 0.040 | < 0.006 | < 6.69E-07 | < 1.35E-07          | Cd |
| Chromium      | 2.144    | 0.321   | 3.68E-05   | 7.56E-06            | 1.756    | 0.262   | 3.01E-05   | 6.19E-06            | 0.388   | 0.059   | 6.73E-06   | 1.37E-06            | Cr |
| Cobalt        | < 0.611  | < 0.098 | < 1.12E-05 | < 2.36E-06          | < 0.125  | < 0.018 | < 2.09E-06 | < 4.22E-07          | < 0.486 | < 0.080 | < 9.10E-06 | < 1.94E-06          | Co |
| Copper        | 6.197    | 0.925   | 1.07E-04   | 2.16E-05            | 3.297    | 0.483   | 5.56E-05   | 1.13E-05            | 2.900   | 0.442   | 5.11E-05   | 1.03E-05            | Cu |
| Lead          | 0.457    | 0.075   | 8.36E-06   | 1.84E-06            | 0.400    | 0.065   | 7.21E-06   | 1.61E-06            | 0.057   | 0.010   | 1.16E-06   | 2.33E-07            | Pb |
| Manganese     | 131.781  | 19.732  | 2.27E-03   | 4.64E-04            | 128.986  | 19.310  | 2.22E-03   | 4.54E-04            | 2.795   | 0.422   | 4.83E-05   | 9.99E-06            | Mn |
| Nickel        | 1.377    | 0.204   | 2.34E-05   | 4.82E-06            | 0.895    | 0.132   | 1.52E-05   | 3.10E-06            | 0.482   | 0.072   | 8.20E-06   | 1.71E-06            | Ni |
| Phosphorus    | < 4.370  | < 0.629 | < 7.18E-05 | < 1.48E-05          | 2.370    | 0.339   | 3.84E-05   | 8.08E-06            | < 2.000 | < 0.290 | < 3.34E-05 | 6.75E-06            | P  |
| Selenium      | < 6.013  | < 0.881 | < 1.01E-04 | < 2.08E-05          | < 4.513  | < 0.664 | < 7.58E-05 | < 1.57E-05          | < 1.500 | < 0.217 | < 2.51E-05 | 5.07E-06            | Se |
| Silver        | < 0.700  | < 0.101 | < 1.17E-05 | < 2.36E-06          | < 0.500  | < 0.072 | < 8.36E-06 | < 1.69E-06          | < 0.200 | < 0.029 | < 3.34E-06 | 6.75E-07            | Ag |
| Thallium      | < 3.500  | < 0.507 | < 5.85E-05 | < 1.18E-05          | < 2.500  | < 0.362 | < 4.18E-05 | < 8.44E-06          | < 1.000 | < 0.145 | < 1.67E-05 | 3.38E-06            | Tl |
| Vanadium      | < 0.350  | < 0.051 | < 5.85E-06 | < 1.18E-06          | < 0.250  | < 0.036 | < 4.18E-06 | < 8.44E-07          | < 0.100 | < 0.014 | < 1.67E-06 | 3.38E-07            | V  |
| Zinc          | 16.954   | 2.397   | 2.75E-04   | 5.60E-05            | 10.300   | 1.486   | 1.70E-04   | 3.51E-05            | 6.654   | 0.911   | 1.06E-04   | 2.09E-05            | Zn |
| Total:        | < 255.22 | < 37.91 | < 4.34E-03 | < 8.94E-04          | < 202.94 | < 30.43 | < 3.47E-03 | < 7.22E-04          | < 52.28 | < 7.48  | < 8.67E-04 | < 1.73E-04          |    |

'<' denotes results which were calculated using the minimum detection limit for front half or back half results that were non-detect.



# BISON

## RING, INC.

|           |                         |
|-----------|-------------------------|
| COMPANY   | Columbia Steel Casting  |
| FACILITY  | Steel Foundry           |
| LOCATION  | Portland, OR            |
| SOURCE    | BH 2                    |
| DATES     | 12/10/2020 - 12/16/2020 |
| METHOD    | 0061                    |
| POLLUTANT | Cr <sub>6</sub>         |

**Isokinetic Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** BH 2  
**EPA Method:** 0061  
**Box Operator:** RTM  
**Technician(s):** RTM/ZDH

**Environmental Conditions/Test Notes:**

40s F and intermittent rain.  
Batch process ended after 6 hr, 13 min and 21 secs (between points 12 and 13).

**Run:** 1  
**Start Date/Time:** 12/10/2020 22:23  
**End Date/Time:** 12/11/2020 5:10

**Stack Dimensional Data:**

Circular  
Diameter 46.500 in  
Rectangular  
Width in  
Length in  
Stack Area 11.793 sq.ft.

**Equipment:**

Meterbox ID Box 11  
Y factor 0.9656  
ΔH@ 1.864  
Probe ID 5C  
Nozzle ID 0.21  
Hot box ID NA  
Pitot Cp 0.84  
Pitot ID 5C  
Liner type glass  
Nozzle size 0.2100 inches  
Nozzle area 0.000241 sq.ft.  
Probe heat 250 F  
Filter heat NA F

**Source Information:**

Barometric Pressure 30.09 "Hg  
Static Pressure 0.95 "H<sub>2</sub>O  
Ave. ΔP 1.2 "H<sub>2</sub>O  
Stack Temperature 75 F  
Assumed moisture 0.5 %  
Assumed meter temp. 58 F  
Total number of points 16  
Time per point 30  
Total run time 373.4 Minutes  
O<sub>2</sub> 20.90 %  
CO<sub>2</sub> 0.00 %  
Rec. Nz. 0.196 inches

**Leak Checks:**

|                        | Pre-test | Post-test |
|------------------------|----------|-----------|
| Pitot                  | x        | x         |
| Train leak rate, dcf   | 0.000    | 0.000     |
| Leak check vacuum, "Hg | 15       | 16        |

**Nozzle check for roundness:**

| 1           | 2     | 3            |
|-------------|-------|--------------|
| 0.210       | 0.210 | 0.210 inches |
| Caliper ID# |       | WS2          |

**Post Test Calculations:**

Sample volume 241.078 dcf  
Wet mol. weight 28.8 M<sub>s</sub> (actual)  
Actual H<sub>2</sub>O 0.36 %  
Std. meter vol. 235.901 dscf  
Isokinetic Average 99.7 %  
Ave. ΔP 0.615 "H<sub>2</sub>O  
Ave. √ΔP 0.7823 "H<sub>2</sub>O  
Ave. ΔH 1.35 "H<sub>2</sub>O  
Ave. T<sub>s</sub> 71.7 °F  
Ave. T<sub>m</sub> 65.5 °F

**Moisture/Lab:**

| Filter            | NA #    |        |       |
|-------------------|---------|--------|-------|
|                   | Initial | Final  | Gain  |
| Impingers, g      | 303.5   | 273.7  | -29.8 |
| Silica gel, g     | 1886.5  | 1934.3 | 47.8  |
| Total water gain: |         |        | 18.0  |

| Traverse Point | Time (min.) | Meter Volume (dcf) | Velocity P ("H <sub>2</sub> O) | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum ("Hg) | Filter Box (°F) | Condenser Temp F |
|----------------|-------------|--------------------|--------------------------------|------------------|------------------|---------|-------|--------------|-----------------|------------------|
| 1              | 30.0        | 597.472            | 0.78                           | 53               | 63               | 1.75    | 1.75  | 4            | NA              | 39               |
| 2              | 60.0        | 619.666            | 0.51                           | 63               | 66               | 1.13    | 1.10  | 3            | NA              | 46               |
| 3              | 90.0        | 637.497            | 0.57                           | 64               | 69               | 1.27    | 1.30  | 3            | NA              | 47               |
| 4              | 120.0       | 656.497            | 0.72                           | 69               | 70               | 1.59    | 1.60  | 3            | NA              | 44               |
| 5              | 150.0       | 677.724            | 0.57                           | 69               | 68               | 1.25    | 1.30  | 3            | NA              | 47               |
| 6              | 180.0       | 696.651            | 0.60                           | 68               | 48               | 1.27    | 1.30  | 3            | NA              | 49               |
| 7              | 210.0       | 715.221            | 0.65                           | 72               | 68               | 1.42    | 1.40  | 3            | NA              | 47               |
| 8              | 240.0       | 735.333            | 0.56                           | 76               | 67               | 1.21    | 1.20  | 3            | NA              | 47               |
| 9              | 270.0       | 753.845            | 0.51                           | 78               | 66               | 1.10    | 1.10  | 3            | NA              | 42               |
| 10             | 300.0       | 771.485            | 0.69                           | 78               | 67               | 1.49    | 1.50  | 3            | NA              | 43               |
| 11             | 330.0       | 791.997            | 0.69                           | 78               | 67               | 1.49    | 1.50  | 3            | NA              | 42               |
| 12             | 360.0       | 812.441            | 0.60                           | 82               | 66               | 1.28    | 1.30  | 2            | NA              | 42               |
| 13             | 373.4       | 831.387            | 0.54                           | 82               | 66               | 1.16    | 1.20  | 2            | NA              | 41               |
|                |             | 838.550            |                                |                  |                  |         |       |              |                 |                  |

**Isokinetic Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** BH 2  
**EPA Method:** 0061  
**Box Operator:** RTM  
**Technician(s):** RTM/ZDH

**Environmental Conditions/Test Notes:**  
40s F and intermittent rain.  
Batch process ended after 4 hrs, 1 min. and 17 seconds.

**Run:** 2  
**Start Date/Time:** 12/1 /2020 22 1  
**End Date/Time:** 12/15/2020 2:55

**Stack Dimensional Data:**

Circular  
Diameter 46.500 in  
Rectangular  
Width in  
Length in  
Stack Area 11.793 sq.ft.

**Equipment:**

Meterbox ID Box 11 Probe ID 5C Liner type: glass  
Y factor 0.9656 Nozzle ID 0.26 Nozzle size: 0.2607 inches  
 $\Delta H@$  1.864 Hot box ID NA Nozzle area: 0.000371 sq.ft.  
Pitot Cp 0.84 Probe heat: 250 F  
Pitot ID 5C Filter heat: NA F

**Source Information:**

Barometric Pressure 30.27 "Hg O<sub>2</sub> 20.9 %  
Static Pressure 0.95 "H<sub>2</sub>O CO<sub>2</sub> 0.0 %  
Ave.  $\Delta P$  1.2 "H<sub>2</sub>O Rec. Nz. 0.195 inches  
Stack Temperature 75 F  
Assumed moisture 0.36 %  
Assumed meter temp. 65.5 F  
Total number of points 16  
Time per point 30  
Total run time 241.3 Minutes

**Leak Checks:**

|                         | Pre-test | Post-test |
|-------------------------|----------|-----------|
| Pitot:                  | x        | x         |
| Train leak rate, dcf:   | 0.000    | 0.000     |
| Leak check vacuum, "Hg: | 15       | 22        |

**Nozzle check for roundness:**

| 1           | 2     | 3            |
|-------------|-------|--------------|
| 0.261       | 0.260 | 0.261 inches |
| Caliper ID# |       | WS 2         |

**Post Test Calculations:**

Sample volume 259.666 dcf Ave.  $\Delta P$  0.708 "H<sub>2</sub>O  
Wet mol. weight 28.77 M<sub>s</sub> (actual) Ave.  $\sqrt{\Delta P}$  0.8412 "H<sub>2</sub>O  
Actual H<sub>2</sub>O 0.63 % Ave.  $\Delta H$  3.689 "H<sub>2</sub>O  
Std. meter vol. 257.690 dscf Ave. T<sub>s</sub> 67.2 °F  
Isokinetic Average 101.3 % Ave. T<sub>m</sub> 64.2 °F

**Moisture/Lab:**

| Filter            | NA # | Initial | Final | Gain  |
|-------------------|------|---------|-------|-------|
| Impingers, g      |      | 310.7   | 214.5 | -96.2 |
| Silica gel, g     |      | 943.1   | 1074  | 130.9 |
| Total water gain: |      |         |       | 34.7  |

| Traverse Point | Time (min.) | Meter Volume (dcf) | Velocity P ("H <sub>2</sub> O) | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum ("Hg) | Filter Box (°F) | Condenser Temp F |
|----------------|-------------|--------------------|--------------------------------|------------------|------------------|---------|-------|--------------|-----------------|------------------|
| 1              | 30.0        | 839.816            | 0.75                           | 53               | 67               | 4.04    | 4.00  | 9            | NA              | 36               |
| 2              | 60.0        | 875.412            | 0.66                           | 60               | 63               | 3.48    | 3.50  | 8            | NA              | 51               |
| 3              | 90.0        | 906.578            | 0.71                           | 64               | 65               | 3.73    | 3.70  | 9            | NA              | 56               |
| 4              | 120.0       | 938.845            | 0.69                           | 67               | 64               | 3.60    | 3.60  | 9            | NA              | 58               |
| 5              | 150.0       | 970.577            | 0.73                           | 58               | 64               | 3.87    | 3.90  | 10           | NA              | 56               |
| 6              | 180.0       | 1003.132           | 0.74                           | 77               | 64               | 3.79    | 3.80  | 10           | NA              | 52               |
| 7              | 210.0       | 1035.454           | 0.70                           | 76               | 63               | 3.58    | 3.60  | 10           | NA              | 52               |
| 8              | 240.0       | 1067.003           | 0.69                           | 75               | 64               | 3.55    | 3.50  | 9            | NA              | 48               |
| 9              | 241.3       | 1098.600           | 0.70                           | 75               | 64               | 3.60    | 3.60  | 9            | NA              | 48               |
|                |             | 1099.482           |                                |                  |                  |         |       |              |                 |                  |

**Isokinetic Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** BH 2  
**EPA Method:** 0061  
**Box Operator:** RTM  
**Technician(s):** RTM/ZDH

**Run:** 3  
**Start Date/Time:** 12/15/2020 22:02  
**End Date/Time:** 12/16/2020 4:13  
**Environmental Conditions/Test Notes:**  
40s F and intermittent rain.  
Batch process ended after 5 hr, 35 min and 22 secs (between points 11 and 12).

**Stack Dimensional Data:**

Circular  
Diameter 46.500 in  
Rectangular  
Width in  
Length in  
Stack Area 11.793 sq.ft.

**Equipment:**

Meterbox ID Box 11 Probe ID 5C Liner type: glass  
Y factor 0.9656 Nozzle ID 0.26 Nozzle size: 0.2607 inches  
 $\Delta H@$  1.864 Hot box ID NA Nozzle area: 0.000371 sq.ft.  
Pitot Cp 0.84 Probe heat: 250 F  
Pitot ID 5C Filter heat: NA F

**Source Information:**

Barometric Pressure 30.18 "Hg O<sub>2</sub> 20.9 %  
Static Pressure 0.95 "H<sub>2</sub>O CO<sub>2</sub> 0.0 %  
Ave.  $\Delta P$  1.2 "H<sub>2</sub>O Rec. Nz. 0.195 inches  
Stack Temperature 75 F  
Assumed moisture 0.63 %  
Assumed meter temp. 64.2 F  
Total number of points 16  
Time per point 30  
Total run time 335.4 Minutes

**Leak Checks:**

|                         | Pre-test | Post-test |
|-------------------------|----------|-----------|
| Pitot:                  | x        | x         |
| Train leak rate, dcf:   | 0.000    | 0.000     |
| Leak check vacuum, "Hg: | 22       | 20        |

**Nozzle check for roundness:**

| 1           | 2     | 3            |
|-------------|-------|--------------|
| 0.261       | 0.260 | 0.261 inches |
| Caliper ID# |       | WS 2         |

**Post Test Calculations:**

Sample volume 373.664 dcf Ave.  $\Delta P$  0.78 "H<sub>2</sub>O  
Wet mol. weight 28.7 M<sub>s</sub> (actual) Ave.  $\sqrt{\Delta P}$  0.8829 "H<sub>2</sub>O  
Actual H<sub>2</sub>O 1.29 % Ave.  $\Delta H$  3.975 "H<sub>2</sub>O  
Std. meter vol. 368.366 dscf Ave. T<sub>s</sub> 79.2 °F  
Isokinetic Average 101.1 % Ave. T<sub>m</sub> 66.5 °F

**Moisture/Lab:**

| Filter            | NA #    |        | Gain  |
|-------------------|---------|--------|-------|
|                   | Initial | Final  |       |
| Impingers, g      | 305.9   | 311.7  | 5.8   |
| Silica gel, g     | 1815.6  | 1912.2 | 96.6  |
| Total water gain: |         |        | 102.4 |

| Traverse Point | Time (min.) | Meter Volume (dcf) | Velocity P ("H <sub>2</sub> O) | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum ("Hg) | Filter Box (°F) | Condenser Temp F |
|----------------|-------------|--------------------|--------------------------------|------------------|------------------|---------|-------|--------------|-----------------|------------------|
| 1              | 30.0        | 134.426            | 0.77                           | 58               | 71               | 4.12    | 4.10  | 8            | NA              | 43               |
| 2              | 60.0        | 169.321            | 0.83                           | 65               | 67               | 4.35    | 4.40  | 10           | NA              | 46               |
| 3              | 90.0        | 204.023            | 0.82                           | 67               | 68               | 4.29    | 4.30  | 10           | NA              | 51               |
| 4              | 120.0       | 237.315            | 0.77                           | 75               | 67               | 3.96    | 4.00  | 9            | NA              | 52               |
| 5              | 150.0       | 270.264            | 0.77                           | 88               | 68               | 3.88    | 3.90  | 9            | NA              | 46               |
| 6              | 180.0       | 303.361            | 0.80                           | 76               | 53               | 4.00    | 4.00  | 9            | NA              | 51               |
| 7              | 210.0       | 337.121            | 0.79                           | 78               | 67               | 4.04    | 4.00  | 9            | NA              | 51               |
| 8              | 240.0       | 371.103            | 0.80                           | 83               | 68               | 4.06    | 4.00  | 9            | NA              | 51               |
| 9              | 270.0       | 402.766            | 0.73                           | 106              | 67               | 3.55    | 3.60  | 6            | NA              | 40               |
| 10             | 300.0       | 433.712            | 0.68                           | 85               | 67               | 3.43    | 3.40  | 6            | NA              | 42               |
| 11             | 330.0       | 467.546            | 0.80                           | 84               | 68               | 4.06    | 4.00  | 6            | NA              | 42               |
| 12             | 335.4       | 473.664            | 0.80                           | 85               | 67               | 4.04    | 4.00  | 6            | NA              | 45               |

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Emissions and Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** BH 2  
**Method:** 0061

**Run: 1**  
**Start Date/Time:** 12/10/2020 22:23  
**End Date/Time:** 12/11/2020 5:10

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 597.472                  |                                 |                            |                   |                         |                            |             |
| 30            | 619.666                  | 1.75                            | 63                         | 1                 | 0.78                    | 53                         | 0.8832      |
| 60            | 637.497                  | 1.10                            | 66                         | 2                 | 0.51                    | 63                         | 0.7141      |
| 90            | 656.497                  | 1.30                            | 69                         | 3                 | 0.57                    | 64                         | 0.7550      |
| 120           | 677.724                  | 1.60                            | 70                         | 4                 | 0.72                    | 69                         | 0.8485      |
| 150           | 696.651                  | 1.30                            | 68                         | 5                 | 0.57                    | 69                         | 0.7550      |
| 180           | 715.221                  | 1.30                            | 48                         | 6                 | 0.60                    | 68                         | 0.7746      |
| 210           | 735.333                  | 1.40                            | 68                         | 7                 | 0.65                    | 72                         | 0.8062      |
| 240           | 753.845                  | 1.20                            | 67                         | 8                 | 0.56                    | 76                         | 0.7483      |
| 270           | 771.485                  | 1.10                            | 66                         | 9                 | 0.51                    | 78                         | 0.7141      |
| 300           | 791.997                  | 1.50                            | 67                         | 10                | 0.69                    | 78                         | 0.8307      |
| 330           | 812.441                  | 1.50                            | 67                         | 11                | 0.69                    | 78                         | 0.8307      |
| 360           | 831.387                  | 1.30                            | 66                         | 12                | 0.60                    | 82                         | 0.7746      |
| 373           | 838.550                  | 1.20                            | 66                         | 13                | 0.54                    | 82                         | 0.7348      |

**Client:** Columbia Steel Casting  
**Source:** BH 2

**Run:** 1  
**Dates:** 12/10/20-12/11/20

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**Field Data Input Continued**Moisture Data

Total Test Time 373.4 min  
Sample Time Interval 30.0 min  
Meter Volume,  $V_m$  241.078 dcf  
Water Volume 18.0 g  
Nozzle Diameter,  $N_z$  0.2100 in.  
Nozzle Area 0.000241 sq.ft.

Stack Dimensional Data:

Circular  
Diameter 46.500 in  
Rectangular  
Width in  
Length in  
Stack Area 11.793 sq.ft.

Traverse Data

Barometric Pressure,  $P_b$  30.09 "Hg  
Static Pressure 0.95 "H<sub>2</sub>O  
Pitot Factor, cp 0.84  
Meter Cal Factor 0.9656 Y

Molecular Weight:

CO<sub>2</sub> Average 0.13 %vd  
O<sub>2</sub> Average 20.76 %vd

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**Field Data Averages**Meter

$\Delta H$  1.350 "H<sub>2</sub>O  
Temperature,  $T_m$  65.5 °F  
Temperature,  $T_m$  525.5 °A (°R)  
Pressure Meter,  $P_m$  30.189 "Hg

Stack

$\sqrt{D_p}$  0.7823 "H<sub>2</sub>O  
Temperature,  $T_s$  71.7 °F  
Temperature,  $T_s$  531.7 °A (R)  
Pressure Stack,  $P_s$  30.160 "Hg

**Field Data Calculations**Meter Box Capture

Standard Volume,  $V_{m(std)}$  235.901 dscf  
6.680 dscm  
Actual Volume,  $V_{m(actual)}$  236.610 awcf

Gas Stream Moisture

Moisture Vapor,  $V_{w(std)}$  0.847 scf  
Moisture,  $B_{ws}$  0.0036  
Moisture EPA M4 0.36 %v

EPA Method 3 Gas Density

Dry,  $M_d$  28.85 lb/lb-mole  
Wet,  $M_s$  28.81 lb/lb-mole

EPA Method 2 Stack Gas Flowrate:

Velocity,  $V_s$  43.95 fps  
Volume (actual) 31,098.1 acfm  
30,986.1 adcfm  
Volume (standard) 1,867,767.0 wscf/hr  
1,861,043.0 dscf/hr  
31,017.4 dscf/min

Volume/Mole,  $V/M$  384.881

Percent Isokinetic 99.7 %

---

**Laboratory Results**

Cr VI 0.126 µg/sample  
Cr VI 1.26E-07 grams

**Emissions:**

Concentration Cr VI,  $C_s$  8.25E-09 gr/dscf  
0.019 µg/dscm  
Mass Emissions Cr VI 2.19E-06 lb/hr

"<" represents MDL value

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Emissions and Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** BH 2  
**Method:** 0061

**Run:** 2  
**Start Date/Time:** 12/14/20 22:18  
**End Date/Time:** 12/15/20 2:55

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 839.816                  |                                 |                            |                   |                         |                            |             |
| 30            | 875.412                  | 4.00                            | 67                         | 1                 | 0.75                    | 53                         | 0.8660      |
| 60            | 906.578                  | 3.50                            | 63                         | 2                 | 0.66                    | 60                         | 0.8124      |
| 90            | 938.845                  | 3.70                            | 65                         | 3                 | 0.71                    | 64                         | 0.8426      |
| 120           | 970.577                  | 3.60                            | 64                         | 4                 | 0.69                    | 67                         | 0.8307      |
| 150           | 1003.132                 | 3.90                            | 64                         | 5                 | 0.73                    | 58                         | 0.8544      |
| 180           | 1035.454                 | 3.80                            | 64                         | 6                 | 0.74                    | 77                         | 0.8602      |
| 210           | 1067.003                 | 3.60                            | 63                         | 7                 | 0.70                    | 76                         | 0.8367      |
| 240           | 1098.600                 | 3.50                            | 64                         | 8                 | 0.69                    | 75                         | 0.8307      |
| 241           | 1099.482                 | 3.60                            | 64                         | 9                 | 0.70                    | 75                         | 0.8367      |

**Client: Columbia Steel Casting****Run: 2****Source: BH 2****Dates: 12/14/20-12/15/20****Field Data Input Continued**Moisture Data

Total Test Time 241.3 min  
 Sample Time Interval 30.0 min  
 Meter Volume,  $V_m$  259.666 dcf  
 Water Volume 34.7 g  
 Nozzle Diameter,  $N_z$  0.2607 in.  
 Nozzle Area 0.000371 sq.ft.

Stack Dimensional Data:

Circular  
 Diameter 46.500 in  
 Rectangular  
 Width in  
 Length in  
 Stack Area 11.793 sq.ft.

Traverse Data

Barometric Pressure,  $P_b$  30.27 "Hg  
 Static Pressure 0.95 "H<sub>2</sub>O  
 Pitot Factor, cp 0.84  
 Meter Cal Factor 0.9656 Y

Molecular Weight:

CO<sub>2</sub> Average 0.13 %vd  
 O<sub>2</sub> Average 20.77 %vd

**Field Data Averages**Meter

$\Delta H$  3.689 "H<sub>2</sub>O  
 Temperature,  $T_m$  64.2 °F  
 Temperature,  $T_m$  524.2 °A (°R)  
 Pressure Meter,  $P_m$  30.541 "Hg

Stack

$\sqrt{Dp}$  0.8412 "H<sub>2</sub>O  
 Temperature,  $T_s$  67.2 °F  
 Temperature,  $T_s$  527.2 °A (R)  
 Pressure Stack,  $P_s$  30.340 "Hg

**Field Data Calculations**Meter Box Capture

Standard Volume,  $V_{m(std)}$  257.690 dscf  
 7.297 dscm  
 Actual Volume,  $V_{m(actual)}$  255.448 awcf

EPA Method 2 Stack Gas Flowrate:

Velocity,  $V_s$  46.94 fps  
 Volume (actual) 33,213.8 acfm  
 33,004.6 adcfm  
 Volume (standard) 2,023,869.0 wscf/hr  
 2,011,118.6 dscf/hr  
 33,518.6 dscf/min

Gas Stream Moisture

Moisture Vapor,  $V_{w(std)}$  1.633 scf  
 Moisture,  $B_{ws}$  0.0063  
 Moisture EPA M4 0.63 %v

EPA Method 3 Gas Density

Dry,  $M_d$  28.85 lb/lb-mole  
 Wet,  $M_s$  28.78 lb/lb-mole

Volume/Mole,  $V/M$  379.359

Percent Isokinetic 101.3 %

**Laboratory Results**

Cr VI 0.041 µg/sample  
 Cr VI 4.06E-08 grams

**Emissions:**

Concentration Cr VI,  $C_s$  2.43E-09 gr/dscf  
 0.006 µg/dscm  
 Mass Emissions Cr VI 6.98E-07 lb/hr

"&lt;" represents MDL value

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Emissions and Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** BH 2  
**Method:** 0061

**Run: 3**  
**Start Date/Time:** 12/15/2020 22:02  
**End Date/Time:** 12/16/2020 4:13

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 100.000                  |                                 |                            |                   |                         |                            |             |
| 30            | 134.426                  | 4.10                            | 71                         | 1                 | 0.77                    | 58                         | 0.8775      |
| 60            | 169.321                  | 4.40                            | 67                         | 2                 | 0.83                    | 65                         | 0.9110      |
| 90            | 204.023                  | 4.30                            | 68                         | 3                 | 0.82                    | 67                         | 0.9055      |
| 120           | 237.315                  | 4.00                            | 67                         | 4                 | 0.77                    | 75                         | 0.8775      |
| 150           | 270.264                  | 3.90                            | 68                         | 5                 | 0.77                    | 88                         | 0.8775      |
| 180           | 303.361                  | 4.00                            | 53                         | 6                 | 0.80                    | 76                         | 0.8944      |
| 210           | 337.121                  | 4.00                            | 67                         | 7                 | 0.79                    | 78                         | 0.8888      |
| 240           | 371.103                  | 4.00                            | 68                         | 8                 | 0.80                    | 83                         | 0.8944      |
| 270           | 402.766                  | 3.60                            | 67                         | 9                 | 0.73                    | 106                        | 0.8544      |
| 300           | 433.712                  | 3.40                            | 67                         | 10                | 0.68                    | 85                         | 0.8246      |
| 330           | 467.546                  | 4.00                            | 68                         | 11                | 0.80                    | 84                         | 0.8944      |
| 335           | 473.664                  | 4.00                            | 67                         | 12                | 0.80                    | 85                         | 0.8944      |

**Client:** Columbia Steel Casting  
**Source:** BH 2

**Run:** 3  
**Dates:** 12/15/20-12/16/20

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**Field Data Input Continued**Moisture Data

Total Test Time 335.4 min  
Sample Time Interval 30.0 min  
Meter Volume,  $V_m$  373.664 dcf  
Water Volume 102.4 g  
Nozzle Diameter,  $N_z$  0.2607 in.  
Nozzle Area 0.000371 sq.ft.

Stack Dimensional Data:

Circular  
Diameter 46.500 in  
Rectangular  
Width in  
Length in  
Stack Area 11.793 sq.ft.

Traverse Data

Barometric Pressure,  $P_b$  30.18 "Hg  
Static Pressure 0.95 "H<sub>2</sub>O  
Pitot Factor, cp 0.84  
Meter Cal Factor 0.9656 Y

Molecular Weight:

CO<sub>2</sub> Average 0.00 %vd  
O<sub>2</sub> Average 20.65 %vd

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**Field Data Averages**Meter

$\Delta H$  3.975 "H<sub>2</sub>O  
Temperature,  $T_m$  66.5 °F  
Temperature,  $T_m$  526.5 °A (°R)  
Pressure Meter,  $P_m$  30.472 "Hg

Stack

$\sqrt{Dp}$  0.8829 "H<sub>2</sub>O  
Temperature,  $T_s$  79.2 °F  
Temperature,  $T_s$  539.2 °A (R)  
Pressure Stack,  $P_s$  30.250 "Hg

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**Field Data Calculations**Meter Box Capture

Standard Volume,  $V_{m(std)}$  368.366 dscf  
10.431 dscm  
Actual Volume,  $V_{m(actual)}$  377.090 awcf

Gas Stream Moisture

Moisture Vapor,  $V_{w(std)}$  4.819 scf  
Moisture,  $B_{ws}$  0.0129  
Moisture EPA M4 1.29 %v

EPA Method 3 Gas Density

Dry,  $M_d$  28.83 lb/lb-mole  
Wet,  $M_s$  28.69 lb/lb-mole

EPA Method 2 Stack Gas Flowrate:

Velocity,  $V_s$  49.98 fps  
Volume (actual) 35,364.8 acfm  
34,908.6 adcfm  
Volume (standard) 2,100,733.1 wscf/hr  
2,073,633.6 dscf/hr  
34,560.6 dscf/min

Volume/Mole,  $V/M$  389.149

Percent Isokinetic 101.1 %

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**Laboratory Results**

Cr VI 0.002 µg/sample  
Cr VI 1.85E-09 grams

**Emissions:**

Concentration Cr VI,  $C_s$  7.75E-11 gr/dscf  
0.000 µg/dscm  
Mass Emissions Cr VI 2.30E-08 lb/hr

"<" represents MDL value

**Method 0061**  
**Laboratory Results**  
**Cr VI**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** BH 2

| Lab ID   | Sample ID                       | Sample Date | < | Result<br>(µg/sample) | MDL<br>(µg/sample) | Sample<br>Vol. (ml) | Blank Correction<br>(µg) | Blank Corrected<br>Results (µg/sample) |
|----------|---------------------------------|-------------|---|-----------------------|--------------------|---------------------|--------------------------|----------------------------------------|
| 20-S2280 | Run 1 Cont #1                   | 12/11/2020  |   | 0.154                 | 0.0044             | 445                 | 0.028                    | 0.126                                  |
| 20-S2313 | Run 2 Cont #1                   | 12/14/2020  |   | 0.0684                | 0.0076             | 380                 | 0.028                    | 0.041                                  |
| 20-S2314 | Run 3 Cont #1                   | 12/15/2020  |   | 0.0297                | 0.0090             | 450                 | 0.028                    | 0.002                                  |
| 20-S2283 | KOH Blank                       | 12/9/2020   |   | 0.0272                | 0.0029             | 293                 | 9.28E-05                 | µg/ml                                  |
| 20-S2284 | H <sub>2</sub> O Blank          | 12/9/2020   | < | MDL                   | 0.0021             | 213                 | 0.00                     | µg/ml                                  |
| 20-S2282 | Field Train Blank (Arc Furnace) | 12/11/2020  |   | 0.0312                | 0.0043             | 433                 | 7.21E-05                 | µg/ml                                  |

\*A "<" sign designates a result less than the minimum detection limit (MDL). If sample results are below MDL, the MDL value is used for calculations.  
If blank value(s) are below MDL, no blank correction is performed.

**Method 0061**  
**Results Summary**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** BH 2

| Run                                |                               |                     | 1          | 2          | 3          | Average  |
|------------------------------------|-------------------------------|---------------------|------------|------------|------------|----------|
| Run Start Date                     |                               |                     | 12/10/2020 | 12/14/2020 | 12/15/2020 |          |
| Run Start Time                     |                               |                     | 22:23      | 22:18      | 22:02      |          |
| Run End Date                       |                               |                     | 12/11/2020 | 12/15/2020 | 12/16/2020 |          |
| Run End Time                       |                               |                     | 5:10       | 2:55       | 4:13       |          |
| Duration, min.                     |                               |                     | 373        | 241        | 335        | 317      |
| Barometric Pressure, "Hg           |                               |                     | 30.09      | 30.27      | 30.18      | 30.18    |
| Nozzle Dia., in.                   |                               |                     | 0.2100     | 0.2607     | 0.2607     | 0.2438   |
| Isokinetic Average, %              |                               |                     | 99.7       | 101.3      | 101.1      | 100.7    |
| Sample Volume, dscf                |                               |                     | 235.901    | 257.690    | 368.366    | 287.319  |
| Sample Volume, dscm                |                               |                     | 6.680      | 7.297      | 10.431     | 8.136    |
| Stack Diameter, in.                |                               |                     | 46.500     | 46.500     | 46.500     | 46.500   |
| Stack Area, sq.ft.                 |                               |                     | 11.793     | 11.793     | 11.793     | 11.793   |
| CO <sub>2</sub> %vd                |                               |                     | 0.13       | 0.13       | 0.00       | 0.09     |
| O <sub>2</sub> %vd                 |                               |                     | 20.76      | 20.77      | 20.65      | 20.73    |
| Static Pressure, "H <sub>2</sub> O |                               |                     | 0.95       | 0.95       | 0.95       | 0.95     |
| H <sub>2</sub> O %v                |                               |                     | 0.36       | 0.63       | 1.29       | 0.76     |
| Wet Molecular Weight, lb/lb-mole   |                               |                     | 28.81      | 28.78      | 28.69      | 28.76    |
| Velocity, FPS                      |                               |                     | 43.95      | 46.94      | 49.98      | 46.96    |
| ADCFM                              |                               |                     | 30,986.1   | 33,004.6   | 34,908.6   | 32,966.4 |
| ACFM                               |                               |                     | 31,098.1   | 33,213.8   | 35,364.8   | 33,225.6 |
| DSCFM                              |                               |                     | 31,017.4   | 33,518.6   | 34,560.6   | 33,032.2 |
| Stack Temperature, °F              |                               |                     | 71.7       | 67.2       | 79.2       | 72.7     |
| Cr VI                              | Concentration, C <sub>s</sub> | gr/dscf             | 8.25E-09   | 2.43E-09   | 7.75E-11   | 3.59E-09 |
|                                    |                               | µg/dscm             | 0.019      | 0.006      | 0.000      | 0.008    |
|                                    | Mass                          | lb/hr               | 2.19E-06   | 6.98E-07   | 2.30E-08   | 9.71E-07 |
|                                    |                               | lb/ton steel melted | 4.42E-07   | 1.62E-07   | 3.70E-09   | 1.88E-07 |
| Production Data                    | tons steel melted/hr          |                     | 4.96       | 4.30       | 6.21       | 5.16     |



|           |                |
|-----------|----------------|
| COMPANY   | Columbia Steel |
| FACILITY  | Steel Foundry  |
| LOCATION  | Portland, OR   |
| SOURCE    | BH 2           |
| DATE      | 12/16-17/2020  |
| METHOD    | 201A           |
| POLLUTANT | PM             |

# 201A Pre Test Field Data

## Field Data Entry

Client: Columbia Steel  
Location: Portland, OR  
Source: BH 2  
EPA Method: 201A  
Box Operator: ZDH  
Technician(s): RTM

Environmental Conditions/Test Notes:  
40-50F, intermittent rain.

Run: Pre Traverse  
Start Time: -  
End Time: -  
Date: 12/16/2020

### Stack Dimensional Data:

Circular  
Diameter 46.500 in  
Rectangular  
Width in  
Length in  
Stack Area 11.793 sq.ft.  
Stack Area 1698.192 sq.in.

### Equipment:

|             |        |           |      |              |                         |
|-------------|--------|-----------|------|--------------|-------------------------|
| Meterbox ID | 11     | Probe ID  | 5C   | Liner type   | glass                   |
| Y factor    | 0.9656 | Nozzle ID | 4    | Nozzle Dia:  | 0.164 inches            |
| ΔH@         | 1.864  | Pitot Cp' | 0.84 | Nozzle Area: | 0.00015 ft <sup>2</sup> |
|             |        | Pitot Cp  | 0.84 |              |                         |

### Source Information:

|                                  |       |                   |                                        |                  |
|----------------------------------|-------|-------------------|----------------------------------------|------------------|
| Barometric Pressure              | 29.65 | "Hg               | O <sub>2</sub>                         | 20.90 %          |
| Static Pressure                  | 0.05  | "H <sub>2</sub> O | CO <sub>2</sub>                        | 0.00 %           |
| Stack Temperature                | 76.0  | F                 |                                        |                  |
| Assumed moisture                 | 1     | %                 | Dry mol. weight (M <sub>d</sub> )      | 28.84 lb/lb-mole |
| Assumed meter temp.              | 65    | F                 | Est. Wet mol. weight (M <sub>w</sub> ) | 28.73 lb/lb-mole |
| Total number of points           | 12    |                   |                                        |                  |
| Stack Temperature                | 527.5 | R                 |                                        |                  |
| Stack Pressure (P <sub>s</sub> ) | 29.65 | "H <sub>2</sub> O |                                        |                  |
| Meter temp.                      | 525   | R                 |                                        |                  |

### Leak Checks:

| Pre-test | Post-test |
|----------|-----------|
| Pitot    | x x       |

### Pre Test Calculations:

|                           |        |                      |                              |        |    |
|---------------------------|--------|----------------------|------------------------------|--------|----|
| Estimated Q <sub>s</sub>  | 0.4051 | acfm                 | Cunningham                   | 1.0676 |    |
| Estimated N <sub>re</sub> | 3070   |                      | D <sub>50LL</sub>            | 10.67  | μm |
| Estimated ΔH              | 0.524  | in. H <sub>2</sub> O | [Nre>3162] D <sub>50LL</sub> | -      | μm |
| Viscosity (μ)             | 184.11 | micropoise           | D <sub>50T</sub>             | 10.83  | μm |

201A Pre Test Field Data  
Field Data Entry

Client: Columbia Steel  
Location: Portland, OR  
Source: BH 2  
EPA Method: 201A  
Box Operator: ZDH  
Technician(s): RTM

Environmental Conditions/Test Notes:  
40-50F, intermittent rain.

Run: Pre Traverse  
Start Time: -  
End Time: -  
Date: 12/16/2020

| Preliminary Traverse |                                   |                                      |                |                 |                     | Nozzle Selection |         |                |                  |                  |                       |                       |                     |                        |                    |                    |
|----------------------|-----------------------------------|--------------------------------------|----------------|-----------------|---------------------|------------------|---------|----------------|------------------|------------------|-----------------------|-----------------------|---------------------|------------------------|--------------------|--------------------|
| Traverse Point       | Cyclonic Flow Check<br>Null Angle | Preliminary P (in. H <sub>2</sub> O) |                |                 | Stack Temp.<br>(°F) | Nozzle           | Diam.   | V <sub>n</sub> | V <sub>min</sub> | V <sub>max</sub> | P <sub>min</sub>      | P <sub>max</sub>      | sqrt P <sub>m</sub> | Absolute<br>Null Angle | R <sub>(min)</sub> | R <sub>(max)</sub> |
|                      |                                   | P <sub>m</sub>                       | P <sub>s</sub> | P <sub>s2</sub> |                     | ID               | Dn (in) | (fps)          | (fps)            | (fps)            | (in H <sub>2</sub> O) | (in H <sub>2</sub> O) |                     |                        |                    |                    |
| 1                    | 6.0                               | 0.64                                 | 0.64           | -               | 65                  | 1                | 0.125   | 79.22          | 60.16            | 97.29            | 1.13                  | 2.96                  | 0.800               | 6.0                    | 0.75945            | 1.22817            |
| 2                    | 4.0                               | 0.61                                 | 0.61           | -               | 65                  | 2                | 0.136   | 66.92          | 50.00            | 82.72            | 0.78                  | 2.14                  | 0.781               | 4.0                    | 0.74718            | 1.23609            |
| 3                    | 0.0                               | 0.66                                 | 0.66           | -               | 65                  | 3                | 0.150   | 55.01          | 40.04            | 68.66            | 0.50                  | 1.48                  | 0.812               | 0.0                    | 0.72783            | 1.24804            |
| 4                    | 5.0                               | 0.64                                 | 0.64           | -               | 70                  | 4                | 0.164   | 46.02          | 32.37            | 58.09            | 0.33                  | 1.06                  | 0.800               | 5.0                    | 0.70342            | 1.26221            |
| 5                    | 0.0                               | 0.63                                 | 0.63           | -               | 70                  | 5                | 0.180   | 38.20          | 25.51            | 48.95            | 0.20                  | 0.75                  | 0.794               | 0.0                    | 0.66764            | 1.28127            |
| 6                    | 5.0                               | 0.66                                 | 0.66           | -               | 70                  | 6                | 0.197   | 31.89          | 19.68            | 41.62            | 0.12                  | 0.54                  | 0.812               | 5.0                    | 0.61700            | 1.30496            |
| 7                    | 5.0                               | 0.71                                 | 0.71           | -               | 70                  | 7                | 0.215   | 26.78          | 14.48            | 35.72            | 0.07                  | 0.40                  | 0.843               | 5.0                    | 0.54079            | 1.33402            |
| 8                    | 8.0                               | 0.72                                 | 0.72           | -               | 70                  | 8                | 0.233   | 22.80          | 9.35             | 31.17            | 0.03                  | 0.30                  | 0.849               | 8.0                    | 0.41012            | 1.36720            |
| 9                    | 9.0                               | 0.69                                 | 0.69           | -               | 70                  | 9                | 0.264   | 17.76          | 8.88             | 25.47            | 0.02                  | 0.20                  | 0.831               | 9.0                    | 0.50000            | 1.43389            |
| 10                   | 5.0                               | 0.74                                 | 0.74           | -               | 65                  | 10               | 0.300   | 13.75          | 6.88             | 20.63            | 0.01                  | 0.13                  | 0.860               | 5.0                    | 0.50000            | 1.50000            |
| 11                   | 4.0                               | 0.71                                 | 0.71           | -               | 65                  | 11               | 0.342   | 10.58          | 5.29             | 15.87            | 0.01                  | 0.08                  | 0.843               | 4.0                    | 0.50000            | 1.50000            |
| 12                   | 0.0                               | 0.67                                 | 0.67           | -               | 65                  | 12               | 0.390   | 8.14           | 4.07             | 12.21            | 0.01                  | 0.05                  | 0.819               | 0.0                    | 0.50000            | 1.50000            |
| Average              |                                   |                                      |                |                 |                     |                  |         |                |                  |                  |                       |                       | 0.820               | 4.25                   |                    |                    |

201A Field Data  
Field Data Entry

Page 1 of 2

Client: Columbia Steel  
Location: Portland, OR  
Source: BH 2  
EPA Method: 201A  
Box Operator: ZDH  
Technician(s): RTM

Environmental Conditions/Test Notes:  
40-50F, intermittent rain.

Run: 1  
Start Time: 22:37  
End Time: 23:46  
Date: 12/16/2020  
Filter: 445

Stack Dimensional Data:

Circular  
Diameter 46.500 in  
Rectangular  
Width - in  
Length - in  
Stack Area 11.793 sq.ft.  
Stack Area 1698.192 sq.in.

Equipment:

Meterbox ID 11  
Y factor 0.9656  
 $\Delta H @$  1.864  
Probe ID 5C  
Nozzle ID 4  
Pitot Cp 0.84  
Pitot Cp 0.84  
Liner type glass  
Nozzle size 0.1640 inches  
Nozzle area 0.00015 sq.ft.  
Probe heat 250 F

Source Information:

|                                  |        |                   |                                        |       |            |
|----------------------------------|--------|-------------------|----------------------------------------|-------|------------|
| Barometric Pressure              | 29.63  | "Hg               | O <sub>2</sub>                         | 20.97 | %          |
| Static Pressure                  | 0.95   | "H <sub>2</sub> O | CO <sub>2</sub>                        | 0.11  | %          |
| Stack Temperature                | 65     | F                 |                                        |       |            |
| Assumed moisture                 | 1      | %                 | Dry mol. weight (M <sub>d</sub> )      | 28.86 | lb/lb-mole |
| Assumed meter temp.              | 67     | F                 | Est. Wet mol. weight (M <sub>w</sub> ) | 28.75 | lb/lb-mole |
| Total number of points           | 12     |                   |                                        |       |            |
| Total projected run time         | 60.0   |                   |                                        |       |            |
| Stack Temperature                | 525.00 | R                 |                                        |       |            |
| Stack Pressure (P <sub>s</sub> ) | 29.70  | "H <sub>2</sub> O |                                        |       |            |
| Meter temp.                      | 527    | R                 |                                        |       |            |
| Meter Pressure (P <sub>m</sub> ) | 29.67  |                   |                                        |       |            |

Leak Checks:

|                        | Pre-test | Post-test |
|------------------------|----------|-----------|
| Pitot                  | x        | x         |
| Train leak rate, dcf   | 0.000    | 0.000     |
| Leak check vacuum, "Hg | 12       | 9         |

Moisture/Lab:

|                                     | Initial | Final  | Gain   |
|-------------------------------------|---------|--------|--------|
| Impingers, g                        | 2156.8  | 2155.2 | -1.6   |
| Silica gel, g                       | 839.2   | 842.4  | 3.2    |
| Total water gain:                   |         |        | 1.6    |
| Moisture Vapor, V <sub>w(mad)</sub> |         |        | 0.075  |
| Moisture, B <sub>ws</sub>           |         |        | 0.0029 |

Pre Test Calculations:

|                          | Ts - °F 50 | Ts + °F 50 | Ts (°F) |
|--------------------------|------------|------------|---------|
| Estimates                | 15         | 115        |         |
| Estimated Q <sub>s</sub> | 0.4051     | 0.4394     | 0.4648  |
| Estimated $\Delta H$     | 0.524      | 0.6514     | 0.4445  |
| Viscosity ( $\mu$ )      | 184.11     | 159.44     | 183.43  |

Post Test Calculations:

|                         |        |                         |                        |        |                   |
|-------------------------|--------|-------------------------|------------------------|--------|-------------------|
| Sample volume           | 27.339 | dcf                     | Ave. $\Delta P$        | 0.76   | "H <sub>2</sub> O |
| Wet mol. weight         | 28.82  | M <sub>w</sub> (actual) | Ave. $\sqrt{\Delta P}$ | 0.8711 | "H <sub>2</sub> O |
| Actual H <sub>2</sub> O | 0.29   | %                       | Ave. $\Delta H$        | 0.530  | "H <sub>2</sub> O |
| Std. meter vol.         | 26.107 | dscf                    | Ave. T <sub>s</sub>    | 69.3   | °F                |
| Std. meter vol.         | 0.739  | dscm                    | Ave. T <sub>m</sub>    | 69.2   | °F                |
| Isokinetic Average      | 95.2   | %                       |                        |        |                   |

Stack:

|                          |          |       |              |             |          |
|--------------------------|----------|-------|--------------|-------------|----------|
| Velocity, V <sub>s</sub> | 49.19    | fps   | Volume (std) | 2,067,894.4 | wscf/hr  |
| Volume (actual)          | 34,805.9 | acfm  |              | 2,061,897.5 | dscf/hr  |
|                          | 34,705.0 | adcfm |              | 34,365.0    | dscf/min |

| Traverse Point | Time (mm:ss) | Meter Volume (dcf) | Velocit P "H <sub>2</sub> O) |                      | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum "Hg | Probe Temp (°F) | Condenser Temp F | CPM Filter Temp >65°F <85°F | %I w/ est. Moisture |
|----------------|--------------|--------------------|------------------------------|----------------------|------------------|------------------|---------|-------|------------|-----------------|------------------|-----------------------------|---------------------|
|                |              |                    | Velocit                      | P "H <sub>2</sub> O) |                  |                  |         |       |            |                 |                  |                             |                     |
| 1              | 0:05:00      | 474.600            | 0.64                         |                      | 58               | 68               | 0.549   | 0.53  | 2          | 252             | 44               | na                          | 101.7               |
| 2              | 0:10:15      | 476.700            | 0.71                         |                      | 70               | 60               | 0.516   | 0.53  | 2          | 254             | 39               | na                          | 98.5                |
| 3              | 0:15:45      | 481.220            | 0.79                         |                      | 71               | 69               | 0.523   | 0.53  | 2          | 254             | 39               | na                          | 93.3                |
| 4              | 0:21:00      | 483.380            | 0.76                         |                      | 70               | 69               | 0.525   | 0.53  | 2          | 252             | 39               | na                          | 92.3                |
| 5              | 0:26:30      | 485.770            | 0.85                         |                      | 69               | 69               | 0.527   | 0.53  | 2          | 253             | 39               | na                          | 92.1                |
| 6              | 0:32:00      | 488.142            | 0.84                         |                      | 69               | 70               | 0.528   | 0.53  | 2          | 250             | 39               | na                          | 91.8                |
| 7              | 0:37:30      | 490.450            | 0.83                         |                      | 69               | 70               | 0.528   | 0.53  | 2          | 253             | 40               | na                          | 89.9                |
| 8              | 0:43:00      | 492.930            | 0.79                         |                      | 69               | 70               | 0.528   | 0.53  | 2          | 251             | 39               | na                          | 99.0                |
| 9              | 0:48:15      | 495.250            | 0.73                         |                      | 68               | 71               | 0.531   | 0.53  | 2          | 255             | 39               | na                          | 100.6               |
| 10             | 0:53:30      | 497.470            | 0.71                         |                      | 71               | 71               | 0.525   | 0.53  | 2          | 252             | 39               | na                          | 97.9                |
| 11             | 0:58:45      | 499.720            | 0.74                         |                      | 73               | 71               | 0.521   | 0.53  | 2          | 253             | 40               | na                          | 97.4                |
| 12             | 1:04:00      | 501.939            | 0.73                         |                      | 74               | 72               | 0.520   | 0.53  | 2          | 252             | 41               | na                          | 96.6                |

201A Field Data  
Field Data Entry

Run: 1  
Page 2 of 2

| Qs (acfm) | D <sub>50</sub> (10 μm) | Z (10 μm) | D <sub>50</sub> (2.5 μm) | Z (2.5 μm) | Sqrt P (in. H <sub>2</sub> O) | V <sub>s</sub> (fps) | Std vol per pt. | V <sub>m</sub> (dscfm) | Q <sub>Std</sub> (dscfm) | Viscosity (μm) | N <sub>re Actual</sub> | Re-estim. C <sub>r50</sub> | P min (in H <sub>2</sub> O) | P ma (in H <sub>2</sub> O) | Vn (fps) | Vmin (fps) | Vmax (fps) | Rmin | Rmax |
|-----------|-------------------------|-----------|--------------------------|------------|-------------------------------|----------------------|-----------------|------------------------|--------------------------|----------------|------------------------|----------------------------|-----------------------------|----------------------------|----------|------------|------------|------|------|
| 0.4015    | 10.76                   | -         | 2.27                     | -          | 0.800                         | 44.75                | 2.010           | 2.0107                 | 0.4021                   | 181.86         | 3143.81                | 1.065                      | 0.329                       | 1.059                      | 45.61    | 32.10      | 57.56      | 0.70 | 1.26 |
| 0.4143    | 10.69                   | 1.01      | 2.26                     | 1.00       | 0.843                         | 47.67                | 2.128           | 2.1292                 | 0.4056                   | 184.75         | 3120.93                | 1.068                      | 0.344                       | 1.101                      | 47.07    | 33.20      | 59.35      | 0.71 | 1.26 |
| 0.4143    | 10.71                   | 1.00      | 2.27                     | 1.00       | 0.889                         | 50.34                | 2.226           | 2.2268                 | 0.4049                   | 184.99         | 3111.53                | 1.067                      | 0.344                       | 1.099                      | 47.07    | 33.20      | 59.37      | 0.71 | 1.26 |
| 0.4016    | 10.93                   | 0.98      | 2.35                     | 0.97       | 0.872                         | 49.32                | 2.063           | 2.0643                 | 0.3932                   | 184.75         | 3025.80                | 1.065                      | 0.321                       | 1.038                      | 45.63    | 32.04      | 57.63      | 0.70 | 1.26 |
| 0.4234    | 10.52                   | 1.04      | 2.21                     | 1.07       | 0.922                         | 52.11                | 2.283           | 2.2841                 | 0.4153                   | 184.51         | 3199.98                | 1.069                      | 0.363                       | 1.150                      | 48.10    | 34.05      | 60.60      | 0.71 | 1.26 |
| 0.4194    | 10.59                   | 0.99      | 2.22                     | 0.99       | 0.917                         | 51.81                | 2.262           | 2.2626                 | 0.4114                   | 184.51         | 3169.89                | 1.069                      | 0.355                       | 1.129                      | 47.65    | 33.68      | 60.05      | 0.71 | 1.26 |
| 0.4081    | 10.79                   | 0.98      | 2.30                     | 0.97       | 0.911                         | 51.50                | 2.201           | 2.2016                 | 0.4003                   | 184.51         | 3084.36                | 1.066                      | 0.333                       | 1.072                      | 46.37    | 32.64      | 58.51      | 0.70 | 1.26 |
| 0.4385    | 10.26                   | 1.05      | 2.14                     | 1.07       | 0.889                         | 50.24                | 2.365           | 2.3656                 | 0.4301                   | 184.51         | 3314.22                | 1.071                      | 0.393                       | 1.229                      | 49.82    | 35.44      | 62.66      | 0.71 | 1.26 |
| 0.4281    | 10.42                   | 0.98      | 2.18                     | 0.98       | 0.854                         | 48.25                | 2.208           | 2.2088                 | 0.4207                   | 184.27         | 3246.15                | 1.070                      | 0.373                       | 1.176                      | 48.64    | 34.49      | 61.24      | 0.71 | 1.26 |
| 0.4120    | 10.75                   | 0.97      | 2.28                     | 0.96       | 0.843                         | 47.72                | 2.113           | 2.1136                 | 0.4026                   | 184.99         | 3094.11                | 1.067                      | 0.339                       | 1.087                      | 46.81    | 32.99      | 59.05      | 0.70 | 1.26 |
| 0.4191    | 10.65                   | 1.01      | 2.25                     | 1.02       | 0.860                         | 48.81                | 2.141           | 2.1422                 | 0.4080                   | 185.47         | 3127.78                | 1.068                      | 0.351                       | 1.120                      | 47.62    | 33.63      | 60.03      | 0.71 | 1.26 |
| 0.4134    | 10.77                   | 0.99      | 2.29                     | 0.98       | 0.854                         | 48.52                | 2.108           | 2.1087                 | 0.4017                   | 185.71         | 3074.90                | 1.067                      | 0.339                       | 1.089                      | 46.96    | 33.09      | 59.25      | 0.70 | 1.26 |

201A Field Data  
Field Data Entry

Page 1 of 2

Client: Columbia Steel  
Location: Portland, OR  
Source: BH 2  
EPA Method: 201A  
Box Operator: ZDH  
Technician(s): RTM

Environmental Conditions/Test Notes:  
40-50F, intermittent rain.

Run: 2  
Start Time: 12:18  
End Time: 1:24  
Date: 12/17/2020  
Filter: 446

Stack Dimensional Data:

|             |          |        |
|-------------|----------|--------|
| Circular    |          |        |
| Diameter    | 46.500   | in     |
| Rectangular |          |        |
| Width       |          | in     |
| Length      |          | in     |
| Stack Area  | 11.793   | sq.ft. |
| Stack Area  | 1698.192 | sq.in. |

Equipment:

|             |        |           |      |             |                |
|-------------|--------|-----------|------|-------------|----------------|
| Meterbox ID | 11     | Probe ID  | 5C   | Liner type  | glass          |
| Y factor    | 0.9656 | Nozzle ID | 4    | Nozzle size | 0.1640 inches  |
| ΔH@         | 1.864  | Pitot Cp  | 0.84 | Nozzle area | 0.00015 sq.ft. |
|             |        | Pitot Cp  | 0.84 | Probe heat  | 250 F          |

Source Information:

|                                  |        |                   |                                        |       |            |
|----------------------------------|--------|-------------------|----------------------------------------|-------|------------|
| Barometric Pressure              | 29.79  | "Hg               | O <sub>2</sub>                         | 20.85 | %          |
| Static Pressure                  | 0.95   | "H <sub>2</sub> O | CO <sub>2</sub>                        | 0.09  | %          |
| Stack Temperature                | 69     | F                 |                                        |       |            |
| Assumed moisture                 | 0.29   | %                 | Dry mol. weight (M <sub>d</sub> )      | 28.85 | lb/lb-mole |
| Assumed meter temp.              | 71     | F                 | Est. Wet mol. weight (M <sub>w</sub> ) | 28.82 | lb/lb-mole |
| Total number of points           | 12     |                   |                                        |       |            |
| Total projected run time         | 60.0   |                   |                                        |       |            |
| Stack Temperature                | 529.30 | R                 |                                        |       |            |
| Stack Pressure (P <sub>s</sub> ) | 29.86  | "H <sub>2</sub> O |                                        |       |            |
| Meter temp.                      | 531    | R                 |                                        |       |            |
| Meter Pressure (P <sub>m</sub> ) | 29.83  |                   |                                        |       |            |

Leak Checks:

|                        | Pre-test | Post-test |
|------------------------|----------|-----------|
| Pitot                  | x        | x         |
| Train leak rate, dcf   | 0.000    | 0.000     |
| Leak check vacuum, "Hg | 9        | 5         |

Moisture/Lab:

|                                     | Initial | Final  | Gain   |
|-------------------------------------|---------|--------|--------|
| Impingers, g                        | 2155.2  | 2156.9 | 1.7    |
| Silica gel, g                       | 842.1   | 846.1  | 4.0    |
| Total water gain:                   |         |        | 5.7    |
| Moisture Vapor, V <sub>w(gas)</sub> |         |        | 0.268  |
| Moisture, B <sub>ws</sub>           |         |        | 0.0107 |

Pre Test Calculations:

|                          | Ts - °F 50 | Ts + °F 50 |                      |
|--------------------------|------------|------------|----------------------|
| Estimates                | 19.3       | 119.3      | Ts (°F)              |
| Estimated Q <sub>s</sub> | 0.4051     | 0.4395     | cfm                  |
| Estimated ΔH             | 0.524      | 0.6572     | in. H <sub>2</sub> O |
| Viscosity (μ)            | 184.11     | 161.09     | micropoise           |

Post Test Calculations:

|                         |        |                         |                     |        |                   |
|-------------------------|--------|-------------------------|---------------------|--------|-------------------|
| Sample volume           | 25.906 | dcf                     | Ave. ΔP             | 0.698  | "H <sub>2</sub> O |
| Wet mol. weight         | 28.73  | M <sub>w</sub> (actual) | Ave. √ΔP            | 0.8352 | "H <sub>2</sub> O |
| Actual H <sub>2</sub> O | 1.07   | %                       | Ave. ΔH             | 0.530  | "H <sub>2</sub> O |
| Std. meter vol.         | 24.896 | dscf                    | Ave. T <sub>s</sub> | 75.1   | °F                |
| Std. meter vol.         | 0.705  | dscm                    | Ave. T <sub>m</sub> | 68.7   | °F                |
| Isokinetic Average      | 99.7   | %                       |                     |        |                   |

Stack:

|                          |          |       |              |             |          |
|--------------------------|----------|-------|--------------|-------------|----------|
| Velocity, V <sub>s</sub> | 47.37    | fps   | Volume (std) | 1,980,410.5 | wscf/hr  |
| Volume (actual)          | 33,518.1 | acfm  |              | 1,959,220.1 | dscf/hr  |
|                          | 33,159.5 | adcfm |              | 32,653.7    | dscf/min |

| Traverse Point | Time (mm:ss) | Meter Volume (dcf) | Velocit | P | "H <sub>2</sub> O | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum "Hg | Probe Temp (°F) | Condenser Temp F | CPM Filter Temp >65°F <85°F | %I w/ est. Moisture |
|----------------|--------------|--------------------|---------|---|-------------------|------------------|------------------|---------|-------|------------|-----------------|------------------|-----------------------------|---------------------|
| 1              | 0:06:30      | 502.098            |         |   |                   | 75               | 70               | 0.526   | 0.53  | 1          | 251             | 38               | na                          | 94.9                |
| 2              | 0:10:45      | 504.470            | 0.79    |   |                   | 73               | 69               | 0.529   | 0.53  | 1          | 252             | 38               | na                          | 96.4                |
| 3              | 0:16:00      | 508.870            | 0.73    |   |                   | 72               | 69               | 0.531   | 0.53  | 1          | 251             | 37               | na                          | 96.7                |
| 4              | 0:21:00      | 510.970            | 0.71    |   |                   | 72               | 69               | 0.531   | 0.53  | 1          | 251             | 38               | na                          | 98.8                |
| 5              | 0:26:00      | 513.055            | 0.69    |   |                   | 76               | 69               | 0.524   | 0.53  | 1          | 250             | 38               | na                          | 100.7               |
| 6              | 0:31:00      | 515.126            | 0.66    |   |                   | 75               | 69               | 0.525   | 0.53  | 1          | 252             | 38               | na                          | 101.4               |
| 7              | 0:35:45      | 517.100            | 0.64    |   |                   | 77               | 69               | 0.522   | 0.53  | 1          | 251             | 39               | na                          | 103.6               |
| 8              | 0:40:45      | 519.205            | 0.62    |   |                   | 78               | 68               | 0.519   | 0.53  | 1          | 253             | 39               | na                          | 102.0               |
| 9              | 0:45:45      | 521.315            | 0.66    |   |                   | 77               | 68               | 0.521   | 0.53  | 1          | 251             | 39               | na                          | 100.6               |
| 10             | 0:51:00      | 523.550            | 0.68    |   |                   | 76               | 68               | 0.523   | 0.53  | 1          | 255             | 39               | na                          | 99.3                |
| 11             | 0:56:15      | 525.770            | 0.71    |   |                   | 75               | 68               | 0.524   | 0.53  | 1          | 253             | 39               | na                          | 97.8                |
| 12             | 1:01:30      | 528.004            | 0.72    |   |                   | 75               | 68               | 0.524   | 0.53  | 1          | 251             | 39               | na                          | 95.2                |

201A Field Data  
Field Data Entry

Run: 2  
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| Qs (acfm) | D <sub>20</sub><br>(10 μm) | Z (10<br>μm) | D <sub>20</sub><br>(2.5 μm) | Z<br>(2.5 μm) | Sqrt P<br>(in. H <sub>2</sub> O) | V <sub>s</sub><br>(fps) | Std vol<br>per pt. | V <sub>m</sub><br>(dscfm) | Q <sub>Set</sub><br>(dscfm) | Viscosity<br>(μm) | N <sub>re,Actual</sub> | Re-estim.<br>C <sub>r50</sub> | P min<br>(in H <sub>2</sub> O) | P ma<br>(in H <sub>2</sub> O) | Vn<br>(fps) | Vmin<br>(fps) | Vmax<br>(fps) | Rmin | Rmax |
|-----------|----------------------------|--------------|-----------------------------|---------------|----------------------------------|-------------------------|--------------------|---------------------------|-----------------------------|-------------------|------------------------|-------------------------------|--------------------------------|-------------------------------|-------------|---------------|---------------|------|------|
| 0.4212    | 10.65                      | -            | 2.25                        | -             | 0.889                            | 50.33                   | 2.274              | 2.2748                    | 0.4136                      | 186.59            | 3136.48                | 1.069                         | 0.356                          | 1.135                         | 47.85       | 33.79         | 60.32         | 0.71 | 1.26 |
| 0.4103    | 10.82                      | 0.98         | 2.31                        | 0.97          | 0.854                            | 48.29                   | 2.123              | 2.1235                    | 0.4045                      | 186.11            | 3075.14                | 1.066                         | 0.337                          | 1.084                         | 46.62       | 32.80         | 58.84         | 0.70 | 1.26 |
| 0.4058    | 10.89                      | 0.99         | 2.33                        | 0.99          | 0.843                            | 47.58                   | 2.103              | 2.1042                    | 0.4008                      | 185.87            | 3051.26                | 1.066                         | 0.329                          | 1.063                         | 46.11       | 32.40         | 58.22         | 0.70 | 1.26 |
| 0.4086    | 10.84                      | 1.00         | 2.31                        | 1.01          | 0.831                            | 46.90                   | 2.017              | 2.0178                    | 0.4036                      | 185.87            | 3072.15                | 1.066                         | 0.334                          | 1.077                         | 46.42       | 32.65         | 58.60         | 0.70 | 1.26 |
| 0.4087    | 10.89                      | 1.00         | 2.34                        | 0.99          | 0.812                            | 46.04                   | 2.003              | 2.0034                    | 0.4007                      | 186.83            | 3034.50                | 1.066                         | 0.332                          | 1.070                         | 46.44       | 32.64         | 58.63         | 0.70 | 1.26 |
| 0.4052    | 10.94                      | 1.00         | 2.35                        | 0.99          | 0.800                            | 45.30                   | 1.989              | 1.9899                    | 0.3980                      | 186.59            | 3018.01                | 1.065                         | 0.326                          | 1.055                         | 46.04       | 32.32         | 58.15         | 0.70 | 1.26 |
| 0.4081    | 10.92                      | 1.00         | 2.35                        | 1.00          | 0.787                            | 44.67                   | 1.896              | 1.8967                    | 0.3993                      | 187.07            | 3020.27                | 1.066                         | 0.330                          | 1.065                         | 46.37       | 32.57         | 58.55         | 0.70 | 1.26 |
| 0.4150    | 10.80                      | 1.01         | 2.31                        | 1.02          | 0.812                            | 46.13                   | 2.026              | 2.0264                    | 0.4053                      | 187.31            | 3061.52                | 1.067                         | 0.342                          | 1.098                         | 47.15       | 33.20         | 59.49         | 0.70 | 1.26 |
| 0.4152    | 10.78                      | 1.00         | 2.30                        | 1.00          | 0.825                            | 46.78                   | 2.030              | 2.0312                    | 0.4062                      | 187.07            | 3072.74                | 1.067                         | 0.343                          | 1.101                         | 47.17       | 33.23         | 59.52         | 0.70 | 1.26 |
| 0.4181    | 10.72                      | 1.01         | 2.27                        | 1.01          | 0.843                            | 47.76                   | 2.151              | 2.1516                    | 0.4098                      | 186.83            | 3103.78                | 1.068                         | 0.349                          | 1.117                         | 47.50       | 33.50         | 59.91         | 0.71 | 1.26 |
| 0.4145    | 10.77                      | 1.00         | 2.29                        | 0.99          | 0.849                            | 48.05                   | 2.136              | 2.1371                    | 0.4071                      | 186.59            | 3086.92                | 1.067                         | 0.343                          | 1.101                         | 47.09       | 33.17         | 59.41         | 0.70 | 1.26 |
| 0.4171    | 10.72                      | 1.00         | 2.27                        | 1.01          | 0.877                            | 49.69                   | 2.150              | 2.1506                    | 0.4096                      | 186.59            | 3106.39                | 1.068                         | 0.348                          | 1.115                         | 47.39       | 33.41         | 59.77         | 0.71 | 1.26 |

201A Field Data  
Field Data Entry

Page 1 of 2

Client: Columbia Steel  
Location: Portland, OR  
Source: BH 2  
EPA Method: 201A  
Box Operator: ZDH  
Technician(s): RTM

Environmental Conditions/Test Notes:  
40-50F, intermittent rain.

Run: 3  
Start Time: 1:56  
End Time: 3:04  
Date: 12/17/2020  
Filter: 447

Stack Dimensional Data:

Circular  
Diameter 46.500 in  
Rectangular  
Width in  
Length in  
Stack Area 11.793 sq.ft.  
Stack Area 1698.192 sq.in.

Equipment:

Meterbox ID 11  
Y factor 0.9656  
ΔH@ 1.864  
Probe ID 5C  
Nozzle ID 4  
Pitot Cp 0.84  
Pitot Cp 0.84  
Liner type glass  
Nozzle size 0.1640 inches  
Nozzle area 0.00015 sq.ft.  
Probe heat 250 F

Source Information:

Barometric Pressure 29.79 "Hg  
Static Pressure 0.95 "H<sub>2</sub>O  
Stack Temperature 75 F  
Assumed moisture 1.07 %  
Assumed meter temp. 69 F  
Total number of points 12  
Total projected run time 60.0  
Stack Temperature 535.10 R  
Stack Pressure (P<sub>s</sub>) 29.86 "H<sub>2</sub>O  
Meter temp. 529 R  
Meter Pressure (P<sub>m</sub>) 29.83  
O<sub>2</sub> 29.65 %  
CO<sub>2</sub> 0.11 %  
Dry mol. weight (M<sub>d</sub>) 29.20 lb/lb-mole  
Est. Wet mol. weight (M<sub>w</sub>) 29.08 lb/lb-mole

Leak Checks:

Pre-test Post-test  
Pitot x x  
Train leak rate, dcf 0.000 0.000  
Leak check vacuum, "Hg 7 9

Moisture/Lab:

Initial Final Gain  
Impingers, g 2156.9 2157.8 0.9  
Silica gel, g 846.1 850.1 4.0  
Total water gain: 4.9  
Moisture Vapor, V<sub>w(ad)</sub> 0.231  
Moisture, B<sub>ws</sub> 0.0093

Pre Test Calculations:

Estimates  
Estimated Q<sub>s</sub> 0.4051  
Estimated ΔH 0.524  
Viscosity (μ) 184.11  
Ts - °F 50 25.1  
Ts + °F 50 125.1  
Ts (°F)  
cfm  
in. H<sub>2</sub>O  
micropoise

Post Test Calculations:

Sample volume 25.656 dcf  
Wet mol. weight 29.1 M<sub>w</sub> (actual)  
Actual H<sub>2</sub>O 0.93 %  
Std. meter vol. 24.660 dscf  
Std. meter vol. 0.698 dscm  
Isokinetic Average 99.3 %  
Ave. ΔP 0.702 "H<sub>2</sub>O  
Ave. √ΔP 0.8372 "H<sub>2</sub>O  
Ave. ΔH 0.520 "H<sub>2</sub>O  
Ave. T<sub>s</sub> 75.8 °F  
Ave. T<sub>m</sub> 68.6 °F

Stack:

Velocity, V<sub>s</sub> 47.21 fps  
Volume (actual) 33,404.9 acfm  
Volume (std) 33,094.2 adcfm  
1,971,142.8 wscf/hr  
1,952,811.2 dscf/hr  
32,546.9 dscf/min

| Traverse Point | Time (mm:ss) | Meter Volume (dcf) | Velocity P "H <sub>2</sub> O | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum "Hg | Probe Temp (°F) | Condenser Temp F | CPM Filter Temp >65°F <85°F | %I est. w/ Moisture |
|----------------|--------------|--------------------|------------------------------|------------------|------------------|---------|-------|------------|-----------------|------------------|-----------------------------|---------------------|
| 1              | 0:06:15      | 528.311            | 0.74                         | 74               | 68               | 0.525   | 0.52  | 1          | 254             | 43               | na                          | 96.3                |
| 2              | 0:10:30      | 532.690            | 0.77                         | 79               | 69               | 0.516   | 0.52  | 1          | 253             | 39               | na                          | 94.7                |
| 3              | 0:15:45      | 534.970            | 0.71                         | 78               | 69               | 0.518   | 0.52  | 1          | 252             | 39               | na                          | 102.5               |
| 4              | 0:20:45      | 536.980            | 0.68                         | 79               | 69               | 0.516   | 0.52  | 1          | 250             | 38               | na                          | 97.1                |
| 5              | 0:25:45      | 539.050            | 0.66                         | 78               | 69               | 0.518   | 0.52  | 1          | 254             | 38               | na                          | 101.4               |
| 6              | 0:30:45      | 541.110            | 0.65                         | 78               | 68               | 0.517   | 0.52  | 1          | 252             | 39               | na                          | 101.9               |
| 7              | 0:35:30      | 543.085            | 0.61                         | 77               | 64               | 0.515   | 0.52  | 1          | 253             | 39               | na                          | 106.8               |
| 8              | 0:40:30      | 545.150            | 0.67                         | 75               | 69               | 0.524   | 0.52  | 1          | 254             | 39               | na                          | 100.1               |
| 9              | 0:45:30      | 547.250            | 0.70                         | 74               | 69               | 0.526   | 0.52  | 1          | 252             | 39               | na                          | 99.5                |
| 10             | 0:50:45      | 549.400            | 0.73                         | 73               | 69               | 0.528   | 0.52  | 1          | 251             | 39               | na                          | 94.9                |
| 11             | 0:56:00      | 551.740            | 0.76                         | 72               | 70               | 0.531   | 0.52  | 1          | 252             | 39               | na                          | 101.0               |
| 12             | 1:01:15      | 553.967            | 0.74                         | 73               | 70               | 0.529   | 0.52  | 1          | 252             | 39               | na                          | 97.5                |

201A Field Data  
Field Data Entry

Run: 3  
Page 2 of 2

| Qs (acfm) | D <sub>50</sub><br>(10 µm) | Z (10<br>µm) | D <sub>50</sub><br>(2.5 µm) | Z<br>(2.5 µm) | Sqrt P<br>(in. H <sub>2</sub> O) | V <sub>s</sub><br>(fps) | Std vol<br>per pt. | V <sub>m</sub><br>(dscfm) | Q <sub>Set</sub><br>(dscfm) | Viscosity<br>(µm) | N <sub>re Actual</sub> | Re-estim.<br>C <sub>r25</sub> | P min<br>(in H <sub>2</sub> O) | P ma<br>(in H <sub>2</sub> O) | Vn<br>(fps) | Vmin<br>(fps) | Vmax<br>(fps) | Rmin | Rmax |
|-----------|----------------------------|--------------|-----------------------------|---------------|----------------------------------|-------------------------|--------------------|---------------------------|-----------------------------|-------------------|------------------------|-------------------------------|--------------------------------|-------------------------------|-------------|---------------|---------------|------|------|
| 0.4112    | 10.97                      | -            | 2.36                        | -             | 0.860                            | 48.44                   | 2.11               | 2.1072                    | 0.4014                      | 190.72            | 3029.16                | 1.066                         | 0.338                          | 1.099                         | 46.71       | 32.76         | 59.02         | 0.70 | 1.26 |
| 0.4144    | 10.98                      | 1.00         | 2.37                        | 1.00          | 0.877                            | 49.64                   | 2.10               | 2.1042                    | 0.4008                      | 191.92            | 3005.84                | 1.067                         | 0.341                          | 1.106                         | 47.08       | 33.02         | 59.48         | 0.70 | 1.26 |
| 0.4306    | 10.67                      | 1.03         | 2.25                        | 1.05          | 0.843                            | 47.63                   | 2.19               | 2.1907                    | 0.4173                      | 191.68            | 3133.30                | 1.070                         | 0.373                          | 1.192                         | 48.93       | 34.52         | 61.70         | 0.71 | 1.26 |
| 0.3994    | 11.28                      | 0.95         | 2.48                        | 0.91          | 0.825                            | 46.65                   | 1.93               | 1.9312                    | 0.3862                      | 191.92            | 2896.73                | 1.064                         | 0.313                          | 1.031                         | 45.37       | 31.64         | 57.43         | 0.70 | 1.27 |
| 0.4105    | 11.04                      | 1.02         | 2.39                        | 1.04          | 0.812                            | 45.92                   | 1.99               | 1.9889                    | 0.3978                      | 191.68            | 2986.94                | 1.066                         | 0.334                          | 1.088                         | 46.64       | 32.67         | 58.95         | 0.70 | 1.26 |
| 0.4093    | 11.07                      | 1.00         | 2.40                        | 1.00          | 0.806                            | 45.57                   | 1.98               | 1.9830                    | 0.3966                      | 191.68            | 2978.14                | 1.066                         | 0.332                          | 1.082                         | 46.50       | 32.56         | 58.78         | 0.70 | 1.26 |
| 0.4155    | 10.94                      | 1.01         | 2.35                        | 1.02          | 0.781                            | 44.10                   | 1.91               | 1.9157                    | 0.4033                      | 191.44            | 3032.29                | 1.067                         | 0.344                          | 1.115                         | 47.20       | 33.13         | 59.62         | 0.70 | 1.26 |
| 0.4072    | 11.06                      | 0.99         | 2.39                        | 0.98          | 0.819                            | 46.14                   | 1.98               | 1.9841                    | 0.3968                      | 190.96            | 2991.00                | 1.066                         | 0.330                          | 1.077                         | 46.27       | 32.39         | 58.49         | 0.70 | 1.26 |
| 0.4134    | 10.93                      | 1.01         | 2.34                        | 1.02          | 0.837                            | 47.11                   | 2.02               | 2.0177                    | 0.4035                      | 190.72            | 3045.53                | 1.067                         | 0.343                          | 1.110                         | 46.97       | 32.96         | 59.32         | 0.70 | 1.26 |
| 0.4023    | 11.13                      | 0.98         | 2.41                        | 0.97          | 0.854                            | 48.07                   | 2.06               | 2.0658                    | 0.3935                      | 190.48            | 2973.32                | 1.065                         | 0.322                          | 1.056                         | 45.71       | 31.95         | 57.81         | 0.70 | 1.26 |
| 0.4362    | 10.50                      | 1.06         | 2.20                        | 1.10          | 0.872                            | 49.00                   | 2.24               | 2.2441                    | 0.4274                      | 190.24            | 3234.06                | 1.071                         | 0.389                          | 1.234                         | 49.56       | 35.07         | 62.44         | 0.71 | 1.26 |
| 0.4159    | 10.87                      | 0.97         | 2.32                        | 0.95          | 0.860                            | 48.40                   | 2.13               | 2.1357                    | 0.4068                      | 190.48            | 3074.00                | 1.067                         | 0.348                          | 1.125                         | 47.26       | 33.20         | 59.67         | 0.70 | 1.26 |

**EPA Method 201A**  
**Filterable Particulate**  
**Laboratory Gravimetric Data**

**Client:** Columbia Steel  
**Location:** Portland, OR  
**Source:** BH 2

| Run | Sample Description            | mls soln./<br>Filter # | Initial<br>(grams) | Final<br>(grams) | Net Gain | Blank<br>Correction      | Corrected<br>Gain (grams) |
|-----|-------------------------------|------------------------|--------------------|------------------|----------|--------------------------|---------------------------|
| 1   | PM 2.5 Acetone (Container #4) | 64                     | 7.58749            | 7.58889          | 0.00140  | 1.69E-04                 | 0.00123                   |
|     | PM 2.5 Filter (Container #1)  | U445                   | 0.13138            | 0.12944          | -0.00194 |                          | 0.00000                   |
|     | PM 10 Acetone (Container #3)  | 61                     | 7.69640            | 7.69661          | 0.00021  | 1.61E-04                 | 0.00005                   |
|     |                               |                        |                    |                  |          | <b>Total PM 10</b>       | <b>0.00128</b>            |
|     |                               |                        |                    |                  |          | <b>*Total PM 10 &lt;</b> | <b>0.00144</b>            |
| 2   | PM 2.5 Acetone (Container #4) | 61                     | 7.70278            | 7.70332          | 0.00054  | 1.61E-04                 | 0.00038                   |
|     | PM 2.5 Filter (Container #1)  | U446                   | 0.14697            | 0.14650          | -0.00047 |                          | 0.00000                   |
|     | PM 10 Acetone (Container #3)  | 70                     | 7.63414            | 7.63409          | -0.00005 | 1.85E-04                 | 0.00000                   |
|     |                               |                        |                    |                  |          | <b>Total PM 10</b>       | <b>0.00038</b>            |
|     |                               |                        |                    |                  |          | <b>*Total PM 10 &lt;</b> | <b>0.00144</b>            |
| 3   | PM 2.5 Acetone (Container #4) | 55                     | 7.71263            | 7.71274          | 0.00011  | 1.46E-04                 | 0.00000                   |
|     | PM 2.5 Filter (Container #1)  | U447                   | 0.14242            | 0.14250          | 0.00008  |                          | 0.00008                   |
|     | PM 10 Acetone (Container #3)  | 80                     | 7.63510            | 7.63531          | 0.00021  | 2.12E-04                 | 0.00000                   |
|     |                               |                        |                    |                  |          | <b>Total PM 10</b>       | <b>0.00008</b>            |
|     |                               |                        |                    |                  |          | <b>*Total PM 10 &lt;</b> | <b>0.00144</b>            |
|     | Acetone Blank                 | 170                    | 102.30054          | 102.30099        | 0.00045  | 2.65E-06                 | g/ml                      |

\*Results are below minimum detection limits (MDL) for the method. Results are reported as less than the MDL.

**Gas Stream Characteristics  
Columbia Steel  
Portland, OR  
BH 2  
12/16-17/2020**

| Run                              |                               |                      | 1             | 2             | 3             | Average    |
|----------------------------------|-------------------------------|----------------------|---------------|---------------|---------------|------------|
| Date                             |                               |                      | 12/16/2020    | 12/17/2020    | 12/17/2020    |            |
| Run Start Time                   |                               |                      | 22:37         | 12:18         | 1:56          |            |
| Run End Date                     |                               |                      | 12/16/2020    | 12/17/2020    | 12/17/2020    |            |
| Run End Time                     |                               |                      | 23:46         | 1:24          | 3:04          |            |
| Duration, min:sec                |                               |                      | 64 min 00 sec | 61 min 30 sec | 61 min 15 sec |            |
| Barometric Pressure, "Hg         |                               |                      | 29.63         | 29.79         | 29.79         |            |
| Nozzle Dia., in.                 |                               |                      | 0.164         | 0.164         | 0.164         |            |
| Isokinetic average, %            |                               |                      | 95.1          | 99.7          | 99.2          |            |
| Meter Volume, dscf               |                               |                      | 26.101        | 24.890        | 24.654        |            |
| Meter Volume, dscm               |                               |                      | 0.739         | 0.705         | 0.698         |            |
| Stack Area, sq.ft.               |                               |                      | 11.793        | 11.793        | 11.793        |            |
| CO <sub>2</sub> %vd              |                               |                      | 0.11          | 0.09          | 0.11          |            |
| O <sub>2</sub> %vd               |                               |                      | 20.97         | 20.85         | 29.65         |            |
| Static Press., "H <sub>2</sub> O |                               |                      | 0.95          | 0.95          | 0.95          |            |
| H <sub>2</sub> O %v              |                               |                      | 0.29          | 1.07          | 0.93          |            |
| Velocity, FPS                    |                               |                      | 49.25         | 47.29         | 47.22         |            |
| DSCFM                            |                               |                      | 34,365.0      | 32,653.7      | 32,546.9      |            |
| Stack Temp, °F                   |                               |                      | 69.3          | 75.1          | 75.8          |            |
| Total PM 2.5                     | Concentration, C <sub>s</sub> | gr/dscf              | 7.27E-04      | 2.35E-04      | 5.01E-05      | 3.37E-04   |
|                                  | Mass                          | lb/hr                | 0.21          | 0.07          | 0.01          | 0.10       |
|                                  |                               | lb/tons steel melted | 0.0602        | 0.0184        | 0.0020        | 0.0269     |
| *Total PM 2.5                    | Concentration, C <sub>s</sub> | gr/dscf              | < 7.98E-04    | < 8.37E-04    | < 8.45E-04    | < 8.27E-04 |
|                                  | Mass                          | lb/hr                | < 0.24        | < 0.23        | < 0.24        | < 0.24     |
|                                  |                               | lb/tons steel melted | < 0.0660      | < 0.0658      | < 0.0344      | < 0.0554   |
| Total PM 10                      | Concentration, C <sub>s</sub> | gr/dscf              | 7.56E-04      | 2.35E-04      | 4.90E-05      | 3.47E-04   |
|                                  | Mass                          | lb/hr                | 0.22          | 0.07          | 0.01          | 0.10       |
|                                  |                               | lb/tons steel melted | 0.0626        | 0.0184        | 0.0020        | 0.0277     |
| *Total PM 10                     | Concentration, C <sub>s</sub> | gr/dscf              | < 8.51E-04    | < 8.93E-04    | < 9.01E-04    | < 8.82E-04 |
|                                  | Mass                          | lb/hr                | < 0.25        | < 0.25        | < 0.25        | < 0.25     |
|                                  |                               | lb/tons steel melted | < 0.0704      | < 0.0702      | < 0.0367      | < 0.0591   |
| Production Data                  |                               | tons steel melted/hr | 3.56          | 3.56          | 6.86          | 4.66       |

\*Results are below minimum detection limits (MDL) for the method. Results are reported as less than the MDL.  
(PM2.5 - 1.35mg, PM10 - 1.44mg).



# BISON

## RING, INC.

|           |                         |
|-----------|-------------------------|
| COMPANY   | Columbia Steel Casting  |
| FACILITY  | Steel Foundry           |
| LOCATION  | Portland, OR            |
| SOURCE    | BH 2                    |
| DATE      | 12/16/2020 - 12/17/2020 |
| METHOD    | ODEQ 5                  |
| POLLUTANT | PM                      |

**Isokinetic Field Data**  
**Field Data Entry**

|                       |                               |                                                              |                                |
|-----------------------|-------------------------------|--------------------------------------------------------------|--------------------------------|
| <b>Client:</b>        | <b>Columbia Steel Casting</b> | <b>Run:</b>                                                  | <b>1</b>                       |
| <b>Location:</b>      | <b>Portland, OR</b>           | <b>Start Time:</b>                                           | <b>22:37</b>                   |
| <b>Source:</b>        | <b>BH 2</b>                   | <b>Environmental Conditions/Test Notes:</b>                  | <b>End Time:</b> <b>23:46</b>  |
| <b>EPA Method:</b>    | <b>ODEQ 5</b>                 | 50 F and intermittent rain                                   | <b>Date:</b> <b>12/16/2020</b> |
| <b>Box Operator:</b>  | <b>ZDH</b>                    | O <sub>2</sub> lancing started at 10:28 and lasted 4 minutes |                                |
| <b>Technician(s):</b> | <b>RTM</b>                    |                                                              |                                |

**Stack Dimensional Data:**

Circular  
Diameter 46.500 in  
Rectangular  
Width in  
Length in  
Stack Area 11.793 sq.ft.

**Equipment:**

|             |        |            |      |             |                 |
|-------------|--------|------------|------|-------------|-----------------|
| Meterbox ID | 13     | Probe ID   | 5B   | Liner type  | glass           |
| Y factor    | 0.9956 | Nozzle ID  | 0.26 | Nozzle size | 0.2613 inches   |
| ΔH@         | 1.861  | Hot box ID | 2    | Nozzle area | 0.000372 sq.ft. |
|             |        | Pitot Cp   | 0.84 | Probe heat  | 250 F           |
|             |        | Pitot ID   | 5B   | Filter heat | 250 F           |

**Source Information:**

|                        |                        |                 |              |
|------------------------|------------------------|-----------------|--------------|
| Barometric Pressure    | 29.63 "Hg              | O <sub>2</sub>  | 20.90 %      |
| Static Pressure        | 0.95 "H <sub>2</sub> O | CO <sub>2</sub> | 0.00 %       |
| Ave. ΔP                | 0.54 "H <sub>2</sub> O | Rec. Nz.        | 0.237 inches |
| Stack Temperature      | 65.5 F                 |                 |              |
| Assumed moisture       | 1 %                    |                 |              |
| Assumed meter temp.    | 64 F                   |                 |              |
| Total number of points | 16                     |                 |              |
| Time per point         | 4                      |                 |              |
| Total run time         | 64                     |                 |              |

**Leak Checks:**

|                        | Pre-test | Post-test |
|------------------------|----------|-----------|
| Pitot                  | x        | x         |
| Train leak rate, dcf   | 0.000    | 0.000     |
| Leak check vacuum, "Hg | 22       | 23        |

**Nozzle check for roundness:**

| 1           | 2     | 3            |
|-------------|-------|--------------|
| 0.262       | 0.261 | 0.261 inches |
| Caliper ID# |       | WS2          |

**Post Test Calculations:**

|                         |                              |                     |                          |
|-------------------------|------------------------------|---------------------|--------------------------|
| Sample volume           | 65.834 dcf                   | Ave. ΔP             | 0.683 "H <sub>2</sub> O  |
| Wet mol. weight         | 28.7 M <sub>s</sub> (actual) | Ave. √ΔP            | 0.8257 "H <sub>2</sub> O |
| Actual H <sub>2</sub> O | 1.31 %                       | Ave. ΔH             | 3.575 "H <sub>2</sub> O  |
| Std. meter vol.         | 65.921 dscf                  | Ave. T <sub>s</sub> | 66.9 °F                  |
| Isokinetic Average      | 100.9 %                      | Ave. T <sub>m</sub> | 64.3 °F                  |

**Moisture/Lab:**

| Filter            | U205 #  |        |      |
|-------------------|---------|--------|------|
|                   | Initial | Final  | Gain |
| Impingers, g      | 2188.2  | 2191.7 | 3.5  |
| Silica gel, g     | 862.1   | 877.2  | 15.1 |
| Total water gain: |         |        | 18.6 |

| Traverse Point | Time (min.) | Meter Volume (dcf) | Velocity P ("H <sub>2</sub> O) | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum ("Hg) | Filter Box (°F) | Condenser Temp F |
|----------------|-------------|--------------------|--------------------------------|------------------|------------------|---------|-------|--------------|-----------------|------------------|
| 1              | 4.0         | 0.000              | 0.80                           | 57               | 65               | 4.25    | 4.30  | 4            | 252             | 38               |
| 2              | 8.0         | 4.470              | 0.74                           | 65               | 65               | 3.87    | 3.90  | 4            | 252             | 38               |
| 3              | 12.0        | 8.740              | 0.71                           | 70               | 64               | 3.67    | 3.70  | 3.5          | 251             | 42               |
| 4              | 16.0        | 12.920             | 0.65                           | 68               | 64               | 3.38    | 3.40  | 3.5          | 251             | 43               |
| 5              | 20.0        | 16.910             | 0.59                           | 67               | 64               | 3.07    | 3.10  | 3.5          | 252             | 43               |
| 6              | 24.0        | 20.810             | 0.64                           | 66               | 64               | 3.34    | 3.30  | 3.5          | 248             | 44               |
| 7              | 28.0        | 24.760             | 0.71                           | 65               | 64               | 3.71    | 3.70  | 4            | 253             | 44               |
| 8              | 32.0        | 28.950             | 0.72                           | 66               | 64               | 3.75    | 3.80  | 4            | 253             | 44               |
| 9              | 36.0        | 33.161             | 0.72                           | 66               | 64               | 3.75    | 3.80  | 4            | 252             | 45               |
| 10             | 40.0        | 37.370             | 0.68                           | 66               | 64               | 3.55    | 3.60  | 4            | 252             | 45               |
| 11             | 44.0        | 41.500             | 0.67                           | 67               | 64               | 3.49    | 3.50  | 4            | 252             | 46               |
| 12             | 48.0        | 45.580             | 0.66                           | 66               | 64               | 3.44    | 3.40  | 3.5          | 253             | 46               |
| 13             | 52.0        | 49.590             | 0.55                           | 68               | 64               | 2.86    | 2.90  | 3.5          | 250             | 46               |
| 14             | 56.0        | 53.320             | 0.72                           | 70               | 65               | 3.73    | 3.70  | 3.5          | 250             | 45               |
| 15             | 60.0        | 57.490             | 0.63                           | 71               | 65               | 3.26    | 3.30  | 3.5          | 250             | 45               |
| 16             | 64.0        | 61.650             | 0.74                           | 72               | 65               | 3.82    | 3.80  | 3.5          | 250             | 46               |
|                |             | 65.834             |                                |                  |                  |         |       |              |                 |                  |

**Isokinetic Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** BH 2  
**EPA Method:** ODEQ 5  
**Box Operator:** ZDH  
**Technician(s):** RTM

**Environmental Conditions/Test Notes:**  
50 F and intermittent rain

**Run:** 2  
**Start Time:** 0 1  
**End Time:** 1 2  
**Date:** 12/17/2020

**Stack Dimensional Data:**

Circular  
Diameter 46.500 in  
Rectangular  
Width in  
Length in  
Stack Area 11.793 sq.ft.

**Equipment:**

Meterbox ID 13 Probe ID 5B Liner type: glass  
Y factor 0.9956 Nozzle ID 0.26 Nozzle size: 0.2613 inches  
 $\Delta H@$  1.861 Hot box ID 2 Nozzle area: 0.000372 sq.ft.  
Pitot Cp 0.84 Probe heat: 250 F  
Pitot ID 5B Filter heat: 250 F

**Source Information:**

Barometric Pressure 29.79 "Hg O<sub>2</sub> 20.9 %  
Static Pressure 0.95 "H<sub>2</sub>O CO<sub>2</sub> 0.0 %  
Ave.  $\Delta P$  0.54 "H<sub>2</sub>O Rec. Nz. 0.237 inches  
Stack Temperature 65.5 F  
Assumed moisture 1.31 %  
Assumed meter temp. 64.3 F  
Total number of points 16  
Time per point 4  
Total run time 64

**Leak Checks:**

|                         | Pre-test | Post-test |
|-------------------------|----------|-----------|
| Pitot:                  | x        | x         |
| Train leak rate, dcf:   | 0.000    | 0.000     |
| Leak check vacuum, "Hg: | 15       | 16        |

**Nozzle check for roundness:**

| 1           | 2     | 3            |
|-------------|-------|--------------|
| 0.262       | 0.261 | 0.261 inches |
| Caliper ID# |       | WS2          |

**Post Test Calculations:**

Sample volume 63.678 dcf Ave.  $\Delta P$  0.654 "H<sub>2</sub>O  
Wet mol. weight 28.76 M<sub>s</sub> (actual) Ave.  $\sqrt{\Delta P}$  0.8086 "H<sub>2</sub>O  
Actual H<sub>2</sub>O 0.77 % Ave.  $\Delta H$  3.356 "H<sub>2</sub>O  
Std. meter vol. 64.192 dscf Ave. T<sub>s</sub> 74.1 °F  
Isokinetic Average 100.3 % Ave. T<sub>m</sub> 63.3 °F

**Moisture/Lab:**

| Filter            | U206 # | Initial | Final  | Gain  |
|-------------------|--------|---------|--------|-------|
| Impingers, g      |        | 2213.0  | 2202.4 | -10.6 |
| Silica gel, g     |        | 831.2   | 852.4  | 21.2  |
| Total water gain: |        |         |        | 10.6  |

| Traverse Point | Time (min.) | Meter Volume (dcf) | Velocity P ("H <sub>2</sub> O) | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum ("Hg) | Filter Box (°F) | Condenser Temp F |
|----------------|-------------|--------------------|--------------------------------|------------------|------------------|---------|-------|--------------|-----------------|------------------|
| 1              | 4.0         | 0.000              | 0.69                           | 74               | 66               | 3.54    | 3.60  | 4            | 246             | 41               |
| 2              | 8.0         | 4.210              | 0.70                           | 72               | 64               | 3.59    | 3.60  | 4            | 250             | 42               |
| 3              | 12.0        | 8.340              | 0.69                           | 71               | 65               | 3.55    | 3.60  | 4            | 252             | 44               |
| 4              | 16.0        | 12.400             | 0.65                           | 71               | 64               | 3.34    | 3.30  | 4            | 253             | 48               |
| 5              | 20.0        | 16.370             | 0.66                           | 72               | 64               | 3.39    | 3.40  | 4            | 252             | 48               |
| 6              | 24.0        | 20.390             | 0.64                           | 73               | 64               | 3.28    | 3.30  | 4            | 253             | 48               |
| 7              | 28.0        | 24.340             | 0.57                           | 78               | 63               | 2.89    | 2.90  | 3.5          | 251             | 49               |
| 8              | 32.0        | 28.040             | 0.64                           | 77               | 63               | 3.25    | 3.30  | 4            | 252             | 49               |
| 9              | 36.0        | 31.980             | 0.66                           | 78               | 63               | 3.34    | 3.30  | 4            | 250             | 49               |
| 10             | 40.0        | 35.920             | 0.62                           | 78               | 63               | 3.14    | 3.10  | 4            | 252             | 50               |
| 11             | 44.0        | 39.850             | 0.67                           | 76               | 63               | 3.41    | 3.40  | 4            | 251             | 49               |
| 12             | 48.0        | 43.840             | 0.61                           | 73               | 62               | 3.11    | 3.10  | 4            | 252             | 49               |
| 13             | 52.0        | 47.690             | 0.60                           | 74               | 62               | 3.06    | 3.10  | 4            | 252             | 49               |
| 14             | 56.0        | 51.550             | 0.67                           | 76               | 62               | 3.40    | 3.40  | 4            | 252             | 50               |
| 15             | 60.0        | 55.480             | 0.69                           | 73               | 62               | 3.52    | 3.70  | 4            | 251             | 50               |
| 16             | 64.0        | 59.600             | 0.71                           | 70               | 62               | 3.64    | 3.60  | 4            | 253             | 50               |

**Isokinetic Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** BH 2  
**EPA Method:** ODEQ 5  
**Box Operator:** ZDH  
**Technician(s):** RTM

**Environmental Conditions/Test Notes:**  
50 F and intermittent rain

**Run:** 3  
**Start Time:** 1:56  
**End Time:** 3:06  
**Date:** 12/17/2020

**Stack Dimensional Data:**

Circular  
Diameter 46.500 in  
Rectangular  
Width in  
Length in  
Stack Area 11.793 sq.ft.

**Equipment:**

Meterbox ID 13  
Y factor 0.9956  
 $\Delta H@$  1.861  
Probe ID 5B  
Nozzle ID 0.26  
Hot box ID 2  
Pitot Cp 0.84  
Pitot ID 5B  
Liner type: glass  
Nozzle size: 0.2613 inches  
Nozzle area: 0.000372 sq.ft.  
Probe heat: 250 F  
Filter heat: 250 F

**Source Information:**

Barometric Pressure 29.79 "Hg  
Static Pressure 0.95 "H<sub>2</sub>O  
Ave.  $\Delta P$  0.54 "H<sub>2</sub>O  
Stack Temperature 65.5 F  
Assumed moisture 0.77 %  
Assumed meter temp. 63.3 F  
Total number of points 16  
Time per point 4  
Total run time 64  
O<sub>2</sub> 20.9 %  
CO<sub>2</sub> 0.0 %  
Rec. Nz. 0.237 inches

**Leak Checks:**

|                         | Pre-test | Post-test |
|-------------------------|----------|-----------|
| Pitot:                  | x        | x         |
| Train leak rate, dcf:   | 0.000    | 0.000     |
| Leak check vacuum, "Hg: | 17       | 19        |

**Nozzle check for roundness:**

| 1           | 2     | 3            |
|-------------|-------|--------------|
| 0.262       | 0.261 | 0.261 inches |
| Caliper ID# |       | WS2          |

**Post Test Calculations:**

Sample volume 66.181 dcf  
Wet mol. weight 28.77 M<sub>s</sub> (actual)  
Actual H<sub>2</sub>O 0.68 %  
Std. meter vol. 66.764 dscf  
Isokinetic Average 99.9 %  
Ave.  $\Delta P$  0.712 "H<sub>2</sub>O  
Ave.  $\sqrt{\Delta P}$  0.8433 "H<sub>2</sub>O  
Ave.  $\Delta H$  3.663 "H<sub>2</sub>O  
Ave. T<sub>s</sub> 74 °F  
Ave. T<sub>m</sub> 63.3 °F

**Moisture/Lab:**

| Filter            | U207 # | Initial | Final  | Gain  |
|-------------------|--------|---------|--------|-------|
| Impingers, g      |        | 2137.4  | 2123.4 | -14.0 |
| Silica gel, g     |        | 843.5   | 867.2  | 23.7  |
| Total water gain: |        |         |        | 9.7   |

| Traverse Point | Time (min.) | Meter Volume (dcf) | Velocity P ("H <sub>2</sub> O) | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum ("Hg) | Filter Box (°F) | Condenser Temp F |
|----------------|-------------|--------------------|--------------------------------|------------------|------------------|---------|-------|--------------|-----------------|------------------|
| 1              | 4.0         | 4.210              | 0.74                           | 73               | 63               | 3.82    | 3.80  | 3.5          | 252             | 51               |
| 2              | 8.0         | 8.480              | 0.75                           | 76               | 63               | 3.85    | 3.90  | 3.5          | 255             | 55               |
| 3              | 12.0        | 12.580             | 0.71                           | 78               | 63               | 3.63    | 3.60  | 3.5          | 252             | 58               |
| 4              | 16.0        | 16.700             | 0.70                           | 79               | 63               | 3.57    | 3.60  | 3.5          | 252             | 58               |
| 5              | 20.0        | 20.880             | 0.73                           | 77               | 63               | 3.74    | 3.70  | 4            | 251             | 57               |
| 6              | 24.0        | 25.100             | 0.74                           | 76               | 63               | 3.79    | 3.80  | 4            | 253             | 57               |
| 7              | 28.0        | 29.120             | 0.67                           | 76               | 64               | 3.44    | 3.40  | 3.5          | 252             | 56               |
| 8              | 32.0        | 33.164             | 0.65                           | 75               | 63               | 3.34    | 3.30  | 3.5          | 249             | 55               |
| 9              | 36.0        | 36.910             | 0.60                           | 76               | 63               | 3.08    | 3.10  | 3            | 253             | 54               |
| 10             | 40.0        | 41.010             | 0.71                           | 74               | 63               | 3.65    | 3.70  | 4            | 252             | 54               |
| 11             | 44.0        | 45.260             | 0.75                           | 72               | 64               | 3.88    | 3.90  | 4            | 252             | 54               |
| 12             | 48.0        | 49.570             | 0.77                           | 71               | 63               | 3.99    | 4.00  | 4            | 251             | 54               |
| 13             | 52.0        | 53.700             | 0.72                           | 70               | 63               | 3.73    | 3.70  | 4            | 250             | 55               |
| 14             | 56.0        | 57.880             | 0.74                           | 70               | 63               | 3.84    | 3.80  | 4            | 251             | 55               |
| 15             | 60.0        | 62.050             | 0.72                           | 70               | 64               | 3.74    | 3.70  | 4            | 252             | 56               |
| 16             | 64.0        | 66.181             | 0.69                           | 71               | 64               | 3.58    | 3.60  | 4            | 251             | 55               |

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Particulate Emissions and Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** BH 2  
**Method:** ODEQ 5

**Run:** 1  
**Start Time:** 22:37  
**End Time:** 23:46  
**Date:** 12/16/2020

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 0.000                    |                                 |                            |                   |                         |                            |             |
| 4             | 4.470                    | 4.30                            | 65                         | 1                 | 0.80                    | 57                         | 0.8944      |
| 8             | 8.740                    | 3.90                            | 65                         | 2                 | 0.74                    | 65                         | 0.8602      |
| 12            | 12.920                   | 3.70                            | 64                         | 3                 | 0.71                    | 70                         | 0.8426      |
| 16            | 16.910                   | 3.40                            | 64                         | 4                 | 0.65                    | 68                         | 0.8062      |
| 20            | 20.810                   | 3.10                            | 64                         | 5                 | 0.59                    | 67                         | 0.7681      |
| 24            | 24.760                   | 3.30                            | 64                         | 6                 | 0.64                    | 66                         | 0.8000      |
| 28            | 28.950                   | 3.70                            | 64                         | 7                 | 0.71                    | 65                         | 0.8426      |
| 32            | 33.161                   | 3.80                            | 64                         | 8                 | 0.72                    | 66                         | 0.8485      |
| 36            | 37.370                   | 3.80                            | 64                         | 9                 | 0.72                    | 66                         | 0.8485      |
| 40            | 41.500                   | 3.60                            | 64                         | 10                | 0.68                    | 66                         | 0.8246      |
| 44            | 45.580                   | 3.50                            | 64                         | 11                | 0.67                    | 67                         | 0.8185      |
| 48            | 49.590                   | 3.40                            | 64                         | 12                | 0.66                    | 66                         | 0.8124      |
| 52            | 53.320                   | 2.90                            | 64                         | 13                | 0.55                    | 68                         | 0.7416      |
| 56            | 57.490                   | 3.70                            | 65                         | 14                | 0.72                    | 70                         | 0.8485      |
| 60            | 61.650                   | 3.30                            | 65                         | 15                | 0.63                    | 71                         | 0.7937      |
| 64            | 65.834                   | 3.80                            | 65                         | 16                | 0.74                    | 72                         | 0.8602      |

**Client:** Columbia Steel Casting  
**Source:** BH 2

**Run:** 1  
**Date:** 12/16/20

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**Field Data Input Continued**Moisture Data

Total Test Time 64.0 min  
Sample Time Interval 4.0 min  
Meter Volume,  $V_m$  65.834 dcf  
Water Volume 18.6 g  
Nozzle Diameter,  $N_z$  0.2613 in.  
Nozzle Area 0.000372 sq.ft.

Stack Dimensional Data:

Circular  
Diameter 46.500 in  
Rectangular  
Width in  
Length in  
Stack Area 11.793 sq.ft.

Traverse Data

Barometric Pressure,  $P_b$  29.63 "Hg  
Static Pressure 0.95 "H<sub>2</sub>O  
Pitot Factor, cp 0.84  
Meter Cal Factor 0.9956 Y

Molecular Weight:

CO<sub>2</sub> Average 0.11 %vd  
O<sub>2</sub> Average 20.97 %vd

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**Field Data Averages**Meter

$\Delta H$  3.575 "H<sub>2</sub>O  
Temperature,  $T_m$  64.3 °F  
Temperature,  $T_m$  524.3 °A (°R)  
Pressure Meter,  $P_m$  29.893 "Hg

Stack

$\sqrt{Dp}$  0.8257 "H<sub>2</sub>O  
Temperature,  $T_s$  66.9 °F  
Temperature,  $T_s$  526.9 °A (R)  
Pressure Stack,  $P_s$  29.700 "Hg

**Field Data Calculations**Meter Box Capture

Standard Volume,  $V_{m(std)}$  65.921 dscf  
1.867 dscm  
Actual Volume,  $V_{m(actual)}$  67.177 awcf

EPA Method 2 Stack Gas Flowrate:

Velocity,  $V_s$  46.60 fps  
Volume (actual) 32,973.2 acfm  
32,541.3 adcfm  
Volume (standard) 1,967,946.6 wscf/hr  
1,942,166.5 dscf/hr  
32,369.4 dscf/min

Gas Stream Moisture

Moisture Vapor,  $V_{w(std)}$  0.875 scf  
Moisture,  $B_{ws}$  0.0131  
Moisture EPA M4 1.31 %v

EPA Method 3 Gas Density

Dry,  $M_d$  28.86 lb/lb-mole  
Wet,  $M_s$  28.72 lb/lb-mole

Percent Isokinetic 100.9 %

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**Laboratory Results****EPA Method 5**

Filterable PM 0.00000 grams

**Emissions:**

Concentration,  $C_s$  0.0000 gr/dscf  
0 µg/dscm  
Mass Emissions 0.00 lb/hr

**Back Half:**

Inorganic CPM 1.75E-03 grams  
Inorganic CPM,  $C_s$  4.09E-04 gr/dscf  
935 µg/dscm  
Mass Emissions 0.11 lb/hr

Organic CPM 5.01E-04 grams  
Organic CPM,  $C_s$  1.17E-04 gr/dscf  
268 µg/dscm  
Mass Emissions 0.03 lb/hr

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Particulate Emissions and Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** BH 2  
**Method:** ODEQ 5

**Run:** 2  
**Start Time:** 0:18  
**End Time:** 1:28  
**Date:** 12/17/20

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 0.000                    |                                 |                            |                   |                         |                            |             |
| 4             | 4.210                    | 3.60                            | 66                         | 1                 | 0.69                    | 74                         | 0.8307      |
| 8             | 8.340                    | 3.60                            | 64                         | 2                 | 0.70                    | 72                         | 0.8367      |
| 12            | 12.400                   | 3.60                            | 65                         | 3                 | 0.69                    | 71                         | 0.8307      |
| 16            | 16.370                   | 3.30                            | 64                         | 4                 | 0.65                    | 71                         | 0.8062      |
| 20            | 20.390                   | 3.40                            | 64                         | 5                 | 0.66                    | 72                         | 0.8124      |
| 24            | 24.340                   | 3.30                            | 64                         | 6                 | 0.64                    | 73                         | 0.8000      |
| 28            | 28.040                   | 2.90                            | 63                         | 7                 | 0.57                    | 78                         | 0.7550      |
| 32            | 31.980                   | 3.30                            | 63                         | 8                 | 0.64                    | 77                         | 0.8000      |
| 36            | 35.920                   | 3.30                            | 63                         | 9                 | 0.66                    | 78                         | 0.8124      |
| 40            | 39.850                   | 3.10                            | 63                         | 10                | 0.62                    | 78                         | 0.7874      |
| 44            | 43.840                   | 3.40                            | 63                         | 11                | 0.67                    | 76                         | 0.8185      |
| 48            | 47.690                   | 3.10                            | 62                         | 12                | 0.61                    | 73                         | 0.7810      |
| 52            | 51.550                   | 3.10                            | 62                         | 13                | 0.60                    | 74                         | 0.7746      |
| 56            | 55.480                   | 3.40                            | 62                         | 14                | 0.67                    | 76                         | 0.8185      |
| 60            | 59.600                   | 3.70                            | 62                         | 15                | 0.69                    | 73                         | 0.8307      |
| 64            | 63.678                   | 3.60                            | 62                         | 16                | 0.71                    | 70                         | 0.8426      |

**Client:** Columbia Steel Casting  
**Source:** BH 2

**Run:** 2  
**Date:** 12/17/20

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**Field Data Input Continued**Moisture Data

Total Test Time 64.0 min  
Sample Time Interval 4.0 min  
Meter Volume,  $V_m$  63.678 dcf  
Water Volume 10.6 g  
Nozzle Diameter,  $N_z$  0.2613 in.  
Nozzle Area 0.000372 sq.ft.

Stack Dimensional Data:

Circular  
Diameter 46.500 in  
Rectangular  
Width in  
Length in  
Stack Area 11.793 sq.ft.

Traverse Data

Barometric Pressure,  $P_b$  29.79 "Hg  
Static Pressure 0.95 "H<sub>2</sub>O  
Pitot Factor, cp 0.84  
Meter Cal Factor 0.9956 Y

Molecular Weight:

CO<sub>2</sub> Average 0.09 %vd  
O<sub>2</sub> Average 20.85 %vd

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**Field Data Averages**Meter

$\Delta H$  3.356 "H<sub>2</sub>O  
Temperature,  $T_m$  63.3 °F  
Temperature,  $T_m$  523.3 °A (°R)  
Pressure Meter,  $P_m$  30.037 "Hg

Stack

$\sqrt{Dp}$  0.8086 "H<sub>2</sub>O  
Temperature,  $T_s$  74.1 °F  
Temperature,  $T_s$  534.1 °A (R)  
Pressure Stack,  $P_s$  29.860 "Hg

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**Field Data Calculations**Meter Box Capture

Standard Volume,  $V_{m(std)}$  64.192 dscf  
1.818 dscm  
Actual Volume,  $V_{m(actual)}$  65.595 awcf

EPA Method 2 Stack Gas Flowrate:

Velocity,  $V_s$  45.79 fps  
Volume (actual) 32,400.1 acfm  
32,150.6 adcfm  
Volume (standard) 1,917,948.8 wscf/hr  
1,903,180.6 dscf/hr  
31,719.7 dscf/min

Gas Stream Moisture

Moisture Vapor,  $V_{w(std)}$  0.499 scf  
Moisture,  $B_{ws}$  0.0077  
Moisture EPA M4 0.77 %v

EPA Method 3 Gas Density

Dry,  $M_d$  28.85 lb/lb-mole  
Wet,  $M_s$  28.77 lb/lb-mole

Percent Isokinetic 100.3 %

---

**Laboratory Results****Front Half:**

Filterable PM 0.00095 grams

**Emissions:**

Concentration,  $C_s$  2.29E-04 gr/dscf  
525 µg/dscm  
Mass Emissions 0.06 lb/hr

**Back Half:**

Inorganic CPM 4.43E-03 grams  
Inorganic CPM,  $C_s$  1.06E-03 gr/dscf  
2,435 µg/dscm  
Mass Emissions 0.29 lb/hr

Organic CPM 2.81E-04 grams  
Organic CPM,  $C_s$  6.76E-05 gr/dscf  
155 µg/dscm  
Mass Emissions 0.02 lb/hr

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Particulate Emissions and Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** BH 2  
**Method:** ODEQ 5

**Run:** 3  
**Start Time:** 1:56  
**End Time:** 3:06  
**Date:** 12/17/20

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 0.000                    |                                 |                            |                   |                         |                            |             |
| 4             | 4.210                    | 3.80                            | 63                         | 1                 | 0.74                    | 73                         | 0.8602      |
| 8             | 8.480                    | 3.90                            | 63                         | 2                 | 0.75                    | 76                         | 0.8660      |
| 12            | 12.580                   | 3.60                            | 63                         | 3                 | 0.71                    | 78                         | 0.8426      |
| 16            | 16.700                   | 3.60                            | 63                         | 4                 | 0.70                    | 79                         | 0.8367      |
| 20            | 20.880                   | 3.70                            | 63                         | 5                 | 0.73                    | 77                         | 0.8544      |
| 24            | 25.100                   | 3.80                            | 63                         | 6                 | 0.74                    | 76                         | 0.8602      |
| 28            | 29.120                   | 3.40                            | 64                         | 7                 | 0.67                    | 76                         | 0.8185      |
| 32            | 33.164                   | 3.30                            | 63                         | 8                 | 0.65                    | 75                         | 0.8062      |
| 36            | 36.910                   | 3.10                            | 63                         | 9                 | 0.60                    | 76                         | 0.7746      |
| 40            | 41.010                   | 3.70                            | 63                         | 10                | 0.71                    | 74                         | 0.8426      |
| 44            | 45.260                   | 3.90                            | 64                         | 11                | 0.75                    | 72                         | 0.8660      |
| 48            | 49.570                   | 4.00                            | 63                         | 12                | 0.77                    | 71                         | 0.8775      |
| 52            | 53.700                   | 3.70                            | 63                         | 13                | 0.72                    | 70                         | 0.8485      |
| 56            | 57.880                   | 3.80                            | 63                         | 14                | 0.74                    | 70                         | 0.8602      |
| 60            | 62.050                   | 3.70                            | 64                         | 15                | 0.72                    | 70                         | 0.8485      |
| 64            | 66.181                   | 3.60                            | 64                         | 16                | 0.69                    | 71                         | 0.8307      |

**Client:** Columbia Steel Casting  
**Source:** BH 2

**Run:** 3  
**Date:** 12/17/20

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**Field Data Input Continued**Moisture Data

Total Test Time 64.0 min  
Sample Time Interval 4.0 min  
Meter Volume,  $V_m$  66.181 dcf  
Water Volume 9.7 g  
Nozzle Diameter,  $N_z$  0.2613 in.  
Nozzle Area 0.000372 sq.ft.

Stack Dimensional Data:

Circular  
Diameter 46.500 in  
Rectangular  
Width in  
Length in  
Stack Area 11.793 sq.ft.

Traverse Data

Barometric Pressure,  $P_b$  29.79 "Hg  
Static Pressure 0.95 "H<sub>2</sub>O  
Pitot Factor, cp 0.84  
Meter Cal Factor 0.9956 Y

Molecular Weight:

CO<sub>2</sub> Average 0.11 %vd  
O<sub>2</sub> Average 20.95 %vd

---

**Field Data Averages**Meter

$\Delta H$  3.663 "H<sub>2</sub>O  
Temperature,  $T_m$  63.3 °F  
Temperature,  $T_m$  523.3 °A (°R)  
Pressure Meter,  $P_m$  30.059 "Hg

Stack

$\sqrt{D_p}$  0.8433 "H<sub>2</sub>O  
Temperature,  $T_s$  74.0 °F  
Temperature,  $T_s$  534.0 °A (R)  
Pressure Stack,  $P_s$  29.860 "Hg

**Field Data Calculations**Meter Box Capture

Standard Volume,  $V_{m(std)}$  66.764 dscf  
1.891 dscm  
Actual Volume,  $V_{m(actual)}$  68.149 awcf

Gas Stream Moisture

Moisture Vapor,  $V_{w(std)}$  0.456 scf  
Moisture,  $B_{ws}$  0.0068  
Moisture EPA M4 0.68 %v

EPA Method 3 Gas Density

Dry,  $M_d$  28.86 lb/lb-mole  
Wet,  $M_s$  28.79 lb/lb-mole

Percent Isokinetic 100.0 %

EPA Method 2 Stack Gas Flowrate:

Velocity,  $V_s$  47.73 fps  
Volume (actual) 33,772.8 acfm  
33,543.1 adcfm  
Volume (standard) 1,999,581.5 wscf/hr  
1,985,984.3 dscf/hr  
33,099.7 dscf/min

---

**Laboratory Results****Front Half:**

Filterable PM 0.00037 grams

**Emissions:**

Concentration,  $C_s$  8.48E-05 gr/dscf  
194 µg/dscm  
Mass Emissions 0.02 lb/hr

**Back Half:**

Inorganic CPM 3.37E-03 grams  
Inorganic CPM,  $C_s$  7.79E-04 gr/dscf  
1,782 µg/dscm  
Mass Emissions 0.22 lb/hr

Organic CPM 2.14E-03 grams  
Organic CPM,  $C_s$  4.95E-04 gr/dscf  
1,132 µg/dscm  
Mass Emissions 0.14 lb/hr

**Oregon Method 5**  
**Filterable and Condensable Particulate**  
**Laboratory Gravimetric Data**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** BH 2

| Run | Sample Description                   | ml,# | Initial<br>(grams) | Final<br>(grams) | Net Gain<br>(grams)       | Blank<br>Correction<br>(grams) | Corrected<br>Gain (grams) |           |
|-----|--------------------------------------|------|--------------------|------------------|---------------------------|--------------------------------|---------------------------|-----------|
| 1   | CPM Organics (Acetone BH)            | 94   | 103.45050          | 103.45108        | 0.00058                   | 0.00025                        | <b>0.00033</b>            |           |
|     | Probe Rinse (Acetone FH)             | 97   | 103.18963          | 103.18961        | -0.00002                  | 0.00026                        | <b>0.00000</b>            |           |
|     | Filter                               | U205 | 0.47102            | 0.47101          | -0.00001                  |                                | <b>0.00000</b>            |           |
|     | CPM Inorganics (Water)               | 253  | 121.80215          | 121.80420        | 0.00205                   | 0.00030                        | <b>0.00175</b>            |           |
|     | CPM Organics (Methylene Chloride BH) | 150  | 109.17124          | 109.17154        | 0.00030                   | 0.00013                        | <b>0.00017</b>            |           |
|     | Impinger H <sub>2</sub> O Gain, g    |      |                    |                  | 3.5                       |                                |                           |           |
|     |                                      |      |                    |                  | <b>Filterable PM (mg)</b> |                                | <b>0.00</b>               |           |
|     |                                      |      |                    |                  | <b>Total PM (mg)</b>      |                                | <b>2.25</b>               | <b>ND</b> |
| 2   | CPM Organics (Acetone BH)            | 128  | 117.00381          | 117.00429        | 0.00048                   | 0.00034                        | <b>0.00014</b>            |           |
|     | Probe Rinse (Acetone FH)             | 89   | 98.66506           | 98.66625         | 0.00119                   | 0.00024                        | <b>0.00095</b>            |           |
|     | Filter                               | U206 | 0.47718            | 0.47614          | -0.00104                  |                                | <b>0.00000</b>            |           |
|     | CPM Inorganics (Water)               | 260  | 115.63632          | 115.64106        | 0.00474                   | 0.00031                        | <b>0.00443</b>            |           |
|     | CPM Organics (Methylene Chloride BH) | 150  | 119.90593          | 119.90620        | 0.00027                   | 0.00013                        | <b>0.00014</b>            |           |
|     | Impinger H <sub>2</sub> O Gain, g    |      |                    |                  | -10.6                     |                                |                           |           |
|     |                                      |      |                    |                  | <b>Filterable PM (mg)</b> |                                | <b>0.95</b>               |           |
|     |                                      |      |                    |                  | <b>Total PM (mg)</b>      |                                | <b>5.66</b>               | <b>ND</b> |
| 3   | CPM Organics (Acetone BH)            | 102  | 99.26531           | 99.26721         | 0.00190                   | 0.00027                        | <b>0.00163</b>            |           |
|     | Probe Rinse (Acetone FH)             | 141  | 100.18576          | 100.18650        | 0.00074                   | 0.00037                        | <b>0.00037</b>            |           |
|     | Filter                               | U207 | 0.47562            | 0.47454          | -0.00108                  |                                | <b>0.00000</b>            |           |
|     | CPM Inorganics (Water)               | 257  | 102.45032          | 102.45400        | 0.00368                   | 0.00031                        | <b>0.00337</b>            |           |
|     | CPM Organics (Methylene Chloride BH) | 150  | 120.68345          | 120.68409        | 0.00064                   | 0.00013                        | <b>0.00051</b>            |           |
|     | Impinger H <sub>2</sub> O Gain, g    |      |                    |                  | -14.0                     |                                |                           |           |
|     |                                      |      |                    |                  | <b>Filterable PM (mg)</b> |                                | <b>0.37</b>               |           |
|     |                                      |      |                    |                  | <b>Total PM (mg)</b>      |                                | <b>5.88</b>               | <b>ND</b> |
|     | Acetone Blank                        | 170  | 102.30054          | 102.30099        | 0.00045                   | 2.65E-06                       | g/ml                      |           |
|     | Water Blank                          | 216  | 99.57033           | 99.57059         | 0.00026                   | 1.20E-06                       | g/ml                      |           |
|     | Methylene Chloride Blank             | 150  | 101.38136          | 101.38149        | 0.00013                   | 8.67E-07                       | g/ml                      |           |

ND = Non-Detect. Values are below the method detection limit (7 mg). Emission rates were calculated using these results, rather than the 7 mg detection limit, as this testing was conducted for emission factor verification purposes.

**Oregon Methods 1-5**  
**Filterable and Condensable Particulate**  
**Results Summary**

**Client:** Columbia Steel Casting  
**Source:** BH 2  
**Location:** Portland, OR

| Run                              |                               |                     | 1          | 2          | 3          |                   |
|----------------------------------|-------------------------------|---------------------|------------|------------|------------|-------------------|
| Date                             |                               |                     | 12/16/2020 | 12/17/2020 | 12/17/2020 |                   |
| Run Start Time                   |                               |                     | 22:37      | 0:18       | 1:56       |                   |
| Run End Date                     |                               |                     | 12/16/2020 | 12/17/2020 | 12/17/2020 |                   |
| Run End Time                     |                               |                     | 23:46      | 1:28       | 3:06       |                   |
| Duration, min.                   |                               |                     | 64         | 64         | 64         | <b>Average</b>    |
| Barometric Pressure, "Hg         |                               |                     | 29.63      | 29.79      | 29.79      | <b>29.74</b>      |
| Nozzle Dia., in.                 |                               |                     | 0.2613     | 0.2613     | 0.2613     | <b>0.2613</b>     |
| Isokinetic Average, %            |                               |                     | 100.9      | 100.3      | 99.9       | <b>100.4</b>      |
| Sample Volume, dscf              |                               |                     | 65.906     | 64.177     | 66.749     | <b>65.611</b>     |
| Sample Volume, dscm              |                               |                     | 1.866      | 1.817      | 1.890      | <b>1.858</b>      |
| Stack Diameter, in.              |                               |                     | 46.50      | 46.50      | 46.50      | <b>46.50</b>      |
| Stack Area, sq.ft.               |                               |                     | 11.793     | 11.793     | 11.793     | <b>11.793</b>     |
| CO <sub>2</sub> %vd              |                               |                     | 0.11       | 0.09       | 0.11       | <b>0.10</b>       |
| O <sub>2</sub> %vd               |                               |                     | 20.97      | 20.85      | 20.95      | <b>20.92</b>      |
| Static Press., "H <sub>2</sub> O |                               |                     | 0.95       | 0.95       | 0.95       | <b>0.95</b>       |
| H <sub>2</sub> O %v              |                               |                     | 1.31       | 0.77       | 0.68       | <b>0.92</b>       |
| Wet Molecular Weight, lb/lb-mole |                               |                     | 28.72      | 28.77      | 28.79      | <b>28.76</b>      |
| Velocity, FPS                    |                               |                     | 46.60      | 45.79      | 47.73      | <b>46.71</b>      |
| ADCFM                            |                               |                     | 32,541.3   | 32,150.6   | 33,543.1   | <b>32,745.0</b>   |
| ACFM                             |                               |                     | 32,973.2   | 32,400.1   | 33,772.8   | <b>33,048.7</b>   |
| DSCFM                            |                               |                     | 32,369.4   | 31,719.7   | 33,099.7   | <b>32,396.3</b>   |
| Stack Temperature, °F            |                               |                     | 66.9       | 74.1       | 74.0       | <b>71.7</b>       |
| Filterable Particulate           | Concentration, C <sub>s</sub> | gr/dscf             | 0.00E+00   | 2.29E-04   | 8.48E-05   | <b>1.05E-04</b>   |
|                                  |                               | µg/dscm             | 0          | 525        | 194        | <b>240</b>        |
|                                  | Mass                          | lb/hr               | 0.00       | 0.06       | 0.02       | <b>0.03</b>       |
| Inorganic CPM                    | Concentration, C <sub>s</sub> | gr/dscf             | 4.09E-04   | 1.06E-03   | 7.79E-04   | <b>7.51E-04</b>   |
|                                  |                               | µg/dscm             | 936        | 2,436      | 1,783      | <b>1,719</b>      |
|                                  | Mass                          | lb/hr               | 0.11       | 0.29       | 0.22       | <b>0.21</b>       |
| Organic CPM                      | Concentration, C <sub>s</sub> | gr/dscf             | 1.17E-04   | 6.76E-05   | 4.95E-04   | <b>2.27E-04</b>   |
|                                  |                               | µg/dscm             | 269        | 155        | 1,132      | <b>519</b>        |
|                                  | Mass                          | lb/hr               | 0.03       | 0.02       | 0.14       | <b>0.06</b>       |
| Total PM                         | Concentration, C <sub>s</sub> | gr/dscf             | 5.26E-04   | 1.36E-03   | 1.36E-03   | <b>1.08E-03</b>   |
|                                  |                               | µg/dscm             | 1,204.3    | 3,116.5    | 3,109.7    | <b>2,476.8</b>    |
|                                  | Mass                          | lb/hr               | 0.15       | 0.37       | 0.39       | <b>0.30</b>       |
|                                  |                               | lb/ton steel melted | 0.0410     | 0.1040     | 0.0562     | <b>0.0671</b>     |
| *Total PM                        | Concentration, C <sub>s</sub> | gr/dscf             | < 1.64E-03 | < 1.68E-03 | < 1.62E-03 | < <b>1.65E-03</b> |
|                                  |                               | µg/dscm             | < 3,751.3  | < 3,852.5  | < 3,703.7  | < <b>3,769.2</b>  |
|                                  | Mass                          | lb/hr               | < 0.45     | < 0.46     | < 0.46     | < <b>0.46</b>     |
|                                  |                               | lb/ton steel melted | < 0.1277   | < 0.1285   | < 0.0669   | < <b>0.1077</b>   |
| Production Data                  | Steel Melted                  | tons/hr             | 3.56       | 3.56       | 6.86       | <b>4.66</b>       |

\*Results are below method detection limit. Results are calculated using the method detection limit of 7 mg.

## **APPENDIX D: BAGHOUSE #15 TEST DATA**

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|           |                        |
|-----------|------------------------|
| COMPANY   | Columbia Steel Casting |
| FACILITY  | Steel Foundry          |
| LOCATION  | Portland, Oregon       |
| SOURCE    | BH 15                  |
| DATE      | 12/7/2020 - 12/9/2020  |
| METHOD    | M29                    |
| POLLUTANT | Selected Metals        |

**EPA Method 1**  
**Stack Parameters and Traverse Points**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 15  
**Facility:** Steel Foundry

Type of Testing: p (P for Particulate; V for Velocity/Nonparticulate)  
Type of Duct: c (C for circular; R for rectangular)

Number of ports available: 2  
Number of ports to be used: 2  
Port diameter: 6 inches

Circular ID (Rectangular Depth): 66.00 inches  
Port depth and/or wall thickness: 6.00 inches  
Stack width (Rectangular only): inches

Equivalent Diameter  
If rectangular =  $\frac{2 * \text{Depth} * \text{Width}}{\text{Depth} + \text{Width}}$  = 66.00 inches (If circular = duct ID)

Stack/duct area = 23.758 sq.feet 3421.2 sq.inches

Sample Port Location:

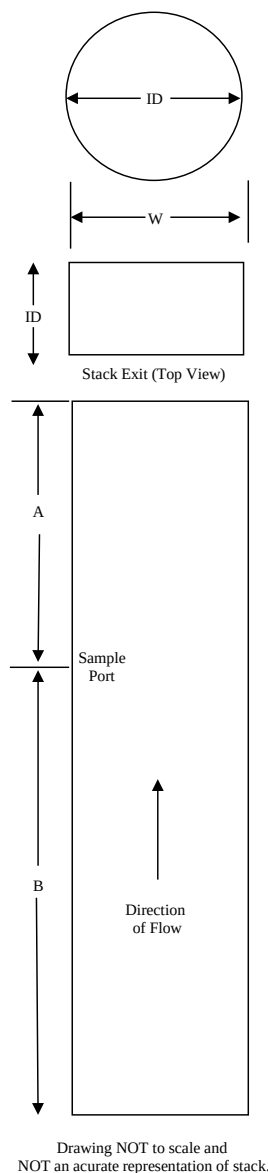
|                      | Downstream from<br>flow disturbance<br><u>from process</u> | Upstream from<br>flow disturbance<br><u>toward exit</u> |
|----------------------|------------------------------------------------------------|---------------------------------------------------------|
|                      | B                                                          | A                                                       |
| Number of Inches:    | 132.00                                                     | 42.00                                                   |
| Number of Diameters: | 2.00                                                       | 0.64                                                    |

Minimum Number of Traverse Points: 24

| Points | % of<br>diameter | Distance from<br>inside wall (in.) | Distance including<br>port (in.) |
|--------|------------------|------------------------------------|----------------------------------|
| 1      | 2.1              | 1.39                               | 7 3/8                            |
| 2      | 6.7              | 4.42                               | 10 3/8                           |
| 3      | 11.8             | 7.79                               | 13 3/4                           |
| 4      | 17.7             | 11.68                              | 17 5/8                           |
| 5      | 25.0             | 16.50                              | 22 1/2                           |
| 6      | 35.6             | 23.50                              | 29 1/2                           |
| 7      | 64.4             | 42.50                              | 48 1/2                           |
| 8      | 75.0             | 49.50                              | 55 1/2                           |
| 9      | 82.3             | 54.32                              | 60 3/8                           |
| 10     | 88.2             | 58.21                              | 64 1/4                           |
| 11     | 93.3             | 61.58                              | 67 5/8                           |
| 12     | 97.9             | 64.61                              | 70 5/8                           |

#  
#

**Reference Diagram**



Drawing NOT to scale and  
NOT an accurate representation of stack.

### Pre Traverse Flow Information

**Client:** Columbia Steel Casting

**Location:** Portland, Oregon

**Source:** BH 15

**Stack Temp:** 51

| Traverse Point | Velocity (ft/min) | Angle |
|----------------|-------------------|-------|
| 1              | 0.32              | 10.0  |
| 2              | 0.32              | 0.0   |
| 3              | 0.30              | 5.0   |
| 4              | 0.31              | 10.0  |
| 5              | 0.25              | 10.0  |
| 6              | 0.26              | 10.0  |
| 7              | 0.25              | 5.0   |
| 8              | 0.21              | 5.0   |
| 9              | 0.22              | 10.0  |
| 10             | 0.24              | 5.0   |
| 11             | 0.27              | 10.0  |
| 12             | 0.27              | 5.0   |
| 13             | 0.28              | 5.0   |
| 14             | 0.28              | 5.0   |
| 15             | 0.30              | 5.0   |
| 16             | 0.30              | 10.0  |
| 17             | 0.25              | 0.0   |
| 18             | 0.26              | 0.0   |
| 19             | 0.24              | 0.0   |
| 20             | 0.22              | 0.0   |
| 21             | 0.22              | 5.0   |
| 22             | 0.23              | 10.0  |
| 23             | 0.24              | 10.0  |
| 24             | 0.26              | 5.0   |

Average: 0.26 5.8

Flow is found to be:

Non-cyclonic x

Cyclonic

**Isokinetic Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 15  
**EPA Method:** M29  
**Box Operator:** JCR  
**Technician(s):** JCR

**Environmental Conditions/Test Notes:**  
Partly cloudy and 40s F.

**Run:** 1  
**Start Time:** 7:20  
**End Time:** 19:25  
**Date:** 12/7/2020

**Stack Dimensional Data:**

Circular  
Diameter 66.000 in  
Rectangular  
Width in  
Length in  
Stack Area 23.758 sq.ft.

**Equipment:**

|             |        |            |        |             |                 |
|-------------|--------|------------|--------|-------------|-----------------|
| Meterbox ID | 13     | Probe ID   | 6E     | Liner type  | glass           |
| Y factor    | 0.9956 | Nozzle ID  | G 0.31 | Nozzle size | 0.3097 inches   |
| ΔH@         | 1.861  | Hot box ID | HB3    | Nozzle area | 0.000523 sq.ft. |
|             |        | Pitot Cp   | 0.84   | Probe heat  | 250 F           |
|             |        | Pitot ID   | 6E     | Filter heat | 250 F           |

**Source Information:**

|                        |                        |                 |              |
|------------------------|------------------------|-----------------|--------------|
| Barometric Pressure    | 30.41 "Hg              | O <sub>2</sub>  | 20.90 %      |
| Static Pressure        | -8.0 "H <sub>2</sub> O | CO <sub>2</sub> | 0.00 %       |
| Ave. ΔP                | 0.28 "H <sub>2</sub> O | Rec. Nz.        | 0.283 inches |
| Stack Temperature      | 50 F                   |                 |              |
| Assumed moisture       | 1.5 %                  |                 |              |
| Assumed meter temp.    | 55 F                   |                 |              |
| Total number of points | 24                     |                 |              |
| Time per point         | 30                     |                 |              |
| Total run time         | 720                    |                 |              |

**Leak Checks:**

|                        | Pre-test | Post-test |
|------------------------|----------|-----------|
| Pitot                  | x        | x         |
| Train leak rate, dcf   | 0.000    | 0.000     |
| Leak check vacuum, "Hg | 10       | 10        |

**Nozzle check for roundness:**

| 1           | 2     | 3            |
|-------------|-------|--------------|
| 0.310       | 0.310 | 0.309 inches |
| Caliper ID# | ws2   |              |

**Post Test Calculations:**

|                         |                               |                     |                         |
|-------------------------|-------------------------------|---------------------|-------------------------|
| Sample volume           | 637.152 dcf                   | Ave. ΔP             | 0.282 "H <sub>2</sub> O |
| Wet mol. weight         | 28.79 M <sub>s</sub> (actual) | Ave. √ΔP            | 0.53 "H <sub>2</sub> O  |
| Actual H <sub>2</sub> O | 0.46 %                        | Ave. ΔH             | 2.798 "H <sub>2</sub> O |
| Std. meter vol.         | 674.390 dscf                  | Ave. T <sub>s</sub> | 50.3 °F                 |
| Isokinetic Average      | 99.2 %                        | Ave. T <sub>m</sub> | 48 °F                   |

**Moisture/Lab:**

| Filter        | NA #              |       |      |
|---------------|-------------------|-------|------|
|               | Initial           | Final | Gain |
| Impingers, g  | 217.1             | 211.3 | -5.8 |
| Silica gel, g | 266.6             | 338.8 | 72.2 |
|               | Total water gain: |       | 66.4 |

| Traverse Point | Time (min.) | Meter Volume (dcf) | Velocity P ("H <sub>2</sub> O) | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum ("Hg) | Filter Box (°F) | Condenser Temp F |
|----------------|-------------|--------------------|--------------------------------|------------------|------------------|---------|-------|--------------|-----------------|------------------|
|                |             | 0.000              |                                |                  |                  |         |       |              |                 |                  |
| 1              | 30.0        | 28.200             | 0.33                           | 52               | 39               | 3.22    | 3.20  | 6            | 250             | 38               |
| 2              | 60.0        | 55.730             | 0.31                           | 46               | 39               | 3.06    | 3.00  | 6            | 251             | 34               |
| 3              | 90.0        | 83.840             | 0.32                           | 45               | 42               | 3.19    | 3.15  | 6            | 254             | 47               |
| 4              | 120.0       | 111.150            | 0.30                           | 45               | 43               | 2.99    | 3.00  | 6            | 256             | 41               |
| 5              | 150.0       | 138.400            | 0.30                           | 46               | 44               | 2.99    | 3.00  | 6            | 255             | 44               |
| 6              | 180.0       | 162.190            | 0.24                           | 46               | 47               | 2.41    | 2.40  | 5            | 252             | 40               |
| 7              | 210.0       | 186.450            | 0.24                           | 48               | 47               | 2.40    | 2.40  | 5            | 258             | 38               |
| 8              | 240.0       | 212.290            | 0.27                           | 56               | 48               | 2.66    | 2.65  | 5            | 261             | 40               |
| 9              | 270.0       | 239.730            | 0.30                           | 56               | 49               | 2.97    | 2.95  | 5            | 253             | 41               |
| 10             | 300.0       | 266.640            | 0.30                           | 55               | 50               | 2.98    | 2.95  | 5.5          | 256             | 41               |
| 11             | 330.0       | 294.260            | 0.30                           | 57               | 51               | 2.97    | 2.95  | 5.5          | 256             | 42               |
| 12             | 360.0       | 319.427            | 0.26                           | 54               | 51               | 2.59    | 2.55  | 5            | 255             | 38               |
| 13             | 390.0       | 345.720            | 0.27                           | 53               | 52               | 2.70    | 2.65  | 4            | 254             | 40               |
| 14             | 420.0       | 373.410            | 0.29                           | 57               | 53               | 2.88    | 2.90  | 5            | 255             | 40               |
| 15             | 450.0       | 402.260            | 0.32                           | 55               | 53               | 3.19    | 3.20  | 5            | 255             | 40               |
| 16             | 480.0       | 428.050            | 0.26                           | 52               | 54               | 2.62    | 2.60  | 4.5          | 256             | 40               |
| 17             | 510.0       | 452.730            | 0.23                           | 50               | 52               | 2.31    | 2.30  | 4.5          | 257             | 40               |
| 18             | 540.0       | 474.180            | 0.18                           | 51               | 51               | 1.80    | 1.80  | 4.5          | 257             | 40               |
| 19             | 570.0       | 500.230            | 0.25                           | 48               | 50               | 2.52    | 2.50  | 5            | 256             | 40               |
| 20             | 600.0       | 526.070            | 0.26                           | 47               | 49               | 2.62    | 2.60  | 5            | 253             | 40               |
| 21             | 630.0       | 553.588            | 0.30                           | 48               | 49               | 3.01    | 3.00  | 5.5          | 255             | 40               |
| 22             | 660.0       | 580.420            | 0.31                           | 47               | 47               | 3.11    | 3.10  | 5.5          | 255             | 40               |
| 23             | 690.0       | 610.010            | 0.33                           | 47               | 45               | 3.29    | 3.30  | 6            | 255             | 41               |
| 24             | 720.0       | 637.152            | 0.30                           | 46               | 46               | 3.01    | 3.00  | 5            | 256             | 40               |

**Isokinetic Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 15  
**EPA Method:** M29  
**Box Operator:** JCR  
**Technician(s):** JCR

**Environmental Conditions/Test Notes:**  
Partly cloudy and 40s F.

**Run:** 2  
**Start Time:** 00  
**End Time:** 20:04  
**Date:** 12/ /2020

**Stack Dimensional Data:**

Circular  
Diameter 66.000 in  
Rectangular  
Width in  
Length in  
Stack Area 23.758 sq.ft.

**Equipment:**

Meterbox ID 13 Probe ID 6E Liner type: glass  
Y factor 0.9956 Nozzle ID G 0.31 Nozzle size: 0.3097 inches  
 $\Delta H@$  1.861 Hot box ID HB3 Nozzle area: 0.000523 sq.ft.  
Pitot Cp 0.84 Probe heat: 250 F  
Pitot ID 6E Filter heat: 250 F

**Source Information:**

Barometric Pressure 30.25 "Hg O<sub>2</sub> 20.9 %  
Static Pressure -8 "H<sub>2</sub>O CO<sub>2</sub> 0.0 %  
Ave.  $\Delta P$  0.28 "H<sub>2</sub>O Rec. Nz. 0.284 inches  
Stack Temperature 50 F  
Assumed moisture 0.46 %  
Assumed meter temp. 48 F  
Total number of points 24  
Time per point 30  
Total run time 720

**Leak Checks:**

|                         | Pre-test | Post-test |
|-------------------------|----------|-----------|
| Pitot:                  | x        | x         |
| Train leak rate, dcf:   | 0.000    | 0.000     |
| Leak check vacuum, "Hg: | 14       | 14        |

**Nozzle check for roundness:**

| 1           | 2     | 3            |
|-------------|-------|--------------|
| 0.310       | 0.310 | 0.309 inches |
| Caliper ID# |       | ws2          |

**Post Test Calculations:**

Sample volume 561.848 dcf Ave.  $\Delta P$  0.211 "H<sub>2</sub>O  
Wet mol. weight 28.76 M<sub>s</sub> (actual) Ave.  $\sqrt{\Delta P}$  0.4564 "H<sub>2</sub>O  
Actual H<sub>2</sub>O 0.71 % Ave.  $\Delta H$  2.144 "H<sub>2</sub>O  
Std. meter vol. 586.489 dscf Ave. T<sub>s</sub> 51.6 °F  
Isokinetic Average 100.7 % Ave. T<sub>m</sub> 51.6 °F

**Moisture/Lab:**

| Filter            | NA # | Initial | Final | Gain |
|-------------------|------|---------|-------|------|
| Impingers, g      |      | 217.2   | 232.4 | 15.2 |
| Silica gel, g     |      | 879.2   | 953.1 | 73.9 |
| Total water gain: |      |         |       | 89.1 |

| Traverse Point | Time (min.) | Meter Volume (dcf) | Velocity P ("H <sub>2</sub> O) | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum ("Hg) | Filter Box (°F) | Condenser Temp F |
|----------------|-------------|--------------------|--------------------------------|------------------|------------------|---------|-------|--------------|-----------------|------------------|
|                |             | 0.000              |                                |                  |                  |         |       |              |                 |                  |
| 1              | 30.0        | 25.470             | 0.25                           | 46               | 41               | 2.52    | 2.50  | 3.5          | 255             | 40               |
| 2              | 60.0        | 53.080             | 0.30                           | 42               | 39               | 3.04    | 3.05  | 4.5          | 254             | 36               |
| 3              | 90.0        | 79.550             | 0.27                           | 45               | 44               | 2.75    | 2.75  | 4.5          | 256             | 48               |
| 4              | 120.0       | 104.890            | 0.25                           | 47               | 46               | 2.54    | 2.55  | 4.5          | 255             | 52               |
| 5              | 150.0       | 128.500            | 0.22                           | 48               | 48               | 2.24    | 2.20  | 4            | 255             | 45               |
| 6              | 180.0       | 152.140            | 0.21                           | 47               | 49               | 2.15    | 2.10  | 4            | 254             | 44               |
| 7              | 210.0       | 174.560            | 0.19                           | 48               | 49               | 1.94    | 1.90  | 4            | 254             | 43               |
| 8              | 240.0       | 193.540            | 0.14                           | 49               | 50               | 1.43    | 1.40  | 3            | 254             | 42               |
| 9              | 270.0       | 219.850            | 0.27                           | 55               | 52               | 2.73    | 2.70  | 4            | 255             | 44               |
| 10             | 300.0       | 240.080            | 0.15                           | 57               | 55               | 1.52    | 1.50  | 3            | 255             | 42               |
| 11             | 330.0       | 259.230            | 0.14                           | 55               | 55               | 1.43    | 1.40  | 2.5          | 255             | 41               |
| 12             | 360.0       | 279.063            | 0.15                           | 58               | 55               | 1.52    | 1.50  | 2.5          | 252             | 41               |
| 13             | 390.0       | 298.900            | 0.15                           | 58               | 56               | 1.52    | 1.50  | 2.5          | 255             | 43               |
| 14             | 420.0       | 318.590            | 0.15                           | 58               | 57               | 1.53    | 1.50  | 2.5          | 255             | 42               |
| 15             | 450.0       | 338.960            | 0.16                           | 56               | 55               | 1.63    | 1.65  | 2.5          | 257             | 42               |
| 16             | 480.0       | 360.230            | 0.17                           | 56               | 55               | 1.73    | 1.75  | 3            | 256             | 42               |
| 17             | 510.0       | 382.830            | 0.19                           | 54               | 56               | 1.94    | 1.95  | 3            | 256             | 40               |
| 18             | 540.0       | 407.650            | 0.23                           | 53               | 55               | 2.35    | 2.35  | 3.5          | 256             | 40               |
| 19             | 570.0       | 431.850            | 0.22                           | 51               | 54               | 2.25    | 2.25  | 3.5          | 255             | 39               |
| 20             | 600.0       | 456.540            | 0.23                           | 51               | 55               | 2.36    | 2.35  | 3.5          | 252             | 39               |
| 21             | 630.0       | 482.920            | 0.26                           | 51               | 53               | 2.66    | 2.65  | 4            | 255             | 39               |
| 22             | 660.0       | 508.900            | 0.24                           | 52               | 53               | 2.45    | 2.50  | 4.5          | 255             | 39               |
| 23             | 690.0       | 534.770            | 0.27                           | 51               | 54               | 2.77    | 2.75  | 4            | 255             | 40               |
| 24             | 720.0       | 561.848            | 0.26                           | 51               | 52               | 2.65    | 2.70  | 4            | 254             | 39               |

**Isokinetic Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** BH 15  
**EPA Method:** M29  
**Box Operator:** JCR  
**Technician(s):** JCR

**Environmental Conditions/Test Notes:**  
Partly cloudy and 40s F.

**Run:** 3  
**Start Time:** 7:45  
**End Time:** 1  
**Date:** 12/9/2020

**Stack Dimensional Data:**

Circular  
Diameter 66.000 in  
Rectangular  
Width in  
Length in  
Stack Area 23.758 sq.ft.

**Equipment:**

Meterbox ID 13  
Y factor 0.9956  
 $\Delta H@$  1.861  
Probe ID 6E  
Nozzle ID G 0.31  
Hot box ID HB3  
Pitot Cp 0.84  
Pitot ID 6E  
Liner type: glass  
Nozzle size: 0.3097 inches  
Nozzle area: 0.000523 sq.ft.  
Probe heat: 250 F  
Filter heat: 250 F

**Source Information:**

Barometric Pressure 30.36 "Hg  
Static Pressure -8 "H<sub>2</sub>O  
Ave.  $\Delta P$  0.28 "H<sub>2</sub>O  
Stack Temperature 50 F  
Assumed moisture 0.71 %  
Assumed meter temp. 51.6 F  
Total number of points 24  
Time per point 30  
Total run time 720  
O<sub>2</sub> 20.9 %  
CO<sub>2</sub> 0.0 %  
Rec. Nz. 0.283 inches

**Leak Checks:**

|                         | Pre-test | Post-test |
|-------------------------|----------|-----------|
| Pitot:                  | x        | x         |
| Train leak rate, dcf:   | 0.000    | 0.000     |
| Leak check vacuum, "Hg: | 15       | 15        |

**Nozzle check for roundness:**

| 1           | 2     | 3            |
|-------------|-------|--------------|
| 0.310       | 0.310 | 0.309 inches |
| Caliper ID# |       | ws2          |

**Post Test Calculations:**

Sample volume 576.816 dcf  
Wet mol. weight 28.73 M<sub>s</sub> (actual)  
Actual H<sub>2</sub>O 1.00 %  
Std. meter vol. 600.673 dscf  
Isokinetic Average 101.0 %  
Ave.  $\Delta P$  0.22 "H<sub>2</sub>O  
Ave.  $\sqrt{\Delta P}$  0.4669 "H<sub>2</sub>O  
Ave.  $\Delta H$  2.244 "H<sub>2</sub>O  
Ave. T<sub>s</sub> 52.5 °F  
Ave. T<sub>m</sub> 54.8 °F

**Moisture/Lab:**

| Filter            | NA #    |        | Gain  |
|-------------------|---------|--------|-------|
|                   | Initial | Final  |       |
| Impingers, g      | 205.6   | 243.9  | 38.3  |
| Silica gel, g     | 964.5   | 1054.8 | 90.3  |
| Total water gain: |         |        | 128.6 |

| Traverse Point | Time (min.) | Meter Volume (dcf) | Velocity P ("H <sub>2</sub> O) | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum ("Hg) | Filter Box (°F) | Condenser Temp F |
|----------------|-------------|--------------------|--------------------------------|------------------|------------------|---------|-------|--------------|-----------------|------------------|
| 1              | 30.0        | 20.140             | 0.14                           | 50               | 43               | 1.40    | 1.40  | 4            | 257             | 44               |
| 2              | 60.0        | 41.110             | 0.18                           | 51               | 40               | 1.79    | 1.80  | 4.5          | 256             | 35               |
| 3              | 90.0        | 61.900             | 0.17                           | 51               | 48               | 1.72    | 1.70  | 4.5          | 255             | 35               |
| 4              | 120.0       | 82.420             | 0.16                           | 52               | 51               | 1.62    | 1.60  | 4.5          | 255             | 35               |
| 5              | 150.0       | 105.330            | 0.20                           | 52               | 54               | 2.04    | 2.05  | 5.5          | 256             | 37               |
| 6              | 180.0       | 129.460            | 0.22                           | 55               | 56               | 2.24    | 2.25  | 6            | 255             | 38               |
| 7              | 210.0       | 152.690            | 0.20                           | 55               | 57               | 2.04    | 2.05  | 5.5          | 257             | 38               |
| 8              | 240.0       | 177.330            | 0.23                           | 55               | 58               | 2.35    | 2.35  | 6            | 256             | 39               |
| 9              | 270.0       | 201.580            | 0.22                           | 55               | 58               | 2.25    | 2.25  | 6            | 255             | 38               |
| 10             | 300.0       | 224.730            | 0.20                           | 56               | 59               | 2.04    | 2.05  | 5.5          | 256             | 39               |
| 11             | 330.0       | 248.130            | 0.21                           | 56               | 59               | 2.14    | 2.15  | 6            | 254             | 39               |
| 12             | 360.0       | 270.776            | 0.19                           | 58               | 60               | 1.94    | 1.95  | 5.5          | 255             | 41               |
| 13             | 390.0       | 293.870            | 0.20                           | 55               | 59               | 2.05    | 2.05  | 5.5          | 255             | 41               |
| 14             | 420.0       | 318.120            | 0.22                           | 54               | 58               | 2.25    | 2.30  | 6            | 252             | 41               |
| 15             | 450.0       | 342.230            | 0.21                           | 55               | 59               | 2.15    | 2.20  | 5.5          | 253             | 44               |
| 16             | 480.0       | 368.390            | 0.27                           | 54               | 60               | 2.77    | 2.70  | 6            | 252             | 44               |
| 17             | 510.0       | 394.600            | 0.24                           | 53               | 59               | 2.46    | 2.50  | 6            | 252             | 44               |
| 18             | 540.0       | 420.760            | 0.26                           | 53               | 58               | 2.66    | 2.60  | 6.5          | 252             | 45               |
| 19             | 570.0       | 446.550            | 0.25                           | 51               | 57               | 2.57    | 2.60  | 6.5          | 252             | 47               |
| 20             | 600.0       | 472.050            | 0.24                           | 50               | 56               | 2.46    | 2.50  | 6.5          | 252             | 48               |
| 21             | 630.0       | 497.570            | 0.25                           | 48               | 54               | 2.57    | 2.55  | 6.5          | 255             | 42               |
| 22             | 660.0       | 522.990            | 0.25                           | 47               | 52               | 2.56    | 2.55  | 6.5          | 252             | 43               |
| 23             | 690.0       | 549.010            | 0.26                           | 47               | 51               | 2.66    | 2.65  | 7            | 252             | 43               |
| 24             | 720.0       | 576.816            | 0.30                           | 46               | 50               | 3.07    | 3.05  | 8            | 252             | 45               |

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** Baghouse 15  
**Method:** 29

**Run:** 1  
**Start Time:** 7:20  
**End Time:** 19:25  
**Date:** 12/7/2020

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 0.000                    |                                 |                            |                   |                         |                            |             |
| 30.0          | 28.200                   | 3.20                            | 39                         | 1                 | 0.33                    | 52                         | 0.5745      |
| 60.0          | 55.730                   | 3.00                            | 39                         | 2                 | 0.31                    | 46                         | 0.5568      |
| 90.0          | 83.840                   | 3.15                            | 42                         | 3                 | 0.32                    | 45                         | 0.5657      |
| 120.0         | 111.150                  | 3.00                            | 43                         | 4                 | 0.30                    | 45                         | 0.5477      |
| 150.0         | 138.400                  | 3.00                            | 44                         | 5                 | 0.30                    | 46                         | 0.5477      |
| 180.0         | 162.190                  | 2.40                            | 47                         | 6                 | 0.24                    | 46                         | 0.4899      |
| 210.0         | 186.450                  | 2.40                            | 47                         | 7                 | 0.24                    | 48                         | 0.4899      |
| 240.0         | 212.290                  | 2.65                            | 48                         | 8                 | 0.27                    | 56                         | 0.5196      |
| 270.0         | 239.730                  | 2.95                            | 49                         | 9                 | 0.30                    | 56                         | 0.5477      |
| 300.0         | 266.640                  | 2.95                            | 50                         | 10                | 0.30                    | 55                         | 0.5477      |
| 330.0         | 294.260                  | 2.95                            | 51                         | 11                | 0.30                    | 57                         | 0.5477      |
| 360.0         | 319.427                  | 2.55                            | 51                         | 12                | 0.26                    | 54                         | 0.5099      |
| 390.0         | 345.720                  | 2.65                            | 52                         | 13                | 0.27                    | 53                         | 0.5196      |
| 420.0         | 373.410                  | 2.90                            | 53                         | 14                | 0.29                    | 57                         | 0.5385      |
| 450.0         | 402.260                  | 3.20                            | 53                         | 15                | 0.32                    | 55                         | 0.5657      |
| 480.0         | 428.050                  | 2.60                            | 54                         | 16                | 0.26                    | 52                         | 0.5099      |
| 510.0         | 452.730                  | 2.30                            | 52                         | 17                | 0.23                    | 50                         | 0.4796      |
| 540.0         | 474.180                  | 1.80                            | 51                         | 18                | 0.18                    | 51                         | 0.4243      |
| 570.0         | 500.230                  | 2.50                            | 50                         | 19                | 0.25                    | 48                         | 0.5000      |
| 600.0         | 526.070                  | 2.60                            | 49                         | 20                | 0.26                    | 47                         | 0.5099      |
| 630.0         | 553.588                  | 3.00                            | 49                         | 21                | 0.30                    | 48                         | 0.5477      |
| 660.0         | 580.420                  | 3.10                            | 47                         | 22                | 0.31                    | 47                         | 0.5568      |
| 690.0         | 610.010                  | 3.30                            | 45                         | 23                | 0.33                    | 47                         | 0.5745      |
| 720.0         | 637.152                  | 3.00                            | 46                         | 24                | 0.30                    | 46                         | 0.5477      |

**Client: Columbia Steel Casting****Run: 1****Source: Baghouse 15****Date: 12/07/20****Field Data Input Continued**Moisture Data

|                        |                 |
|------------------------|-----------------|
| Total Test Time        | 720.0 min       |
| Sample Time Interval   | 30.0 min        |
| Meter Volume, $V_m$    | 637.152 dcf     |
| Water Volume           | 66.4 g          |
| Nozzle Diameter, $N_z$ | 0.3097 in.      |
| Nozzle Area            | 0.000523 sq.ft. |

Stack Dimensional Data:

|             |               |
|-------------|---------------|
| Circular    |               |
| Diameter    | 66.000 in     |
| Rectangular |               |
| Width       | in            |
| Length      | in            |
| Stack Area  | 23.758 sq.ft. |

Traverse Data

|                            |                         |
|----------------------------|-------------------------|
| Barometric Pressure, $P_b$ | 30.41 "Hg               |
| Static Pressure            | -8.00 "H <sub>2</sub> O |
| Pitot Factor, cp           | 0.84                    |
| Meter Cal Factor           | 0.9956 Y                |

Molecular Weight:

|                         |           |
|-------------------------|-----------|
| CO <sub>2</sub> Average | 0.00 %vd  |
| O <sub>2</sub> Average  | 20.90 %vd |

**Field Data Averages**Meter

|                       |                         |
|-----------------------|-------------------------|
| $\Delta H$            | 2.798 "H <sub>2</sub> O |
| Temperature, $T_m$    | 48.0 °F                 |
| Temperature, $T_m$    | 508.0 °A (°R)           |
| Pressure Meter, $P_m$ | 30.616 "Hg              |

Stack

|                       |                          |
|-----------------------|--------------------------|
| $\sqrt{D_p}$          | 0.5300 "H <sub>2</sub> O |
| Temperature, $T_s$    | 50.3 °F                  |
| Temperature, $T_s$    | 510.3 °A (°R)            |
| Pressure Stack, $P_s$ | 29.822 "Hg               |

**Field Data Calculations**Meter Box Capture

|                                |              |
|--------------------------------|--------------|
| Standard Volume, $V_{m(std)}$  | 674.390 dscf |
|                                | 19.097 dscm  |
| Actual Volume, $V_{m(actual)}$ | 657.210 awcf |

EPA Method 2 Stack Gas Flowrate:

|                   |                     |
|-------------------|---------------------|
| Velocity, $V_s$   | 29.34 fps           |
| Volume (actual)   | 41,823.6 acfm       |
|                   | 41,631.2 adcfm      |
| Volume (standard) | 2,587,950.8 wscf/hr |
|                   | 2,576,046.2 dscf/hr |
|                   | 42,934.1 dscf/min   |

Gas Stream Moisture

|                              |           |
|------------------------------|-----------|
| Moisture Vapor, $V_{w(std)}$ | 3.125 scf |
| Moisture, $B_{ws}$           | 0.0046    |
| Moisture EPA M4              | 0.46 %v   |

EPA Method 3 Gas Density

|            |                  |
|------------|------------------|
| Dry, $M_d$ | 28.84 lb/lb-mole |
| Wet, $M_s$ | 28.79 lb/lb-mole |

|                    |        |
|--------------------|--------|
| Percent Isokinetic | 99.2 % |
|--------------------|--------|

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** Baghouse 15  
**Method:** 29

**Run:** 2  
**Start Time:** 8:00  
**End Time:** 20:04  
**Date:** 12/08/20

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 0.000                    |                                 |                            |                   |                         |                            |             |
| 30.0          | 25.470                   | 2.50                            | 41                         | 1                 | 0.25                    | 46                         | 0.5000      |
| 60.0          | 53.080                   | 3.05                            | 39                         | 2                 | 0.30                    | 42                         | 0.5477      |
| 90.0          | 79.550                   | 2.75                            | 44                         | 3                 | 0.27                    | 45                         | 0.5196      |
| 120.0         | 104.890                  | 2.55                            | 46                         | 4                 | 0.25                    | 47                         | 0.5000      |
| 150.0         | 128.500                  | 2.20                            | 48                         | 5                 | 0.22                    | 48                         | 0.4690      |
| 180.0         | 152.140                  | 2.10                            | 49                         | 6                 | 0.21                    | 47                         | 0.4583      |
| 210.0         | 174.560                  | 1.90                            | 49                         | 7                 | 0.19                    | 48                         | 0.4359      |
| 240.0         | 193.540                  | 1.40                            | 50                         | 8                 | 0.14                    | 49                         | 0.3742      |
| 270.0         | 219.850                  | 2.70                            | 52                         | 9                 | 0.27                    | 55                         | 0.5196      |
| 300.0         | 240.080                  | 1.50                            | 55                         | 10                | 0.15                    | 57                         | 0.3873      |
| 330.0         | 259.230                  | 1.40                            | 55                         | 11                | 0.14                    | 55                         | 0.3742      |
| 360.0         | 279.063                  | 1.50                            | 55                         | 12                | 0.15                    | 58                         | 0.3873      |
| 390.0         | 298.900                  | 1.50                            | 56                         | 13                | 0.15                    | 58                         | 0.3873      |
| 420.0         | 318.590                  | 1.50                            | 57                         | 14                | 0.15                    | 58                         | 0.3873      |
| 450.0         | 338.960                  | 1.65                            | 55                         | 15                | 0.16                    | 56                         | 0.4000      |
| 480.0         | 360.230                  | 1.75                            | 55                         | 16                | 0.17                    | 56                         | 0.4123      |
| 510.0         | 382.830                  | 1.95                            | 56                         | 17                | 0.19                    | 54                         | 0.4359      |
| 540.0         | 407.650                  | 2.35                            | 55                         | 18                | 0.23                    | 53                         | 0.4796      |
| 570.0         | 431.850                  | 2.25                            | 54                         | 19                | 0.22                    | 51                         | 0.4690      |
| 600.0         | 456.540                  | 2.35                            | 55                         | 20                | 0.23                    | 51                         | 0.4796      |
| 630.0         | 482.920                  | 2.65                            | 53                         | 21                | 0.26                    | 51                         | 0.5099      |
| 660.0         | 508.900                  | 2.50                            | 53                         | 22                | 0.24                    | 52                         | 0.4899      |
| 690.0         | 534.770                  | 2.75                            | 54                         | 23                | 0.27                    | 51                         | 0.5196      |
| 720.0         | 561.848                  | 2.70                            | 52                         | 24                | 0.26                    | 51                         | 0.5099      |

**Client: Columbia Steel Casting****Run: 2****Source: Baghouse 15****Date: 12/08/20**

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**Field Data Input Continued**Moisture Data

|                        |                 |
|------------------------|-----------------|
| Total Test Time        | 720.0 min       |
| Sample Time Interval   | 30.0 min        |
| Meter Volume, $V_m$    | 561.848 dcf     |
| Water Volume           | 89.1 g          |
| Nozzle Diameter, $N_z$ | 0.3097 in.      |
| Nozzle Area            | 0.000523 sq.ft. |

Stack Dimensional Data:

|             |               |
|-------------|---------------|
| Circular    |               |
| Diameter    | 66.000 in     |
| Rectangular |               |
| Width       | in            |
| Length      | in            |
| Stack Area  | 23.758 sq.ft. |

Traverse Data

|                            |                         |
|----------------------------|-------------------------|
| Barometric Pressure, $P_b$ | 30.25 "Hg               |
| Static Pressure            | -8.00 "H <sub>2</sub> O |
| Pitot Factor, cp           | 0.84                    |
| Meter Cal Factor           | 0.9956 Y                |

Molecular Weight:

|                         |           |
|-------------------------|-----------|
| CO <sub>2</sub> Average | 0.00 %vd  |
| O <sub>2</sub> Average  | 20.90 %vd |

**Field Data Averages**

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Meter

|                       |                         |
|-----------------------|-------------------------|
| $\Delta H$            | 2.144 "H <sub>2</sub> O |
| Temperature, $T_m$    | 51.6 °F                 |
| Temperature, $T_m$    | 511.6 °A (°R)           |
| Pressure Meter, $P_m$ | 30.408 "Hg              |

Stack

|                       |                          |
|-----------------------|--------------------------|
| $\sqrt{D_p}$          | 0.4564 "H <sub>2</sub> O |
| Temperature, $T_s$    | 51.6 °F                  |
| Temperature, $T_s$    | 511.6 °A (°R)            |
| Pressure Stack, $P_s$ | 29.662 "Hg               |

**Field Data Calculations**Meter Box Capture

|                                |              |
|--------------------------------|--------------|
| Standard Volume, $V_{m(std)}$  | 586.489 dscf |
|                                | 16.607 dscm  |
| Actual Volume, $V_{m(actual)}$ | 577.545 awcf |

EPA Method 2 Stack Gas Flowrate:

|                   |                     |
|-------------------|---------------------|
| Velocity, $V_s$   | 25.38 fps           |
| Volume (actual)   | 36,178.7 acfm       |
|                   | 35,921.8 adcfm      |
| Volume (standard) | 2,220,988.1 wscf/hr |
|                   | 2,205,219.1 dscf/hr |
|                   | 36,753.7 dscf/min   |

Gas Stream Moisture

|                              |           |
|------------------------------|-----------|
| Moisture Vapor, $V_{w(std)}$ | 4.193 scf |
| Moisture, $B_{ws}$           | 0.0071    |
| Moisture EPA M4              | 0.71 %v   |

EPA Method 3 Gas Density

|            |                  |
|------------|------------------|
| Dry, $M_d$ | 28.84 lb/lb-mole |
| Wet, $M_s$ | 28.76 lb/lb-mole |

|                    |         |
|--------------------|---------|
| Percent Isokinetic | 100.7 % |
|--------------------|---------|

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, Oregon  
**Source:** Baghouse 15  
**Method:** 29

**Run:** 3  
**Start Time:** 7:45  
**End Time:** 19:48  
**Date:** 12/09/20

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 0.000                    |                                 |                            |                   |                         |                            |             |
| 30.0          | 20.140                   | 1.40                            | 43                         | 1                 | 0.14                    | 50                         | 0.3742      |
| 60.0          | 41.110                   | 1.80                            | 40                         | 2                 | 0.18                    | 51                         | 0.4243      |
| 90.0          | 61.900                   | 1.70                            | 48                         | 3                 | 0.17                    | 51                         | 0.4123      |
| 120.0         | 82.420                   | 1.60                            | 51                         | 4                 | 0.16                    | 52                         | 0.4000      |
| 150.0         | 105.330                  | 2.05                            | 54                         | 5                 | 0.20                    | 52                         | 0.4472      |
| 180.0         | 129.460                  | 2.25                            | 56                         | 6                 | 0.22                    | 55                         | 0.4690      |
| 210.0         | 152.690                  | 2.05                            | 57                         | 7                 | 0.20                    | 55                         | 0.4472      |
| 240.0         | 177.330                  | 2.35                            | 58                         | 8                 | 0.23                    | 55                         | 0.4796      |
| 270.0         | 201.580                  | 2.25                            | 58                         | 9                 | 0.22                    | 55                         | 0.4690      |
| 300.0         | 224.730                  | 2.05                            | 59                         | 10                | 0.20                    | 56                         | 0.4472      |
| 330.0         | 248.130                  | 2.15                            | 59                         | 11                | 0.21                    | 56                         | 0.4583      |
| 360.0         | 270.776                  | 1.95                            | 60                         | 12                | 0.19                    | 58                         | 0.4359      |
| 390.0         | 293.870                  | 2.05                            | 59                         | 13                | 0.20                    | 55                         | 0.4472      |
| 420.0         | 318.120                  | 2.30                            | 58                         | 14                | 0.22                    | 54                         | 0.4690      |
| 450.0         | 342.230                  | 2.20                            | 59                         | 15                | 0.21                    | 55                         | 0.4583      |
| 480.0         | 368.390                  | 2.70                            | 60                         | 16                | 0.27                    | 54                         | 0.5196      |
| 510.0         | 394.600                  | 2.50                            | 59                         | 17                | 0.24                    | 53                         | 0.4899      |
| 540.0         | 420.760                  | 2.60                            | 58                         | 18                | 0.26                    | 53                         | 0.5099      |
| 570.0         | 446.550                  | 2.60                            | 57                         | 19                | 0.25                    | 51                         | 0.5000      |
| 600.0         | 472.050                  | 2.50                            | 56                         | 20                | 0.24                    | 50                         | 0.4899      |
| 630.0         | 497.570                  | 2.55                            | 54                         | 21                | 0.25                    | 48                         | 0.5000      |
| 660.0         | 522.990                  | 2.55                            | 52                         | 22                | 0.25                    | 47                         | 0.5000      |
| 690.0         | 549.010                  | 2.65                            | 51                         | 23                | 0.26                    | 47                         | 0.5099      |
| 720.0         | 576.816                  | 3.05                            | 50                         | 24                | 0.30                    | 46                         | 0.5477      |

**Client: Columbia Steel Casting****Run: 3****Source: Baghouse 15****Date: 12/09/20****Field Data Input Continued**Moisture Data

|                        |                 |
|------------------------|-----------------|
| Total Test Time        | 720.0 min       |
| Sample Time Interval   | 30.0 min        |
| Meter Volume, $V_m$    | 576.816 dcf     |
| Water Volume           | 128.6 g         |
| Nozzle Diameter, $N_z$ | 0.3097 in.      |
| Nozzle Area            | 0.000523 sq.ft. |

Stack Dimensional Data:

|             |               |
|-------------|---------------|
| Circular    |               |
| Diameter    | 66.000 in     |
| Rectangular |               |
| Width       | in            |
| Length      | in            |
| Stack Area  | 23.758 sq.ft. |

Traverse Data

|                            |                         |
|----------------------------|-------------------------|
| Barometric Pressure, $P_b$ | 30.36 "Hg               |
| Static Pressure            | -8.00 "H <sub>2</sub> O |
| Pitot Factor, cp           | 0.84                    |
| Meter Cal Factor           | 0.9956 Y                |

Molecular Weight:

|                         |           |
|-------------------------|-----------|
| CO <sub>2</sub> Average | 0.00 %vd  |
| O <sub>2</sub> Average  | 20.90 %vd |

**Field Data Averages**Meter

|                       |                         |
|-----------------------|-------------------------|
| $\Delta H$            | 2.244 "H <sub>2</sub> O |
| Temperature, $T_m$    | 54.8 °F                 |
| Temperature, $T_m$    | 514.8 °A (°R)           |
| Pressure Meter, $P_m$ | 30.525 "Hg              |

Stack

|                       |                          |
|-----------------------|--------------------------|
| $\sqrt{Dp}$           | 0.4669 "H <sub>2</sub> O |
| Temperature, $T_s$    | 52.5 °F                  |
| Temperature, $T_s$    | 512.5 °A (°R)            |
| Pressure Stack, $P_s$ | 29.772 "Hg               |

**Field Data Calculations**Meter Box Capture

|                                |              |
|--------------------------------|--------------|
| Standard Volume, $V_{m(std)}$  | 600.673 dscf |
|                                | 17.009 dscm  |
| Actual Volume, $V_{m(actual)}$ | 592.093 awcf |

Gas Stream Moisture

|                              |           |
|------------------------------|-----------|
| Moisture Vapor, $V_{w(std)}$ | 6.052 scf |
| Moisture, $B_{ws}$           | 0.0100    |
| Moisture EPA M4              | 1.00 %v   |

EPA Method 3 Gas Density

|            |                  |
|------------|------------------|
| Dry, $M_d$ | 28.84 lb/lb-mole |
| Wet, $M_s$ | 28.73 lb/lb-mole |

|                    |         |
|--------------------|---------|
| Percent Isokinetic | 101.0 % |
|--------------------|---------|

EPA Method 2 Stack Gas Flowrate:

|                   |                     |
|-------------------|---------------------|
| Velocity, $V_s$   | 25.95 fps           |
| Volume (actual)   | 36,991.2 acfm       |
|                   | 36,621.3 adcfm      |
| Volume (standard) | 2,275,287.2 wscf/hr |
|                   | 2,252,534.3 dscf/hr |
|                   | 37,542.2 dscf/min   |

|                   |                    |               |                     |               |                 |
|-------------------|--------------------|---------------|---------------------|---------------|-----------------|
| <b>Source:</b>    | <b>Baghouse 15</b> |               | <b>Sample Date:</b> |               | <b>12/07/20</b> |
| <b>Run:</b>       | <b>1</b>           |               |                     |               |                 |
|                   | <b>Filter +</b>    |               |                     |               |                 |
| <b>Client ID:</b> | <b>Front Half</b>  |               | <b>Back Half</b>    |               |                 |
| <b>Analyte</b>    | <                  | <b>Result</b> | <                   | <b>Result</b> | <b>Units</b>    |
| Arsenic           |                    | 3.91          |                     | MDL           | µg/sample       |
| Chromium          |                    | 12.6          |                     | 0.539         | µg/sample       |
| Lead              | <                  | MDL           |                     | MDL           | µg/sample       |
| Manganese         |                    | 316           |                     | 1.040         | µg/sample       |
| Nickel            |                    | 13.4          | <                   | MDL           | µg/sample       |
| Lab ID:           | 20-S2285           |               | 20-S2286            |               |                 |
| Sample Vol:       | 250                |               | 100                 | mL            |                 |

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|                   |                    |               |                     |               |                 |
|-------------------|--------------------|---------------|---------------------|---------------|-----------------|
| <b>Source:</b>    | <b>Baghouse 15</b> |               | <b>Sample Date:</b> |               | <b>12/08/20</b> |
| <b>Run:</b>       | <b>2</b>           |               |                     |               |                 |
|                   | <b>Filter +</b>    |               |                     |               |                 |
| <b>Client ID:</b> | <b>Front Half</b>  |               | <b>Back Half</b>    |               |                 |
| <b>Analyte</b>    | <                  | <b>Result</b> | <                   | <b>Result</b> | <b>Units</b>    |
| Arsenic           |                    | 2.73          |                     | MDL           | µg/sample       |
| Chromium          |                    | 4.37          |                     | 0.550         | µg/sample       |
| Lead              | <                  | MDL           |                     | 0.652         | µg/sample       |
| Manganese         |                    | 85.7          |                     | 4.78          | µg/sample       |
| Nickel            |                    | 8.48          |                     | 0.321         | µg/sample       |
| Lab ID:           | 20-S2287           |               | 20-S2288            |               |                 |
| Sample Vol:       | 250                |               | 100                 | mL            |                 |

Source: Baghouse 15

Sample Date: 12/09/20

Run: 3

Filter +

Client ID: Front Half Back Half

| <u>Analyte</u> | < | <u>Result</u> | < | <u>Result</u> | <u>FH MDL</u> | <u>BH MDL</u> | <u>Units</u> |
|----------------|---|---------------|---|---------------|---------------|---------------|--------------|
| Arsenic        |   | 4.63          | < | MDL           | 1.75          | 0.700         | µg/sample    |
| Chromium       |   | 4.56          |   | 0.457         | 0.200         | 0.080         | µg/sample    |
| Lead           | < | MDL           |   | 0.688         | 1.250         | 0.500         | µg/sample    |
| Manganese      |   | 119           |   | 1.500         | 0.075         | 0.030         | µg/sample    |
| Nickel         |   | 8.75          | < | MDL           | 0.750         | 0.300         | µg/sample    |
| Lab ID:        |   | 20-S2289      |   | 20-S2290      |               |               |              |
| Sample Vol:    |   | 250           |   | 100           |               |               | mL           |

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**Source: Baghouse 15**  
**Blank Values**

| Client ID:      | Filter             | MDL                                   | BH Capture<br>Soln.                                        | MDL                                                        | FH/BH<br>Rinse         | MDL                            |
|-----------------|--------------------|---------------------------------------|------------------------------------------------------------|------------------------------------------------------------|------------------------|--------------------------------|
|                 |                    |                                       | 5% HNO <sub>3</sub> /<br>10% H <sub>2</sub> O <sub>2</sub> | 5% HNO <sub>3</sub> /<br>10% H <sub>2</sub> O <sub>2</sub> | 0.1 N HNO <sub>3</sub> | 0.1 N HNO <sub>3</sub>         |
| <u>Analyte</u>  | < <u>µg/sample</u> | <u>Filter MDL</u><br><u>µg/sample</u> | < <u>µg/sample</u>                                         | MDL <u>µg/sample</u>                                       | < <u>µg/sample</u>     | <u>MDL</u><br><u>µg/sample</u> |
| Arsenic         | 5.84               | 1.75                                  | < MDL                                                      | 0.700                                                      | < MDL                  | 1.75                           |
| Chromium        | 1.74               | 0.200                                 | 0.343                                                      | 0.080                                                      | 0.209                  | 0.200                          |
| Lead            | < MDL              | 1.25                                  | < MDL                                                      | 0.500                                                      | < MDL                  | 1.25                           |
| Manganese       | 1.23               | 0.075                                 | 0.376                                                      | 0.030                                                      | < MDL                  | 0.075                          |
| Nickel          | 7.06               | 0.750                                 | < MDL                                                      | 0.300                                                      | < MDL                  | 0.750                          |
| Lab ID:         | 20-S2292           |                                       | 20-S2293                                                   |                                                            | 20-S2291               |                                |
| Sample Vol, ml: | 250                |                                       | 100                                                        |                                                            | 250                    |                                |

Columbia Steel Casting

Baghouse 15

12/07/20

Method 29 Metals Blank Calculations

Run: 1

1 of 3

|            | I                                 | II                   | III                  | IV                                                                 | V                                | VI                               | VII                  | VIII      |           |
|------------|-----------------------------------|----------------------|----------------------|--------------------------------------------------------------------|----------------------------------|----------------------------------|----------------------|-----------|-----------|
|            | Sample*                           | Blank*               | Blank*               | Sample*                                                            | Blank*                           | BH Blank*                        | BH Blank*            | Allowable |           |
|            | FH                                | FH                   | FH                   | BH                                                                 | BH                               | Corrected                        | Corrected            | BH        |           |
| Species    | Wash+Filter                       | Wash, µg             | Filter, µg           | Cap.Sol.                                                           | Cap.Sol.                         | Cap.Sol.                         | Wash, µg             | Blank, µg | Species   |
| Volume(ml) | 100                               | 100                  | N/A                  | 100                                                                | µg/mL                            | 200                              | 100                  |           |           |
| As         | 3.910 <                           | 0.7000               | 5.840 <              | 0.700 <                                                            | 0.0070 <                         | 1.400 <                          | 0.7000               | 0.000     | Arsenic   |
| Cr         | 12.600                            | 0.0836               | 1.740                | 0.539                                                              | 0.0034                           | 0.686                            | 0.0836               | 0.770     | Chromium  |
| Pb         | < 1.250 <                         | 0.5000 <             | 1.250 <              | 0.500 <                                                            | 0.0050 <                         | 1.000 <                          | 0.5000               | 0.000     | Lead      |
| Mn         | 316.000 <                         | 0.0300               | 1.230                | 1.040                                                              | 0.0038                           | 0.752 <                          | 0.0300               | 0.752     | Manganese |
| Ni         | 13.400 <                          | 0.3000               | 7.060 <              | 0.300 <                                                            | 0.0030 <                         | 0.600 <                          | 0.3000               | 0.000     | Nickel    |
| Lab:       | 20-S2285                          | 20-S2291             | 20-S2292             | 20-S2286                                                           | 20-S2293                         |                                  |                      |           |           |
| Content:   | 0.1NHNO <sub>3</sub>              | 0.1NHNO <sub>3</sub> | 0.1NHNO <sub>3</sub> | 5%HNO <sub>3</sub> /                                               | 5%HNO <sub>3</sub> /             | 5%HNO <sub>3</sub> /             | 0.1NHNO <sub>3</sub> |           |           |
|            | FH Filter & Probe Rinse           |                      |                      | 10%H <sub>2</sub> O <sub>2</sub>                                   | 10%H <sub>2</sub> O <sub>2</sub> | 10%H <sub>2</sub> O <sub>2</sub> |                      |           |           |
|            | 100ml 0.1N HNO <sub>3</sub> rinse |                      |                      | BH Imps 1&2                                                        |                                  |                                  |                      |           |           |
|            |                                   | Same as BH           |                      | 100ml .1N HNO <sub>3</sub> rinse                                   |                                  |                                  | Same as FH           |           |           |
|            |                                   | Blank Wash           |                      | 200ml 5%HNO <sub>3</sub> /10%H <sub>2</sub> O <sub>2</sub> reagent |                                  |                                  | Blank Wash           |           |           |

Blanks are prorated to reflect 100ml for HNO<sub>3</sub> and 200ml for HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>

\* Blank Rules:

"<" indicates value is below the minimum detection limit (MDL)

If Blank is a "<" value it is treated as zero.

If Sample is a "<" it used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

Baghouse 15  
12/7/20

Method 29 Metals Blank Calculations

Run: 1

2 of 3

| Species | X<br>Allowable<br>FH<br>Blank, $\mu g$ | XI<br>FH Blank<br>Corrected<br>$\mu g$ | XII<br>5% of FH<br>Sample, $\mu g$ | XIII<br>Lessor of<br>XI or XII | XIV<br>Greater of<br>A or XIII | XV<br>FH<br>Net<br>Sample, $\mu g$ | Species   |
|---------|----------------------------------------|----------------------------------------|------------------------------------|--------------------------------|--------------------------------|------------------------------------|-----------|
| As      | 5.840                                  | 5.840                                  | 0.196                              | 0.196                          | 11.63                          | -1.930                             | Arsenic   |
| Cr      | 1.824                                  | 1.824                                  | 0.630                              | 0.630                          | 11.63                          | 10.776                             | Chromium  |
| Pb      | 0.000                                  | 0.000                                  | < 0.063                            | 0.000                          | 11.63                          | < 1.250                            | Lead      |
| Mn      | 1.230                                  | 1.230                                  | 15.800                             | 1.230                          | 11.63                          | 314.770                            | Manganese |
| Ni      | 7.060                                  | 7.060                                  | 0.670                              | 0.670                          | 11.63                          | 6.340                              | Nickel    |

Allowable FH Blank Calculation:

$A = (\text{area of filter, sq. in.}) \times (1.4 \mu g/\text{sq.in.}) = \mu g$

$A = 11.63 \mu g$

if  $A > \text{blank} > 0$ , use blank derived

if blank  $> A$ , use greater of A or 5% of sample  $\mu g$  or FH blank whichever is lessor.

**\* Blank Rules:**

"<" indicates value is below the minimum detection limit (MDL)

If Blank is a "<" value it is treated as zero.

If Sample is a "<" it used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

Baghouse 15  
12/7/20

Method 29 Metals Blank Calculations

Run: 1

3 of 3

|         | XVI            | XVII     | XVIII           | XIX           | XX               | XXI             | XXII            | XXIII           |           |
|---------|----------------|----------|-----------------|---------------|------------------|-----------------|-----------------|-----------------|-----------|
|         | Allowable      | Blank BH | 5% of BH        | Lessor of     | Greater of       | BH              | FH              | FH+BH           |           |
|         | BH             | Total    | sample, $\mu g$ | XVII or XVIII | 1 $\mu g$ or XIX | Net             | Net             | Total Net       |           |
| Species | Blank, $\mu g$ |          |                 |               |                  | Sample, $\mu g$ | Sample, $\mu g$ | Sample, $\mu g$ | Species   |
| As      | 0.000          | 0.000 <  | 0.035           | 0.000         | 1.000 <          | 0.700           | 0.000 <         | 0.700           | Arsenic   |
| Cr      | 0.770          | 0.770    | 0.027           | 0.027         | 1.000            | 0.000           | 10.776          | 10.776          | Chromium  |
| Pb      | 0.000          | 0.000 <  | 0.025           | 0.000         | 1.000 <          | 0.500 <         | 1.250 <         | 1.750           | Lead      |
| Mn      | 0.752          | 0.752    | 0.052           | 0.052         | 1.000            | 0.288           | 314.770         | 315.058         | Manganese |
| Ni      | 0.000          | 0.000 <  | 0.015           | 0.000         | 1.000 <          | 0.300           | 6.340 <         | 6.640           | Nickel    |

Allowable BH Blank Calculation:

if 1.00 $\mu g$  > blank > 0, use blank derived

if blank > 1.00 $\mu g$ , use greater of 1.00 or 5% of sample ug or BH blank whichever is lessor

**\* Blank Rules:**

"<" indicates value is below the minimum detection limit (MDL)

If Blank is a "<" value it is treated as zero.

If Sample is a "<" it used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

Columbia Steel Casting

Baghouse 15

12/08/20

## Method 29 Metals Blank Calculations

Run: 2

1 of 3

|            | I                                 | II                   | III                  | IV                                                                 | V                                | VI                               | VII                  | VIII      |           |
|------------|-----------------------------------|----------------------|----------------------|--------------------------------------------------------------------|----------------------------------|----------------------------------|----------------------|-----------|-----------|
|            | Sample*                           | Blank*               | Blank*               | Sample*                                                            | Blank*                           | BH Blank*                        | BH Blank*            | Allowable |           |
|            | FH                                | FH                   | FH                   | BH                                                                 | BH                               | Corrected                        | Corrected            | BH        |           |
| Species    | Wash+Filter                       | Wash, µg             | Filter, µg           | Cap.Sol.                                                           | Cap.Sol.                         | Cap.Sol.                         | Wash, µg             | Blank, µg | Species   |
| Volume(ml) | 100                               | 100                  | N/A                  | 100                                                                | µg/mL                            | 200                              | 100                  |           |           |
| As         | 2.730 <                           | 0.7000               | 5.840 <              | 0.700 <                                                            | 0.0070 <                         | 1.400 <                          | 0.7000               | 0.000     | Arsenic   |
| Cr         | 4.370                             | 0.0836               | 1.740                | 0.550                                                              | 0.0034                           | 0.686                            | 0.0836               | 0.770     | Chromium  |
| Pb         | 1.250 <                           | 0.5000 <             | 1.250                | 0.652 <                                                            | 0.0050 <                         | 1.000 <                          | 0.5000               | 0.000     | Lead      |
| Mn         | 85.700 <                          | 0.0300               | 1.230                | 4.780                                                              | 0.0038                           | 0.752 <                          | 0.0300               | 0.752     | Manganese |
| Ni         | 8.480 <                           | 0.3000               | 7.060                | 0.321 <                                                            | 0.0030 <                         | 0.600 <                          | 0.3000               | 0.000     | Nickel    |
| Lab:       | 20-S2287                          | 20-S2291             | 20-S2292             | 20-S2288                                                           | 20-S2293                         |                                  |                      |           |           |
| Content:   | 0.1NHNO <sub>3</sub>              | 0.1NHNO <sub>3</sub> | 0.1NHNO <sub>3</sub> | 5%HNO <sub>3</sub> /                                               | 5%HNO <sub>3</sub> /             | 5%HNO <sub>3</sub> /             | 0.1NHNO <sub>3</sub> |           |           |
|            | FH Filter & Probe Rinse           |                      |                      | 10%H <sub>2</sub> O <sub>2</sub>                                   | 10%H <sub>2</sub> O <sub>2</sub> | 10%H <sub>2</sub> O <sub>2</sub> |                      |           |           |
|            | 100ml 0.1N HNO <sub>3</sub> rinse |                      |                      | BH Imps 1&2                                                        |                                  |                                  |                      |           |           |
|            |                                   | Same as BH           |                      | 100ml .1N HNO <sub>3</sub> rinse                                   |                                  |                                  | Same as FH           |           |           |
|            |                                   | Blank Wash           |                      | 200ml 5%HNO <sub>3</sub> /10%H <sub>2</sub> O <sub>2</sub> reagent |                                  |                                  | Blank Wash           |           |           |

Blanks are prorated to reflect 100ml for HNO<sub>3</sub> and 200ml for HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>

## \* Blank Rules:

"&lt;" indicates value is below the minimum detection limit (MDL)

If Blank is a "&lt;" value it is treated as zero.

If Sample is a "&lt;" it used for emission rate calculations but the final answer contains a "&lt;" to demonstrate the value is unknown

Baghouse 15  
12/8/20

Method 29 Metals Blank Calculations

Run: 2

2 of 3

|         | X              | XI                | XII             | XIII      | XIV        | XV                  |           |
|---------|----------------|-------------------|-----------------|-----------|------------|---------------------|-----------|
|         | Allowable      | FH Blank          | 5% of FH        | Lessor of | Greater of | FH                  |           |
| Species | Blank, $\mu g$ | Corrected $\mu g$ | Sample, $\mu g$ | XI or XII | A or XIII  | Net Sample, $\mu g$ | Species   |
| As      | 5.840          | 5.840             | 0.137           | 0.137     | 11.63      | -3.110              | Arsenic   |
| Cr      | 1.824          | 1.824             | 0.219           | 0.219     | 11.63      | 2.546               | Chromium  |
| Pb      | 0.000          | 0.000             | 0.063           | 0.000     | 11.63      | 1.250               | Lead      |
| Mn      | 1.230          | 1.230             | 4.285           | 1.230     | 11.63      | 84.470              | Manganese |
| Ni      | 7.060          | 7.060             | 0.424           | 0.424     | 11.63      | 1.420               | Nickel    |

Allowable FH Blank Calculation:

$A = (\text{area of filter, sq. in.}) \times (1.4 \mu g/\text{sq.in.}) = \mu g$

A= 11.63  $\mu g$

if  $A > \text{blank} > 0$ , use blank derived

if blank > A, use greater of A or 5% of sample  $\mu g$  or FH blank whichever is lessor.

**\* Blank Rules:**

"<" indicates value is below the minimum detection limit (MDL)

If Blank is a "<" value it is treated as zero.

If Sample is a "<" it used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

Baghouse 15  
12/8/20

Method 29 Metals Blank Calculations

Run: 2

3 of 3

|         | XVI            | XVII     | XVIII           | XIX           | XX               | XXI             | XXII            | XXIII           |           |
|---------|----------------|----------|-----------------|---------------|------------------|-----------------|-----------------|-----------------|-----------|
|         | Allowable      | Blank BH | 5% of BH        | Lessor of     | Greater of       | BH              | FH              | FH+BH           |           |
|         | BH             | Total    | sample, $\mu g$ | XVII or XVIII | 1 $\mu g$ or XIX | Net             | Net             | Total Net       |           |
| Species | Blank, $\mu g$ |          |                 |               |                  | Sample, $\mu g$ | Sample, $\mu g$ | Sample, $\mu g$ | Species   |
| As      | 0.000          | 0.000 <  | 0.035           | 0.000         | 1.000 <          | 0.700           | 0.000 <         | 0.700           | Arsenic   |
| Cr      | 0.770          | 0.770    | 0.028           | 0.028         | 1.000            | 0.000           | 2.546           | 2.546           | Chromium  |
| Pb      | 0.000          | 0.000    | 0.033           | 0.000         | 1.000            | 0.652 <         | 1.250 <         | 1.902           | Lead      |
| Mn      | 0.752          | 0.752    | 0.239           | 0.239         | 1.000            | 4.028           | 84.470          | 88.498          | Manganese |
| Ni      | 0.000          | 0.000    | 0.016           | 0.000         | 1.000            | 0.321           | 1.420           | 1.741           | Nickel    |

Allowable BH Blank Calculation:

if  $1.00\mu g > \text{blank} > 0$ , use blank derived

if blank  $> 1.00\mu g$ , use greater of 1.00 or 5% of sample ug or BH blank whichever is lessor

**\* Blank Rules:**

"<" indicates value is below the minimum detection limit (MDL)

If Blank is a "<" value it is treated as zero.

If Sample is a "<" it used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

Columbia Steel Casting

Baghouse 15

12/09/20

## Method 29 Metals Blank Calculations

Run: 3

1 of 3

|            | I                                 | II                   | III                  | IV                                                                 | V                                | VI                               | VII                  | VIII      |           |
|------------|-----------------------------------|----------------------|----------------------|--------------------------------------------------------------------|----------------------------------|----------------------------------|----------------------|-----------|-----------|
|            | Sample*                           | Blank*               | Blank*               | Sample*                                                            | Blank*                           | BH Blank*                        | BH Blank*            | Allowable |           |
|            | FH                                | FH                   | FH                   | BH                                                                 | BH                               | Corrected                        | Corrected            | BH        |           |
| Species    | Wash+Filter                       | Wash, µg             | Filter, µg           | Cap.Sol.                                                           | Cap.Sol.                         | Cap.Sol.                         | Wash, µg             | Blank, µg | Species   |
| Volume(ml) | 100                               | 100                  | N/A                  | 100                                                                | µg/mL                            | 200                              | 100                  |           |           |
| As         | 4.630 <                           | 0.7000               | 5.840 <              | 0.700 <                                                            | 0.0070 <                         | 1.400 <                          | 0.7000               | 0.000     | Arsenic   |
| Cr         | 4.560                             | 0.0836               | 1.740                | 0.457                                                              | 0.0034                           | 0.686                            | 0.0836               | 0.770     | Chromium  |
| Pb <       | 1.250 <                           | 0.5000 <             | 1.250                | 0.688 <                                                            | 0.0050 <                         | 1.000 <                          | 0.5000               | 0.000     | Lead      |
| Mn         | 119.000 <                         | 0.0300               | 1.230                | 1.500                                                              | 0.0038                           | 0.752 <                          | 0.0300               | 0.752     | Manganese |
| Ni         | 8.750 <                           | 0.3000               | 7.060 <              | 0.300 <                                                            | 0.0030 <                         | 0.600 <                          | 0.3000               | 0.000     | Nickel    |
| Lab:       | 20-S2289                          | 20-S2291             | 20-S2292             | 20-S2290                                                           | 20-S2293                         |                                  |                      |           |           |
| Content:   | 0.1NHNO <sub>3</sub>              | 0.1NHNO <sub>3</sub> | 0.1NHNO <sub>3</sub> | 5%HNO <sub>3</sub> /                                               | 5%HNO <sub>3</sub> /             | 5%HNO <sub>3</sub> /             | 0.1NHNO <sub>3</sub> |           |           |
|            | FH Filter & Probe Rinse           |                      |                      | 10%H <sub>2</sub> O <sub>2</sub>                                   | 10%H <sub>2</sub> O <sub>2</sub> | 10%H <sub>2</sub> O <sub>2</sub> |                      |           |           |
|            | 100ml 0.1N HNO <sub>3</sub> rinse |                      |                      | BH Imps 1&2                                                        |                                  |                                  |                      |           |           |
|            |                                   | Same as BH           |                      | 100ml .1N HNO <sub>3</sub> rinse                                   |                                  |                                  | Same as FH           |           |           |
|            |                                   | Blank Wash           |                      | 200ml 5%HNO <sub>3</sub> /10%H <sub>2</sub> O <sub>2</sub> reagent |                                  |                                  | Blank Wash           |           |           |

Blanks are prorated to reflect 100ml for HNO<sub>3</sub> and 200ml for HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>**\* Blank Rules:**

" &lt; " indicates value is below the minimum detection limit (MDL)

If Blank is a " &lt; " value it is treated as zero.

If Sample is a " &lt; " it used for emission rate calculations but the final answer contains a " &lt; " to demonstrate the value is unknown

Baghouse 15  
12/9/20

Method 29 Metals Blank Calculations

Run: 3

2 of 3

|         | X              | XI        | XII             | XIII      | XIV        | XV      |                         |
|---------|----------------|-----------|-----------------|-----------|------------|---------|-------------------------|
|         | Allowable      | FH Blank  | 5% of FH        | Lessor of | Greater of | FH      |                         |
| Species | Blank, $\mu g$ | Corrected | Sample, $\mu g$ | XI or XII | A or XIII  | Net     | Sample, $\mu g$ Species |
| As      | 5.840          | 5.840     | 0.232           | 0.232     | 11.63      | -1.210  | Arsenic                 |
| Cr      | 1.824          | 1.824     | 0.228           | 0.228     | 11.63      | 2.736   | Chromium                |
| Pb      | 0.000          | 0.000     | < 0.063         | 0.000     | 11.63      | < 1.250 | Lead                    |
| Mn      | 1.230          | 1.230     | 5.950           | 1.230     | 11.63      | 117.770 | Manganese               |
| Ni      | 7.060          | 7.060     | 0.438           | 0.438     | 11.63      | 1.690   | Nickel                  |

Allowable FH Blank Calculation:

$A = (\text{area of filter, sq. in.}) \times (1.4 \mu g/\text{sq.in.}) = \mu g$

A= 11.63  $\mu g$

if  $A > \text{blank} > 0$ , use blank derived

if blank > A, use greater of A or 5% of sample  $\mu g$  or FH blank whichever is lessor.

**\* Blank Rules:**

"<" indicates value is below the minimum detection limit (MDL)

If Blank is a "<" value it is treated as zero.

If Sample is a "<" it used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

Baghouse 15  
12/9/20

Method 29 Metals Blank Calculations

Run: 3

3 of 3

|         | XVI            | XVII     | XVIII           | XIX           | XX               | XXI             | XXII            | XXIII           |           |
|---------|----------------|----------|-----------------|---------------|------------------|-----------------|-----------------|-----------------|-----------|
|         | Allowable      | Blank BH | 5% of BH        | Lessor of     | Greater of       | BH              | FH              | FH+BH           |           |
|         | BH             | Total    | sample, $\mu g$ | XVII or XVIII | 1 $\mu g$ or XIX | Net             | Net             | Total Net       |           |
| Species | Blank, $\mu g$ |          |                 |               |                  | Sample, $\mu g$ | Sample, $\mu g$ | Sample, $\mu g$ | Species   |
| As      | 0.000          | 0.000 <  | 0.035           | 0.000         | 1.000 <          | 0.700           | 0.000 <         | 0.700           | Arsenic   |
| Cr      | 0.770          | 0.770    | 0.023           | 0.023         | 1.000            | 0.000           | 2.736           | 2.736           | Chromium  |
| Pb      | 0.000          | 0.000    | 0.034           | 0.000         | 1.000            | 0.688 <         | 1.250 <         | 1.938           | Lead      |
| Mn      | 0.752          | 0.752    | 0.075           | 0.075         | 1.000            | 0.748           | 117.770         | 118.518         | Manganese |
| Ni      | 0.000          | 0.000 <  | 0.015           | 0.000         | 1.000 <          | 0.300           | 1.690 <         | 1.990           | Nickel    |

Allowable BH Blank Calculation:

if 1.00 $\mu g$  > blank > 0, use blank derived

if blank > 1.00 $\mu g$ , use greater of 1.00 or 5% of sample  $\mu g$  or BH blank whichever is lessor

**\* Blank Rules:**

"<" indicates value is below the minimum detection limit (MDL)

If Blank is a "<" value it is treated as zero.

If Sample is a "<" it used for emission rate calculations but the final answer contains a "<" to demonstrate the value is unknown

**EPA Method 29**  
**Gas Stream Characteristics**  
**Test Summary**

**Client:** Columbia Steel Casting  
**Source:** Baghouse 15  
**Location:** Portland, Oregon

| Run                              | 1                            | 2         | 3         |                 |
|----------------------------------|------------------------------|-----------|-----------|-----------------|
| Date                             | 12/7/2020                    | 12/8/2020 | 12/9/2020 |                 |
| Run Start Time                   | 7:20                         | 8:00      | 7:45      |                 |
| Run End Time                     | 19:25                        | 20:04     | 19:48     |                 |
| Duration, min.                   | 720                          | 720       | 720       | <b>Average</b>  |
| Barometric Pressure, "Hg         | 30.41                        | 30.25     | 30.36     | <b>30.34</b>    |
| Nozzle Dia., in.                 | 0.3097                       | 0.3097    | 0.3097    | <b>0.3097</b>   |
| Isokinetic Average, %            | 99.1                         | 100.7     | 101.0     | <b>100.3</b>    |
| Sample Volume, dscf              | 674.237                      | 586.356   | 600.537   | <b>620.377</b>  |
| Sample Volume, dscm              | 19.092                       | 16.604    | 17.005    | <b>17.567</b>   |
| Stack Diameter, in.              | 66.00                        | 66.00     | 66.00     | <b>66.00</b>    |
| Stack Area, sq.ft.               | 23.758                       | 23.758    | 23.758    | <b>23.758</b>   |
| CO <sub>2</sub> %vd              | 0.00                         | 0.00      | 0.00      | <b>0.00</b>     |
| O <sub>2</sub> %vd               | 20.90                        | 20.90     | 20.90     | <b>20.90</b>    |
| Static Press., "H <sub>2</sub> O | -8.00                        | -8.00     | -8.00     | <b>-8.00</b>    |
| H <sub>2</sub> O %v              | 0.46                         | 0.71      | 1.00      | <b>0.72</b>     |
| Wet Molecular Weight, lb/lb-mole | 28.79                        | 28.76     | 28.73     | <b>28.76</b>    |
| Velocity, FPS                    | 29.34                        | 25.38     | 25.95     | <b>26.89</b>    |
| ADCFM                            | 41,631.2                     | 35,921.8  | 36,621.3  | <b>38,058.1</b> |
| ACFM                             | 41,823.6                     | 36,178.7  | 36,991.2  | <b>38,331.2</b> |
| DSCFM                            | 42,934.1                     | 36,753.7  | 37,542.2  | <b>39,076.7</b> |
| Stack Temperature, °F            | 50.3                         | 51.6      | 52.5      | <b>51.5</b>     |
| Production Data                  | Tons castings processed/hour | 4.70      | 0.86      | 2.08            |
|                                  |                              |           |           | <b>2.5</b>      |

Columbia Steel Casting  
Baghouse 15  
Metals Results Summary

Test: M29

| Run 1     |           |          |            |                           |           |          |            |                           |         |         |            |                           |    |
|-----------|-----------|----------|------------|---------------------------|-----------|----------|------------|---------------------------|---------|---------|------------|---------------------------|----|
| Total     |           |          |            |                           | FH Net    |          |            |                           |         | BH Net  |            |                           |    |
| Species   | µg        | µg/dscm  | lb/hr      | lb/ton castings processed | µg        | µg/dscm  | lb/hr      | lb/ton castings processed | µg      | µg/dscm | lb/hr      | lb/ton castings processed |    |
| Arsenic   | < 0.700   | < 0.037  | < 5.90E-06 | < 1.25E-06                | 0.000     | 0.000    | 0.00E+00   | 0.00E+00                  | < 0.700 | < 0.037 | < 5.90E-06 | < 1.25E-06                | As |
| Chromium  | 10.776    | 0.564    | 9.08E-05   | 1.93E-05                  | 10.776    | 0.564    | 9.08E-05   | 1.93E-05                  | 0.000   | 0.000   | 0.00E+00   | 0.00E+00                  | Cr |
| Lead      | < 1.750   | < 0.092  | < 1.47E-05 | < 3.14E-06                | < 1.250   | < 0.065  | < 1.05E-05 | < 2.24E-06                | < 0.500 | < 0.026 | < 4.21E-06 | < 8.96E-07                | Pb |
| Manganese | 315.058   | 16.502   | 2.65E-03   | 5.65E-04                  | 314.770   | 16.487   | 2.65E-03   | 5.64E-04                  | 0.288   | 0.015   | 2.43E-06   | 5.16E-07                  | Mn |
| Nickel    | < 6.640   | < 0.348  | < 5.59E-05 | < 1.19E-05                | 6.340     | 0.332    | 5.34E-05   | 1.14E-05                  | < 0.300 | < 0.016 | < 2.53E-06 | < 5.38E-07                | Ni |
| Total:    | < 334.924 | < 17.543 | < 2.82E-03 | < 6.00E-04                | < 333.136 | < 17.449 | < 2.81E-03 | < 5.97E-04                | < 1.788 | < 0.094 | < 1.51E-05 | < 3.20E-06                |    |

| Run 2     |          |         |            |                           |          |         |            |                           |         |         |            |                           |    |
|-----------|----------|---------|------------|---------------------------|----------|---------|------------|---------------------------|---------|---------|------------|---------------------------|----|
| Total     |          |         |            |                           | FH Net   |         |            |                           |         | BH Net  |            |                           |    |
| Species   | µg       | µg/dscm | lb/hr      | lb/ton castings processed | µg       | µg/dscm | lb/hr      | lb/ton castings processed | µg      | µg/dscm | lb/hr      | lb/ton castings processed |    |
| Arsenic   | < 0.700  | < 0.042 | < 5.80E-06 | < 6.75E-06                | 0.000    | 0.000   | 0.00E+00   | 0.00E+00                  | < 0.700 | < 0.042 | < 5.80E-06 | < 6.75E-06                | As |
| Chromium  | 2.546    | 0.153   | 2.11E-05   | 2.46E-05                  | 2.546    | 0.153   | 2.11E-05   | 2.46E-05                  | 0.000   | 0.000   | 0.00E+00   | 0.00E+00                  | Cr |
| Lead      | < 1.902  | < 0.115 | < 1.58E-05 | < 1.83E-05                | < 1.250  | < 0.075 | < 1.04E-05 | < 1.21E-05                | 0.652   | 0.039   | 5.41E-06   | 6.29E-06                  | Pb |
| Manganese | 88.498   | 5.330   | 7.34E-04   | 8.53E-04                  | 84.470   | 5.087   | 7.00E-04   | 8.14E-04                  | 4.028   | 0.243   | 3.34E-05   | 3.88E-05                  | Mn |
| Nickel    | 1.741    | 0.105   | 1.44E-05   | 1.68E-05                  | 1.420    | 0.086   | 1.18E-05   | 1.37E-05                  | 0.321   | 0.019   | 2.66E-06   | 3.09E-06                  | Ni |
| Total:    | < 95.387 | < 5.745 | < 7.91E-04 | < 9.20E-04                | < 89.686 | < 5.401 | < 7.44E-04 | < 8.65E-04                | < 5.701 | < 0.343 | < 4.73E-05 | < 5.50E-05                |    |

Columbia Steel Casting  
Baghouse 15  
Metals Results Summary

Test: M29

| Run 3     |           |         |            |                           |           |         |            |                           |         |         |            |                           |    |
|-----------|-----------|---------|------------|---------------------------|-----------|---------|------------|---------------------------|---------|---------|------------|---------------------------|----|
| Total     |           |         |            |                           | FH Net    |         |            |                           |         | BH Net  |            |                           |    |
| Species   | µg        | µg/dscm | lb/hr      | lb/ton castings processed | µg        | µg/dscm | lb/hr      | lb/ton castings processed | µg      | µg/dscm | lb/hr      | lb/ton castings processed |    |
| Arsenic   | < 0.700   | < 0.041 | < 5.79E-06 | < 2.78E-06                | 0.000     | 0.000   | 0.00E+00   | 0.00E+00                  | < 0.700 | < 0.041 | < 5.79E-06 | < 2.78E-06                | As |
| Chromium  | 2.736     | 0.161   | 2.26E-05   | 1.09E-05                  | 2.736     | 0.161   | 2.26E-05   | 1.09E-05                  | 0.000   | 0.000   | 0.00E+00   | 0.00E+00                  | Cr |
| Lead      | < 1.938   | < 0.114 | < 1.60E-05 | < 7.70E-06                | < 1.250   | < 0.074 | < 1.03E-05 | < 4.97E-06                | 0.688   | 0.040   | 5.69E-06   | 2.74E-06                  | Pb |
| Manganese | 118.518   | 6.970   | 9.80E-04   | 4.71E-04                  | 117.770   | 6.926   | 9.74E-04   | 4.68E-04                  | 0.748   | 0.044   | 6.19E-06   | 2.97E-06                  | Mn |
| Nickel    | < 1.990   | < 0.117 | < 1.65E-05 | < 7.91E-06                | 1.690     | 0.099   | 1.40E-05   | 6.72E-06                  | < 0.300 | < 0.018 | < 2.48E-06 | < 1.19E-06                | Ni |
| Total:    | < 125.882 | < 7.403 | < 1.04E-03 | < 5.00E-04                | < 123.446 | < 7.259 | < 1.02E-03 | < 4.91E-04                | < 2.436 | < 0.143 | < 2.01E-05 | < 9.68E-06                |    |

| Mean Runs 1-3 |          |         |            |                           |          |         |            |                           |         |         |            |                           |    |
|---------------|----------|---------|------------|---------------------------|----------|---------|------------|---------------------------|---------|---------|------------|---------------------------|----|
| Total         |          |         |            |                           | FH Net   |         |            |                           |         | BH Net  |            |                           |    |
| Species       | µg       | µg/dscm | lb/hr      | lb/ton castings processed | µg       | µg/dscm | lb/hr      | lb/ton castings processed | µg      | µg/dscm | lb/hr      | lb/ton castings processed |    |
| Arsenic       | < 0.700  | < 0.040 | < 5.83E-06 | < 3.60E-06                | 0.000    | 0.000   | 0.00E+00   | 0.00E+00                  | < 0.700 | < 0.040 | < 5.83E-06 | < 3.60E-06                | As |
| Chromium      | 5.353    | 0.293   | 4.48E-05   | 1.82E-05                  | 5.353    | 0.293   | 4.48E-05   | 1.82E-05                  | 0.000   | 0.000   | 0.00E+00   | 0.00E+00                  | Cr |
| Lead          | < 1.863  | < 0.107 | < 1.55E-05 | < 9.73E-06                | < 1.250  | < 0.071 | < 1.04E-05 | < 6.42E-06                | < 0.613 | < 0.035 | < 5.10E-06 | < 3.31E-06                | Pb |
| Manganese     | 174.025  | 9.601   | 1.46E-03   | 6.30E-04                  | 172.337  | 9.500   | 1.44E-03   | 6.16E-04                  | 1.688   | 0.101   | 1.40E-05   | 1.41E-05                  | Mn |
| Nickel        | < 3.457  | < 0.190 | < 2.89E-05 | < 1.22E-05                | 3.150    | 0.172   | 2.64E-05   | 1.06E-05                  | < 0.307 | < 0.018 | < 2.56E-06 | < 1.61E-06                | Ni |
| Total:        | < 185.40 | < 10.23 | < 1.55E-03 | < 6.7E-04                 | < 182.09 | < 10.04 | < 1.52E-03 | < 6.51E-04                | < 3.308 | < 0.193 | < 2.75E-05 | < 2.26E-05                |    |

'<' denotes results which were calculated using the minimum detection limit for front half or back half results that were non-detect.



|           |                        |
|-----------|------------------------|
| COMPANY   | Columbia Steel Casting |
| FACILITY  | Steel Foundry          |
| LOCATION  | Portland, OR           |
| SOURCE    | Baghouse 15            |
| DATE      | 12/7/2020 - 12/9/2020  |
| METHOD    | 0061                   |
| POLLUTANT | Cr <sub>6</sub>        |

**Isokinetic Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** Baghouse 15  
**EPA Method:** 0061  
**Box Operator:** JMK  
**Technician(s):** JCR

**Environmental Conditions/Test Notes:**  
Cloudy and cool, 40s F.

**Run:** 1  
**Start Time:** 7:20  
**End Time:** 19:25  
**Date:** 12/7/2020

**Stack Dimensional Data:**

Circular  
Diameter 66.000 in  
Rectangular  
Width in  
Length in  
Stack Area 23.758 sq.ft.

**Equipment:**

|             |        |            |      |             |                 |
|-------------|--------|------------|------|-------------|-----------------|
| Meterbox ID | 11     | Probe ID   | 6C   | Liner type  | Glass           |
| Y factor    | 0.9656 | Nozzle ID  | 0.30 | Nozzle size | 0.3083 inches   |
| ΔH@         | 1.864  | Hot box ID | NA   | Nozzle area | 0.000518 sq.ft. |
|             |        | Pitot Cp   | 0.84 | Probe heat  | 250 F           |
|             |        | Pitot ID   | 6C   | Filter heat | NA F            |

**Source Information:**

|                        |                        |                 |              |
|------------------------|------------------------|-----------------|--------------|
| Barometric Pressure    | 30.41 "Hg              | O <sub>2</sub>  | 20.90 %      |
| Static Pressure        | -8 "H <sub>2</sub> O   | CO <sub>2</sub> | 0.00 %       |
| Ave. ΔP                | 0.28 "H <sub>2</sub> O | Rec. Nz.        | 0.285 inches |
| Stack Temperature      | 51 F                   |                 |              |
| Assumed moisture       | 1.5 %                  |                 |              |
| Assumed meter temp.    | 48 F                   |                 |              |
| Total number of points | 24                     |                 |              |
| Time per point         | 30                     |                 |              |
| Total run time         | 720                    |                 |              |

**Leak Checks:**

|                        | Pre-test | Post-test |
|------------------------|----------|-----------|
| Pitot                  | x        | x         |
| Train leak rate, dcf   | 0.000    | 0.010     |
| Leak check vacuum, "Hg | 11       | 11        |

**Nozzle check for roundness:**

| 1           | 2     | 3            |
|-------------|-------|--------------|
| 0.308       | 0.308 | 0.309 inches |
| Caliper ID# | WS2   |              |

**Post Test Calculations:**

|                         |                               |                     |                          |
|-------------------------|-------------------------------|---------------------|--------------------------|
| Sample volume           | 575.285 dcf                   | Ave. ΔP             | 0.211 "H <sub>2</sub> O  |
| Wet mol. weight         | 28.76 M <sub>s</sub> (actual) | Ave. √ΔP            | 0.4584 "H <sub>2</sub> O |
| Actual H <sub>2</sub> O | 0.70 %                        | Ave. ΔH             | 2.103 "H <sub>2</sub> O  |
| Std. meter vol.         | 585.313 dscf                  | Ave. T <sub>s</sub> | 52.2 °F                  |
| Isokinetic Average      | 100.8 %                       | Ave. T <sub>m</sub> | 51.7 °F                  |

**Moisture/Lab:**

| Filter        | NA #              |       |      |
|---------------|-------------------|-------|------|
|               | Initial           | Final | Gain |
| Impingers, g  | 305.0             | 319.4 | 14.4 |
| Silica gel, g | 276.7             | 349.7 | 73.0 |
|               | Total water gain: |       | 87.4 |

| Traverse Point | Time (min.) | Meter Volume (dcf) | Velocity P ("H <sub>2</sub> O) | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum ("Hg) | Filter Box (°F) | Condenser Temp F |
|----------------|-------------|--------------------|--------------------------------|------------------|------------------|---------|-------|--------------|-----------------|------------------|
| 1              | 30.0        | 943.120            | 0.25                           | 51               | 44               | 2.43    | 2.50  | 5            | NA              | 42               |
| 2              | 60.0        | 968.750            | 0.24                           | 49               | 45               | 2.35    | 2.40  | 5            | NA              | 48               |
| 3              | 90.0        | 993.470            | 0.23                           | 49               | 46               | 2.25    | 2.30  | 5            | NA              | 50               |
| 4              | 120.0       | 1018.440           | 0.23                           | 49               | 46               | 2.25    | 2.30  | 5            | NA              | 43               |
| 5              | 150.0       | 1042.500           | 0.22                           | 49               | 47               | 2.16    | 2.40  | 5            | NA              | 45               |
| 6              | 180.0       | 1066.730           | 0.21                           | 49               | 49               | 2.07    | 2.05  | 5            | NA              | 43               |
| 7              | 210.0       | 1089.270           | 0.18                           | 51               | 49               | 1.77    | 1.80  | 5            | NA              | 41               |
| 8              | 240.0       | 1109.420           | 0.15                           | 58               | 55               | 1.47    | 1.47  | 4.5          | NA              | 43               |
| 9              | 270.0       | 1133.350           | 0.21                           | 53               | 56               | 2.08    | 2.08  | 5.5          | NA              | 44               |
| 10             | 300.0       | 1157.170           | 0.20                           | 58               | 53               | 1.95    | 1.95  | 5.5          | NA              | 44               |
| 11             | 330.0       | 1179.010           | 0.18                           | 60               | 53               | 1.75    | 1.75  | 5.5          | NA              | 44               |
| 12             | 360.0       | 1203.525           | 0.22                           | 57               | 54               | 2.16    | 2.16  | 6            | NA              | 43               |
| 13             | 390.0       | 1227.450           | 0.21                           | 54               | 54               | 2.07    | 2.00  | 5.5          | NA              | 44               |
| 14             | 420.0       | 1249.710           | 0.16                           | 58               | 57               | 1.57    | 1.60  | 5            | NA              | 46               |
| 15             | 450.0       | 1274.100           | 0.23                           | 57               | 57               | 2.27    | 2.30  | 5            | NA              | 46               |
| 16             | 480.0       | 1294.300           | 0.16                           | 55               | 57               | 1.58    | 1.60  | 5            | NA              | 46               |
| 17             | 510.0       | 1317.070           | 0.19                           | 52               | 55               | 1.88    | 1.80  | 5            | NA              | 42               |
| 18             | 540.0       | 1340.930           | 0.20                           | 54               | 57               | 1.98    | 2.00  | 5            | NA              | 42               |
| 19             | 570.0       | 1364.820           | 0.21                           | 51               | 53               | 2.08    | 2.10  | 5            | NA              | 42               |
| 20             | 600.0       | 1389.690           | 0.21                           | 49               | 52               | 2.08    | 2.10  | 5            | NA              | 42               |
| 21             | 630.0       | 1413.880           | 0.22                           | 49               | 51               | 2.18    | 2.20  | 6            | NA              | 42               |
| 22             | 660.0       | 1439.120           | 0.25                           | 47               | 50               | 2.48    | 2.50  | 6.5          | NA              | 40               |
| 23             | 690.0       | 1466.770           | 0.28                           | 47               | 49               | 2.77    | 2.80  | 7.5          | NA              | 40               |
| 24             | 720.0       | 1492.485           | 0.23                           | 47               | 52               | 2.29    | 2.30  | 6.5          | NA              | 39               |

**Isokinetic Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** Baghouse 15  
**EPA Method:** 0061  
**Box Operator:** JMK  
**Technician(s):** JCR

**Environmental Conditions/Test Notes:**  
Cloudy and cool, 40s F.

**Run:** 2  
**Start Time:** 00  
**End Time:** 20:04  
**Date:** 12/ /2020

**Stack Dimensional Data:**

Circular  
Diameter 66.000 in  
Rectangular  
Width in  
Length in  
Stack Area 23.758 sq.ft.

**Equipment:**

Meterbox ID 11 Probe ID 6C Liner type: Glass  
Y factor 0.9656 Nozzle ID 0.3 Nozzle size: 0.3083 inches  
 $\Delta H@$  1.864 Hot box ID NA Nozzle area: 0.000519 sq.ft.  
Pitot Cp 0.84 Probe heat: 250 F  
Pitot ID 6C Filter heat: NA F

**Source Information:**

Barometric Pressure 30.25 "Hg O<sub>2</sub> 20.9 %  
Static Pressure -8 "H<sub>2</sub>O CO<sub>2</sub> 0.0 %  
Ave.  $\Delta P$  0.28 "H<sub>2</sub>O Rec. Nz. 0.283 inches  
Stack Temperature 51 F  
Assumed moisture 0.7 %  
Assumed meter temp. 51.7 F  
Total number of points 24  
Time per point 30  
Total run time 720

**Leak Checks:** Pre-test Post-test  
Pitot: x x  
Train leak rate, dcf: 0.010 0.010  
Leak check vacuum, "Hg: 8 8

**Nozzle check for roundness:**

1 2 3  
0.308 0.308 0.309 inches  
Caliper ID# WS2

**Post Test Calculations:**

Sample volume 542.210 dcf Ave.  $\Delta P$  0.183 "H<sub>2</sub>O  
Wet mol. weight 28.72 M<sub>s</sub> (actual) Ave.  $\sqrt{\Delta P}$  0.4263 "H<sub>2</sub>O  
Actual H<sub>2</sub>O 1.14 % Ave.  $\Delta H$  1.829 "H<sub>2</sub>O  
Std. meter vol. 545,516 dscf Ave. T<sub>s</sub> 53.9 °F  
Isokinetic Average 101.7 % Ave. T<sub>m</sub> 54.4 °F

**Moisture/Lab:**

Filter NA #  
Initial Final Gain  
Impingers, g 305.6 340.1 34.5  
Silica gel, g 957.5 1056.3 98.8  
Total water gain: 133.3

| Traverse Point | Time (min.) | Meter Volume (dcf) | Velocity P ("H <sub>2</sub> O) | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum ("Hg) | Filter Box (°F) | Condenser Temp F |
|----------------|-------------|--------------------|--------------------------------|------------------|------------------|---------|-------|--------------|-----------------|------------------|
| 1              | 30.0        | 497.320            | 0.18                           | 46               | 41               | 1.78    | 1.80  | 1.8          | NA              | 40               |
| 2              | 60.0        | 519.220            | 0.21                           | 47               | 44               | 2.09    | 2.10  | 5            | NA              | 38               |
| 3              | 90.0        | 543.120            | 0.17                           | 47               | 47               | 1.70    | 1.70  | 5.5          | NA              | 41               |
| 4              | 120.0       | 565.300            | 0.14                           | 50               | 48               | 1.39    | 1.40  | 5            | NA              | 42               |
| 5              | 150.0       | 585.400            | 0.13                           | 51               | 49               | 1.29    | 1.30  | 4.5          | NA              | 39               |
| 6              | 180.0       | 604.790            | 0.16                           | 50               | 50               | 1.60    | 1.60  | 4.5          | NA              | 40               |
| 7              | 210.0       | 625.860            | 0.16                           | 51               | 52               | 1.60    | 1.60  | 4.5          | NA              | 42               |
| 8              | 240.0       | 646.850            | 0.17                           | 52               | 53               | 1.70    | 1.70  | 4.5          | NA              | 44               |
| 9              | 270.0       | 668.310            | 0.25                           | 62               | 55               | 2.46    | 2.50  | 5            | NA              | 45               |
| 10             | 300.0       | 694.710            | 0.20                           | 59               | 59               | 2.00    | 2.00  | 5            | NA              | 44               |
| 11             | 330.0       | 718.970            | 0.19                           | 58               | 61               | 1.91    | 1.90  | 5            | NA              | 43               |
| 12             | 360.0       | 742.090            | 0.18                           | 61               | 60               | 1.80    | 1.80  | 5            | NA              | 45               |
| 13             | 390.0       | 765.985            | 0.20                           | 61               | 61               | 2.00    | 2.00  | 5            | NA              | 45               |
| 14             | 420.0       | 789.630            | 0.16                           | 61               | 63               | 1.60    | 1.60  | 4.5          | NA              | 46               |
| 15             | 450.0       | 809.590            | 0.15                           | 59               | 58               | 1.50    | 1.50  | 4.5          | NA              | 46               |
| 16             | 480.0       | 830.750            | 0.16                           | 58               | 58               | 1.60    | 1.60  | 4.5          | NA              | 47               |
| 17             | 510.0       | 851.740            | 0.15                           | 57               | 58               | 1.50    | 1.50  | 4.5          | NA              | 47               |
| 18             | 540.0       | 872.460            | 0.19                           | 55               | 58               | 1.91    | 1.90  | 5.5          | NA              | 47               |
| 19             | 570.0       | 895.700            | 0.19                           | 53               | 56               | 1.91    | 1.90  | 5.5          | NA              | 47               |
| 20             | 600.0       | 918.840            | 0.20                           | 51               | 55               | 2.01    | 2.00  | 5.5          | NA              | 47               |
| 21             | 630.0       | 942.430            | 0.20                           | 53               | 55               | 2.01    | 2.00  | 5.5          | NA              | 48               |
| 22             | 660.0       | 965.810            | 0.19                           | 45               | 55               | 1.94    | 1.90  | 5.5          | NA              | 49               |
| 23             | 690.0       | 989.130            | 0.22                           | 53               | 55               | 2.21    | 2.20  | 6            | NA              | 51               |
| 24             | 720.0       | 1014.210           | 0.24                           | 53               | 55               | 2.41    | 2.40  | 6.5          | NA              | 53               |

**Isokinetic Field Data**  
**Field Data Entry**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** Baghouse 15  
**EPA Method:** 0061  
**Box Operator:** JMK  
**Technician(s):** JCR

**Environmental Conditions/Test Notes:**

Cloudy and cool, 40s F.  
Silica Gel impinger blew out bottom at 15:44. It was noticed immediately because the dry gas meter stopped. The sample line was blown-out to clear water and the silica gel was replaced. The process took an hour and 0061 train was delayed by this amount of time.

**Run:** 3  
**Start Time:** 7:43  
**End Time:** 20:45  
**Date:** 12/9/2020

**Stack Dimensional Data:**

Circular  
Diameter 66.000 in  
Rectangular  
Width in  
Length in  
Stack Area 23.758 sq.ft.

**Equipment:**

|             |        |            |      |              |                 |
|-------------|--------|------------|------|--------------|-----------------|
| Meterbox ID | 11     | Probe ID   | 6C   | Liner type:  | Glass           |
| Y factor    | 0.9656 | Nozzle ID  | 0.3  | Nozzle size: | 0.3083 inches   |
| $\Delta H@$ | 1.864  | Hot box ID | NA   | Nozzle area: | 0.000519 sq.ft. |
|             |        | Pitot Cp   | 0.84 | Probe heat:  | 250 F           |
|             |        | Pitot ID   | 6C   | Filter heat: | NA F            |

**Source Information:**

|                        |                        |                 |              |
|------------------------|------------------------|-----------------|--------------|
| Barometric Pressure    | 30.36 "Hg              | O <sub>2</sub>  | 20.9 %       |
| Static Pressure        | -8 "H <sub>2</sub> O   | CO <sub>2</sub> | 0.0 %        |
| Ave. $\Delta P$        | 0.28 "H <sub>2</sub> O | Rec. Nz.        | 0.283 inches |
| Stack Temperature      | 51 F                   |                 |              |
| Assumed moisture       | 1.14 %                 |                 |              |
| Assumed meter temp.    | 54.4 F                 |                 |              |
| Total number of points | 24                     |                 |              |
| Time per point         | 30                     |                 |              |
| Total run time         | 720                    |                 |              |

**Leak Checks:**

|                         | Pre-test | Post-test |
|-------------------------|----------|-----------|
| Pitot:                  | x        | x         |
| Train leak rate, dcf:   | 0.000    | 0.000     |
| Leak check vacuum, "Hg: | 10       | 12        |

**Nozzle check for roundness:**

| 1           | 2     | 3            |
|-------------|-------|--------------|
| 0.308       | 0.308 | 0.309 inches |
| Caliper ID# | WS2   |              |

**Post Test Calculations:**

|                         |                               |                        |                          |
|-------------------------|-------------------------------|------------------------|--------------------------|
| Sample volume           | 556.232 dcf                   | Ave. $\Delta P$        | 0.193 "H <sub>2</sub> O  |
| Wet mol. weight         | 28.72 M <sub>s</sub> (actual) | Ave. $\sqrt{\Delta P}$ | 0.4386 "H <sub>2</sub> O |
| Actual H <sub>2</sub> O | 1.07 %                        | Ave. $\Delta H$        | 1.925 "H <sub>2</sub> O  |
| Std. meter vol.         | 560.598 dscf                  | Ave. T <sub>s</sub>    | 53 °F                    |
| Isokinetic Average      | 101.2 %                       | Ave. T <sub>m</sub>    | 55.5 °F                  |

**Moisture/Lab:**

| Filter        | NA #    |                                                         |              |
|---------------|---------|---------------------------------------------------------|--------------|
|               | Initial | Final                                                   | Gain         |
| Impingers, g  | 296.4   | VOID                                                    | NA           |
| Silica gel, g | 1010.6  | VOID                                                    | NA           |
|               |         | <b>Total water gain*:</b>                               | <b>128.6</b> |
|               |         | <b>*Total water gain is from simultaneous M29 train</b> |              |

| Traverse Point | Time (min.) | Meter Volume (dcf) | Velocity P ("H <sub>2</sub> O) | Stack Temp. (°F) | Meter Temp. (°F) | Calc. H | Run H | Vacuum ("Hg) | Filter Box (°F) | Condenser Temp F |
|----------------|-------------|--------------------|--------------------------------|------------------|------------------|---------|-------|--------------|-----------------|------------------|
| 1              | 30.0        | 61.450             | 0.17                           | 45               | 43               | 1.68    | 1.70  | 4.5          | NA              | 44               |
| 2              | 60.0        | 84.700             | 0.19                           | 51               | 46               | 1.87    | 1.90  | 5            | NA              | 44               |
| 3              | 90.0        | 106.080            | 0.19                           | 53               | 50               | 1.87    | 1.90  | 5            | NA              | 49               |
| 4              | 120.0       | 128.170            | 0.17                           | 54               | 61               | 1.71    | 1.70  | 5            | NA              | 47               |
| 5              | 150.0       | 150.270            | 0.18                           | 54               | 55               | 1.79    | 1.80  | 5.5          | NA              | 47               |
| 6              | 180.0       | 172.790            | 0.18                           | 57               | 57               | 1.79    | 1.80  | 6            | NA              | 49               |
| 7              | 210.0       | 195.490            | 0.18                           | 58               | 59               | 1.79    | 1.80  | 6            | NA              | 49               |
| 8              | 240.0       | 219.100            | 0.20                           | 56               | 60               | 2.00    | 2.00  | 6.5          | NA              | 51               |
| 9              | 270.0       | 244.210            | 0.22                           | 57               | 60               | 2.19    | 2.20  | 6.5          | NA              | 47               |
| 10             | 300.0       | 267.100            | 0.18                           | 58               | 61               | 1.80    | 1.80  | 6            | NA              | 49               |
| 11             | 330.0       | 289.880            | 0.19                           | 58               | 61               | 1.90    | 1.90  | 6            | NA              | 47               |
| 12             | 360.0       | 312.654            | 0.18                           | 60               | 62               | 1.79    | 1.80  | 6            | NA              | 46               |
| 13             | 390.0       | 335.780            | 0.19                           | 57               | 67               | 1.92    | 1.90  | 5.5          | NA              | 44               |
| 14             | 420.0       | 358.720            | 0.18                           | 53               | 68               | 1.84    | 1.84  | 5.5          | NA              | 44               |
| 15             | 450.0       | 379.710            | 0.14                           | 54               | 62               | 1.41    | 1.40  | 5            | NA              | 46               |
| 16             | 480.0       | 405.670            | 0.21                           | 54               | 63               | 2.12    | 2.10  | 6.5          | NA              | 45               |
| 17             | 510.0       | 429.360            | 0.21                           | 51               | 54               | 2.10    | 2.10  | 5            | NA              | 42               |
| 18             | 540.0       | 455.310            | 0.24                           | 51               | 53               | 2.39    | 2.40  | 4            | NA              | 41               |
| 19             | 570.0       | 479.640            | 0.22                           | 50               | 50               | 2.18    | 2.20  | 4.5          | NA              | 40               |
| 20             | 600.0       | 502.000            | 0.19                           | 49               | 49               | 1.88    | 1.90  | 4            | NA              | 40               |
| 21             | 630.0       | 525.910            | 0.21                           | 49               | 48               | 2.08    | 2.05  | 4            | NA              | 41               |
| 22             | 660.0       | 549.710            | 0.21                           | 48               | 48               | 2.08    | 2.05  | 4.5          | NA              | 41               |
| 23             | 690.0       | 573.480            | 0.21                           | 48               | 48               | 2.08    | 2.05  | 4.5          | NA              | 41               |
| 24             | 720.0       | 596.310            | 0.19                           | 47               | 46               | 1.88    | 1.90  | 4.5          | NA              | 42               |

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Emissions and Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** Baghouse 15  
**Method:** 0061

**Run:** 1  
**Start Time:** 7:20  
**End Time:** 19:25  
**Date:** 12/7/2020

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 917.200                  |                                 |                            |                   |                         |                            |             |
| 30            | 943.120                  | 2.50                            | 44                         | 1                 | 0.25                    | 51                         | 0.5000      |
| 60            | 968.750                  | 2.40                            | 45                         | 2                 | 0.24                    | 49                         | 0.4899      |
| 90            | 993.470                  | 2.30                            | 46                         | 3                 | 0.23                    | 49                         | 0.4796      |
| 120           | 1018.440                 | 2.30                            | 46                         | 4                 | 0.23                    | 49                         | 0.4796      |
| 150           | 1042.500                 | 2.40                            | 47                         | 5                 | 0.22                    | 49                         | 0.4690      |
| 180           | 1066.730                 | 2.05                            | 49                         | 6                 | 0.21                    | 49                         | 0.4583      |
| 210           | 1089.270                 | 1.80                            | 49                         | 7                 | 0.18                    | 51                         | 0.4243      |
| 240           | 1109.420                 | 1.47                            | 55                         | 8                 | 0.15                    | 58                         | 0.3873      |
| 270           | 1133.350                 | 2.08                            | 56                         | 9                 | 0.21                    | 53                         | 0.4583      |
| 300           | 1157.170                 | 1.95                            | 53                         | 10                | 0.20                    | 58                         | 0.4472      |
| 330           | 1179.010                 | 1.75                            | 53                         | 11                | 0.18                    | 60                         | 0.4243      |
| 360           | 1203.525                 | 2.16                            | 54                         | 12                | 0.22                    | 57                         | 0.4690      |
| 390           | 1227.450                 | 2.00                            | 54                         | 13                | 0.21                    | 54                         | 0.4583      |
| 420           | 1249.710                 | 1.60                            | 57                         | 14                | 0.16                    | 58                         | 0.4000      |
| 450           | 1274.100                 | 2.30                            | 57                         | 15                | 0.23                    | 57                         | 0.4796      |
| 480           | 1294.300                 | 1.60                            | 57                         | 16                | 0.16                    | 55                         | 0.4000      |
| 510           | 1317.070                 | 1.80                            | 55                         | 17                | 0.19                    | 52                         | 0.4359      |
| 540           | 1340.930                 | 2.00                            | 57                         | 18                | 0.20                    | 54                         | 0.4472      |
| 570           | 1364.820                 | 2.10                            | 53                         | 19                | 0.21                    | 51                         | 0.4583      |
| 600           | 1389.690                 | 2.10                            | 52                         | 20                | 0.21                    | 49                         | 0.4583      |
| 630           | 1413.880                 | 2.20                            | 51                         | 21                | 0.22                    | 49                         | 0.4690      |
| 660           | 1439.120                 | 2.50                            | 50                         | 22                | 0.25                    | 47                         | 0.5000      |
| 690           | 1466.770                 | 2.80                            | 49                         | 23                | 0.28                    | 47                         | 0.5292      |
| 720           | 1492.485                 | 2.30                            | 52                         | 24                | 0.23                    | 47                         | 0.4796      |

**Client: Columbia Steel Casting****Run: 1****Source: Baghouse 15****Date: 12/07/20****Field Data Input Continued**Moisture Data

Total Test Time 720.0 min  
 Sample Time Interval 30.0 min  
 Meter Volume,  $V_m$  575.285 dcf  
 Water Volume 87.4 g  
 Nozzle Diameter,  $N_z$  0.3083 in.  
 Nozzle Area 0.000518 sq.ft.

Stack Dimensional Data:

Circular  
 Diameter 66.000 in  
 Rectangular  
 Width in  
 Length in  
 Stack Area 23.758 sq.ft.

Traverse Data

Barometric Pressure,  $P_b$  30.41 "Hg  
 Static Pressure -8.00 "H<sub>2</sub>O  
 Pitot Factor, cp 0.84  
 Meter Cal Factor 0.9656 Y

Molecular Weight:

CO<sub>2</sub> Average 0.00 %vd  
 O<sub>2</sub> Average 20.90 %vd

**Field Data Averages**Meter

$\Delta H$  2.103 "H<sub>2</sub>O  
 Temperature,  $T_m$  51.7 °F  
 Temperature,  $T_m$  511.7 °A (°R)  
 Pressure Meter,  $P_m$  30.565 "Hg

Stack

$\sqrt{Dp}$  0.4584 "H<sub>2</sub>O  
 Temperature,  $T_s$  52.2 °F  
 Temperature,  $T_s$  512.2 °A (R)  
 Pressure Stack,  $P_s$  29.822 "Hg

**Field Data Calculations**Meter Box Capture

Standard Volume,  $V_{m(std)}$  585.313 dscf  
 16.574 dscm  
 Actual Volume,  $V_{m(actual)}$  573.909 awcf

EPA Method 2 Stack Gas Flowrate:

Velocity,  $V_s$  25.44 fps  
 Volume (actual) 36,264.2 acfm  
 36,010.4 adcfm  
 Volume (standard) 2,235,625.3 wscf/hr  
 2,219,975.9 dscf/hr  
 36,999.6 dscf/min

Gas Stream Moisture

Moisture Vapor,  $V_{w(std)}$  4.113 scf  
 Moisture,  $B_{ws}$  0.0070  
 Moisture EPA M4 0.70 %v

EPA Method 3 Gas Density

Dry,  $M_d$  28.84 lb/lb-mole  
 Wet,  $M_s$  28.76 lb/lb-mole

Volume/Mole,  $V/M$  374.968

Percent Isokinetic 100.8 %

**Laboratory Results**

Cr VI 0.172 µg/sample  
 Cr VI 1.72E-07 grams

**Emissions:**

Concentration Cr VI,  $C_s$  4.54E-09 gr/dscf  
 0.010 µg/dscm  
 Mass Emissions Cr VI 1.44E-06 lb/hr

"<" represents MDL value

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Emissions and Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** Baghouse 15  
**Method:** 0061

**Run:** 2  
**Start Time:** 8:00  
**End Time:** 20:04  
**Date:** 12/08/20

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 497.320                  |                                 |                            |                   |                         |                            |             |
| 30            | 519.220                  | 1.80                            | 41                         | 1                 | 0.18                    | 46                         | 0.4243      |
| 60            | 543.120                  | 2.10                            | 44                         | 2                 | 0.21                    | 47                         | 0.4583      |
| 90            | 565.300                  | 1.70                            | 47                         | 3                 | 0.17                    | 47                         | 0.4123      |
| 120           | 585.400                  | 1.40                            | 48                         | 4                 | 0.14                    | 50                         | 0.3742      |
| 150           | 604.790                  | 1.30                            | 49                         | 5                 | 0.13                    | 51                         | 0.3606      |
| 180           | 625.860                  | 1.60                            | 50                         | 6                 | 0.16                    | 50                         | 0.4000      |
| 210           | 646.850                  | 1.60                            | 52                         | 7                 | 0.16                    | 51                         | 0.4000      |
| 240           | 668.310                  | 1.70                            | 53                         | 8                 | 0.17                    | 52                         | 0.4123      |
| 270           | 694.710                  | 2.50                            | 55                         | 9                 | 0.25                    | 62                         | 0.5000      |
| 300           | 718.970                  | 2.00                            | 59                         | 10                | 0.20                    | 59                         | 0.4472      |
| 330           | 742.090                  | 1.90                            | 61                         | 11                | 0.19                    | 58                         | 0.4359      |
| 360           | 765.985                  | 1.80                            | 60                         | 12                | 0.18                    | 61                         | 0.4243      |
| 390           | 789.630                  | 2.00                            | 61                         | 13                | 0.20                    | 61                         | 0.4472      |
| 420           | 809.590                  | 1.60                            | 63                         | 14                | 0.16                    | 61                         | 0.4000      |
| 450           | 830.750                  | 1.50                            | 58                         | 15                | 0.15                    | 59                         | 0.3873      |
| 480           | 851.740                  | 1.60                            | 58                         | 16                | 0.16                    | 58                         | 0.4000      |
| 510           | 872.460                  | 1.50                            | 58                         | 17                | 0.15                    | 57                         | 0.3873      |
| 540           | 895.700                  | 1.90                            | 58                         | 18                | 0.19                    | 55                         | 0.4359      |
| 570           | 918.840                  | 1.90                            | 56                         | 19                | 0.19                    | 53                         | 0.4359      |
| 600           | 942.430                  | 2.00                            | 55                         | 20                | 0.20                    | 51                         | 0.4472      |
| 630           | 965.810                  | 2.00                            | 55                         | 21                | 0.20                    | 53                         | 0.4472      |
| 660           | 989.130                  | 1.90                            | 55                         | 22                | 0.19                    | 45                         | 0.4359      |
| 690           | 1014.210                 | 2.20                            | 55                         | 23                | 0.22                    | 53                         | 0.4690      |
| 720           | 1039.530                 | 2.40                            | 55                         | 24                | 0.24                    | 53                         | 0.4899      |

**Client: Columbia Steel Casting****Run: 2****Source: Baghouse 15****Date: 12/08/20****Field Data Input Continued**Moisture Data

Total Test Time 720.0 min  
 Sample Time Interval 30.0 min  
 Meter Volume,  $V_m$  542.210 dcf  
 Water Volume 133.3 g  
 Nozzle Diameter,  $N_z$  0.3083 in.  
 Nozzle Area 0.000519 sq.ft.

Stack Dimensional Data:

Circular  
 Diameter 66.000 in  
 Rectangular  
 Width in  
 Length in  
 Stack Area 23.758 sq.ft.

Traverse Data

Barometric Pressure,  $P_b$  30.25 "Hg  
 Static Pressure -8.00 "H<sub>2</sub>O  
 Pitot Factor, cp 0.84  
 Meter Cal Factor 0.9656 Y

Molecular Weight:

CO<sub>2</sub> Average 0.00 %vd  
 O<sub>2</sub> Average 20.90 %vd

**Field Data Averages**Meter

$\Delta H$  1.829 "H<sub>2</sub>O  
 Temperature,  $T_m$  54.4 °F  
 Temperature,  $T_m$  514.4 °A (°R)  
 Pressure Meter,  $P_m$  30.384 "Hg

Stack

$\sqrt{D_p}$  0.4263 "H<sub>2</sub>O  
 Temperature,  $T_s$  53.9 °F  
 Temperature,  $T_s$  513.9 °A (R)  
 Pressure Stack,  $P_s$  29.662 "Hg

**Field Data Calculations**Meter Box Capture

Standard Volume,  $V_{m(std)}$  545.516 dscf  
 15.447 dscm  
 Actual Volume,  $V_{m(actual)}$  541.959 awcf

EPA Method 2 Stack Gas Flowrate:

Velocity,  $V_s$  23.78 fps  
 Volume (actual) 33,897.9 acfm  
 33,511.5 adcfm  
 Volume (standard) 2,071,659.5 wscf/hr  
 2,048,042.6 dscf/hr  
 34,134.0 dscf/min

Gas Stream Moisture

Moisture Vapor,  $V_{w(std)}$  6.273 scf  
 Moisture,  $B_{ws}$  0.0114  
 Moisture EPA M4 1.14 %v

EPA Method 3 Gas Density

Dry,  $M_d$  28.84 lb/lb-mole  
 Wet,  $M_s$  28.72 lb/lb-mole

Volume/Mole,  $V/M$  378.241

Percent Isokinetic 101.7 %

**Laboratory Results**

Cr VI 0.009 µg/sample  
 Cr VI 9.15E-09 grams

**Emissions:**

Concentration Cr VI,  $C_s$  2.59E-10 gr/dscf  
 0.001 µg/dscm  
 Mass Emissions Cr VI 7.57E-08 lb/hr

"<" represents MDL value

**Isokinetic Field Data**  
**Field Data and Calculations**  
**Emissions and Gas Stream Characteristics**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** Baghouse 15  
**Method:** 0061

**Run:** 3  
**Start Time:** 7:43  
**End Time:** 20:45  
**Date:** 12/09/20

| Sampling Data |                          |                                 |                            | Traverse Data     |                         |                            |             |
|---------------|--------------------------|---------------------------------|----------------------------|-------------------|-------------------------|----------------------------|-------------|
| Time<br>min.  | Meter<br>ft <sup>3</sup> | $\Delta H$<br>"H <sub>2</sub> O | Meter<br>T <sub>m</sub> °F | Traverse<br>Point | Dp<br>"H <sub>2</sub> O | Stack<br>T <sub>s</sub> °F | $\sqrt{Dp}$ |
|               | 40.078                   |                                 |                            |                   |                         |                            |             |
| 30            | 61.450                   | 1.70                            | 43                         | 1                 | 0.17                    | 45                         | 0.4123      |
| 60            | 84.700                   | 1.90                            | 46                         | 2                 | 0.19                    | 51                         | 0.4359      |
| 90            | 106.080                  | 1.90                            | 50                         | 3                 | 0.19                    | 53                         | 0.4359      |
| 120           | 128.170                  | 1.70                            | 61                         | 4                 | 0.17                    | 54                         | 0.4123      |
| 150           | 150.270                  | 1.80                            | 55                         | 5                 | 0.18                    | 54                         | 0.4243      |
| 180           | 172.790                  | 1.80                            | 57                         | 6                 | 0.18                    | 57                         | 0.4243      |
| 210           | 195.490                  | 1.80                            | 59                         | 7                 | 0.18                    | 58                         | 0.4243      |
| 240           | 219.100                  | 2.00                            | 60                         | 8                 | 0.20                    | 56                         | 0.4472      |
| 270           | 244.210                  | 2.20                            | 60                         | 9                 | 0.22                    | 57                         | 0.4690      |
| 300           | 267.100                  | 1.80                            | 61                         | 10                | 0.18                    | 58                         | 0.4243      |
| 330           | 289.880                  | 1.90                            | 61                         | 11                | 0.19                    | 58                         | 0.4359      |
| 360           | 312.654                  | 1.80                            | 62                         | 12                | 0.18                    | 60                         | 0.4243      |
| 390           | 335.780                  | 1.90                            | 67                         | 13                | 0.19                    | 57                         | 0.4359      |
| 420           | 358.720                  | 1.84                            | 68                         | 14                | 0.18                    | 53                         | 0.4243      |
| 450           | 379.710                  | 1.40                            | 62                         | 15                | 0.14                    | 54                         | 0.3742      |
| 480           | 405.670                  | 2.10                            | 63                         | 16                | 0.21                    | 54                         | 0.4583      |
| 510           | 429.360                  | 2.10                            | 54                         | 17                | 0.21                    | 51                         | 0.4583      |
| 540           | 455.310                  | 2.40                            | 53                         | 18                | 0.24                    | 51                         | 0.4899      |
| 570           | 479.640                  | 2.20                            | 50                         | 19                | 0.22                    | 50                         | 0.4690      |
| 600           | 502.000                  | 1.90                            | 49                         | 20                | 0.19                    | 49                         | 0.4359      |
| 630           | 525.910                  | 2.05                            | 48                         | 21                | 0.21                    | 49                         | 0.4583      |
| 660           | 549.710                  | 2.05                            | 48                         | 22                | 0.21                    | 48                         | 0.4583      |
| 690           | 573.480                  | 2.05                            | 48                         | 23                | 0.21                    | 48                         | 0.4583      |
| 720           | 596.310                  | 1.90                            | 46                         | 24                | 0.19                    | 47                         | 0.4359      |

Client: Columbia Steel Casting

Run: 3

Source: Baghouse 15

Date: 12/09/20

**Field Data Input Continued**Moisture Data

Total Test Time 720.0 min  
 Sample Time Interval 30.0 min  
 Meter Volume,  $V_m$  556.232 dcf  
 Water Volume\* 128.6 g  
 Nozzle Diameter,  $N_z$  0.3083 in.  
 Nozzle Area 0.000519 sq.ft.

Stack Dimensional Data:

Circular  
 Diameter 66.000 in  
 Rectangular  
 Width in  
 Length in  
 Stack Area 23.758 sq.ft.

Traverse Data

Barometric Pressure,  $P_b$  30.36 "Hg  
 Static Pressure -8.00 "H<sub>2</sub>O  
 Pitot Factor, cp 0.84  
 Meter Cal Factor 0.9656 Y

Molecular Weight:

CO<sub>2</sub> Average 0.00 %vd  
 O<sub>2</sub> Average 20.90 %vd

\*Water gain is from simultaneous Method 29 train.

**Field Data Averages**Meter

$\Delta H$  1.925 "H<sub>2</sub>O  
 Temperature,  $T_m$  55.5 °F  
 Temperature,  $T_m$  515.5 °A (°R)  
 Pressure Meter,  $P_m$  30.502 "Hg

Stack

$\sqrt{D_p}$  0.4386 "H<sub>2</sub>O  
 Temperature,  $T_s$  53.0 °F  
 Temperature,  $T_s$  513.0 °A (R)  
 Pressure Stack,  $P_s$  29.772 "Hg

**Field Data Calculations**Meter Box Capture

Standard Volume,  $V_{m(std)}$  560.598 dscf  
 15.874 dscm  
 Actual Volume,  $V_{m(actual)}$  553.521 awcf

EPA Method 2 Stack Gas Flowrate:

Velocity,  $V_s$  24.40 fps  
 Volume (actual) 34,781.7 acfm  
 34,409.5 adcfm  
 Volume (standard) 2,137,298.5 wscf/hr  
 2,114,429.4 dscf/hr  
 35,240.5 dscf/min

Gas Stream Moisture

Moisture Vapor,  $V_{w(std)}$  6.052 scf  
 Moisture,  $B_{ws}$  0.0107  
 Moisture EPA M4 1.07 %v

EPA Method 3 Gas Density

Dry,  $M_d$  28.84 lb/lb-mole  
 Wet,  $M_s$  28.72 lb/lb-mole

Volume/Mole,  $V/M$  376.184

Percent Isokinetic 101.2 %

**Laboratory Results**

Cr VI 0.147 µg/sample  
 Cr VI 1.47E-07 grams

**Emissions:**

Concentration Cr VI,  $C_s$  4.05E-09 gr/dscf  
 0.009 µg/dscm  
 Mass Emissions Cr VI 1.22E-06 lb/hr

&lt;" represents MDL value

**Method 0061**  
**Laboratory Results**  
**Cr VI**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** Baghouse 15

| Lab ID   | Sample ID                 | Sample Date | < | Result<br>(µg/sample) | MDL<br>(µg/sample) | Sample<br>Vol. (ml) | Blank Correction<br>(ug) | Blank Corrected<br>Results (µg/sample) |
|----------|---------------------------|-------------|---|-----------------------|--------------------|---------------------|--------------------------|----------------------------------------|
| 20-S2276 | Run 1 Cont #1             | 12/7/2020   |   | 0.200                 | 0.0048             | 475                 | 0.028                    | 0.172                                  |
| 20-S2277 | Run 2 Cont #1             | 12/8/2020   |   | 0.037                 | 0.0044             | 441                 | 0.028                    | 0.009                                  |
| 20-S2278 | Run 3 Cont #1             | 12/9/2020   |   | 0.175                 | 0.0044             | 441                 | 0.028                    | 0.147                                  |
| 20-S2283 | KOH Blank                 | 12/9/2020   |   | 0.0272                | 0.0029             | 293                 | 9.28E-05                 | µg/ml                                  |
| 20-S2284 | H <sub>2</sub> O Blank    | 12/9/2020   | < | MDL                   | 0.0021             | 213                 | 0.00                     | µg/ml                                  |
| 20-S2281 | Field Train Blank (BH-15) | 12/9/2020   |   | 0.0268                | 0.0046             | 455                 | 5.89E-05                 | µg/ml                                  |

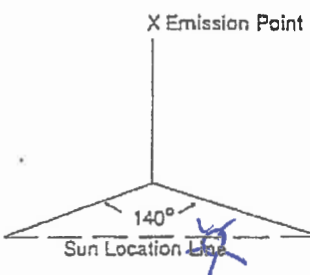
\*A "<" sign designates a result less than the minimum detection limit (MDL). If sample results are below MDL, the MDL value is used for calculations.  
If blank value(s) are below MDL, no blank correction is performed.

**Method 0061**  
**Results Summary**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Source:** Baghouse 15

| Run                                |                               |                            | 1         | 2         | 3         | Average  |
|------------------------------------|-------------------------------|----------------------------|-----------|-----------|-----------|----------|
| Date                               |                               |                            | 12/7/2020 | 12/8/2020 | 12/9/2020 |          |
| Start Time                         |                               |                            | 7:20      | 8:00      | 7:43      |          |
| End Time                           |                               |                            | 19:25     | 20:04     | 20:45     |          |
| Duration, min.                     |                               |                            | 720       | 720       | 720       | 720      |
| Barometric Pressure, "Hg           |                               |                            | 30.41     | 30.25     | 30.36     | 30.34    |
| Nozzle Dia., in.                   |                               |                            | 0.3083    | 0.3083    | 0.3083    | 0.3083   |
| Isokinetic Average, %              |                               |                            | 100.8     | 101.6     | 101.2     | 101.2    |
| Sample Volume, dscf                |                               |                            | 585.180   | 545.392   | 560.471   | 563.681  |
| Sample Volume, dscm                |                               |                            | 16.570    | 15.444    | 15.871    | 15.962   |
| Stack Diameter, in.                |                               |                            | 66.000    | 66.000    | 66.000    | 66.000   |
| Stack Area, sq.ft.                 |                               |                            | 23.758    | 23.758    | 23.758    | 23.758   |
| CO <sub>2</sub> %vd                |                               |                            | 0.00      | 0.00      | 0.00      | 0.00     |
| O <sub>2</sub> %vd                 |                               |                            | 20.90     | 20.90     | 20.90     | 20.90    |
| Static Pressure, "H <sub>2</sub> O |                               |                            | -8.00     | -8.00     | -8.00     | -8.00    |
| H <sub>2</sub> O %v                |                               |                            | 0.70      | 1.14      | 1.07      | 0.97     |
| Wet Molecular Weight, lb/lb-mole   |                               |                            | 28.76     | 28.72     | 28.72     | 28.73    |
| Velocity, FPS                      |                               |                            | 25.44     | 23.78     | 24.40     | 24.54    |
| ADCFM                              |                               |                            | 36,010.4  | 33,511.5  | 34,409.5  | 34,643.8 |
| ACFM                               |                               |                            | 36,264.2  | 33,897.9  | 34,781.7  | 34,981.3 |
| DSCFM                              |                               |                            | 36,999.6  | 34,134.0  | 35,240.5  | 35,458.0 |
| Stack Temperature, °F              |                               |                            | 52.2      | 53.9      | 53.0      | 53.0     |
| Cr VI                              | Concentration, C <sub>s</sub> | gr/dscf                    | 4.54E-09  | 2.59E-10  | 4.05E-09  | 2.95E-09 |
|                                    |                               | µg/dscm                    | 0.010     | 0.001     | 0.009     | 0.007    |
|                                    | Mass                          | lb/hr                      | 1.44E-06  | 7.57E-08  | 1.22E-06  | 9.13E-07 |
|                                    |                               | lb/tons castings processed | 3.06E-07  | 8.81E-08  | 5.88E-07  | 3.28E-07 |
| Production Data                    | tons castings processed/hr    |                            | 4.70      | 0.86      | 2.08      | 2.55     |

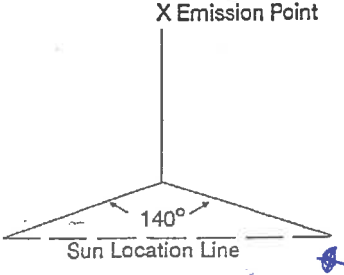
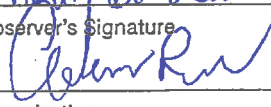
# VISIBLE EMISSION OBSERVATION FORM

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                    |                                                                                              |                                                                |         |    |    |                                                      |                          |                           |    |    |    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------|---------|----|----|------------------------------------------------------|--------------------------|---------------------------|----|----|----|
| Source Name<br><b>Columbia Steel BH#15</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                    |                                                                                              | Observation Date<br><b>12/7/2020</b>                           |         |    |    | Start Time<br><b>15:11</b>                           |                          | Stop Time<br><b>16:11</b> |    |    |    |
| Address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                                                                                              | Min                                                            | Seconds |    |    |                                                      | Min                      | Seconds                   |    |    |    |
| City<br><b>Portland</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | State<br><b>OR</b> | Zip                                                                                          |                                                                | 0       | 15 | 30 | 45                                                   |                          | 0                         | 15 | 30 | 45 |
| Phone                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                    | Source ID Number<br><b>BH#15</b>                                                             | 1                                                              | 0       | 0  | 0  | 0                                                    | 31                       | 0                         | 0  | 0  | 0  |
| Process Equipment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                    | Operating Mode                                                                               | 2                                                              | 0       | 0  | 0  | 0                                                    | 32                       | 0                         | 0  | 0  | 0  |
| Control Equipment<br><b>Baghouse</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                    | Operating Mode<br><b>Normal</b>                                                              | 3                                                              | 0       | 0  | 0  | 0                                                    | 33                       | 0                         | 0  | 0  | 0  |
| Describe Emission Point                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                                                                                              | 4                                                              | 0       | 0  | 0  | 0                                                    | 34                       | 0                         | 0  | 0  | 0  |
| Start <b>Green Circular Stack</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                    | Stop <b>Same</b>                                                                             | 5                                                              | 0       | 0  | 0  | 0                                                    | 35                       | 0                         | 0  | 0  | 0  |
| Height above Ground Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                    | Height Relative to Observer                                                                  | 6                                                              | 0       | 0  | 0  | 0                                                    | 36                       | 0                         | 0  | 0  | 0  |
| Start <b>40'</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                    | Stop <b>40'</b>                                                                              | 7                                                              | 0       | 0  | 0  | 0                                                    | 37                       | 0                         | 0  | 0  | 0  |
| Distance from Observer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                    | Direction from Observer                                                                      | 8                                                              | 0       | 0  | 0  | 0                                                    | 38                       | 0                         | 0  | 0  | 0  |
| Start <b>70'</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                    | Stop <b>NE</b>                                                                               | 9                                                              | 0       | 0  | 0  | 0                                                    | 39                       | 0                         | 0  | 0  | 0  |
| Describe Emissions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                    |                                                                                              | 10                                                             | 0       | 0  | 0  | 0                                                    | 40                       | 0                         | 0  | 0  | 0  |
| Start <b>None visible</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                    | Stop <b>None visible</b>                                                                     | 11                                                             | 0       | 0  | 0  | 0                                                    | 41                       | 0                         | 0  | 0  | 0  |
| Emission Color                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                    | Plume Type: Continuous <input checked="" type="checkbox"/> Fugitive <input type="checkbox"/> | 12                                                             | 0       | 0  | 0  | 0                                                    | 42                       | 0                         | 0  | 0  | 0  |
| Start <b>None</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                    | Intermittent <input type="checkbox"/>                                                        | 13                                                             | 0       | 0  | 0  | 0                                                    | 43                       | 0                         | 0  | 0  | 0  |
| Water Droplets Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                    | If Water Droplet Plume: Attached <input type="checkbox"/> Detached <input type="checkbox"/>  | 14                                                             | 0       | 0  | 0  | 0                                                    | 44                       | 0                         | 0  | 0  | 0  |
| Point in the Plume at which Opacity was Determined                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                    |                                                                                              | 15                                                             | 0       | 0  | 0  | 0                                                    | 45                       | 0                         | 0  | 0  | 0  |
| Start <b>1 above exit</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                    | Stop <b>Same</b>                                                                             | 16                                                             | 0       | 0  | 0  | 0                                                    | 46                       | 0                         | 0  | 0  | 0  |
| Describe Background                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                    |                                                                                              | 17                                                             | 0       | 0  | 0  | 0                                                    | 47                       | 0                         | 0  | 0  | 0  |
| Start <b>clouds</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                    | Stop <b>clouds</b>                                                                           | 18                                                             | 0       | 0  | 0  | 0                                                    | 48                       | 0                         | 0  | 0  | 0  |
| Background Color                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                    | Sky Conditions                                                                               | 19                                                             | 0       | 0  | 0  | 0                                                    | 49                       | 0                         | 0  | 0  | 0  |
| Start <b>Grey</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                    | Stop <b>overcast</b>                                                                         | 20                                                             | 0       | 0  | 0  | 0                                                    | 50                       | 0                         | 0  | 0  | 0  |
| Wind Speed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                    | Wind Direction                                                                               | 21                                                             | 0       | 0  | 0  | 0                                                    | 51                       | 0                         | 0  | 0  | 0  |
| Start <b>0-5 mph</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                    | Stop <b>NE</b>                                                                               | 22                                                             | 0       | 0  | 0  | 0                                                    | 52                       | 0                         | 0  | 0  | 0  |
| Ambient Temp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                    | Wet Bulb Temp.                                                                               | 23                                                             | 0       | 0  | 0  | 0                                                    | 53                       | 0                         | 0  | 0  | 0  |
| Start <b>41°F</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                    | RH Percent                                                                                   | 24                                                             | 0       | 0  | 0  | 0                                                    | 54                       | 0                         | 0  | 0  | 0  |
| <div style="text-align: center;"> <b>Source Layout Sketch</b><br/> <div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="text-align: left;"> <input checked="" type="checkbox"/> Sun<br/> <input checked="" type="checkbox"/> Wind<br/> <input checked="" type="checkbox"/> Plume &amp; Stack </div> <div style="text-align: center;"> <b>Draw North Arrow</b><br/>  </div> </div> <div style="text-align: center; margin-top: 20px;"> X Emission Point<br/>  </div> </div> |                    |                                                                                              | Average Opacity for Highest Period<br><b>0</b>                 |         |    |    | Number of Readings Above<br><b>0</b> % Were <b>0</b> |                          |                           |    |    |    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                    |                                                                                              | Range of Opacity Readings<br>Minimum <b>0</b> Maximum <b>0</b> |         |    |    |                                                      |                          |                           |    |    |    |
| Observer's Name (Print)<br><b>Zach Hardy</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                                              |                                                                |         |    |    |                                                      |                          |                           |    |    |    |
| Observer's Signature<br>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                                              |                                                                |         |    |    |                                                      | Date<br><b>12/7/2020</b> |                           |    |    |    |
| Organization<br><b>Bison Engineering</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                    |                                                                                              |                                                                |         |    |    |                                                      |                          |                           |    |    |    |
| Comments <b>RUN 1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                    |                                                                                              |                                                                |         |    |    |                                                      |                          |                           |    |    |    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                    |                                                                                              |                                                                |         |    |    |                                                      |                          |                           |    |    |    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                    |                                                                                              |                                                                |         |    |    |                                                      |                          |                           |    |    |    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                    |                                                                                              |                                                                |         |    |    |                                                      |                          |                           |    |    |    |

# VISIBLE EMISSION OBSERVATION FORM

|                                                                                                                                                                                                                                                                                                                                                                                      |                    |     |                                                                                                                                    |         |    |    |                                             |                          |                           |    |    |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----|------------------------------------------------------------------------------------------------------------------------------------|---------|----|----|---------------------------------------------|--------------------------|---------------------------|----|----|----|
| Source Name<br><b>COLUMBIA STEEL BH #15</b>                                                                                                                                                                                                                                                                                                                                          |                    |     | Observation Date<br><b>12/8/2020</b>                                                                                               |         |    |    | Start Time<br><b>15:14</b>                  |                          | Stop Time<br><b>16:14</b> |    |    |    |
| Address                                                                                                                                                                                                                                                                                                                                                                              |                    |     | Min                                                                                                                                | Seconds |    |    |                                             | Min                      | Seconds                   |    |    |    |
|                                                                                                                                                                                                                                                                                                                                                                                      |                    |     |                                                                                                                                    | 0       | 15 | 30 | 45                                          |                          | 0                         | 15 | 30 | 45 |
| City<br><b>PORTLAND</b>                                                                                                                                                                                                                                                                                                                                                              | State<br><b>OR</b> | Zip | 1                                                                                                                                  | 0       | 0  | 0  | 0                                           | 31                       | 0                         | 0  | 0  | 0  |
| Phone                                                                                                                                                                                                                                                                                                                                                                                |                    |     | Source ID Number<br><b>BH #15</b>                                                                                                  |         |    |    | 2                                           | 0                        | 0                         | 0  | 0  | 0  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                    |     | 3                                                                                                                                  | 0       | 0  | 0  | 0                                           | 33                       | 0                         | 0  | 0  | 0  |
| Process Equipment                                                                                                                                                                                                                                                                                                                                                                    |                    |     | Operating Mode                                                                                                                     |         |    |    | 4                                           | 0                        | 0                         | 0  | 0  | 0  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                    |     | 5                                                                                                                                  | 0       | 0  | 0  | 0                                           | 34                       | 0                         | 0  | 0  | 0  |
| Control Equipment<br><b>BAGHOUSE</b>                                                                                                                                                                                                                                                                                                                                                 |                    |     | Operating Mode<br><b>NORMAL</b>                                                                                                    |         |    |    | 6                                           | 0                        | 0                         | 0  | 0  | 0  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                    |     | 7                                                                                                                                  | 0       | 0  | 0  | 0                                           | 35                       | 0                         | 0  | 0  | 0  |
| Describe Emission Point<br>Start <b>GREEN CIRCULAR STACK</b> Stop <b>SAME</b>                                                                                                                                                                                                                                                                                                        |                    |     | 8                                                                                                                                  | 0       | 0  | 0  | 0                                           | 36                       | 0                         | 0  | 0  | 0  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                    |     | 9                                                                                                                                  | 0       | 0  | 0  | 0                                           | 37                       | 0                         | 0  | 0  | 0  |
| Height above Ground Level<br>Start <b>40'</b> Stop <b>40'</b>                                                                                                                                                                                                                                                                                                                        |                    |     | Height Relative to Observer<br>Start <b>40'</b> Stop <b>40'</b>                                                                    |         |    |    | 10                                          | 0                        | 0                         | 0  | 0  | 0  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                    |     | 11                                                                                                                                 | 0       | 0  | 0  | 0                                           | 38                       | 0                         | 0  | 0  | 0  |
| Distance from Observer<br>Start <b>70'</b> Stop <b>70'</b>                                                                                                                                                                                                                                                                                                                           |                    |     | Direction from Observer<br>Start <b>NE</b> Stop <b>NE</b>                                                                          |         |    |    | 12                                          | 0                        | 0                         | 0  | 0  | 0  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                    |     | 13                                                                                                                                 | 0       | 0  | 0  | 0                                           | 39                       | 0                         | 0  | 0  | 0  |
| Describe Emissions<br>Start <b>NONE VISIBLE</b> Stop <b>NONE VISIBLE</b>                                                                                                                                                                                                                                                                                                             |                    |     | 14                                                                                                                                 | 0       | 0  | 0  | 0                                           | 40                       | 0                         | 0  | 0  | 0  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                    |     | 15                                                                                                                                 | 0       | 0  | 0  | 0                                           | 41                       | 0                         | 0  | 0  | 0  |
| Emission Color<br>Start <b>NONE</b> Stop <b>NONE</b>                                                                                                                                                                                                                                                                                                                                 |                    |     | Plume Type: Continuous <input checked="" type="checkbox"/> Fugitive <input type="checkbox"/> Intermittent <input type="checkbox"/> |         |    |    | 16                                          | 0                        | 0                         | 0  | 0  | 0  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                    |     | 17                                                                                                                                 | 0       | 0  | 0  | 0                                           | 42                       | 0                         | 0  | 0  | 0  |
| Water Droplets Present?<br>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>                                                                                                                                                                                                                                                                                       |                    |     | If Water Droplet Plume: Attached <input type="checkbox"/> Detached <input type="checkbox"/>                                        |         |    |    | 18                                          | 0                        | 0                         | 0  | 0  | 0  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                    |     | 19                                                                                                                                 | 0       | 0  | 0  | 0                                           | 43                       | 0                         | 0  | 0  | 0  |
| Point in the Plume at which Opacity was Determined<br>Start <b>EXIT</b> Stop <b>EXIT</b>                                                                                                                                                                                                                                                                                             |                    |     | 20                                                                                                                                 | 0       | 0  | 0  | 0                                           | 44                       | 0                         | 0  | 0  | 0  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                    |     | 21                                                                                                                                 | 0       | 0  | 0  | 0                                           | 45                       | 0                         | 0  | 0  | 0  |
| Describe Background<br>Start <b>BLUE SKY</b> Stop <b>BLUE SKY</b>                                                                                                                                                                                                                                                                                                                    |                    |     | 22                                                                                                                                 | 0       | 0  | 0  | 0                                           | 46                       | 0                         | 0  | 0  | 0  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                    |     | 23                                                                                                                                 | 0       | 0  | 0  | 0                                           | 47                       | 0                         | 0  | 0  | 0  |
| Background Color<br>Start <b>BLUE</b> Stop <b>BLUE</b>                                                                                                                                                                                                                                                                                                                               |                    |     | Sky Conditions<br>Start <b>PARTLY</b> Stop <b>PARTLY</b>                                                                           |         |    |    | 24                                          | 0                        | 0                         | 0  | 0  | 0  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                    |     | 25                                                                                                                                 | 0       | 0  | 0  | 0                                           | 48                       | 0                         | 0  | 0  | 0  |
| Wind Speed<br>Start <b>0 MPH</b> Stop <b>0 MPH</b>                                                                                                                                                                                                                                                                                                                                   |                    |     | Wind Direction<br>Start                      Stop                                                                                  |         |    |    | 26                                          | 0                        | 0                         | 0  | 0  | 0  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                    |     | 27                                                                                                                                 | 0       | 0  | 0  | 0                                           | 49                       | 0                         | 0  | 0  | 0  |
| Ambient Temp.<br>Start <b>52°F</b> Stop <b>52°F</b>                                                                                                                                                                                                                                                                                                                                  |                    |     | Wet Bulb Temp.                                                                                                                     |         |    |    | 28                                          | 0                        | 0                         | 0  | 0  | 0  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                    |     | RH Percent                                                                                                                         |         |    |    | 29                                          | 0                        | 0                         | 0  | 0  | 0  |
| Source Layout Sketch<br><br><div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div> <p>☼ Sun</p> <p>» Wind</p> <p>✕ Plume &amp; Stack</p> </div> <div style="text-align: center;"> <p>Draw North Arrow</p> </div> </div> <div style="text-align: center; margin-top: 20px;"> <p>X Emission Point</p> <p>140°</p> <p>Sun Location Line</p> </div> |                    |     | Average Opacity for Highest Period<br><b>0</b>                                                                                     |         |    |    | Number of Readings Above<br>% Were <b>0</b> |                          |                           |    |    |    |
|                                                                                                                                                                                                                                                                                                                                                                                      |                    |     | Range of Opacity Readings<br><b>0</b> Minimum <b>0</b> Maximum                                                                     |         |    |    |                                             |                          |                           |    |    |    |
| Observer's Name (Print)<br><b>JACOB RANKIN</b>                                                                                                                                                                                                                                                                                                                                       |                    |     |                                                                                                                                    |         |    |    |                                             |                          |                           |    |    |    |
| Observer's Signature<br>                                                                                                                                                                                                                                                                                                                                                             |                    |     |                                                                                                                                    |         |    |    |                                             | Date<br><b>12/8/2020</b> |                           |    |    |    |
| Organization<br><b>BISON ENGINEERING</b>                                                                                                                                                                                                                                                                                                                                             |                    |     |                                                                                                                                    |         |    |    |                                             |                          |                           |    |    |    |
| Comments                                                                                                                                                                                                                                                                                                                                                                             |                    |     |                                                                                                                                    |         |    |    |                                             |                          |                           |    |    |    |
|                                                                                                                                                                                                                                                                                                                                                                                      |                    |     |                                                                                                                                    |         |    |    |                                             |                          |                           |    |    |    |
|                                                                                                                                                                                                                                                                                                                                                                                      |                    |     |                                                                                                                                    |         |    |    |                                             |                          |                           |    |    |    |
|                                                                                                                                                                                                                                                                                                                                                                                      |                    |     |                                                                                                                                    |         |    |    |                                             |                          |                           |    |    |    |

# VISIBLE EMISSION OBSERVATION FORM

|                                                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                         |                                                                |         |    |    |                                             |     |                           |                        |    |    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------|----------------------------------------------------------------|---------|----|----|---------------------------------------------|-----|---------------------------|------------------------|----|----|
| Source Name<br><b>Columbia Steel BH 15</b>                                                                                                                                                                                                                                                                                                                                       |                    |                                                                         | Observation Date<br><b>12/9/20</b>                             |         |    |    | Start Time<br><b>11:30</b>                  |     | Stop Time<br><b>12:30</b> |                        |    |    |
| Address                                                                                                                                                                                                                                                                                                                                                                          |                    |                                                                         | Min                                                            | Seconds |    |    |                                             | Min | Seconds                   |                        |    |    |
|                                                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                         |                                                                | 0       | 15 | 30 | 45                                          |     | 0                         | 15                     | 30 | 45 |
| City<br><b>Portland</b>                                                                                                                                                                                                                                                                                                                                                          | State<br><b>OR</b> | Zip                                                                     | 1                                                              | 0       | 0  | 0  | 0                                           | 31  | 0                         | 0                      | 0  | 0  |
| Phone                                                                                                                                                                                                                                                                                                                                                                            |                    | Source ID Number<br><b>BH 15</b>                                        | 2                                                              | 0       | 0  | 0  | 0                                           | 32  | 0                         | 0                      | 0  | 0  |
| Process Equipment<br><b>welding/grinding</b>                                                                                                                                                                                                                                                                                                                                     |                    | Operating Mode<br><b>normal</b>                                         | 3                                                              | 0       | 0  | 0  | 0                                           | 33  | 0                         | 0                      | 0  | 0  |
| Control Equipment<br><b>baghouse</b>                                                                                                                                                                                                                                                                                                                                             |                    | Operating Mode<br><b>normal</b>                                         | 4                                                              | 0       | 0  | 0  | 0                                           | 34  | 0                         | 0                      | 0  | 0  |
| Describe Emission Point                                                                                                                                                                                                                                                                                                                                                          |                    |                                                                         | 5                                                              | 0       | 0  | 0  | 0                                           | 35  | 0                         | 0                      | 0  | 0  |
| Start <b>40'</b> Stop <b>40'</b>                                                                                                                                                                                                                                                                                                                                                 |                    |                                                                         | 6                                                              | 0       | 0  | 0  | 0                                           | 36  | 0                         | 0                      | 0  | 0  |
| Height above Ground Level                                                                                                                                                                                                                                                                                                                                                        |                    |                                                                         | 7                                                              | 0       | 0  | 0  | 0                                           | 37  | 0                         | 0                      | 0  | 0  |
| Start <b>40'</b> Stop <b>40'</b>                                                                                                                                                                                                                                                                                                                                                 |                    |                                                                         | 8                                                              | 0       | 0  | 0  | 0                                           | 38  | 0                         | 0                      | 0  | 0  |
| Distance from Observer                                                                                                                                                                                                                                                                                                                                                           |                    |                                                                         | 9                                                              | 0       | 0  | 0  | 0                                           | 39  | 0                         | 0                      | 0  | 0  |
| Start <b>100ft</b> Stop <b>160ft</b>                                                                                                                                                                                                                                                                                                                                             |                    |                                                                         | 10                                                             | 0       | 0  | 0  | 0                                           | 40  | 0                         | 0                      | 0  | 0  |
| Direction from Observer                                                                                                                                                                                                                                                                                                                                                          |                    |                                                                         | 11                                                             | 0       | 0  | 0  | 0                                           | 41  | 0                         | 0                      | 0  | 0  |
| Start <b>NE</b> Stop <b>NE</b>                                                                                                                                                                                                                                                                                                                                                   |                    |                                                                         | 12                                                             | 0       | 0  | 0  | 0                                           | 42  | 0                         | 0                      | 0  | 0  |
| Describe Emissions                                                                                                                                                                                                                                                                                                                                                               |                    |                                                                         | 13                                                             | 0       | 0  | 0  | 0                                           | 43  | 0                         | 0                      | 0  | 0  |
| Start <b>None visible</b> Stop <b>None visible</b>                                                                                                                                                                                                                                                                                                                               |                    |                                                                         | 14                                                             | 0       | 0  | 0  | 0                                           | 44  | 0                         | 0                      | 0  | 0  |
| Emission Color                                                                                                                                                                                                                                                                                                                                                                   |                    | Plume Type: Continuous <input checked="" type="checkbox"/>              | 15                                                             | 0       | 0  | 0  | 0                                           | 45  | 0                         | 0                      | 0  | 0  |
| Start <b>None</b> Stop <b>None</b>                                                                                                                                                                                                                                                                                                                                               |                    | Fugitive <input type="checkbox"/> Intermittent <input type="checkbox"/> | 16                                                             | 0       | 0  | 0  | 0                                           | 46  | 0                         | 0                      | 0  | 0  |
| Water Droplets Present?                                                                                                                                                                                                                                                                                                                                                          |                    | If Water Droplet Plume:                                                 | 17                                                             | 0       | 0  | 0  | 0                                           | 47  | 0                         | 0                      | 0  | 0  |
| Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>                                                                                                                                                                                                                                                                                                              |                    | Attached <input type="checkbox"/> Detached <input type="checkbox"/>     | 18                                                             | 0       | 0  | 0  | 0                                           | 48  | 0                         | 0                      | 0  | 0  |
| Point in the Plume at which Opacity was Determined                                                                                                                                                                                                                                                                                                                               |                    |                                                                         | 19                                                             | 0       | 0  | 0  | 0                                           | 49  | 0                         | 0                      | 0  | 0  |
| Start <b>exit to atmosphere</b> Stop <b>exit to atmosphere</b>                                                                                                                                                                                                                                                                                                                   |                    |                                                                         | 20                                                             | 0       | 0  | 0  | 0                                           | 50  | 0                         | 0                      | 0  | 0  |
| Describe Background                                                                                                                                                                                                                                                                                                                                                              |                    |                                                                         | 21                                                             | 0       | 0  | 0  | 0                                           | 51  | 0                         | 0                      | 0  | 0  |
| Start <b>cloudy</b> Stop <b>cloudy</b>                                                                                                                                                                                                                                                                                                                                           |                    |                                                                         | 22                                                             | 0       | 0  | 0  | 0                                           | 52  | 0                         | 0                      | 0  | 0  |
| Background Color                                                                                                                                                                                                                                                                                                                                                                 |                    | Sky Conditions                                                          | 23                                                             | 0       | 0  | 0  | 0                                           | 53  | 0                         | 0                      | 0  | 0  |
| Start <b>gray</b> Stop <b>gray</b>                                                                                                                                                                                                                                                                                                                                               |                    | Start <b>overcast</b> Stop <b>overcast</b>                              | 24                                                             | 0       | 0  | 0  | 0                                           | 54  | 0                         | 0                      | 0  | 0  |
| Wind Speed                                                                                                                                                                                                                                                                                                                                                                       |                    | Wind Direction                                                          | 25                                                             | 0       | 0  | 0  | 0                                           | 55  | 0                         | 0                      | 0  | 0  |
| Start <b>0</b> Stop <b>0</b>                                                                                                                                                                                                                                                                                                                                                     |                    | Start Stop                                                              | 26                                                             | 0       | 0  | 0  | 0                                           | 56  | 0                         | 0                      | 0  | 0  |
| Ambient Temp.                                                                                                                                                                                                                                                                                                                                                                    |                    | Wet Bulb Temp.                                                          | 27                                                             | 0       | 0  | 0  | 0                                           | 57  | 0                         | 0                      | 0  | 0  |
| Start <b>50°F</b> Stop <b>55°F</b>                                                                                                                                                                                                                                                                                                                                               |                    | RH Percent                                                              | 28                                                             | 0       | 0  | 0  | 0                                           | 58  | 0                         | 0                      | 0  | 0  |
| <b>Source Layout Sketch</b><br><br><input checked="" type="checkbox"/> Sun      Draw North Arrow <br><input checked="" type="checkbox"/> Wind<br><input checked="" type="checkbox"/> Plume & Stack<br><br> |                    |                                                                         | Average Opacity for Highest Period<br><b>0</b>                 |         |    |    | Number of Readings Above % Were<br><b>0</b> |     |                           |                        |    |    |
|                                                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                         | Range of Opacity Readings<br><b>0</b> Minimum <b>0</b> Maximum |         |    |    |                                             |     |                           |                        |    |    |
| Observer's Name (Print)<br><b>Adam Bender</b>                                                                                                                                                                                                                                                                                                                                    |                    |                                                                         |                                                                |         |    |    |                                             |     |                           |                        |    |    |
| Observer's Signature<br>                                                                                                                                                                                                                                                                     |                    |                                                                         |                                                                |         |    |    |                                             |     |                           | Date<br><b>12/9/20</b> |    |    |
| Organization<br><b>Bison Engineering, Inc.</b>                                                                                                                                                                                                                                                                                                                                   |                    |                                                                         |                                                                |         |    |    |                                             |     |                           |                        |    |    |
| Comments                                                                                                                                                                                                                                                                                                                                                                         |                    |                                                                         |                                                                |         |    |    |                                             |     |                           |                        |    |    |

## **APPENDIX E: BUILDINGS #8 AND #11 ROOF VENT TEST DATA**

| <b>MiniVol Roof Vent Sampling</b><br><b>Columbia Steel</b><br><b>Portland, OR</b><br><b>Cr VI Sample Summary</b> |      |                  |                  |                          |          |          |                     |          |                                                                          |
|------------------------------------------------------------------------------------------------------------------|------|------------------|------------------|--------------------------|----------|----------|---------------------|----------|--------------------------------------------------------------------------|
| Sample Location                                                                                                  |      | Concentration    |                  | Mass Rate                |          | Average  |                     | Average  |                                                                          |
| Building                                                                                                         | Vent | Start Date/Time  | End Date/Time    | $\mu\text{g}/\text{m}^3$ | lb/hr    | (lb/hr)  | lb/ton metal melted | (lb/ton) | Notes                                                                    |
| 8                                                                                                                | *1   | 12/6/2020 21:00  | 12/7/2020 21:00  | NA                       | NA       |          | NA                  | NA       | Incorrect filter was loaded into Mini-Vol. Filter could not be analyzed. |
| 8                                                                                                                | 1    | 12/13/2020 20:00 | 12/14/2020 18:00 | 0.011                    | 3.32E-07 |          | 1.36E-06            |          |                                                                          |
| 8                                                                                                                | *7   | 12/6/2020 21:00  | 12/7/2020 21:00  | NA                       | NA       |          | NA                  | NA       | Incorrect filter was loaded into Mini-Vol. Filter could not be analyzed. |
| 8                                                                                                                | 7    | 12/13/2020 20:00 | 12/14/2020 18:00 | 0.001                    | 3.67E-08 |          | 1.51E-07            |          |                                                                          |
| 11                                                                                                               | 1    | 12/14/2020 20:00 | 12/15/2020 18:00 | 0.017                    | 2.29E-06 |          | 1.63E-06            |          |                                                                          |
| 11                                                                                                               | 4    | 12/10/2020 20:00 | 12/11/2020 18:00 | 0.232                    | 3.22E-05 |          | 1.50E-05            |          |                                                                          |
| 11                                                                                                               | 4    | 12/14/2020 20:00 | 12/15/2020 18:00 | 0.164                    | 2.27E-05 | 2.75E-05 | 1.61E-05            | 1.56E-05 |                                                                          |
| 11                                                                                                               | 5    | 12/9/2020 20:00  | 12/10/2020 18:00 | 0.306                    | 4.29E-05 |          | 2.97E-05            |          |                                                                          |
| 11                                                                                                               | 5    | 12/10/2020 20:00 | 12/11/2020 18:00 | 0.402                    | 5.57E-05 |          | 2.60E-05            |          |                                                                          |
| 11                                                                                                               | 5    | 12/15/2020 20:00 | 12/16/2020 18:00 | 1.188                    | 1.64E-04 |          | 7.96E-05            |          |                                                                          |
| 11                                                                                                               | 5    | 12/17/2020 20:00 | 12/18/2020 18:00 | 0.859                    | 1.19E-04 | 9.54E-05 | 1.02E-04            | 5.93E-05 | Sample taken durring high chromium melt cycle.                           |
| 11                                                                                                               | 7    | 12/9/2020 20:00  | 12/10/2020 18:00 | 0.030                    | 4.21E-06 |          | 2.92E-06            |          |                                                                          |
| 11                                                                                                               | 7    | 12/15/2020 20:00 | 12/16/2020 18:00 | 0.106                    | 1.47E-05 | 9.46E-06 | 7.14E-06            | 5.03E-06 |                                                                          |
| 11                                                                                                               | 8    | 12/7/2020 23:00  | 12/8/2020 17:00  | 0.065                    | 8.99E-06 |          | 3.96E-06            |          |                                                                          |
| 11                                                                                                               | 8    | 12/8/2020 20:00  | 12/9/2020 18:00  | 0.062                    | 8.51E-06 |          | 3.90E-06            |          |                                                                          |
| 11                                                                                                               | *8   | 12/16/2020 20:00 | 12/17/2020 10:30 | 1.758                    | 2.40E-04 |          | 1.89E-04            |          | 14.5 hours of sampling. Battery error.                                   |
| 11                                                                                                               | 8    | 12/17/2020 20:00 | 12/18/2020 18:00 | 0.053                    | 7.39E-06 | 8.30E-06 | 6.32E-06            | 4.73E-06 | Sample taken during high chromium melt.                                  |
| 11                                                                                                               | 9    | 12/7/2020 23:00  | 12/8/2020 17:00  | 0.036                    | 4.95E-06 |          | 2.18E-06            |          |                                                                          |
| 11                                                                                                               | 9    | 12/8/2020 20:00  | 12/9/2020 20:00  | 0.009                    | 1.26E-06 |          | 5.79E-07            |          |                                                                          |
| 11                                                                                                               | 9    | 12/16/2020 20:00 | 12/17/2020 18:00 | 0.087                    | 1.19E-05 | 6.04E-06 | 9.38E-06            | 4.05E-06 |                                                                          |

\*Sample determined invalid, not included in averges and other results.

| MiniVol Roof Vent Sampling<br>Columbia Steel<br>Portland, OR<br>Selected Metals Sample Summary |      |                  |                  |               |   |          |            |                     |          |
|------------------------------------------------------------------------------------------------|------|------------------|------------------|---------------|---|----------|------------|---------------------|----------|
| Sample Location                                                                                |      |                  |                  | Concentration |   |          | Mass Rate  |                     |          |
| Building                                                                                       | Vent | Start Date/Time  | End Date/Time    | Metal         |   | µg/m3    | lb/hr      | lb/ton Metal melted | Notes    |
| 8                                                                                              | 1    | 12/6/2020 21:00  | 12/7/2020 21:00  | As            | < | 0.250    | < 8.01E-06 | <                   | 4.24E-05 |
|                                                                                                |      |                  |                  | Cr            |   | 2.054    | 6.59E-05   |                     | 3.49E-04 |
|                                                                                                |      |                  |                  | Pb            |   | 3.009    | 9.66E-05   |                     | 5.11E-04 |
|                                                                                                |      |                  |                  | Mn            |   | 121.085  | 3.89E-03   |                     | 2.06E-02 |
|                                                                                                |      |                  |                  | Ni            |   | 0.859    | 2.76E-05   |                     | 1.46E-04 |
|                                                                                                |      |                  |                  | SM            | < | 127.256  | < 4.09E-03 | <                   | 2.16E-02 |
| 8                                                                                              | 1    | 12/13/2020 20:00 | 12/14/2020 18:00 | As            | < | 0.267    | < 8.24E-06 | <                   | 3.39E-05 |
|                                                                                                |      |                  |                  | Cr            |   | 4.852    | 1.50E-04   |                     | 6.16E-04 |
|                                                                                                |      |                  |                  | Pb            |   | 2.106    | 6.50E-05   |                     | 2.68E-04 |
|                                                                                                |      |                  |                  | Mn            |   | 279.224  | 8.62E-03   |                     | 3.55E-02 |
|                                                                                                |      |                  |                  | Ni            |   | 0.851    | 2.63E-05   |                     | 1.08E-04 |
|                                                                                                |      |                  |                  | SM            | < | 287.300  | < 8.87E-03 | <                   | 3.65E-02 |
| 8                                                                                              | 1    |                  | Average          | As            | < | 0.259    | < 8.13E-06 | <                   | 3.82E-05 |
|                                                                                                |      |                  |                  | Cr            |   | 3.453    | 1.08E-04   |                     | 4.83E-04 |
|                                                                                                |      |                  |                  | Pb            |   | 2.558    | 8.08E-05   |                     | 3.90E-04 |
|                                                                                                |      |                  |                  | Mn            |   | 200.155  | 6.26E-03   |                     | 2.81E-02 |
|                                                                                                |      |                  |                  | Ni            |   | 0.855    | 2.70E-05   |                     | 1.27E-04 |
|                                                                                                |      |                  |                  | SM            | < | 2.07E+02 | < 6.48E-03 | <                   | 2.91E-02 |
| 8                                                                                              | 7    | 12/6/2020 21:00  | 12/7/2020 21:00  | As            | < | 0.234    | < 7.51E-06 | <                   | 3.97E-05 |
|                                                                                                |      |                  |                  | Cr            |   | 0.827    | 2.65E-05   |                     | 1.40E-04 |
|                                                                                                |      |                  |                  | Pb            |   | 0.958    | 3.08E-05   |                     | 1.63E-04 |
|                                                                                                |      |                  |                  | Mn            |   | 63.451   | 2.04E-03   |                     | 1.08E-02 |
|                                                                                                |      |                  |                  | Ni            |   | 0.456    | 1.46E-05   |                     | 7.75E-05 |
|                                                                                                |      |                  |                  | SM            | < | 65.926   | < 2.12E-03 | <                   | 1.12E-02 |
| 8                                                                                              | 7    | 12/13/2020 20:00 | 12/14/2020 18:00 | As            | < | 0.251    | < 7.74E-06 | <                   | 3.18E-05 |
|                                                                                                |      |                  |                  | Cr            |   | 1.130    | 3.49E-05   |                     | 1.44E-04 |
|                                                                                                |      |                  |                  | Pb            |   | 0.434    | 1.34E-05   |                     | 5.51E-05 |
|                                                                                                |      |                  |                  | Mn            |   | 55.853   | 1.72E-03   |                     | 7.10E-03 |
|                                                                                                |      |                  |                  | Ni            |   | 1.359    | 4.20E-05   |                     | 1.73E-04 |
|                                                                                                |      |                  |                  | SM            | < | 59.027   | < 1.82E-03 | <                   | 7.50E-03 |
| 8                                                                                              | 7    |                  | Average          | As            | < | 0.243    | < 7.63E-06 | <                   | 3.58E-05 |
|                                                                                                |      |                  |                  | Cr            |   | 0.979    | 3.07E-05   |                     | 1.42E-04 |
|                                                                                                |      |                  |                  | Pb            |   | 0.696    | 2.21E-05   |                     | 1.09E-04 |
|                                                                                                |      |                  |                  | Mn            |   | 59.652   | 1.88E-03   |                     | 8.95E-03 |
|                                                                                                |      |                  |                  | Ni            |   | 0.908    | 2.83E-05   |                     | 1.25E-04 |
|                                                                                                |      |                  |                  | SM            | < | 62.477   | < 1.97E-03 | <                   | 9.36E-03 |
| 11                                                                                             | 1    | 12/14/2020 20:00 | 12/15/2020 18:00 | As            | < | 0.268    | < 3.71E-05 | <                   | 2.63E-05 |
|                                                                                                |      |                  |                  | Cr            |   | 5.031    | 6.96E-04   |                     | 4.94E-04 |
|                                                                                                |      |                  |                  | Pb            |   | 5.566    | 7.70E-04   |                     | 5.46E-04 |
|                                                                                                |      |                  |                  | Mn            |   | 755.371  | 1.04E-01   |                     | 7.42E-02 |
|                                                                                                |      |                  |                  | Ni            |   | 1.309    | 1.81E-04   |                     | 1.29E-04 |
|                                                                                                |      |                  |                  | SM            | < | 767.545  | < 1.06E-01 | <                   | 7.54E-02 |
| 11                                                                                             | 4    | 12/10/2020 20:00 | 12/11/2020 18:00 | As            | < | 0.268    | < 3.71E-05 | <                   | 1.73E-05 |
|                                                                                                |      |                  |                  | Cr            |   | 3.444    | 4.77E-04   |                     | 2.23E-04 |
|                                                                                                |      |                  |                  | Pb            |   | 1.791    | 2.48E-04   |                     | 1.16E-04 |
|                                                                                                |      |                  |                  | Mn            |   | 267.855  | 3.71E-02   |                     | 1.73E-02 |
|                                                                                                |      |                  |                  | Ni            |   | 2.342    | 3.25E-04   |                     | 1.51E-04 |
|                                                                                                |      |                  |                  | SM            | < | 275.700  | < 3.82E-02 | <                   | 1.78E-02 |
| 11                                                                                             | 4    | 12/14/2020 20:00 | 12/15/2020 18:00 | As            | < | 0.251    | < 3.47E-05 | <                   | 2.47E-05 |
|                                                                                                |      |                  |                  | Cr            |   | 2.038    | 2.82E-04   |                     | 2.00E-04 |
|                                                                                                |      |                  |                  | Pb            |   | 0.954    | 1.32E-04   |                     | 9.37E-05 |
|                                                                                                |      |                  |                  | Mn            |   | 128.307  | 1.78E-02   |                     | 1.26E-02 |
|                                                                                                |      |                  |                  | Ni            |   | 2.741    | 3.79E-04   |                     | 2.69E-04 |
|                                                                                                |      |                  |                  | SM            | < | 134.291  | < 1.86E-02 | <                   | 1.32E-02 |
| 11                                                                                             | 4    |                  | Average          | As            | < | 0.260    | < 3.59E-05 | <                   | 2.10E-05 |
|                                                                                                |      |                  |                  | Cr            |   | 2.741    | 3.80E-04   |                     | 2.12E-04 |
|                                                                                                |      |                  |                  | Pb            |   | 1.373    | 1.90E-04   |                     | 1.05E-04 |
|                                                                                                |      |                  |                  | Mn            |   | 198.081  | 2.75E-02   |                     | 1.50E-02 |
|                                                                                                |      |                  |                  | Ni            |   | 2.542    | 3.52E-04   |                     | 2.10E-04 |
|                                                                                                |      |                  |                  | SM            | < | 2.05E+02 | < 2.84E-02 | <                   | 1.55E-02 |

| MiniVol Roof Vent Sampling<br>Columbia Steel<br>Portland, OR<br>Selected Metals Sample Summary |    |                  |                  |    |   |         |   |          |   |          |                                                                                                            |
|------------------------------------------------------------------------------------------------|----|------------------|------------------|----|---|---------|---|----------|---|----------|------------------------------------------------------------------------------------------------------------|
| 11                                                                                             | 5  | 12/9/2020 20:00  | 12/10/2020 18:00 | As | < | 0.253   | < | 3.55E-05 | < | 2.46E-05 |                                                                                                            |
|                                                                                                |    |                  |                  | Cr |   | 8.075   |   | 1.13E-03 |   | 7.84E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | Pb |   | 3.756   |   | 5.26E-04 |   | 3.65E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | Mn |   | 420.347 |   | 5.89E-02 |   | 4.08E-02 |                                                                                                            |
|                                                                                                |    |                  |                  | Ni |   | 8.205   |   | 1.15E-03 |   | 7.97E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | SM | < | 440.636 | < | 6.17E-02 | < | 4.28E-02 |                                                                                                            |
| 11                                                                                             | 5  | 12/10/2020 20:00 | 12/11/2020 18:00 | As | < | 0.251   | < | 3.48E-05 | < | 1.63E-05 |                                                                                                            |
|                                                                                                |    |                  |                  | Cr |   | 8.031   |   | 1.11E-03 |   | 5.19E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | Pb |   | 6.738   |   | 9.34E-04 |   | 4.36E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | Mn |   | 354.845 |   | 4.92E-02 |   | 2.30E-02 |                                                                                                            |
|                                                                                                |    |                  |                  | Ni |   | 6.781   |   | 9.40E-04 |   | 4.39E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | SM | < | 376.646 | < | 5.22E-02 | < | 2.44E-02 |                                                                                                            |
| 11                                                                                             | 5  | 12/15/2020 20:00 | 12/16/2020 18:00 | As | < | 0.259   | < | 3.58E-05 | < | 1.74E-05 | Battery appeared to have run out of charge prior to 22 hours of sampling                                   |
|                                                                                                |    |                  |                  | Cr |   | 7.063   |   | 9.75E-04 |   | 4.73E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | Pb |   | 5.271   |   | 7.28E-04 |   | 3.53E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | Mn |   | 214.695 |   | 2.96E-02 |   | 1.44E-02 |                                                                                                            |
|                                                                                                |    |                  |                  | Ni |   | 3.406   |   | 4.70E-04 |   | 2.28E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | SM | < | 230.694 | < | 3.18E-02 | < | 1.55E-02 |                                                                                                            |
| 11                                                                                             | 5  | 12/17/2020 20:00 | 12/18/2020 18:00 | As | < | 0.251   | < | 3.48E-05 | < | 2.97E-05 | Sample taken durring high chromium melt cycle.                                                             |
|                                                                                                |    |                  |                  | Cr |   | 8.156   |   | 1.13E-03 |   | 9.65E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | Pb |   | 3.432   |   | 4.75E-04 |   | 4.06E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | Mn |   | 249.848 |   | 3.46E-02 |   | 2.96E-02 |                                                                                                            |
|                                                                                                |    |                  |                  | Ni |   | 8.558   |   | 1.19E-03 |   | 1.01E-03 |                                                                                                            |
|                                                                                                |    |                  |                  | SM | < | 270.245 | < | 3.74E-02 | < | 3.20E-02 |                                                                                                            |
| 11                                                                                             | 5  | Average          |                  | As | < | 0.254   | < | 3.52E-05 | < | 2.20E-05 |                                                                                                            |
|                                                                                                |    |                  |                  | Cr |   | 7.831   |   | 1.09E-03 |   | 6.85E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | Pb |   | 4.799   |   | 6.66E-04 |   | 3.90E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | Mn |   | 309.934 |   | 4.31E-02 |   | 2.70E-02 |                                                                                                            |
|                                                                                                |    |                  |                  | Ni |   | 6.738   |   | 9.38E-04 |   | 6.19E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | SM | < | 329.555 | < | 4.58E-02 | < | 2.87E-02 |                                                                                                            |
| 11                                                                                             | 7  | 12/9/2020 20:00  | 12/10/2020 18:00 | As | < | 0.269   | < | 3.77E-05 | < | 2.61E-05 |                                                                                                            |
|                                                                                                |    |                  |                  | Cr |   | 3.524   |   | 4.94E-04 |   | 3.42E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | Pb |   | 1.708   |   | 2.39E-04 |   | 1.66E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | Mn |   | 172.366 |   | 2.42E-02 |   | 1.67E-02 |                                                                                                            |
|                                                                                                |    |                  |                  | Ni |   | 6.879   |   | 9.64E-04 |   | 6.68E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | SM | < | 184.746 | < | 2.59E-02 | < | 1.79E-02 |                                                                                                            |
| 11                                                                                             | *7 | 12/15/2020 20:00 | 12/16/2020 18:00 | As | < | 2.262   | < | 3.12E-04 | < | 1.52E-04 | Battery error. Run duration was only 2.6 hours. Sample data was omitted form averages and reported values. |
|                                                                                                |    |                  |                  | Cr |   | 1.693   |   | 2.34E-04 |   | 1.13E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | Pb |   | 1.615   |   | 2.23E-04 |   | 1.08E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | Mn |   | 63.325  |   | 8.74E-03 |   | 4.24E-03 |                                                                                                            |
|                                                                                                |    |                  |                  | Ni |   | 3.761   |   | 5.19E-04 |   | 2.52E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | SM | < | 72.656  | < | 1.00E-02 | < | 4.87E-03 |                                                                                                            |
| 11                                                                                             | 8  | 12/7/2020 23:00  | 12/8/2020 17:00  | As | < | 0.327   | < | 4.53E-05 | < | 2.00E-05 |                                                                                                            |
|                                                                                                |    |                  |                  | Cr |   | 4.844   |   | 6.71E-04 |   | 2.95E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | Pb |   | 1.283   |   | 1.78E-04 |   | 7.83E-05 |                                                                                                            |
|                                                                                                |    |                  |                  | Mn |   | 114.825 |   | 1.59E-02 |   | 7.00E-03 |                                                                                                            |
|                                                                                                |    |                  |                  | Ni |   | 6.471   |   | 8.96E-04 |   | 3.95E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | SM | < | 127.750 | < | 1.77E-02 | < | 7.79E-03 |                                                                                                            |
| 11                                                                                             | 8  | 12/8/2020 20:00  | 12/9/2020 18:00  | As | < | 0.267   | < | 3.70E-05 | < | 1.69E-05 |                                                                                                            |
|                                                                                                |    |                  |                  | Cr |   | 4.417   |   | 6.10E-04 |   | 2.80E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | Pb |   | 1.712   |   | 2.37E-04 |   | 1.08E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | Mn |   | 127.615 |   | 1.76E-02 |   | 8.08E-03 |                                                                                                            |
|                                                                                                |    |                  |                  | Ni |   | 5.701   |   | 7.88E-04 |   | 3.61E-04 |                                                                                                            |
|                                                                                                |    |                  |                  | SM | < | 139.712 | < | 1.93E-02 | < | 8.85E-03 |                                                                                                            |
| 11                                                                                             | 8  | 12/16/2020 20:00 | 12/17/2020 18:00 | As | < | 0.266   | < | 3.62E-05 | < | 2.87E-05 |                                                                                                            |
|                                                                                                |    |                  |                  | Cr |   | 29.133  |   | 3.97E-03 |   | 3.14E-03 |                                                                                                            |
|                                                                                                |    |                  |                  | Pb |   | 0.613   |   | 8.35E-05 |   | 6.61E-05 |                                                                                                            |
|                                                                                                |    |                  |                  | Mn |   | 218.498 |   | 2.98E-02 |   | 2.35E-02 |                                                                                                            |
|                                                                                                |    |                  |                  | Ni |   | 29.892  |   | 4.07E-03 |   | 3.22E-03 |                                                                                                            |
|                                                                                                |    |                  |                  | SM | < | 278.402 | < | 3.79E-02 | < | 3.00E-02 |                                                                                                            |

| MiniVol Roof Vent Sampling<br>Columbia Steel<br>Portland, OR<br>Selected Metals Sample Summary |    |                  |                  |    |   |         |   |          |   |          |                                                                                  |
|------------------------------------------------------------------------------------------------|----|------------------|------------------|----|---|---------|---|----------|---|----------|----------------------------------------------------------------------------------|
| 11                                                                                             | 8  | 12/17/2020 20:00 | 12/18/2020 18:00 | As | < | 0.268   | < | 3.71E-05 | < | 3.17E-05 | Sample taken during high chromium melt.                                          |
|                                                                                                |    |                  |                  | Cr |   | 6.487   |   | 8.98E-04 |   | 7.68E-04 |                                                                                  |
|                                                                                                |    |                  |                  | Pb |   | 0.661   |   | 9.15E-05 |   | 7.82E-05 |                                                                                  |
|                                                                                                |    |                  |                  | Mn |   | 383.991 |   | 5.32E-02 |   | 4.54E-02 |                                                                                  |
|                                                                                                |    |                  |                  | Ni |   | 5.293   |   | 7.33E-04 |   | 6.26E-04 |                                                                                  |
|                                                                                                |    |                  |                  | SM | < | 396.700 | < | 5.49E-02 | < | 4.70E-02 |                                                                                  |
| 11                                                                                             | 8  |                  | Average          | As | < | 0.282   | < | 3.89E-05 | < | 2.43E-05 |                                                                                  |
|                                                                                                |    |                  |                  | Cr |   | 11.220  |   | 1.54E-03 |   | 1.12E-03 |                                                                                  |
|                                                                                                |    |                  |                  | Pb |   | 1.067   |   | 1.48E-04 |   | 8.27E-05 |                                                                                  |
|                                                                                                |    |                  |                  | Mn |   | 211.232 |   | 2.91E-02 |   | 2.10E-02 |                                                                                  |
|                                                                                                |    |                  |                  | Ni |   | 11.839  |   | 1.62E-03 |   | 1.15E-03 |                                                                                  |
|                                                                                                |    |                  |                  | SM | < | 235.641 | < | 3.24E-02 | < | 2.34E-02 |                                                                                  |
| 11                                                                                             | 9  | 12/7/2020 23:00  | 12/8/2020 17:00  | As | < | 0.307   | < | 4.25E-05 | < | 1.87E-05 |                                                                                  |
|                                                                                                |    |                  |                  | Cr |   | 1.983   |   | 2.75E-04 |   | 1.21E-04 |                                                                                  |
|                                                                                                |    |                  |                  | Pb |   | 2.440   |   | 3.38E-04 |   | 1.49E-04 |                                                                                  |
|                                                                                                |    |                  |                  | Mn |   | 139.019 |   | 1.93E-02 |   | 8.48E-03 |                                                                                  |
|                                                                                                |    |                  |                  | Ni |   | 3.616   |   | 5.01E-04 |   | 2.21E-04 |                                                                                  |
|                                                                                                |    |                  |                  | SM | < | 147.365 | < | 2.04E-02 | < | 8.99E-03 |                                                                                  |
| 11                                                                                             | *9 | 12/8/2020        | 12/9/2020        | As |   | NA      |   | NA       |   |          | A programing error occurred in the setup of the sampler, sampling did not occur. |
|                                                                                                |    |                  |                  | Cr |   | NA      |   | NA       |   |          |                                                                                  |
|                                                                                                |    |                  |                  | Pb |   | NA      |   | NA       |   |          |                                                                                  |
|                                                                                                |    |                  |                  | Mn |   | NA      |   | NA       |   |          |                                                                                  |
|                                                                                                |    |                  |                  | Ni |   | NA      |   | NA       |   |          |                                                                                  |
|                                                                                                |    |                  |                  | SM |   | NA      |   | NA       |   |          |                                                                                  |
| 11                                                                                             | *9 | 12/16/2020       | 12/17/2020       | As |   | NA      |   | NA       |   |          | A programing error occurred in the setup of the sampler, sampling did not occur. |
|                                                                                                |    |                  |                  | Cr |   | NA      |   | NA       |   |          |                                                                                  |
|                                                                                                |    |                  |                  | Pb |   | NA      |   | NA       |   |          |                                                                                  |
|                                                                                                |    |                  |                  | Mn |   | NA      |   | NA       |   |          |                                                                                  |
|                                                                                                |    |                  |                  | Ni |   | NA      |   | NA       |   |          |                                                                                  |
|                                                                                                |    |                  |                  | SM |   | NA      |   | NA       |   |          |                                                                                  |

\*Sample determined invalid, not included in averages and other results.

# MiniVol Roof Vent Sampling Field Data Entry and Calculations

**Run: 1**  
**Start Date/Time: 12/6/2020 21:00**  
**End Date/Time: 12/7/2020 21:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 8  
**Vent:** 1  
**Pollutant:** Cr VI  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
overcast and 30s  
A non-Cr VI filter was loaded into MiniVol.  
This sample was not analyzed.

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    | x        | x         |
| outward direction of flow? |          |           |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 5700     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 5.04 lpm |
| Filter #             | 425      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |             |
|-----------------------------|-------------|
| Barometric pressure (Bp)    | 30.41 "Hg   |
| Average Temperature         | 31 deg F    |
| Initial sampler flow rate   | 5.0 lpm     |
| Post-test sampler flow rate | 5.0 lpm     |
| Hour meter start            | 263.8 hours |
| Hour meter end              | 287.8 hours |
| Run duration                | 24 hours    |

**Lab:**

|               |               |
|---------------|---------------|
| Lab ID        | N/A           |
| Concentration | N/A µg/sample |

**Fan Operations:**

|            |             |
|------------|-------------|
| Fan Rating | 7844.6 acfm |
|            | 8573.9 scfm |

**Post Test Calculations:**

|                     |                         |
|---------------------|-------------------------|
| Sample volume       | 7252.74 liters          |
|                     | 7.25 m <sup>3</sup>     |
| Cr VI concentration | N/A µg/m3               |
| Cr VI mass rate     | N/A lb/hr               |
| Cr VI mass rate     | N/A lb/ton metal melted |

**Production Data:**

|              |               |
|--------------|---------------|
| Metal melted | 0.189 tons/hr |
|--------------|---------------|

# MiniVol Roof Vent Sampling Field Data Entry and Calculations

Run: 1  
Start Date/Time: 12/6/2020 21:00  
End Date/Time: 12/7/2020 21:00

Client: Columbia Steel Casting  
Location: Portland, OR  
Building: 8  
Vent: 1  
Pollutant: SM  
Operator: JCR  
Technician(s): ZDH

Environmental Conditions/Test Notes:  
overcast and 30s

## Direction of Vent Flow:

|                            |          |           |
|----------------------------|----------|-----------|
| Smoke emitter indicates    | Pre-test | Post-test |
| outward direction of flow? | x        | x         |

## Equipment:

|                      |          |
|----------------------|----------|
| Sampler ID           | 4914     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 4.87 lpm |
| Filter #             | 423      |

## Sampler Leak Checks:

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

## Sampling Information:

|                             |       |       |
|-----------------------------|-------|-------|
| Barometric pressure (Bp)    | 30.41 | "Hg   |
| Temperature                 | 31    | deg F |
| Initial sampler flow rate   | 5.0   | lpm   |
| Post-test sampler flow rate | 5.0   | lpm   |
| Hour meter start            | 0.4   | hours |
| Hour meter end              | 24.4  | hours |
| Run duration                | 24    | hours |

## Lab:

|           |                     |
|-----------|---------------------|
| Lab ID    | 20-U423             |
|           | Conc. DL            |
|           | µg/sample µg/sample |
| Arsenic   | < DL 1.75           |
| Chromium  | 14.40 0.200         |
| Lead      | 21.10 1.25          |
| Manganese | 849.00 0.075        |
| Nickel    | 6.02 0.750          |
| SM <      | 892.27              |

## Fan Operations:

|            |             |
|------------|-------------|
| Fan rating | 7844.6 acfm |
|            | 8573.9 scfm |

## Post Test Calculations:

|               |                     |
|---------------|---------------------|
| Sample volume | 7011.62 liters      |
|               | 7.01 m <sup>3</sup> |

## Production:

|              |                 |
|--------------|-----------------|
| Metal melted | 0.189 tons/hour |
|--------------|-----------------|

| Pollutant | Concentration<br>µg/m3 | Mass Rate<br>lb/hr | Mass Rate<br>lb/ton metal melted |
|-----------|------------------------|--------------------|----------------------------------|
| Arsenic   | < 0.250                | < 8.01E-06         | < 4.24E-05                       |
| Chromium  | 2.054                  | 6.59E-05           | 3.49E-04                         |
| Lead      | 3.009                  | 9.66E-05           | 5.11E-04                         |
| Manganese | 121.085                | 3.89E-03           | 2.06E-02                         |
| Nickel    | 0.859                  | 2.76E-05           | 1.46E-04                         |
| SM        | < 127.256              | < 4.09E-03         | < 2.16E-02                       |

Note: A "< DL" sign designates a result less than the minimum detection limit (DL). If sample results are below DL, the DL value is used for calculations.  
A "<" indicates a calculated value derived from one or more sample results that are below DL.

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

Run: 2  
 Start Date/Time: 12/13/2020 20:00  
 End Date/Time: 12/14/2020 18:00

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 8  
**Vent:** 1  
**Pollutant:** Cr VI  
**Operator:** ARB  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
 overcast and 40s

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    | x        |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 5700     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 5.14 lpm |
| Filter #             | 320      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |             |
|-----------------------------|-------------|
| Barometric pressure (Bp)    | 30.2 "Hg    |
| Average Temperature         | 47 deg F    |
| Initial sampler flow rate   | 5.0 lpm     |
| Post-test sampler flow rate | 5.0 lpm     |
| Hour meter start            | 371.8 hours |
| Hour meter end              | 393.8 hours |
| Run duration                | 22 hours    |

**Lab:**

|               |                  |
|---------------|------------------|
| Lab ID        | 20-C320          |
| Concentration | 0.0728 µg/sample |

**Fan Operations:**

|            |             |
|------------|-------------|
| Fan Rating | 7844.6 acfm |
|            | 8246.0 scfm |

**Post Test Calculations:**

|                     |                                       |
|---------------------|---------------------------------------|
| Sample volume       | 6779.25 liters<br>6.78 m <sup>3</sup> |
| Cr VI concentration | 0.011 µg/m <sup>3</sup>               |
| Cr VI mass rate     | 3.32E-07 lb/hr                        |
| Cr VI mass rate     | 1.36E-06 lb/ton metal melted          |

**Production Data:**

|              |                 |
|--------------|-----------------|
| Metal melted | 0.243 tons/hour |
|--------------|-----------------|

**Sample Calculations:**

**Fan Flow Rate:**

Flow Rate Corrected to Standard Conditions (scfm) = acfm \* (528 / (Temp. F + 460)) \* (Bp / 29.92) = 8246.0 scfm  
 Note: acfm (actual cubic feet per minute) is determined by fan specification provided by Columbia Steel

where acfm = 7844.6  
 Temp. F = 47 deg F  
 Bp = 30.2 "Hg

**MiniVol Sample Volume:**

Corrected Flow Rate = (m<sub>vol</sub> \* Q<sub>ind</sub> + b<sub>vol</sub>) \* Squaroot((P<sub>std</sub>/P<sub>act</sub>) \* (T<sub>act</sub>/T<sub>std</sub>)) = 5.14 lpm  
 where m<sub>vol</sub> = 1.1089  
 Q<sub>ind</sub> = 5.00 lpm  
 b<sub>vol</sub> = -0.2806  
 P<sub>std</sub> = 29.92 "Hg  
 P<sub>act</sub> = 30.20 "Hg  
 T<sub>std</sub> = 527.67 Rankin  
 T<sub>act</sub> = 507.00 Rankin

Sample Volume (liters) = Corrected Flow Rate \* Run Duration \* 60 = 6779.25 liters  
 where Corrected Flow Rate = 5.14 liters/min  
 Run Duration = 22 hours

Sample Volume (m<sup>3</sup>) = liters \* 0.001 = 6.78 m<sup>3</sup>  
 where liters = 6779.25

**Cr VI concentration:**

Concentration (µg/m<sup>3</sup>) = µg/sample ÷ Sample Volume (m<sup>3</sup>) = 0.011 µg/m<sup>3</sup>  
 where µg/sample = 0.0728  
 Sample Volume = 6.78 m<sup>3</sup>

**Cr VI mass rate:**

Mass Rate (lb/hr) = Cr VI Concentration \* Fan Flow Rate \* 0.0283 \* 60 \* (2.205x10<sup>-3</sup>) = 3.32E-07 lb/hr  
 where Cr VI Concentration = 0.011 µg/m<sup>3</sup>  
 Fan Flow Rate = 8246.0 scfm  
 0.0283 = cubic foot to cubic meter conversion  
 60 = min to hour conversion  
 2.205x10<sup>-3</sup> = µg to lb conversion

Mass Rate (lb/ton steel melted) = Cr VI (lb/hr) / Steel melted (tons/hr) 1.36E-06 lb/ton steel melted

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 2**  
**Start Date/Time: 12/13/2020 20:00**  
**End Date/Time: 12/14/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 8  
**Vent:** 1  
**Pollutant:** SM  
**Operator:** ARB  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
 overcast and 40s

**Direction of Vent Flow:**

| Smoke emitter indicates    | Pre-test | Post-test |
|----------------------------|----------|-----------|
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 4914     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 4.97 lpm |
| Filter #             | 435      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |       |       |
|-----------------------------|-------|-------|
| Barometric pressure (Bp)    | 30.2  | "Hg   |
| Temperature                 | 47    | deg F |
| Initial sampler flow rate   | 5.0   | lpm   |
| Post-test sampler flow rate | 5.0   | lpm   |
| Hour meter start            | 108.4 | hours |
| Hour meter end              | 130.4 | hours |
| Run duration                | 22    | hours |

**Lab:**

| Lab ID               | 20-U435              |
|----------------------|----------------------|
| Conc.                | DL                   |
| $\mu\text{g/sample}$ | $\mu\text{g/sample}$ |
| Arsenic              | < DL 1.75            |
| Chromium             | 31.80 0.200          |
| Lead                 | 13.80 1.25           |
| Manganese            | 1,830 0.075          |
| Nickel               | 5.58 0.750           |
| <b>SM &lt;</b>       | <b>1,882.93</b>      |

**Fan Operations:**

|            |             |
|------------|-------------|
| Fan rating | 7844.6 acfm |
|            | 8246.0 scfm |

**Post Test Calculations:**

|               |                     |
|---------------|---------------------|
| Sample volume | 6553.87 liters      |
|               | 6.55 m <sup>3</sup> |

**Production:**

|              |                 |
|--------------|-----------------|
| Metal melted | 0.243 tons/hour |
|--------------|-----------------|

| Pollutant | Concentration<br>$\mu\text{g/m}^3$ | Mass Rate<br>lb/hr   | Mass Rate<br>lb/ton metal melted |
|-----------|------------------------------------|----------------------|----------------------------------|
| Arsenic   | < 0.267                            | < 8.24E-06           | < 3.39E-05                       |
| Chromium  | 4.852                              | 1.50E-04             | 6.16E-04                         |
| Lead      | 2.106                              | 6.50E-05             | 2.68E-04                         |
| Manganese | 279.224                            | 8.62E-03             | 3.55E-02                         |
| Nickel    | 0.851                              | 2.63E-05             | 1.08E-04                         |
| <b>SM</b> | <b>&lt; 287.300</b>                | <b>&lt; 8.87E-03</b> | <b>&lt; 3.65E-02</b>             |

Note: A "< DL" sign designates a result less than the minimum detection limit (DL). If sample results are below DL, the DL value is used for calculations. A "<" indicates a calculated value derived from one or more sample results that are below DL.

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 1**  
**Start Date/Time: 12/6/2020 21:00**  
**End Date/Time: 12/7/2020 21:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 8  
**Vent:** 7  
**Pollutant:** Cr VI  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
 overcast and 30s  
 A non-Cr VI filter was loaded into MiniVol.  
 This sample was not analyzed.

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    |          |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 4791     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 4.82 lpm |
| Filter #             | 426      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |            |
|-----------------------------|------------|
| Barometric pressure (Bp)    | 30.41 "Hg  |
| Average Temperature         | 31 deg F   |
| Initial sampler flow rate   | 5.0 lpm    |
| Post-test sampler flow rate | 5.0 lpm    |
| Hour meter start            | 24.3 hours |
| Hour meter end              | 48.3 hours |
| Run duration                | 24 hours   |

**Lab:**

|               |               |
|---------------|---------------|
| Lab ID        | N/A           |
| Concentration | N/A µg/sample |

**Fan Operations:**

|            |             |
|------------|-------------|
| Fan Rating | 7844.6 acfm |
|            | 8573.9 scfm |

**Post Test Calculations:**

|                     |                         |
|---------------------|-------------------------|
| Sample volume       | 6939.84 liters          |
|                     | 6.94 m <sup>3</sup>     |
| Cr VI concentration | N/A µg/m3               |
| Cr VI mass rate     | N/A lb/hr               |
| Cr VI mass rate     | N/A lb/ton metal melted |

**Production Data:**

|              |                 |
|--------------|-----------------|
| Metal melted | 0.189 tons/hour |
|--------------|-----------------|

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 1**  
**Start Date/Time: 12/6/2020 21:00**  
**End Date/Time: 12/7/2020 21:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 8  
**Vent:** 7  
**Pollutant:** SM  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
 overcast and 30s

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    | x        |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 5701     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 5.19 lpm |
| Filter #             | 424      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |       |       |
|-----------------------------|-------|-------|
| Barometric pressure (Bp)    | 30.41 | "Hg   |
| Temperature                 | 31    | deg F |
| Initial sampler flow rate   | 5.0   | lpm   |
| Post-test sampler flow rate | 5.0   | lpm   |
| Hour meter start            | 623.2 | hours |
| Hour meter end              | 647.2 | hours |
| Run duration                | 24    | hours |

**Lab:**

| Lab ID         | 20-U424                                   |
|----------------|-------------------------------------------|
|                | Conc. DL                                  |
|                | $\mu\text{g/sample}$ $\mu\text{g/sample}$ |
| Arsenic        | < DL 1.75                                 |
| Chromium       | 6.18 0.200                                |
| Lead           | 7.16 1.25                                 |
| Manganese      | 474.00 0.075                              |
| Nickel         | 3.41 0.750                                |
| <b>SM &lt;</b> | <b>492.50</b>                             |

**Fan Operations:**

|            |             |
|------------|-------------|
| Fan rating | 7844.6 acfm |
|            | 8573.9 scfm |

**Post Test Calculations:**

|               |                     |
|---------------|---------------------|
| Sample volume | 7470.30 liters      |
|               | 7.47 m <sup>3</sup> |

**Production:**

|              |                 |
|--------------|-----------------|
| Metal melted | 0.189 tons/hour |
|--------------|-----------------|

| Pollutant | Concentration $\mu\text{g/m}^3$ | Mass Rate lb/hr      | Mass Rate lb/ton metal melted |
|-----------|---------------------------------|----------------------|-------------------------------|
| Arsenic   | < 0.234                         | < 7.51E-06           | < 3.97E-05                    |
| Chromium  | 0.827                           | 2.65E-05             | 1.40E-04                      |
| Lead      | 0.958                           | 3.08E-05             | 1.63E-04                      |
| Manganese | 63.451                          | 2.04E-03             | 1.08E-02                      |
| Nickel    | 0.456                           | 1.46E-05             | 7.75E-05                      |
| <b>SM</b> | <b>&lt; 65.926</b>              | <b>&lt; 2.12E-03</b> | <b>&lt; 1.12E-02</b>          |

Note: A "< DL" sign designates a result less than the minimum detection limit (DL). If sample results are below DL, the DL value is used for calculations. A "<" indicates a calculated value derived from one or more sample results that are below DL.

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 2**  
**Start Date/Time: 12/13/2020 20:00**  
**End Date/Time: 12/14/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 8  
**Vent:** 7  
**Pollutant:** Cr VI  
**Operator:** ARB  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
overcast and 40s

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    |          |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 4791     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 4.91 lpm |
| Filter #             | 321      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |             |
|-----------------------------|-------------|
| Barometric pressure (Bp)    | 30.2 "Hg    |
| Average Temperature         | 47 deg F    |
| Initial sampler flow rate   | 5.0 lpm     |
| Post-test sampler flow rate | 5.0 lpm     |
| Hour meter start            | 132.3 hours |
| Hour meter end              | 154.3 hours |
| Run duration                | 22 hours    |

**Lab:**

|               |                   |
|---------------|-------------------|
| Lab ID        | 20-C321           |
| Concentration | 0.00772 µg/sample |

**Fan Operations:**

|            |             |
|------------|-------------|
| Fan Rating | 7844.6 acfm |
|            | 8246.0 scfm |

**Post Test Calculations:**

|                     |                              |
|---------------------|------------------------------|
| Sample volume       | 6486.77 liters               |
|                     | 6.49 m <sup>3</sup>          |
| Cr VI concentration | 0.001 µg/m3                  |
| Cr VI mass rate     | 3.67E-08 lb/hr               |
| Cr VI mass rate     | 1.51E-07 lb/ton metal melted |

**Production Data:**

|              |                 |
|--------------|-----------------|
| Metal melted | 0.243 tons/hour |
|--------------|-----------------|

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 2**  
**Start Date/Time: 12/13/2020 20:00**  
**End Date/Time: 12/14/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 8  
**Vent:** 7  
**Pollutant:** SM  
**Operator:** ARB  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
 overcast and 40s

**Direction of Vent Flow:**

| Smoke emitter indicates    | Pre-test | Post-test |
|----------------------------|----------|-----------|
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 5701     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 5.29 lpm |
| Filter #             | 436      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |       |       |
|-----------------------------|-------|-------|
| Barometric pressure (Bp)    | 30.2  | "Hg   |
| Temperature                 | 47    | deg F |
| Initial sampler flow rate   | 5.0   | lpm   |
| Post-test sampler flow rate | 5.0   | lpm   |
| Hour meter start            | 709.2 | hours |
| Hour meter end              | 731.2 | hours |
| Run duration                | 22    | hours |

**Lab:**

| Lab ID    | Conc.              | DL        |
|-----------|--------------------|-----------|
|           | µg/sample          | µg/sample |
| Arsenic   | < DL               | 1.75      |
| Chromium  | 7.89               | 0.200     |
| Lead      | 3.03               | 1.25      |
| Manganese | 390.00             | 0.075     |
| Nickel    | 9.49               | 0.750     |
| <b>SM</b> | <b>&lt; 412.16</b> |           |

**Fan Operations:**

|            |        |      |
|------------|--------|------|
| Fan rating | 7844.6 | acfm |
|            | 8246.0 | scfm |

**Post Test Calculations:**

|               |         |                |
|---------------|---------|----------------|
| Sample volume | 6982.61 | liters         |
|               | 6.98    | m <sup>3</sup> |

**Production:**

|              |                 |
|--------------|-----------------|
| Metal melted | 0.243 tons/hour |
|--------------|-----------------|

| Pollutant | Concentration<br>µg/m3 | Mass Rate<br>lb/hr   | Mass Rate<br>lb/ton metal melted |
|-----------|------------------------|----------------------|----------------------------------|
| Arsenic   | < 0.251                | < 7.74E-06           | < 3.18E-05                       |
| Chromium  | 1.130                  | 3.49E-05             | 1.44E-04                         |
| Lead      | 0.434                  | 1.34E-05             | 5.51E-05                         |
| Manganese | 55.853                 | 1.72E-03             | 7.10E-03                         |
| Nickel    | 1.359                  | 4.20E-05             | 1.73E-04                         |
| <b>SM</b> | <b>&lt; 59.027</b>     | <b>&lt; 1.82E-03</b> | <b>&lt; 7.50E-03</b>             |

Note: A "< DL" sign designates a result less than the minimum detection limit (DL). If sample results are below DL, the DL value is used for calculations.  
 A "<" indicates a calculated value derived from one or more sample results that are below DL.

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 1**  
**Start Date/Time: 12/14/2020 20:00**  
**End Date/Time: 12/15/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 1  
**Pollutant:** Cr VI  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
overcast and 40s

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    |          |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 5700     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 5.12 lpm |
| Filter #             | 324      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |             |
|-----------------------------|-------------|
| Barometric pressure (Bp)    | 30.27 "Hg   |
| Average Temperature         | 46 deg F    |
| Initial sampler flow rate   | 5.0 lpm     |
| Post-test sampler flow rate | 5.0 lpm     |
| Hour meter start            | 393.8 hours |
| Hour meter end              | 415.8 hours |
| Run duration                | 22 hours    |

**Lab:**

|               |                 |
|---------------|-----------------|
| Lab ID        | 20-C324         |
| Concentration | 0.112 µg/sample |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan Rating | 35,000.0 acfm |
|            | 36,949.0 scfm |

**Post Test Calculations:**

|                     |                              |
|---------------------|------------------------------|
| Sample volume       | 6764.73 liters               |
|                     | 6.76 m <sup>3</sup>          |
| Cr VI concentration | 0.017 µg/m3                  |
| Cr VI mass rate     | 2.29E-06 lb/hr               |
| Cr VI mass rate     | 1.63E-06 lb/ton metal melted |

**Production Data:**

|              |                 |
|--------------|-----------------|
| Metal melted | 1.409 tons/hour |
|--------------|-----------------|

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 1**  
**Start Date/Time: 12/14/2020 20:00**  
**End Date/Time: 12/15/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 1  
**Pollutant:** SM  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
 overcast and 40s

**Direction of Vent Flow:**

| Smoke emitter indicates    | Pre-test | Post-test |
|----------------------------|----------|-----------|
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 4914     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 4.95 lpm |
| Filter #             | 437      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |       |       |
|-----------------------------|-------|-------|
| Barometric pressure (Bp)    | 30.27 | "Hg   |
| Temperature                 | 46    | deg F |
| Initial sampler flow rate   | 5.0   | lpm   |
| Post-test sampler flow rate | 5.0   | lpm   |
| Hour meter start            | 130.4 | hours |
| Hour meter end              | 152.4 | hours |
| Run duration                | 22    | hours |

**Lab:**

| Lab ID    | Conc.                | DL        |
|-----------|----------------------|-----------|
|           | µg/sample            | µg/sample |
| Arsenic   | < DL                 | 1.75      |
| Chromium  | 32.90                | 0.200     |
| Lead      | 36.40                | 1.25      |
| Manganese | 4,940.00             | 0.075     |
| Nickel    | 8.56                 | 0.750     |
| <b>SM</b> | <b>&lt; 5,019.61</b> |           |

**Fan Operations:**

|            |         |      |
|------------|---------|------|
| Fan rating | 35000.0 | acfm |
|            | 36949.0 | scfm |

**Post Test Calculations:**

|               |         |                |
|---------------|---------|----------------|
| Sample volume | 6539.83 | liters         |
|               | 6.54    | m <sup>3</sup> |

**Production:**

|              |                 |
|--------------|-----------------|
| Metal melted | 1.409 tons/hour |
|--------------|-----------------|

| Pollutant | Concentration<br>µg/m3 | Mass Rate<br>lb/hr   | Mass Rate<br>lb/ton metal melted |
|-----------|------------------------|----------------------|----------------------------------|
| Arsenic   | < 0.268                | < 3.71E-05           | < 2.63E-05                       |
| Chromium  | 5.031                  | 6.96E-04             | 4.94E-04                         |
| Lead      | 5.566                  | 7.70E-04             | 5.46E-04                         |
| Manganese | 755.371                | 1.04E-01             | 7.42E-02                         |
| Nickel    | 1.309                  | 1.81E-04             | 1.29E-04                         |
| <b>SM</b> | <b>&lt; 767.545</b>    | <b>&lt; 1.06E-01</b> | <b>&lt; 7.54E-02</b>             |

Note: A "< DL" sign designates a result less than the minimum detection limit (DL). If sample results are below DL, the DL value is used for calculations.  
 A "<" indicates a calculated value derived from one or more sample results that are below DL.

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 1**  
**Start Date/Time: 12/10/2020 20:00**  
**End Date/Time: 12/11/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 4  
**Pollutant:** Cr VI  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
overcast and 40s

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    | x        |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 5700     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 5.12 lpm |
| Filter #             | 319      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |             |
|-----------------------------|-------------|
| Barometric pressure (Bp)    | 30.09 "Hg   |
| Average Temperature         | 42 deg F    |
| Initial sampler flow rate   | 5.0 lpm     |
| Post-test sampler flow rate | 5.0 lpm     |
| Hour meter start            | 349.8 hours |
| Hour meter end              | 371.8 hours |
| Run duration                | 22 hours    |

**Lab:**

|               |                |
|---------------|----------------|
| Lab ID        | 20-C319        |
| Concentration | 1.57 µg/sample |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan Rating | 35,000.0 acfm |
|            | 37,021.9 scfm |

**Post Test Calculations:**

|                     |                              |
|---------------------|------------------------------|
| Sample volume       | 6758.06 liters               |
|                     | 6.76 m <sup>3</sup>          |
| Cr VI concentration | 0.232 µg/m3                  |
| Cr VI mass rate     | 3.22E-05 lb/hr               |
| Cr VI mass rate     | 1.50E-05 lb/ton metal melted |

**Production Data:**

|              |                 |
|--------------|-----------------|
| Metal melted | 2.143 tons/hour |
|--------------|-----------------|

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 1**  
**Start Date/Time: 12/10/2020 20:00**  
**End Date/Time: 12/11/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 4  
**Pollutant:** SM  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
 overcast and 40s

**Direction of Vent Flow:**

| Smoke emitter indicates    | Pre-test | Post-test |
|----------------------------|----------|-----------|
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 4914     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 4.95 lpm |
| Filter #             | 434      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |       |       |
|-----------------------------|-------|-------|
| Barometric pressure (Bp)    | 30.09 | "Hg   |
| Temperature                 | 42    | deg F |
| Initial sampler flow rate   | 5.0   | lpm   |
| Post-test sampler flow rate | 5.0   | lpm   |
| Hour meter start            | 86.4  | hours |
| Hour meter end              | 108.4 | hours |
| Run duration                | 22    | hours |

**Lab:**

| Lab ID    | Conc.                | DL        |
|-----------|----------------------|-----------|
|           | µg/sample            | µg/sample |
| Arsenic   | < DL                 | 1.75      |
| Chromium  | 22.50                | 0.200     |
| Lead      | 11.70                | 1.25      |
| Manganese | 1,750.00             | 0.075     |
| Nickel    | 15.30                | 0.750     |
| <b>SM</b> | <b>&lt; 1,801.25</b> |           |

**Fan Operations:**

|            |          |      |
|------------|----------|------|
| Fan rating | 35,000.0 | acfm |
|            | 37,021.9 | scfm |

**Post Test Calculations:**

|               |             |                |
|---------------|-------------|----------------|
| Sample volume | 6533.384314 | liters         |
|               | 6.5         | m <sup>3</sup> |

**Production:**

|              |                 |
|--------------|-----------------|
| Metal melted | 2.143 tons/hour |
|--------------|-----------------|

| Pollutant | Concentration<br>µg/m3 | Mass Rate<br>lb/hr   | Mass Rate<br>lb/ton metal melted |
|-----------|------------------------|----------------------|----------------------------------|
| Arsenic   | < 0.268                | < 3.71E-05           | < 1.73E-05                       |
| Chromium  | 3.444                  | 4.77E-04             | 2.23E-04                         |
| Lead      | 1.791                  | 2.48E-04             | 1.16E-04                         |
| Manganese | 267.855                | 3.71E-02             | 1.73E-02                         |
| Nickel    | 2.342                  | 3.25E-04             | 1.51E-04                         |
| <b>SM</b> | <b>&lt; 275.700</b>    | <b>&lt; 3.82E-02</b> | <b>&lt; 1.78E-02</b>             |

Note: A "< DL" sign designates a result less than the minimum detection limit (DL). If sample results are below DL, the DL value is used for calculations.  
 A "<" indicates a calculated value derived from one or more sample results that are below DL.

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 2**  
**Start Date/Time: 12/14/2020 20:00**  
**End Date/Time: 12/15/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 4  
**Pollutant:** Cr VI  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
overcast and 40s

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    | x        |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 4791     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 4.90 lpm |
| Filter #             | 325      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |             |
|-----------------------------|-------------|
| Barometric pressure (Bp)    | 30.27 "Hg   |
| Average Temperature         | 46 deg F    |
| Initial sampler flow rate   | 5.0 lpm     |
| Post-test sampler flow rate | 5.0 lpm     |
| Hour meter start            | 154.3 hours |
| Hour meter end              | 176.3 hours |
| Run duration                | 22 hours    |

**Lab:**

|               |                |
|---------------|----------------|
| Lab ID        | 20-C325        |
| Concentration | 1.06 µg/sample |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan Rating | 35,000.0 acfm |
|            | 36,949.0 scfm |

**Post Test Calculations:**

|                     |                              |
|---------------------|------------------------------|
| Sample volume       | 6472.88 liters               |
|                     | 6.47 m <sup>3</sup>          |
| Cr VI concentration | 0.164 µg/m3                  |
| Cr VI mass rate     | 2.27E-05 lb/hr               |
| Cr VI mass rate     | 1.61E-05 lb/ton metal melted |

**Production Data:**

|              |                 |
|--------------|-----------------|
| Metal melted | 1.409 tons/hour |
|--------------|-----------------|

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 2**  
**Start Date/Time: 12/14/2020 20:00**  
**End Date/Time: 12/15/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 4  
**Pollutant:** SM  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
 overcast and 40s

**Direction of Vent Flow:**

| Smoke emitter indicates    | Pre-test | Post-test |
|----------------------------|----------|-----------|
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 5701     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 5.28 lpm |
| Filter #             | 439      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |       |       |
|-----------------------------|-------|-------|
| Barometric pressure (Bp)    | 30.27 | "Hg   |
| Temperature                 | 46    | deg F |
| Initial sampler flow rate   | 5.0   | lpm   |
| Post-test sampler flow rate | 5.0   | lpm   |
| Hour meter start            | 731.2 | hours |
| Hour meter end              | 753.2 | hours |
| Run duration                | 22    | hours |

**Lab:**

| Lab ID         | 20-U439             |
|----------------|---------------------|
|                | Conc. DL            |
|                | µg/sample µg/sample |
| Arsenic        | < DL 1.75           |
| Chromium       | 14.20 0.200         |
| Lead           | 6.65 1.25           |
| Manganese      | 894.00 0.075        |
| Nickel         | 19.10 0.750         |
| <b>SM &lt;</b> | <b>935.70</b>       |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan rating | 35,000.0 acfm |
|            | 36,949.0 scfm |

**Post Test Calculations:**

|               |                     |
|---------------|---------------------|
| Sample volume | 6967.65 liters      |
|               | 6.97 m <sup>3</sup> |

**Production:**

|              |                 |
|--------------|-----------------|
| Metal melted | 1.409 tons/hour |
|--------------|-----------------|

| Pollutant |   | Concentration<br>µg/m3 |   | Mass Rate<br>lb/hr |   | Mass Rate<br>lb/ton metal melted |
|-----------|---|------------------------|---|--------------------|---|----------------------------------|
| Arsenic   | < | 0.251                  | < | 3.47E-05           | < | 2.47E-05                         |
| Chromium  |   | 2.038                  |   | 2.82E-04           |   | 2.00E-04                         |
| Lead      |   | 0.954                  |   | 1.32E-04           |   | 9.37E-05                         |
| Manganese |   | 128.307                |   | 1.78E-02           |   | 1.26E-02                         |
| Nickel    |   | 2.741                  |   | 3.79E-04           |   | 2.69E-04                         |
| <b>SM</b> | < | <b>134.292</b>         | < | <b>1.86E-02</b>    | < | <b>1.32E-02</b>                  |

Note: A "< DL" sign designates a result less than the minimum detection limit (DL). If sample results are below DL, the DL value is used for calculations.  
 A "<" indicates a calculated value derived from one or more sample results that are below DL.

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 1**  
**Start Date/Time: 12/9/2020 20:00**  
**End Date/Time: 12/10/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 5  
**Pollutant:** Cr VI  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
mostly cloudy and 40s

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    |          |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 4791     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 4.87 lpm |
| Filter #             | 322      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |             |
|-----------------------------|-------------|
| Barometric pressure (Bp)    | 30.36 "Hg   |
| Average Temperature         | 41 deg F    |
| Initial sampler flow rate   | 5.0 lpm     |
| Post-test sampler flow rate | 5.0 lpm     |
| Hour meter start            | 88.3 hours  |
| Hour meter end              | 110.3 hours |
| Run duration                | 22 hours    |

**Lab:**

|               |                |
|---------------|----------------|
| Lab ID        | 20-C322        |
| Concentration | 1.97 µg/sample |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan Rating | 35,000.0 acfm |
|            | 37,428.7 scfm |

**Post Test Calculations:**

|                     |                              |
|---------------------|------------------------------|
| Sample volume       | 6431.26211 liters            |
|                     | 6.43126211 m <sup>3</sup>    |
| Cr VI concentration | 0.306 µg/m3                  |
| Cr VI mass rate     | 4.29E-05 lb/hr               |
| Cr VI mass rate     | 2.97E-05 lb/ton metal melted |

**Production Data:**

|              |                 |
|--------------|-----------------|
| Metal melted | 1.443 tons/hour |
|--------------|-----------------|

**MiniVol Roof Vent Sampling  
Field Data Entry and Calculations**

**Run: 1**  
**Start Date/Time: 12/9/2020 20:00**  
**End Date/Time: 12/10/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 5  
**Pollutant:** SM  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
mostly cloudy and 40s

**Direction of Vent Flow:**

|                            |          |           |
|----------------------------|----------|-----------|
| Smoke emitter indicates    | Pre-test | Post-test |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 5701     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 5.24 lpm |
| Filter #             | 427      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |       |       |
|-----------------------------|-------|-------|
| Barometric pressure (Bp)    | 30.36 | "Hg   |
| Temperature                 | 41    | deg F |
| Initial sampler flow rate   | 5.0   | lpm   |
| Post-test sampler flow rate | 5.0   | lpm   |
| Hour meter start            | 665.2 | hours |
| Hour meter end              | 687.2 | hours |
| Run duration                | 22    | hours |

**Lab:**

|           |            |           |
|-----------|------------|-----------|
| Lab ID    | 20-U427    |           |
|           | Conc.      | DL        |
|           | µg/sample  | µg/sample |
| Arsenic   | < DL       | 1.75      |
| Chromium  | 55.90      | 0.200     |
| Lead      | 26.00      | 1.25      |
| Manganese | 2,910.00   | 0.075     |
| Nickel    | 56.80      | 0.750     |
| SM        | < 3,050.45 |           |

**Fan Operations:**

|            |          |      |
|------------|----------|------|
| Fan rating | 35,000.0 | acfm |
|            | 37,428.7 | scfm |

**Post Test Calculations:**

|               |             |                |
|---------------|-------------|----------------|
| Sample volume | 6922.851193 | liters         |
|               | 6.9         | m <sup>3</sup> |

**Production:**

|              |                 |
|--------------|-----------------|
| Metal melted | 1.443 tons/hour |
|--------------|-----------------|

| Pollutant |   | Concentration<br>µg/m3 |   | Mass Rate<br>lb/hr |   | Mass Rate<br>lb/ton metal melted |
|-----------|---|------------------------|---|--------------------|---|----------------------------------|
| Arsenic   | < | 0.253                  | < | 3.55E-05           | < | 2.46E-05                         |
| Chromium  |   | 8.075                  |   | 1.13E-03           |   | 7.84E-04                         |
| Lead      |   | 3.756                  |   | 5.26E-04           |   | 3.65E-04                         |
| Manganese |   | 420.347                |   | 5.89E-02           |   | 4.08E-02                         |
| Nickel    |   | 8.205                  |   | 1.15E-03           |   | 7.97E-04                         |
| SM        | < | 440.636                | < | 6.17E-02           | < | 4.28E-02                         |

Note: A "< DL" sign designates a result less than the minimum detection limit (DL). If sample results are below DL, the DL value is used for calculations.  
A "<" indicates a calculated value derived from one or more sample results that are below DL.

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 2**  
**Start Date/Time: 12/10/2020 20:00**  
**End Date/Time: 12/11/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 5  
**Pollutant:** Cr VI  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
overcast and 40s

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    | x        |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 4791     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 4.90 lpm |
| Filter #             | 316      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |             |
|-----------------------------|-------------|
| Barometric pressure (Bp)    | 30.09 "Hg   |
| Average Temperature         | 42 deg F    |
| Initial sampler flow rate   | 5.0 lpm     |
| Post-test sampler flow rate | 5.0 lpm     |
| Hour meter start            | 110.3 hours |
| Hour meter end              | 132.3 hours |
| Run duration                | 22 hours    |

**Lab:**

|               |                |
|---------------|----------------|
| Lab ID        | 20-C316        |
| Concentration | 2.60 µg/sample |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan Rating | 35,000.0 acfm |
|            | 37,021.9 scfm |

**Post Test Calculations:**

|                     |                              |
|---------------------|------------------------------|
| Sample volume       | 6466.49573 liters            |
|                     | 6.46649573 m <sup>3</sup>    |
| Cr VI concentration | 0.402 µg/m3                  |
| Cr VI mass rate     | 5.57E-05 lb/hr               |
| Cr VI mass rate     | 2.60E-05 lb/ton metal melted |

**Production Data:**

|              |                 |
|--------------|-----------------|
| Metal melted | 2.143 tons/hour |
|--------------|-----------------|

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 2**  
**Start Date/Time: 12/10/2020 20:00**  
**End Date/Time: 12/11/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 5  
**Pollutant:** SM  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
 overcast and 40s

**Direction of Vent Flow:**

| Smoke emitter indicates    | Pre-test | Post-test |
|----------------------------|----------|-----------|
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 5701     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 5.27 lpm |
| Filter #             | 433      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |       |       |
|-----------------------------|-------|-------|
| Barometric pressure (Bp)    | 30.09 | "Hg   |
| Temperature                 | 42    | deg F |
| Initial sampler flow rate   | 5.0   | lpm   |
| Post-test sampler flow rate | 5.0   | lpm   |
| Hour meter start            | 687.2 | hours |
| Hour meter end              | 709.2 | hours |
| Run duration                | 22    | hours |

**Lab:**

| Lab ID    | Conc.<br>μg/sample   | DL<br>μg/sample |
|-----------|----------------------|-----------------|
| 20-U433   |                      |                 |
| Arsenic   | < DL                 | 1.75            |
| Chromium  | 55.90                | 0.200           |
| Lead      | 46.90                | 1.25            |
| Manganese | 2,470.00             | 0.075           |
| Nickel    | 47.20                | 0.750           |
| <b>SM</b> | <b>&lt; 2,621.75</b> |                 |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan rating | 35,000.0 acfm |
|            | 37,021.9 scfm |

**Post Test Calculations:**

|               |                     |
|---------------|---------------------|
| Sample volume | 6960.78 liters      |
|               | 6.96 m <sup>3</sup> |

**Production:**

|              |                 |
|--------------|-----------------|
| Metal melted | 2.143 tons/hour |
|--------------|-----------------|

| Pollutant | Concentration<br>μg/m3 | Mass Rate<br>lb/hr   | Mass Rate<br>lb/ton metal melted |
|-----------|------------------------|----------------------|----------------------------------|
| Arsenic   | < 0.251                | < 3.48E-05           | < 1.63E-05                       |
| Chromium  | 8.031                  | 1.11E-03             | 5.19E-04                         |
| Lead      | 6.738                  | 9.34E-04             | 4.36E-04                         |
| Manganese | 354.845                | 4.92E-02             | 2.30E-02                         |
| Nickel    | 6.781                  | 9.40E-04             | 4.39E-04                         |
| <b>SM</b> | <b>&lt; 376.646</b>    | <b>&lt; 5.22E-02</b> | <b>&lt; 2.44E-02</b>             |

Note: A "< DL" sign designates a result less than the minimum detection limit (DL). If sample results are below DL, the DL value is used for calculations.  
 A "<" indicates a calculated value derived from one or more sample results that are below DL.

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 3**  
**Start Date/Time: 12/15/2020 20:00**  
**End Date/Time: 12/16/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 5  
**Pollutant:** Cr VI  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
overcast and 40s

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    | x        |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 4791     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 4.91 lpm |
| Filter #             | 327      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |             |
|-----------------------------|-------------|
| Barometric pressure (Bp)    | 30.2 "Hg    |
| Average Temperature         | 46 deg F    |
| Initial sampler flow rate   | 5.0 lpm     |
| Post-test sampler flow rate | 5.0 lpm     |
| Hour meter start            | 176.3 hours |
| Hour meter end              | 198.3 hours |
| Run duration                | 22 hours    |

**Lab:**

|               |                |
|---------------|----------------|
| Lab ID        | 20-C327        |
| Concentration | 7.70 µg/sample |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan Rating | 35,000.0 acfm |
|            | 36,863.5 scfm |

**Post Test Calculations:**

|                     |                              |
|---------------------|------------------------------|
| Sample volume       | 6480.37 liters               |
|                     | 6.48 m <sup>3</sup>          |
| Cr VI concentration | 1.188 µg/m3                  |
| Cr VI mass rate     | 1.64E-04 lb/hr               |
| Cr VI mass rate     | 7.96E-05 lb/ton metal melted |

**Production Data:**

|              |                 |
|--------------|-----------------|
| Metal melted | 2.059 tons/hour |
|--------------|-----------------|

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 3**  
**Start Date/Time: 12/15/2020 20:00**  
**End Date/Time: 12/16/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 5  
**Pollutant:** SM  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**

overcast and 40s

Battery appeared to have run out of charge prior to  
 22 hours of sampling

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    |          |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 5701     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 5.28 lpm |
| Filter #             | 440      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |       |       |
|-----------------------------|-------|-------|
| Barometric pressure (Bp)    | 30.2  | "Hg   |
| Temperature                 | 46    | deg F |
| Initial sampler flow rate   | 5.0   | lpm   |
| Post-test sampler flow rate | 5.0   | lpm   |
| Hour meter start            | 753.2 | hours |
| Hour meter end              | 774.5 | hours |
| Run duration                | 21.3  | hours |

**Lab:**

| Lab ID    | 20-U440              |
|-----------|----------------------|
|           | Conc. DL             |
|           | µg/sample µg/sample  |
| Arsenic   | < DL 1.75            |
| Chromium  | 47.70 0.200          |
| Lead      | 35.60 1.25           |
| Manganese | 1,450.00 0.075       |
| Nickel    | 23.00 0.750          |
| <b>SM</b> | <b>&lt; 1,558.05</b> |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan rating | 35,000.0 acfm |
|            | 36,863.5 scfm |

**Post Test Calculations:**

|               |                     |
|---------------|---------------------|
| Sample volume | 6753.76 liters      |
|               | 6.75 m <sup>3</sup> |

**Production:**

|              |                 |
|--------------|-----------------|
| Metal melted | 2.059 tons/hour |
|--------------|-----------------|

| Pollutant |   | Concentration<br>µg/m3 |   | Mass Rate<br>lb/hr |   | Mass Rate<br>lb/ton metal melted |
|-----------|---|------------------------|---|--------------------|---|----------------------------------|
| Arsenic   | < | 0.259                  | < | 3.58E-05           | < | 1.74E-05                         |
| Chromium  |   | 7.063                  |   | 9.75E-04           |   | 4.73E-04                         |
| Lead      |   | 5.271                  |   | 7.28E-04           |   | 3.53E-04                         |
| Manganese |   | 214.695                |   | 2.96E-02           |   | 1.44E-02                         |
| Nickel    |   | 3.406                  |   | 4.70E-04           |   | 2.28E-04                         |
| <b>SM</b> | < | <b>230.694</b>         | < | <b>3.18E-02</b>    | < | <b>1.55E-02</b>                  |

Note: A "< DL" sign designates a result less than the minimum detection limit (DL). If sample results are below DL, the DL value is used for calculations.  
 A "<" indicates a calculated value derived from one or more sample results that are below DL.

# MiniVol Roof Vent Sampling Field Data Entry and Calculations

**Run: 1 (High Chromium)**  
**Start Date/Time: 12/17/2020 20:00**  
**End Date/Time: 12/18/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 5  
**Pollutant:** Cr VI  
**Operator:** JCR  
**Technician(s):** ARB

**Environmental Conditions/Test Notes:**  
mostly cloudy and 40s  
Sample taken durring high chromium melt cycle.

## Direction of Vent Flow:

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    |          |           |
| outward direction of flow? | x        | x         |

## Equipment:

|                      |          |
|----------------------|----------|
| Sampler ID           | 4791     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 4.90 lpm |
| Filter #             | 330      |

## Sampler Leak Checks:

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

## Sampling Information:

|                             |             |
|-----------------------------|-------------|
| Barometric pressure (Bp)    | 30.18 "Hg   |
| Average Temperature         | 44 deg F    |
| Initial sampler flow rate   | 5.0 lpm     |
| Post-test sampler flow rate | 5.0 lpm     |
| Hour meter start            | 220.3 hours |
| Hour meter end              | 242.3 hours |
| Run duration                | 22 hours    |

## Lab:

|               |                |
|---------------|----------------|
| Lab ID        | 20-C330        |
| Concentration | 5.56 µg/sample |

## Fan Operations:

|            |               |
|------------|---------------|
| Fan Rating | 35,000.0 acfm |
|            | 36,985.3 scfm |

## Post Test Calculations:

|                     |                              |
|---------------------|------------------------------|
| Sample volume       | 6469.70 liters               |
|                     | 6.47 m <sup>3</sup>          |
| Cr VI concentration | 0.859 µg/m3                  |
| Cr VI mass rate     | 1.19E-04 lb/hr               |
| Cr VI mass rate     | 1.02E-04 lb/ton metal melted |

## Production Data:

|              |                 |
|--------------|-----------------|
| Metal melted | 1.170 tons/hour |
|--------------|-----------------|

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 1 (High Chromium)**  
**Start Date/Time: 12/17/2020 20:00**  
**End Date/Time: 12/18/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 5  
**Pollutant:** SM  
**Operator:** JCR  
**Technician(s):** ARB

**Environmental Conditions/Test Notes:**  
 mostly cloudy and 40s  
 Sample taken during high chromium melt cycle.

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    |          |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 5701     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 5.28 lpm |
| Filter #             | 592      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |       |       |
|-----------------------------|-------|-------|
| Barometric pressure (Bp)    | 30.18 | "Hg   |
| Temperature                 | 44    | deg F |
| Initial sampler flow rate   | 5.0   | lpm   |
| Post-test sampler flow rate | 5.0   | lpm   |
| Hour meter start            | 774.5 | hours |
| Hour meter end              | 796.5 | hours |
| Run duration                | 22    | hours |

**Lab:**

| Lab ID    | 20-U592                                   |
|-----------|-------------------------------------------|
|           | Conc. DL                                  |
|           | $\mu\text{g/sample}$ $\mu\text{g/sample}$ |
| Arsenic   | < DL 1.75                                 |
| Chromium  | 56.80 0.200                               |
| Lead      | 23.90 1.25                                |
| Manganese | 1,740.00 0.075                            |
| Nickel    | 59.60 0.750                               |
| <b>SM</b> | <b>&lt; 1,882.05</b>                      |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan rating | 35,000.0 acfm |
|            | 36,985.3 scfm |

**Post Test Calculations:**

|               |                     |
|---------------|---------------------|
| Sample volume | 6964.22 liters      |
|               | 6.96 m <sup>3</sup> |

**Production:**

|              |                 |
|--------------|-----------------|
| Metal melted | 1.170 tons/hour |
|--------------|-----------------|

| Pollutant | Concentration $\mu\text{g/m}^3$ | Mass Rate lb/hr      | Mass Rate lb/ton metal melted |
|-----------|---------------------------------|----------------------|-------------------------------|
| Arsenic   | < 0.251                         | < 3.48E-05           | < 2.97E-05                    |
| Chromium  | 8.156                           | 1.13E-03             | 9.65E-04                      |
| Lead      | 3.432                           | 4.75E-04             | 4.06E-04                      |
| Manganese | 249.848                         | 3.46E-02             | 2.96E-02                      |
| Nickel    | 8.558                           | 1.19E-03             | 1.01E-03                      |
| <b>SM</b> | <b>&lt; 270.245</b>             | <b>&lt; 3.74E-02</b> | <b>&lt; 3.20E-02</b>          |

Note: A "< DL" sign designates a result less than the minimum detection limit (DL). If sample results are below DL, the DL value is used for calculations. A "<" indicates a calculated value derived from one or more sample results that are below DL.

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 1**  
**Start Date/Time: 12/9/2020 20:00**  
**End Date/Time: 12/10/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 7  
**Pollutant:** Cr VI  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
mostly cloudy and 40s

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    |          |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 5700     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 5.09 lpm |
| Filter #             | 323      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |             |
|-----------------------------|-------------|
| Barometric pressure (Bp)    | 30.36 "Hg   |
| Average Temperature         | 41 deg F    |
| Initial sampler flow rate   | 5.0 lpm     |
| Post-test sampler flow rate | 5.0 lpm     |
| Hour meter start            | 327.8 hours |
| Hour meter end              | 349.8 hours |
| Run duration                | 22 hours    |

**Lab:**

|               |                 |
|---------------|-----------------|
| Lab ID        | 20-C323         |
| Concentration | 0.202 µg/sample |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan Rating | 35,000.0 acfm |
|            | 37,428.7 scfm |

**Post Test Calculations:**

|                     |                              |
|---------------------|------------------------------|
| Sample volume       | 6721.24 liters               |
|                     | 6.72 m <sup>3</sup>          |
| Cr VI concentration | 0.030 µg/m <sup>3</sup>      |
| Cr VI mass rate     | 4.21E-06 lb/hr               |
| Cr VI mass rate     | 2.92E-06 lb/ton metal melted |

**Production Data:**

|              |                 |
|--------------|-----------------|
| Metal melted | 1.443 tons/hour |
|--------------|-----------------|

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 1**  
**Start Date/Time: 12/9/2020 20:00**  
**End Date/Time: 12/10/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 7  
**Pollutant:** SM  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
 mostly cloudy and 40s

**Direction of Vent Flow:**

| Smoke emitter indicates    | Pre-test | Post-test |
|----------------------------|----------|-----------|
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 4914     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 4.92 lpm |
| Filter #             | 428      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |       |       |
|-----------------------------|-------|-------|
| Barometric pressure (Bp)    | 30.36 | "Hg   |
| Temperature                 | 41    | deg F |
| Initial sampler flow rate   | 5.0   | lpm   |
| Post-test sampler flow rate | 5.0   | lpm   |
| Hour meter start            | 64.4  | hours |
| Hour meter end              | 86.4  | hours |
| Run duration                | 22    | hours |

**Lab:**

| Lab ID    | Conc.                | DL        |
|-----------|----------------------|-----------|
|           | µg/sample            | µg/sample |
| Arsenic   | < DL                 | 1.75      |
| Chromium  | 22.90                | 0.200     |
| Lead      | 11.10                | 1.25      |
| Manganese | 1,120.00             | 0.075     |
| Nickel    | 44.70                | 0.750     |
| <b>SM</b> | <b>&lt; 1,200.45</b> |           |

**Fan Operations:**

|            |          |      |
|------------|----------|------|
| Fan rating | 35,000.0 | acfm |
|            | 37,428.7 | scfm |

**Post Test Calculations:**

|               |            |                |
|---------------|------------|----------------|
| Sample volume | 6497.78624 | liters         |
|               | 6.5        | m <sup>3</sup> |

**Production:**

|              |                 |
|--------------|-----------------|
| Metal melted | 1.443 tons/hour |
|--------------|-----------------|

| Pollutant | Concentration<br>µg/m3 | Mass Rate<br>lb/hr   | Mass Rate<br>lb/ton metal melted |
|-----------|------------------------|----------------------|----------------------------------|
| Arsenic   | < 0.269                | < 3.77E-05           | < 2.61E-05                       |
| Chromium  | 3.524                  | 4.94E-04             | 3.42E-04                         |
| Lead      | 1.708                  | 2.39E-04             | 1.66E-04                         |
| Manganese | 172.366                | 2.42E-02             | 1.67E-02                         |
| Nickel    | 6.879                  | 9.64E-04             | 6.68E-04                         |
| <b>SM</b> | <b>&lt; 184.746</b>    | <b>&lt; 2.59E-02</b> | <b>&lt; 1.79E-02</b>             |

Note: A "< DL" sign designates a result less than the minimum detection limit (DL). If sample results are below DL, the DL value is used for calculations.  
 A "<" indicates a calculated value derived from one or more sample results that are below DL.

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 2**  
**Start Date/Time: 12/15/2020 20:00**  
**End Date/Time: 12/16/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 7  
**Pollutant:** Cr VI  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
 overcast and 40s

**Direction of Vent Flow:**

|                                                    | Pre-test | Post-test |
|----------------------------------------------------|----------|-----------|
| Smoke emitter indicates outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 5700     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 5.13 lpm |
| Filter #             | 326      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |             |
|-----------------------------|-------------|
| Barometric pressure (Bp)    | 30.2 "Hg    |
| Average Temperature         | 46 deg F    |
| Initial sampler flow rate   | 5.0 lpm     |
| Post-test sampler flow rate | 5.0 lpm     |
| Hour meter start            | 415.8 hours |
| Hour meter end              | 437.8 hours |
| Run duration                | 22 hours    |

**Lab:**

|               |                 |
|---------------|-----------------|
| Lab ID        | 20-C326         |
| Concentration | 0.721 µg/sample |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan Rating | 35,000.0 acfm |
|            | 36,863.5 scfm |

**Post Test Calculations:**

|                     |                                       |
|---------------------|---------------------------------------|
| Sample volume       | 6772.56 liters<br>6.77 m <sup>3</sup> |
| Cr VI concentration | 0.106 µg/m3                           |
| Cr VI mass rate     | 1.47E-05 lb/hr                        |
| Cr VI mass rate     | 7.14E-06 lb/ton metal melted          |

**Production Data:**

|              |                 |
|--------------|-----------------|
| Metal melted | 2.059 tons/hour |
|--------------|-----------------|

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 2**  
**Start Date/Time: 12/15/2020 20:00**  
**End Date/Time: 12/16/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 7  
**Pollutant:** SM  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
 overcast and 40s  
 battery malfunction, may not have been fully charged.

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    |          |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 4914     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 4.96 lpm |
| Filter #             | 438      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |       |       |
|-----------------------------|-------|-------|
| Barometric pressure (Bp)    | 30.2  | "Hg   |
| Temperature                 | 46    | deg F |
| Initial sampler flow rate   | 5.0   | lpm   |
| Post-test sampler flow rate | 5.0   | lpm   |
| Hour meter start            | 152.5 | hours |
| Hour meter end              | 155.1 | hours |
| Run duration                | 2.6   | hours |

**Lab:**

| Lab ID    | Conc.<br>µg/sample | DL<br>µg/sample |
|-----------|--------------------|-----------------|
| 20-U438   |                    |                 |
| Arsenic   | < DL               | 1.75            |
| Chromium  | 1.31               | 0.200           |
| Lead      | < DL               | 1.25            |
| Manganese | 49.00              | 0.075           |
| Nickel    | 2.91               | 0.750           |
| <b>SM</b> | <b>&lt; 53.31</b>  |                 |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan rating | 35,000.0 acfm |
|            | 36,863.5 scfm |

**Post Test Calculations:**

|               |                     |
|---------------|---------------------|
| Sample volume | 773.78 liters       |
|               | 0.77 m <sup>3</sup> |

**Production:**

|              |                 |
|--------------|-----------------|
| Metal melted | 2.059 tons/hour |
|--------------|-----------------|

| Pollutant |   | Concentration<br>µg/m3 |   | Mass Rate<br>lb/hr |   | Mass Rate<br>lb/ton metal melted |
|-----------|---|------------------------|---|--------------------|---|----------------------------------|
| Arsenic   | < | 2.262                  | < | 3.12E-04           | < | 1.52E-04                         |
| Chromium  |   | 1.693                  |   | 2.34E-04           |   | 1.13E-04                         |
| Lead      | < | 1.615                  | < | 2.23E-04           |   | 1.08E-04                         |
| Manganese |   | 63.325                 |   | 8.74E-03           |   | 4.24E-03                         |
| Nickel    |   | 3.761                  |   | 5.19E-04           |   | 2.52E-04                         |
| <b>SM</b> | < | <b>72.656</b>          | < | <b>1.00E-02</b>    | < | <b>4.87E-03</b>                  |

Note: A "< DL" sign designates a result less than the minimum detection limit (DL). If sample results are below DL, the DL value is used for calculations.  
 A "<" indicates a calculated value derived from one or more sample results that are below DL.

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 1**  
**Start Date/Time: 12/7/2020 23:00**  
**End Date/Time: 12/8/2020 17:00**

**Client:** SLR/Columbia Steel  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 8  
**Pollutant:** Cr VI  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
clear skies and 30s

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    |          |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 5700     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 5.12 lpm |
| Filter #             | 315      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |             |
|-----------------------------|-------------|
| Barometric pressure (Bp)    | 30.25 "Hg   |
| Average Temperature         | 45 deg F    |
| Initial sampler flow rate   | 5.0 lpm     |
| Post-test sampler flow rate | 5.0 lpm     |
| Hour meter start            | 287.8 hours |
| Hour meter end              | 305.8 hours |
| Run duration                | 18 hours    |

**Lab:**

|               |                                   |
|---------------|-----------------------------------|
| Lab ID        | 20-C315                           |
| Concentration | 0.359 $\mu\text{g}/\text{sample}$ |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan Rating | 35,000.0 acfm |
|            | 36,997.7 scfm |

**Post Test Calculations:**

|                     |                                |
|---------------------|--------------------------------|
| Sample volume       | 5531.13 liters                 |
|                     | 5.53 $\text{m}^3$              |
| Cr VI concentration | 0.065 $\mu\text{g}/\text{m}^3$ |
| Cr VI mass rate     | 8.99E-06 lb/hr                 |
| Cr VI mass rate     | 3.96E-06 lb/ton metal melted   |

**Production Data:**

|              |                 |
|--------------|-----------------|
| Metal melted | 2.271 tons/hour |
|--------------|-----------------|

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 1**  
**Start Date/Time: 12/7/2020 23:00**  
**End Date/Time: 12/8/2020 17:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 8  
**Pollutant:** SM  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
 clear skies and 30s

**Direction of Vent Flow:**

| Smoke emitter indicates    | Pre-test | Post-test |
|----------------------------|----------|-----------|
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 4914     |
| Programmed Flow Rate | 5.0 lpm  |
| Corrected Flow Rate  | 4.95 lpm |
| Filter #             | 429      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |       |       |
|-----------------------------|-------|-------|
| Barometric pressure (Bp)    | 30.25 | "Hg   |
| Temperature                 | 45    | deg F |
| Initial sampler flow rate   | 5.0   | lpm   |
| Post-test sampler flow rate | 5.0   | lpm   |
| Hour meter start            | 24.4  | hours |
| Hour meter end              | 42.4  | hours |
| Run duration                | 18    | hours |

**Lab:**

| Lab ID         | 20-U429                                   |
|----------------|-------------------------------------------|
|                | Conc. DL                                  |
|                | $\mu\text{g/sample}$ $\mu\text{g/sample}$ |
| Arsenic        | < DL 1.75                                 |
| Chromium       | 25.90 0.200                               |
| Lead           | 6.86 1.25                                 |
| Manganese      | 614.00 0.075                              |
| Nickel         | 34.60 0.750                               |
| <b>SM &lt;</b> | <b>683.11</b>                             |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan rating | 35,000.0 acfm |
|            | 36,997.7 scfm |

**Post Test Calculations:**

|               |                     |
|---------------|---------------------|
| Sample volume | 5347.25 liters      |
|               | 5.35 m <sup>3</sup> |

**Production:**

|              |                 |
|--------------|-----------------|
| Metal melted | 2.271 tons/hour |
|--------------|-----------------|

| Pollutant | Concentration $\mu\text{g/m}^3$ | Mass Rate lb/hr      | Mass Rate lb/ton metal melted |
|-----------|---------------------------------|----------------------|-------------------------------|
| Arsenic   | < 0.327                         | < 4.53E-05           | < 2.00E-05                    |
| Chromium  | 4.844                           | 6.71E-04             | 2.95E-04                      |
| Lead      | 1.283                           | 1.78E-04             | 7.83E-05                      |
| Manganese | 114.825                         | 1.59E-02             | 7.00E-03                      |
| Nickel    | 6.471                           | 8.96E-04             | 3.95E-04                      |
| <b>SM</b> | <b>&lt; 127.750</b>             | <b>&lt; 1.77E-02</b> | <b>&lt; 7.79E-03</b>          |

Note: A "< DL" sign designates a result less than the minimum detection limit (DL). If sample results are below DL, the DL value is used for calculations. A "<" indicates a calculated value derived from one or more sample results that are below DL.

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 2**  
**Start Date/Time: 12/8/2020 20:00**  
**End Date/Time: 12/9/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 8  
**Pollutant:** Cr VI  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
partly cloudy and 40s

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    |          |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 5700     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 5.13 lpm |
| Filter #             | 317      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |             |
|-----------------------------|-------------|
| Barometric pressure (Bp)    | 30.12 "Hg   |
| Average Temperature         | 44 deg F    |
| Initial sampler flow rate   | 5.0 lpm     |
| Post-test sampler flow rate | 5.0 lpm     |
| Hour meter start            | 305.8 hours |
| Hour meter end              | 327.8 hours |
| Run duration                | 22 hours    |

**Lab:**

|               |                                   |
|---------------|-----------------------------------|
| Lab ID        | 20-C317                           |
| Concentration | 0.417 $\mu\text{g}/\text{sample}$ |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan Rating | 35,000.0 acfm |
|            | 36,911.8 scfm |

**Post Test Calculations:**

|                     |                                |
|---------------------|--------------------------------|
| Sample volume       | 6768.13 liters                 |
|                     | 6.77 $\text{m}^3$              |
| Cr VI concentration | 0.062 $\mu\text{g}/\text{m}^3$ |
| Cr VI mass rate     | 8.51E-06 lb/hr                 |
| Cr VI mass rate     | 3.90E-06 lb/ton metal melted   |

**Production Data:**

|              |                 |
|--------------|-----------------|
| Metal melted | 2.182 tons/hour |
|--------------|-----------------|

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 2**  
**Start Date/Time: 12/8/2020 20:00**  
**End Date/Time: 12/9/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 8  
**Pollutant:** SM  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
 partly cloudy and 40s

**Direction of Vent Flow:**

| Smoke emitter indicates    | Pre-test | Post-test |
|----------------------------|----------|-----------|
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 4914     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 4.96 lpm |
| Filter #             | 431      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |       |       |
|-----------------------------|-------|-------|
| Barometric pressure (Bp)    | 30.12 | "Hg   |
| Temperature                 | 44    | deg F |
| Initial sampler flow rate   | 5.0   | lpm   |
| Post-test sampler flow rate | 5.0   | lpm   |
| Hour meter start            | 42.4  | hours |
| Hour meter end              | 64.4  | hours |
| Run duration                | 22    | hours |

**Lab:**

| Lab ID         | 20-U431                                   |
|----------------|-------------------------------------------|
|                | Conc. DL                                  |
|                | $\mu\text{g/sample}$ $\mu\text{g/sample}$ |
| Arsenic        | < DL 1.75                                 |
| Chromium       | 28.90 0.200                               |
| Lead           | 11.20 1.25                                |
| Manganese      | 835.00 0.075                              |
| Nickel         | 37.30 0.750                               |
| <b>SM &lt;</b> | <b>914.15</b>                             |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan rating | 35,000.0 acfm |
|            | 36,911.8 scfm |

**Post Test Calculations:**

|               |                     |
|---------------|---------------------|
| Sample volume | 6543.13 liters      |
|               | 6.54 m <sup>3</sup> |

**Production:**

|              |                 |
|--------------|-----------------|
| Metal melted | 2.182 tons/hour |
|--------------|-----------------|

| Pollutant | Concentration $\mu\text{g/m}^3$ | Mass Rate lb/hr      | Mass Rate lb/ton metal melted |
|-----------|---------------------------------|----------------------|-------------------------------|
| Arsenic   | < 0.267                         | < 3.70E-05           | < 1.69E-05                    |
| Chromium  | 4.417                           | 6.10E-04             | 2.80E-04                      |
| Lead      | 1.712                           | 2.37E-04             | 1.08E-04                      |
| Manganese | 127.615                         | 1.76E-02             | 8.08E-03                      |
| Nickel    | 5.701                           | 7.88E-04             | 3.61E-04                      |
| <b>SM</b> | <b>&lt; 139.712</b>             | <b>&lt; 1.93E-02</b> | <b>&lt; 8.85E-03</b>          |

Note: A "< DL" sign designates a result less than the minimum detection limit (DL). If sample results are below DL, the DL value is used for calculations. A "<" indicates a calculated value derived from one or more sample results that are below DL.

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 3**  
**Start Date/Time: 12/16/2020 20:00**  
**End Date/Time: 12/17/2020 10:30**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 8  
**Pollutant:** Cr VI  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**

overcast and 40s

Appears that battery did not hold charge or became disconnected.

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    | x        |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 5700     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 5.16 lpm |
| Filter #             | 328      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |             |
|-----------------------------|-------------|
| Barometric pressure (Bp)    | 29.63 "Hg   |
| Average Temperature         | 43 deg F    |
| Initial sampler flow rate   | 5.0 lpm     |
| Post-test sampler flow rate | 5.0 lpm     |
| Hour meter start            | 437.8 hours |
| Hour meter end              | 452.3 hours |
| Run duration                | 14.5 hours  |

**Lab:**

|               |                |
|---------------|----------------|
| Lab ID        | 20-C328        |
| Concentration | 7.90 µg/sample |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan Rating | 35,000.0 acfm |
|            | 36,383.5 scfm |

**Post Test Calculations:**

|                     |                              |
|---------------------|------------------------------|
| Sample volume       | 4493.09 liters               |
|                     | 4.49 m <sup>3</sup>          |
| Cr VI concentration | 1.758 µg/m3                  |
| Cr VI mass rate     | 2.40E-04 lb/hr               |
| Cr VI mass rate     | 1.89E-04 lb/ton metal melted |

**Production Data:**

|              |                 |
|--------------|-----------------|
| Metal melted | 1.264 tons/hour |
|--------------|-----------------|

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 3**  
**Start Date/Time: 12/16/2020 20:00**  
**End Date/Time: 12/17/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 8  
**Pollutant:** SM  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
 overcast and 40s

**Direction of Vent Flow:**

| Smoke emitter indicates    | Pre-test | Post-test |
|----------------------------|----------|-----------|
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 4914     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 4.99 lpm |
| Filter #             | 590      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |       |       |
|-----------------------------|-------|-------|
| Barometric pressure (Bp)    | 29.63 | "Hg   |
| Temperature                 | 43    | deg F |
| Initial sampler flow rate   | 5.0   | lpm   |
| Post-test sampler flow rate | 5.0   | lpm   |
| Hour meter start            | 155.1 | hours |
| Hour meter end              | 177.1 | hours |
| Run duration                | 22    | hours |

**Lab:**

| Lab ID    | Conc.                | DL        |
|-----------|----------------------|-----------|
|           | µg/sample            | µg/sample |
| Arsenic   | < DL                 | 1.75      |
| Chromium  | 192.00               | 0.200     |
| Lead      | 4.04                 | 1.25      |
| Manganese | 1,440.00             | 0.075     |
| Nickel    | 197.00               | 0.750     |
| <b>SM</b> | <b>&lt; 1,834.79</b> |           |

**Fan Operations:**

|            |          |      |
|------------|----------|------|
| Fan rating | 35,000.0 | acfm |
|            | 36,383.5 | scfm |

**Post Test Calculations:**

|               |         |                |
|---------------|---------|----------------|
| Sample volume | 6590.46 | liters         |
|               | 6.59    | m <sup>3</sup> |

**Production:**

|              |                 |
|--------------|-----------------|
| Metal melted | 1.264 tons/hour |
|--------------|-----------------|

| Pollutant | Concentration<br>µg/m3 | Mass Rate<br>lb/hr   | Mass Rate<br>lb/ton metal melted |
|-----------|------------------------|----------------------|----------------------------------|
| Arsenic   | < 0.266                | < 3.62E-05           | < 2.87E-05                       |
| Chromium  | 29.133                 | 3.97E-03             | 3.14E-03                         |
| Lead      | 0.613                  | 8.35E-05             | 6.61E-05                         |
| Manganese | 218.498                | 2.98E-02             | 2.35E-02                         |
| Nickel    | 29.892                 | 4.07E-03             | 3.22E-03                         |
| <b>SM</b> | <b>&lt; 278.402</b>    | <b>&lt; 3.79E-02</b> | <b>&lt; 3.00E-02</b>             |

Note: A "< DL" sign designates a result less than the minimum detection limit (DL). If sample results are below DL, the DL value is used for calculations.  
 A "<" indicates a calculated value derived from one or more sample results that are below DL.

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 1 (High Chromium)**  
**Start Date/Time: 12/17/2020 20:00**  
**End Date/Time: 12/18/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 8  
**Pollutant:** Cr VI  
**Operator:** JCR  
**Technician(s):** ARB

**Environmental Conditions/Test Notes:**  
mostly cloudy and 40s  
Sample taken during high chromium melt.

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    |          |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 5700     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 5.12 lpm |
| Filter #             | 331      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |             |
|-----------------------------|-------------|
| Barometric pressure (Bp)    | 30.18 "Hg   |
| Average Temperature         | 44 deg F    |
| Initial sampler flow rate   | 5.0 lpm     |
| Post-test sampler flow rate | 5.0 lpm     |
| Hour meter start            | 452.3 hours |
| Hour meter end              | 474.3 hours |
| Run duration                | 22 hours    |

**Lab:**

|               |                 |
|---------------|-----------------|
| Lab ID        | 20-C331         |
| Concentration | 0.361 µg/sample |

**Fan Operations:**

|            |                |
|------------|----------------|
| Fan Rating | 35,000.00 acfm |
|            | 36,985.29 scfm |

**Post Test Calculations:**

|                     |                              |
|---------------------|------------------------------|
| Sample volume       | 6761.40 liters               |
|                     | 6.76 m <sup>3</sup>          |
| Cr VI concentration | 0.053 µg/m <sup>3</sup>      |
| Cr VI mass rate     | 7.39E-06 lb/hr               |
| Cr VI mass rate     | 6.32E-06 lb/ton metal melted |

**Production Data:**

|              |                 |
|--------------|-----------------|
| Metal melted | 1.170 tons/hour |
|--------------|-----------------|

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 1 (High Chromium)**  
**Start Date/Time: 12/17/2020 20:00**  
**End Date/Time: 12/18/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 8  
**Pollutant:** SM  
**Operator:** JCR  
**Technician(s):** ARB

**Environmental Conditions/Test Notes:**  
 mostly cloudy and 40s  
 Sample taken during high chromium melt.

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    |          |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 4914     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 4.95 lpm |
| Filter #             | 593      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |       |       |
|-----------------------------|-------|-------|
| Barometric pressure (Bp)    | 30.18 | "Hg   |
| Temperature                 | 44    | deg F |
| Initial sampler flow rate   | 5.0   | lpm   |
| Post-test sampler flow rate | 5.0   | lpm   |
| Hour meter start            | 177.1 | hours |
| Hour meter end              | 199.1 | hours |
| Run duration                | 22    | hours |

**Lab:**

| Lab ID    | 20-U593                                   |
|-----------|-------------------------------------------|
|           | Conc. DL                                  |
|           | $\mu\text{g/sample}$ $\mu\text{g/sample}$ |
| Arsenic   | < DL 1.75                                 |
| Chromium  | 42.40 0.200                               |
| Lead      | 4.32 1.25                                 |
| Manganese | 2,510.00 0.075                            |
| Nickel    | 34.60 0.750                               |
| <b>SM</b> | <b>&lt; 2,593.07</b>                      |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan rating | 35,000.0 acfm |
|            | 36,985.3 scfm |

**Post Test Calculations:**

|               |                     |
|---------------|---------------------|
| Sample volume | 6536.62 liters      |
|               | 6.54 m <sup>3</sup> |

**Production:**

|              |                 |
|--------------|-----------------|
| Metal melted | 1.170 tons/hour |
|--------------|-----------------|

| Pollutant | Concentration $\mu\text{g/m}^3$ | Mass Rate lb/hr      | Mass Rate lb/ton metal melted |
|-----------|---------------------------------|----------------------|-------------------------------|
| Arsenic   | < 0.268                         | < 3.71E-05           | < 3.17E-05                    |
| Chromium  | 6.487                           | 8.98E-04             | 7.68E-04                      |
| Lead      | 0.661                           | 9.15E-05             | 7.82E-05                      |
| Manganese | 383.991                         | 5.32E-02             | 4.54E-02                      |
| Nickel    | 5.293                           | 7.33E-04             | 6.26E-04                      |
| <b>SM</b> | <b>&lt; 396.700</b>             | <b>&lt; 5.49E-02</b> | <b>&lt; 4.70E-02</b>          |

Note: A "< DL" sign designates a result less than the minimum detection limit (DL). If sample results are below DL, the DL value is used for calculations. A "<" indicates a calculated value derived from one or more sample results that are below DL.

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 1**  
**Start Date/Time: 12/7/2020 23:00**  
**End Date/Time: 12/8/2020 17:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 9  
**Pollutant:** Cr VI  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
clear skies and 40s

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    |          |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 4791     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 4.90 lpm |
| Filter #             | 314      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |            |
|-----------------------------|------------|
| Barometric pressure (Bp)    | 30.25 "Hg  |
| Average Temperature         | 45 deg F   |
| Initial sampler flow rate   | 5.0 lpm    |
| Post-test sampler flow rate | 5.0 lpm    |
| Hour meter start            | 48.3 hours |
| Hour meter end              | 66.3 hours |
| Run duration                | 18 hours   |

**Lab:**

|               |                                   |
|---------------|-----------------------------------|
| Lab ID        | 20-C314                           |
| Concentration | 0.189 $\mu\text{g}/\text{sample}$ |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan Rating | 35,000.0 acfm |
|            | 36,997.7 scfm |

**Post Test Calculations:**

|                     |                                |
|---------------------|--------------------------------|
| Sample volume       | 5292.50 liters                 |
|                     | 5.29 $\text{m}^3$              |
| Cr VI concentration | 0.036 $\mu\text{g}/\text{m}^3$ |
| Cr VI mass rate     | 4.95E-06 lb/hr                 |
| Cr VI mass rate     | 2.18E-06 lb/ton metal melted   |

**Production Data:**

|              |                 |
|--------------|-----------------|
| Metal melted | 2.271 tons/hour |
|--------------|-----------------|

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 1**  
**Start Date/Time: 12/7/2020 23:00**  
**End Date/Time: 12/8/2020 17:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 9  
**Pollutant:** SM  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
 clear skies and 40s

**Direction of Vent Flow:**

| Smoke emitter indicates    | Pre-test | Post-test |
|----------------------------|----------|-----------|
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 5701     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 5.28 lpm |
| Filter #             | 430      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |       |       |
|-----------------------------|-------|-------|
| Barometric pressure (Bp)    | 30.25 | "Hg   |
| Temperature                 | 45    | deg F |
| Initial sampler flow rate   | 5.0   | lpm   |
| Post-test sampler flow rate | 5.0   | lpm   |
| Hour meter start            | 647.2 | hours |
| Hour meter end              | 665.2 | hours |
| Run duration                | 18    | hours |

**Lab:**

| Lab ID         | 20-U430             |
|----------------|---------------------|
|                | Conc. DL            |
|                | µg/sample µg/sample |
| Arsenic        | < DL 1.75           |
| Chromium       | 11.30 0.200         |
| Lead           | 13.90 1.25          |
| Manganese      | 792.00 0.075        |
| Nickel         | 20.60 0.750         |
| <b>SM &lt;</b> | <b>839.55</b>       |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan rating | 35,000.0 acfm |
|            | 36,997.7 scfm |

**Post Test Calculations:**

|               |                     |
|---------------|---------------------|
| Sample volume | 5697.05 liters      |
|               | 5.70 m <sup>3</sup> |

**Production:**

|              |                 |
|--------------|-----------------|
| Metal melted | 2.271 tons/hour |
|--------------|-----------------|

| Pollutant | Concentration µg/m3 | Mass Rate lb/hr      | Mass Rate lb/ton metal melted |
|-----------|---------------------|----------------------|-------------------------------|
| Arsenic   | < 0.307             | < 4.25E-05           | < 1.87E-05                    |
| Chromium  | 1.983               | 2.75E-04             | 1.21E-04                      |
| Lead      | 2.440               | 3.38E-04             | 1.49E-04                      |
| Manganese | 139.019             | 1.93E-02             | 8.48E-03                      |
| Nickel    | 3.616               | 5.01E-04             | 2.21E-04                      |
| <b>SM</b> | <b>&lt; 147.365</b> | <b>&lt; 2.04E-02</b> | <b>&lt; 8.99E-03</b>          |

Note: A "< DL" sign designates a result less than the minimum detection limit (DL). If sample results are below DL, the DL value is used for calculations. A "<" indicates a calculated value derived from one or more sample results that are below DL.

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 2**  
**Start Date/Time: 12/8/2020 20:00**  
**End Date/Time: 12/9/2020 20:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 9  
**Pollutant:** Cr VI  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
partly cloudy and 40s

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    |          |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 4791     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 4.91 lpm |
| Filter #             | 318      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |            |
|-----------------------------|------------|
| Barometric pressure (Bp)    | 30.12 "Hg  |
| Average Temperature         | 44 deg F   |
| Initial sampler flow rate   | 5.0 lpm    |
| Post-test sampler flow rate | 5.0 lpm    |
| Hour meter start            | 66.3 hours |
| Hour meter end              | 88.3 hours |
| Run duration                | 22 hours   |

**Lab:**

|               |                  |
|---------------|------------------|
| Lab ID        | 20-C318          |
| Concentration | 0.0592 µg/sample |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan Rating | 35,000.0 acfm |
|            | 36,911.8 scfm |

**Post Test Calculations:**

|                     |                              |
|---------------------|------------------------------|
| Sample volume       | 6476.14 liters               |
|                     | 6.48 m <sup>3</sup>          |
| Cr VI concentration | 0.009 µg/m3                  |
| Cr VI mass rate     | 1.26E-06 lb/hr               |
| Cr VI mass rate     | 5.79E-07 lb/ton metal melted |

**Production Data:**

|              |                 |
|--------------|-----------------|
| Metal melted | 2.182 tons/hour |
|--------------|-----------------|

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 2**  
**Start Date/Time: 12/8/2020 20:00**  
**End Date/Time: 12/9/2020 20:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 9  
**Pollutant:** SM  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
 partly cloudy and 40s  
 A programing error occurred in the setup of the sampler,  
 sampling did not occur.

**Direction of Vent Flow:**

|                            |          |           |
|----------------------------|----------|-----------|
| Smoke emitter indicates    | Pre-test | Post-test |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 5701     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 5.28 lpm |
| Filter #             | 432      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |       |       |
|-----------------------------|-------|-------|
| Barometric pressure (Bp)    | 30.12 | "Hg   |
| Temperature                 | 44    | deg F |
| Initial sampler flow rate   | 5.0   | lpm   |
| Post-test sampler flow rate | 5.0   | lpm   |
| Hour meter start            | 665.2 | hours |
| Hour meter end              | 665.2 | hours |
| Run duration                | 0     | hours |

**Lab:**

|           |                   |           |
|-----------|-------------------|-----------|
| Lab ID    | 20-U432           |           |
|           | Conc.             | DL        |
|           | µg/sample         | µg/sample |
| Arsenic   | < DL              | 1.75      |
| Chromium  | 0.85              | 0.200     |
| Lead      | < DL              | 1.25      |
| Manganese | 9.18              | 0.075     |
| Nickel    | 2.30              | 0.750     |
| <b>SM</b> | <b>&lt; 15.33</b> |           |

**Fan Operations:**

|            |          |      |
|------------|----------|------|
| Fan rating | 35,000.0 | acfm |
|            | 36,911.8 | scfm |

**Post Test Calculations:**

|               |     |                |
|---------------|-----|----------------|
| Sample volume | 0   | liters         |
|               | 0.0 | m <sup>3</sup> |

**Production:**

|              |       |           |
|--------------|-------|-----------|
| Metal melted | 2.182 | tons/hour |
|--------------|-------|-----------|

| Pollutant |   | Concentration<br>µg/m3 |   | Mass Rate<br>lb/hr |   | Mass Rate<br>lb/ton metal melted |
|-----------|---|------------------------|---|--------------------|---|----------------------------------|
| Arsenic   | < | #DIV/0!                | < | #DIV/0!            | < | #DIV/0!                          |
| Chromium  |   | #DIV/0!                |   | #DIV/0!            |   | #DIV/0!                          |
| Lead      |   | #DIV/0!                |   | #DIV/0!            |   | #DIV/0!                          |
| Manganese |   | #DIV/0!                |   | #DIV/0!            |   | #DIV/0!                          |
| Nickel    |   | #DIV/0!                |   | #DIV/0!            |   | #DIV/0!                          |
| <b>SM</b> |   | <b>#DIV/0!</b>         |   | <b>#DIV/0!</b>     | < | <b>#DIV/0!</b>                   |

Note: A "< DL" sign designates a result less than the minimum detection limit (DL). If sample results are below DL, the DL value is used for calculations. A "<" indicates a calculated value derived from one or more sample results that are below DL.

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 3**  
**Start Date/Time: 12/16/2020 20:00**  
**End Date/Time: 12/17/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 9  
**Pollutant:** Cr VI  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
overcast and 40s

**Direction of Vent Flow:**

|                            | Pre-test | Post-test |
|----------------------------|----------|-----------|
| Smoke emitter indicates    |          |           |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 4791     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 4.94 lpm |
| Filter #             | 329      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |             |
|-----------------------------|-------------|
| Barometric pressure (Bp)    | 29.63 "Hg   |
| Average Temperature         | 43 deg F    |
| Initial sampler flow rate   | 5.0 lpm     |
| Post-test sampler flow rate | 5.0 lpm     |
| Hour meter start            | 198.3 hours |
| Hour meter end              | 220.3 hours |
| Run duration                | 22 hours    |

**Lab:**

|               |                 |
|---------------|-----------------|
| Lab ID        | 20-C329         |
| Concentration | 0.568 µg/sample |

**Fan Operations:**

|            |               |
|------------|---------------|
| Fan Rating | 35,000.0 acfm |
|            | 36,383.5 scfm |

**Post Test Calculations:**

|                     |                              |
|---------------------|------------------------------|
| Sample volume       | 6522.99 liters               |
|                     | 6.52 m <sup>3</sup>          |
| Cr VI concentration | 0.087 µg/m3                  |
| Cr VI mass rate     | 1.19E-05 lb/hr               |
| Cr VI mass rate     | 9.38E-06 lb/ton metal melted |

**Production Data:**

|              |                 |
|--------------|-----------------|
| Metal melted | 1.264 tons/hour |
|--------------|-----------------|

**MiniVol Roof Vent Sampling**  
**Field Data Entry and Calculations**

**Run: 3**  
**Start Date/Time: 12/16/2020 20:00**  
**End Date/Time: 12/17/2020 18:00**

**Client:** Columbia Steel Casting  
**Location:** Portland, OR  
**Building:** 11  
**Vent:** 9  
**Pollutant:** SM  
**Operator:** JCR  
**Technician(s):** ZDH

**Environmental Conditions/Test Notes:**  
 overcast and 40s  
 A programing error occurred in the setup of the sampler,  
 sampling did not occur.

**Direction of Vent Flow:**

|                            |          |           |
|----------------------------|----------|-----------|
| Smoke emitter indicates    | Pre-test | Post-test |
| outward direction of flow? | x        | x         |

**Equipment:**

|                      |          |
|----------------------|----------|
| Sampler ID           | 5701     |
| Programmed Flow Rate | 5.00 lpm |
| Corrected Flow Rate  | 5.32 lpm |
| Filter #             | 591      |

**Sampler Leak Checks:**

|           |   |
|-----------|---|
| Pre-test  | x |
| Post-test | x |

**Sampling Information:**

|                             |       |       |
|-----------------------------|-------|-------|
| Barometric pressure (Bp)    | 29.63 | "Hg   |
| Temperature                 | 43    | deg F |
| Initial sampler flow rate   | 5     | lpm   |
| Post-test sampler flow rate | 5     | lpm   |
| Hour meter start            | 774.5 | hours |
| Hour meter end              | 774.5 | hours |
| Run duration                | 0     | hours |

**Lab:**

|           |                   |           |
|-----------|-------------------|-----------|
| Lab ID    | 20-U591           |           |
|           | Conc.             | DL        |
|           | µg/sample         | µg/sample |
| Arsenic   | < DL              | 1.75      |
| Chromium  | 1.13              | 0.200     |
| Lead      | < DL              | 1.25      |
| Manganese | 16.10             | 0.075     |
| Nickel    | 3.57              | 0.750     |
| <b>SM</b> | <b>&lt; 23.80</b> |           |

**Fan Operations:**

|            |           |      |
|------------|-----------|------|
| Fan rating | 35,000.00 | acfm |
|            | 36,383.46 | scfm |

**Post Test Calculations:**

|               |     |                |
|---------------|-----|----------------|
| Sample volume | 0   | liters         |
|               | 0.0 | m <sup>3</sup> |

**Production:**

|              |                 |
|--------------|-----------------|
| Metal melted | 1.264 tons/hour |
|--------------|-----------------|

| Pollutant |   | Concentration<br>µg/m3 |   | Mass Rate<br>lb/hr |   | Mass Rate<br>lb/ton metal melted |
|-----------|---|------------------------|---|--------------------|---|----------------------------------|
| Arsenic   | < | #DIV/0!                | < | #DIV/0!            | < | #DIV/0!                          |
| Chromium  |   | #DIV/0!                |   | #DIV/0!            |   | #DIV/0!                          |
| Lead      |   | #DIV/0!                |   | #DIV/0!            |   | #DIV/0!                          |
| Manganese |   | #DIV/0!                |   | #DIV/0!            |   | #DIV/0!                          |
| Nickel    |   | #DIV/0!                |   | #DIV/0!            |   | #DIV/0!                          |
| <b>SM</b> |   | <b>#DIV/0!</b>         |   | <b>#DIV/0!</b>     | < | <b>#DIV/0!</b>                   |

Note: A "< DL" sign designates a result less than the minimum detection limit (DL). If sample results are below DL, the DL value is used for calculations.  
 A "<" indicates a calculated value derived from one or more sample results that are below DL.

## **APPENDIX F: GASEOUS TEST DATA**

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## BISON ENGINEERING GASEOUS TESTING SUMMARY

|          |                |        |               |
|----------|----------------|--------|---------------|
| Company  | SLR            | Source | Baghouse #1   |
| Facility | Columbia Steel | Date   | 12/10-15/2020 |
| Location | Portland OR    |        |               |

|                     |               |               |               |       |
|---------------------|---------------|---------------|---------------|-------|
| Run                 | 1             | 2             | 3             |       |
| Date                | 12/10-11/2020 | 12/14-15/2020 | 12/15-16/2020 |       |
| Run Start Time      | 21:25         | 22:15         | 21:20         |       |
| Run End Time        | 6:00          | 3:52          | 3:11          |       |
| Duration, min.      | 516           | 338           | 352           |       |
| CO <sub>2</sub> %vd | 0.00          | 0.03          | 0.00          | 0.01  |
| O <sub>2</sub> %vd  | 21.02         | 21.00         | 21.06         | 21.03 |

\*Negative concentrations are reported as zero.

**Bison Engineering, Inc.**  
**Method 3A Oxygen**  
*Calibration Error, System Bias and System Drift*

|                                 |                           |                                             |
|---------------------------------|---------------------------|---------------------------------------------|
| Company: <b>SLR</b>             | Source <b>Baghouse #1</b> | Instrument Make: <b>Servomex</b>            |
| Facility: <b>Columbia Steel</b> | Date <b>12/10-15/2020</b> | Instrument Model: <b>1440</b>               |
| Location: <b>Portland OR</b>    |                           | Instrument Serial #: <b>01440C1STD/2919</b> |

|       |         | <i>Initial Values</i>        |                           |                                           |           | <i>Final Values</i>       |                                            |           |                           |           |                  | Raw Avg<br>Gas<br>Conc | Corrected<br>Gas<br>Conc | Instrument<br>Cal.<br>Reference<br>Gas |
|-------|---------|------------------------------|---------------------------|-------------------------------------------|-----------|---------------------------|--------------------------------------------|-----------|---------------------------|-----------|------------------|------------------------|--------------------------|----------------------------------------|
|       |         | Analyzer<br>Cal.<br>Response | System<br>Cal<br>Response | Pre test<br>System Cal. Bias<br>% of span | pass/fail | System<br>Cal<br>Response | Post test<br>System Cal. Bias<br>% of span | pass/fail | System Drift<br>% of span | pass/fail | Analyzer<br>Span |                        |                          |                                        |
| Run 1 | zero    | 0.02                         | 0.06                      | 0.18                                      | pass      | 0.08                      | 0.27                                       | pass      | 0.09                      | pass      |                  |                        |                          |                                        |
|       | upscale | 22.06                        | 21.99                     | -0.32                                     | pass      | 22.10                     | 0.18                                       | pass      | 0.50                      | pass      | 22.03            | 21.04                  | 21.02                    | 22.03                                  |
| Run 2 | zero    | 0.03                         | 0.08                      | 0.23                                      | pass      | 0.01                      | -0.09                                      | pass      | 0.32                      | pass      |                  |                        |                          |                                        |
|       | upscale | 22.06                        | 21.94                     | -0.54                                     | pass      | 21.63                     | -1.95                                      | pass      | 1.41                      | pass      | 22.03            | 20.77                  | 21.00                    | 22.03                                  |
| Run 3 | zero    | 0.02                         | 0.02                      | 0.00                                      | pass      | -0.02                     | -0.18                                      | pass      | 0.18                      | pass      |                  |                        |                          |                                        |
|       | upscale | 22.01                        | 21.73                     | -1.27                                     | pass      | 21.80                     | -0.95                                      | pass      | 0.32                      | pass      | 22.03            | 20.81                  | 21.06                    | 22.03                                  |
|       |         |                              |                           | < 5%*                                     |           | < 5%*                     |                                            | < 3%*     |                           |           |                  |                        |                          |                                        |

**12/10-11/2020 Run1**

| <b>ANALYZER CAL. ERROR</b> | <b>Zero</b> | <b>Mid</b> | <b>High</b> |
|----------------------------|-------------|------------|-------------|
| Calibration gas standards  | 0           | 10.02      | 22.03       |
| Cal gas analyzer response  | 0.02        | 10.04      | 22.06       |
| Analyzer Cal. Error        | 0.09        | 0.09       | 0.14        |
| Analyzer Cal. Error < 2%*  | pass        | pass       | pass        |

**12/14-15/2020 Run 2**

| <b>ANALYZER CAL. ERROR</b> | <b>Zero</b> | <b>Mid</b> | <b>High</b> |
|----------------------------|-------------|------------|-------------|
| Calibration gas standards  | 0           | 10.02      | 22.03       |
| Cal gas analyzer response  | 0.03        | 10.03      | 22.06       |
| Analyzer Cal. Error        | 0.14        | 0.05       | 0.14        |
| Analyzer Cal. Error < 2%*  | pass        | pass       | pass        |

**12/15-16/2020 Run 3**

| <b>ANALYZER CAL. ERROR</b> | <b>Zero</b> | <b>Mid</b> | <b>High</b> |
|----------------------------|-------------|------------|-------------|
| Calibration gas standards  | 0           | 10.02      | 22.03       |
| Cal gas analyzer response  | 0.02        | 10         | 22.01       |
| Analyzer Cal. Error        | 0.09        | -0.09      | -0.09       |
| Analyzer Cal. Error < 2%*  | pass        | pass       | pass        |

Note: All units are in %

\*Or < 0.5 % absolute difference

# Bison Engineering, Inc.

## Method 3A CO2

Calibration Error, System Bias and System Drift

|                                 |                            |                                             |
|---------------------------------|----------------------------|---------------------------------------------|
| Company: <b>SLR</b>             | Source: <b>Baghouse #1</b> | Instrument Make: <b>Servomex</b>            |
| Facility: <b>Columbia Steel</b> | Date: <b>12/10-15/2020</b> | Instrument Model: <b>1440</b>               |
| Location: <b>Portland OR</b>    |                            | Instrument Serial #: <b>01440C1C02-2927</b> |

|       |         | <b>Initial Values</b>        |                           |                                           |           | <b>Final Values</b>       |                                            |           |                           |           |                  |                        |                          | Instrument<br>Cal.<br>Reference<br>Gas |
|-------|---------|------------------------------|---------------------------|-------------------------------------------|-----------|---------------------------|--------------------------------------------|-----------|---------------------------|-----------|------------------|------------------------|--------------------------|----------------------------------------|
|       |         | Analyzer<br>Cal.<br>Response | System<br>Cal<br>Response | Pre test<br>System Cal. Bias<br>% of span | pass/fail | System<br>Cal<br>Response | Post test<br>System Cal. Bias<br>% of span | pass/fail | System Drift<br>% of span | pass/fail | Analyzer<br>Span | Raw Avg<br>Gas<br>Conc | Corrected<br>Gas<br>Conc |                                        |
| Run 1 | zero    | 0.04                         | 0.08                      | 0.18                                      | pass      | -0.26                     | -1.39                                      | pass      | 1.57                      | pass      |                  |                        |                          |                                        |
|       | upscale | 9.90                         | 9.96                      | 0.28                                      | pass      | 9.93                      | 0.14                                       | pass      | 0.14                      | pass      | 21.64            | -0.15                  | -0.06                    | 10.01                                  |
| Run 2 | zero    | 0.00                         | 0.15                      | 0.69                                      | pass      | 0.03                      | 0.14                                       | pass      | 0.55                      | pass      |                  |                        |                          |                                        |
|       | upscale | 9.92                         | 9.88                      | -0.18                                     | pass      | 9.94                      | 0.09                                       | pass      | 0.28                      | pass      | 21.64            | 0.12                   | 0.03                     | 10.01                                  |
| Run 3 | zero    | 0.03                         | 0.13                      | 0.46                                      | pass      | 0.00                      | -0.14                                      | pass      | 0.60                      | pass      |                  |                        |                          |                                        |
|       | upscale | 9.88                         | 9.95                      | 0.32                                      | pass      | 9.95                      | 0.32                                       | pass      | 0.00                      | pass      | 21.64            | 0.06                   | -0.01                    | 10.01                                  |
|       |         |                              |                           | < 5%*                                     |           | < 5%*                     |                                            | < 3%*     |                           |           |                  |                        |                          |                                        |

### 12/10-11/2020 Run 1

| <b>ANALYZER CAL. ERROR</b> | <b>Zero</b> | <b>Mid</b> | <b>High</b> |
|----------------------------|-------------|------------|-------------|
| Calibration gas standards  | 0           | 10.01      | 21.64       |
| Cal gas analyzer response  | 0.04        | 9.9        | 21.69       |
| Analyzer Cal. Error        | 0.18        | -0.51      | 0.23        |
| Analyzer Cal. Error < 2%*  | pass        | pass       | pass        |

### 12/14-15/2020 Run 2

| <b>ANALYZER CAL. ERROR</b> | <b>Zero</b> | <b>Mid</b> | <b>High</b> |
|----------------------------|-------------|------------|-------------|
| Calibration gas standards  | 0           | 10.01      | 21.64       |
| Cal gas analyzer response  | 0           | 9.92       | 21.65       |
| Analyzer Cal. Error        | 0.00        | -0.42      | 0.05        |
| Analyzer Cal. Error < 2%*  | pass        | pass       | pass        |

### 12/15-16/2020 Run 3

| <b>ANALYZER CAL. ERROR</b> | <b>Zero</b> | <b>Mid</b> | <b>High</b> |
|----------------------------|-------------|------------|-------------|
| Calibration gas standards  | 0           | 10.01      | 21.64       |
| Cal gas analyzer response  | 0.03        | 9.88       | 21.67       |
| Analyzer Cal. Error        | 0.14        | -0.60      | 0.14        |
| Analyzer Cal. Error < 2%*  | pass        | pass       | pass        |

Note: All units are in %

\*Or < 0.5 % absolute difference

**EPA Method 3A,  
Example Calculations**

**Client: SLR**  
**Location: Portland OR**  
**Source: Baghouse #1**  
**Method: 3A**

**Run: 1**  
**Start Time: 21:25**  
**End Time: 6:00**  
**Date: 12/10-11/2020**

**EPA Method 3A (O<sub>2</sub>):**

Analyzer Calibration Error (Mid)

$$1) \text{ ACE} = \left( \frac{C_{\text{Dir}} - C_V}{C_S} \right) \times 100 = 0.09 \%v$$

where  $C_{\text{Dir}}$ : 10.04 %  
 $C_V$ : 10.02 %  
 $C_S$ : 22.03 %

System Bias (Upscale)

$$2) \text{ SB} = \left( \frac{C_S - C_{\text{Dir}}}{C_S} \right) \times 100 = -0.32 \%v$$

where  $C_{\text{Dir}}$ : 22.06 %  
 $C_S$ : 21.99 %  
 $C_S$ : 22.03 %

Drift Assessment (Upscale)

$$3) \text{ D} = | \text{SB}_{\text{Final}} - \text{SB}_i | = 0.50 \%v$$

where  $\text{SB}_{\text{Final}}$ : 0.18 %  
 $\text{SB}_i$ : -0.32 %

Effluent Gas Concentration

$$4) \text{ C}_{\text{Gas}} = (C_{\text{Avg}} - C_O) \left( \frac{C_{\text{MA}}}{C_M - C_O} \right) = 21.02 \%v$$

where  $C_{\text{Avg}}$ : 21.04 %  
 $C_O$ : 0.07 %  
 $C_{\text{MA}}$ : 22.03 %  
 $C_M$ : 22.05 %

**EPA Method 3A,  
Example Calculations**

**Client: SLR**  
**Location: Portland OR**  
**Source: Baghouse #1**  
**Method: 3A**

**Run: 1**  
**Start Time: 21:25**  
**End Time: 6:00**  
**Date: 12/10-11/2020**

**EPA Method 3A (CO<sub>2</sub>):**

**Analyzer Calibration Error (Mid)**

$$1) \text{ ACE} = \left( \frac{C_{\text{Dir}} - C_V}{C_S} \right) \times 100 = -0.51 \%v$$

where  $C_{\text{Dir}}$ : 9.90 %  
 $C_V$ : 10.01 %  
 $C_S$ : 21.64 %

**System Bias (Upscale)**

$$2) \text{ SB} = \left( \frac{C_S - C_{\text{Dir}}}{C_S} \right) \times 100 = 0.28 \%v$$

where  $C_{\text{Dir}}$ : 9.90 %  
 $C_S$ : 9.96 %  
 $C_S$ : 21.64 %

**Drift Assessment (Upscale)**

$$3) \text{ D} = | \text{SB}_{\text{Final}} - \text{SB}_i | = 0.14 \%v$$

where  $\text{SB}_{\text{Final}}$ : 0.14 %  
 $\text{SB}_i$ : 0.28 %

**Effluent Gas Concentration**

$$4) \text{ C}_{\text{Gas}} = (C_{\text{Avg}} - C_O) \left( \frac{C_{\text{MA}}}{C_M - C_O} \right) = -0.06 \%v$$

where  $C_{\text{Avg}}$ : -0.15 %  
 $C_O$ : -0.09 %  
 $C_{\text{MA}}$ : 10.01 %  
 $C_M$ : 9.95 %

## BISON ENGINEERING GASEOUS TESTING SUMMARY

|          |                |        |               |
|----------|----------------|--------|---------------|
| Company  | SLR            | Source | Baghouse #1   |
| Facility | Columbia Steel | Date   | 12/16-17/2020 |
| Location | Portland, OR   |        |               |

| Run                              |                               |                      | 1          | 2             | 3          | Average |
|----------------------------------|-------------------------------|----------------------|------------|---------------|------------|---------|
| Date                             |                               |                      | 12/16/2020 | 12/16-17/2020 | 12/17/2020 |         |
| Run Start Time                   |                               |                      | 21:13      | 23:47         | 2:10       |         |
| Run End Time                     |                               |                      | 23:09      | 1:40          | 3:55       |         |
| Duration, min.                   |                               |                      | 117        | 114           | 106        |         |
| Stack Diameter, in.              |                               |                      | 46.00      | 46.00         | 46.00      |         |
| Stack Area, sq.ft.               |                               |                      | 11.541     | 11.541        | 11.541     |         |
| Barometric Pressure, "Hg         |                               |                      | 29.65      | 29.65         | 29.65      |         |
| CO <sub>2</sub> %vd              |                               |                      | 0.01       | 0.00          | 0.00       | 0.00    |
| O <sub>2</sub> %vd               |                               |                      | 21.31      | 21.36         | 21.41      | 21.36   |
| H <sub>2</sub> O%v               |                               |                      | 1.40       | 1.20          | 1.30       | 1.30    |
| Wet Molecular Weight, lb/lb-mole |                               |                      | 28.70      | 28.72         | 28.72      | 28.71   |
| WSCFM                            |                               |                      | 44,573.7   | 43,528.0      | 41,554.5   | 43,219  |
| DSCFM                            |                               |                      | 42,575.1   | 41,982.9      | 39,961.0   | 41,506  |
| Nitrogen Oxides                  | Concentration, C <sub>s</sub> | ppmvd                | 18.47      | 10.42         | 14.80      | 14.56   |
|                                  | Mass                          | lb/hr                | 5.64       | 3.14          | 4.24       | 4.34    |
|                                  |                               | lb/ton metal melted  | 3.082      | 1.610         | 2.395      | 2.363   |
| Carbon Monoxide                  | Concentration, C <sub>s</sub> | ppmvd                | 7.85       | 13.05         | 16.01      | 12.30   |
|                                  | Mass                          | lb/hr                | 1.46       | 2.39          | 2.79       | 2.21    |
|                                  |                               | lb/ton metal melted  | 0.798      | 1.226         | 1.576      | 1.200   |
| Production Data                  |                               | tons/hr metal melted | 1.83       | 1.95          | 1.77       | 1.85    |

\*Negative concentrations are reported as zero.

Moisture and stack flow rates for lb/hr calculations are from ODEQ Method 5 sample runs.

**Bison Engineering, Inc.**  
**Method 7E Nitrogen Oxides**  
*Calibration Error, System Bias and System Drift*  
 NOx molecular weight of 46

|                                 |                            |                                     |
|---------------------------------|----------------------------|-------------------------------------|
| Company: <b>SLR</b>             | Source: <b>Baghouse #1</b> | Instrument Make: <b>CAI</b>         |
| Facility: <b>Columbia Steel</b> | Date: <b>12/16-17/2020</b> | Instrument Model: <b>700-CLD</b>    |
| Location: <b>Portland, OR</b>   |                            | Instrument Serial #: <b>2009032</b> |

|       |         | <i>Initial Values</i>        |                           |                                           |           | <i>Final Values</i>       |                                            |           |                           |           |                  | Raw Avg<br>Gas<br>Conc | Corrected<br>Gas<br>Conc | Instrument<br>Cal.<br>Reference<br>Gas |
|-------|---------|------------------------------|---------------------------|-------------------------------------------|-----------|---------------------------|--------------------------------------------|-----------|---------------------------|-----------|------------------|------------------------|--------------------------|----------------------------------------|
|       |         | Analyzer<br>Cal.<br>Response | System<br>Cal<br>Response | Pre test<br>System Cal. Bias<br>% of span | pass/fail | System<br>Cal<br>Response | Post test<br>System Cal. Bias<br>% of span | pass/fail | System Drift<br>% of span | pass/fail | Analyzer<br>Span |                        |                          |                                        |
| Run 1 | zero    | 0.15                         | 0.27                      | 0.12                                      | pass      | 0.26                      | 0.11                                       | pass      | 0.01                      | pass      |                  |                        |                          |                                        |
|       | upscale | 48.78                        | 48.07                     | -0.70                                     | pass      | 48.65                     | -0.13                                      | pass      | 0.57                      | pass      | 101.1            | 18.03                  | 18.47                    | 50                                     |
| Run 2 | zero    | 0.15                         | 0.27                      | 0.12                                      | pass      | 0.26                      | 0.11                                       | pass      | 0.01                      | pass      |                  |                        |                          |                                        |
|       | upscale | 48.78                        | 48.07                     | -0.70                                     | pass      | 48.65                     | -0.13                                      | pass      | 0.57                      | pass      | 101.1            | 10.29                  | 10.42                    | 50                                     |
| Run 3 | zero    | 0.15                         | 0.27                      | 0.12                                      | pass      | 0.26                      | 0.11                                       | pass      | 0.01                      | pass      |                  |                        |                          |                                        |
|       | upscale | 48.78                        | 48.07                     | -0.70                                     | pass      | 48.65                     | -0.13                                      | pass      | 0.57                      | pass      | 101.1            | 14.50                  | 14.80                    | 50                                     |
|       |         |                              |                           | < 5%*                                     |           | < 5%*                     |                                            | < 3%*     |                           |           |                  |                        |                          |                                        |

| <b>ANALYZER CAL. ERROR</b> | <b>Zero</b> | <b>Mid</b> | <b>High</b> |
|----------------------------|-------------|------------|-------------|
| Calibration gas standards  | 0           | 50         | 101.1       |
| Cal gas analyzer response  | 0.15        | 48.78      | 100.5       |
| Analyzer Cal. Error %      | 0.15        | -1.21      | -0.59       |
| Analyzer Cal. Error < 2%*  | pass        | pass       | pass        |

**NO2 CONVERTER TEST**

|                        |       |
|------------------------|-------|
| NO2 Tank Value (ppm)   | 52.28 |
| NO Check Value         | 49.30 |
| NO2 to NO Conversion % | 94.3% |
| NO2 Conversion > 90%   | pass  |

Note: All units are in ppm unless specified otherwise.

\*Or < 0.5 ppm absolute difference

**Bison Engineering, Inc.**  
**Method 10 Carbon Monoxide**  
*Calibration Error, System Bias and System Drift*  
CO molecular weight of 28

|                                 |                            |                                              |
|---------------------------------|----------------------------|----------------------------------------------|
| Company: <b>SLR</b>             | Source: <b>Baghouse #1</b> | Instrument Make: <b>Thermo Environmental</b> |
| Facility: <b>Columbia Steel</b> | Date: <b>12/16-17/2020</b> | Instrument Model: <b>48i HL</b>              |
| Location: <b>Portland, OR</b>   |                            | Instrument Serial #: <b>1134350818</b>       |

|       |         | <i>Initial Values</i>        |                           |                                           |           | <i>Final Values</i>       |                                            |           |                           |           |                  | Raw Avg<br>Gas<br>Conc | Corrected<br>Gas<br>Conc | Instrument<br>Cal.<br>Reference<br>Gas |
|-------|---------|------------------------------|---------------------------|-------------------------------------------|-----------|---------------------------|--------------------------------------------|-----------|---------------------------|-----------|------------------|------------------------|--------------------------|----------------------------------------|
|       |         | Analyzer<br>Cal.<br>Response | System<br>Cal<br>Response | Pre test<br>System Cal. Bias<br>% of span | pass/fail | System<br>Cal<br>Response | Post test<br>System Cal. Bias<br>% of span | pass/fail | System Drift<br>% of span | pass/fail | Analyzer<br>Span |                        |                          |                                        |
| Run 1 | zero    | 0.59                         | -0.37                     | -0.95                                     | pass      | -0.89                     | -1.46                                      | pass      | 0.51                      | pass      |                  |                        |                          |                                        |
|       | upscale | 49.78                        | 49.79                     | 0.01                                      | pass      | 50.19                     | 0.40                                       | pass      | 0.39                      | pass      | 101.4            | 7.32                   | 7.85                     | 50                                     |
| Run 2 | zero    | 0.59                         | -0.37                     | -0.95                                     | pass      | -0.89                     | -1.46                                      | pass      | 0.51                      | pass      |                  |                        |                          |                                        |
|       | upscale | 49.78                        | 49.79                     | 0.01                                      | pass      | 50.19                     | 0.40                                       | pass      | 0.39                      | pass      | 101.4            | 12.58                  | 13.05                    | 50                                     |
| Run 3 | zero    | 0.59                         | -0.37                     | -0.95                                     | pass      | -0.89                     | -1.46                                      | pass      | 0.51                      | pass      |                  |                        |                          |                                        |
|       | upscale | 49.78                        | 49.79                     | 0.01                                      | pass      | 50.19                     | 0.40                                       | pass      | 0.39                      | pass      | 101.4            | 15.58                  | 16.01                    | 50                                     |
|       |         |                              |                           | < 5%*                                     |           | < 5%*                     |                                            | < 3%*     |                           |           |                  |                        |                          |                                        |

| <i>ANALYZER CAL. ERROR</i> | Zero | Mid   | High   |
|----------------------------|------|-------|--------|
| Calibration gas standards  | 0    | 50    | 101.4  |
| Cal gas analyzer response  | 0.59 | 49.78 | 100.37 |
| Analyzer Cal. Error        | 0.58 | -0.22 | -1.02  |
| Analyzer Cal. Error < 2%*  | pass | pass  | pass   |

Note: All units are in ppm unless specified otherwise.

\*Or < 0.5 ppm absolute difference

**Bison Engineering, Inc.**  
**Method 3A Oxygen**  
*Calibration Error, System Bias and System Drift*

|                                 |                           |                                             |
|---------------------------------|---------------------------|---------------------------------------------|
| Company: <b>SLR</b>             | Source <b>Baghouse #1</b> | Instrument Make: <b>Servomex</b>            |
| Facility: <b>Columbia Steel</b> | Date <b>12/16-17/2020</b> | Instrument Model: <b>1440</b>               |
| Location: <b>Portland, OR</b>   |                           | Instrument Serial #: <b>01440C1STD/2919</b> |

|       |         | <i>Initial Values</i>        |                           |                                           |           | <i>Final Values</i>       |                                            |           |                           |           |                  | Raw Avg<br>Gas<br>Conc | Corrected<br>Gas<br>Conc | Instrument<br>Cal.<br>Reference<br>Gas |
|-------|---------|------------------------------|---------------------------|-------------------------------------------|-----------|---------------------------|--------------------------------------------|-----------|---------------------------|-----------|------------------|------------------------|--------------------------|----------------------------------------|
|       |         | Analyzer<br>Cal.<br>Response | System<br>Cal<br>Response | Pre test<br>System Cal. Bias<br>% of span | pass/fail | System<br>Cal<br>Response | Post test<br>System Cal. Bias<br>% of span | pass/fail | System Drift<br>% of span | pass/fail | Analyzer<br>Span |                        |                          |                                        |
| Run 1 | zero    | 0.01                         | -0.01                     | -0.09                                     | pass      | 0.03                      | 0.09                                       | pass      | 0.18                      | pass      |                  |                        |                          |                                        |
|       | upscale | 9.98                         | 9.94                      | -0.18                                     | pass      | 10.00                     | 0.09                                       | pass      | 0.27                      | pass      | 22.03            | 21.23                  | 21.31                    | 10                                     |
| Run 2 | zero    | 0.01                         | -0.01                     | -0.09                                     | pass      | 0.03                      | 0.09                                       | pass      | 0.18                      | pass      |                  |                        |                          |                                        |
|       | upscale | 9.98                         | 9.94                      | -0.18                                     | pass      | 10.00                     | 0.09                                       | pass      | 0.27                      | pass      | 22.03            | 21.28                  | 21.36                    | 10                                     |
| Run 3 | zero    | 0.01                         | -0.01                     | -0.09                                     | pass      | 0.03                      | 0.09                                       | pass      | 0.18                      | pass      |                  |                        |                          |                                        |
|       | upscale | 9.98                         | 9.94                      | -0.18                                     | pass      | 10.00                     | 0.09                                       | pass      | 0.27                      | pass      | 22.03            | 21.33                  | 21.41                    | 10                                     |
|       |         |                              |                           | < 5%*                                     |           | < 5%*                     |                                            | < 3%*     |                           |           |                  |                        |                          |                                        |

| <i>ANALYZER CAL. ERROR</i> | Zero | Mid   | High  |
|----------------------------|------|-------|-------|
| Calibration gas standards  | 0    | 10    | 22.03 |
| Cal gas analyzer response  | 0.01 | 9.98  | 22    |
| Analyzer Cal. Error        | 0.05 | -0.09 | -0.14 |
| Analyzer Cal. Error < 2%*  | pass | pass  | pass  |

Note: All units are in %  
 \*Or < 0.5 % absolute difference

# Bison Engineering, Inc.

## Method 3A CO2

Calibration Error, System Bias and System Drift

|                                 |                            |                                             |
|---------------------------------|----------------------------|---------------------------------------------|
| Company: <b>SLR</b>             | Source: <b>Baghouse #1</b> | Instrument Make: <b>Servomex</b>            |
| Facility: <b>Columbia Steel</b> | Date: <b>12/16-17/2020</b> | Instrument Model: <b>1440</b>               |
| Location: <b>Portland, OR</b>   |                            | Instrument Serial #: <b>01440C1C02-2927</b> |

|       |         | Initial Values         |                     |                                     |           | Final Values        |                                      |           |                        |       |           |               |                  |                    |                               |
|-------|---------|------------------------|---------------------|-------------------------------------|-----------|---------------------|--------------------------------------|-----------|------------------------|-------|-----------|---------------|------------------|--------------------|-------------------------------|
|       |         | Analyzer Cal. Response | System Cal Response | Pre test System Cal. Bias % of span | pass/fail | System Cal Response | Post test System Cal. Bias % of span | pass/fail | System Drift % of span |       | pass/fail | Analyzer Span | Raw Avg Gas Conc | Corrected Gas Conc | Instrument Cal. Reference Gas |
| Run 1 | zero    | 0.02                   | 0.15                | 0.60                                | pass      | 0.13                | 0.51                                 | pass      | 0.09                   | pass  |           |               |                  |                    |                               |
|       | upscale | 10.07                  | 10.08               | 0.05                                | pass      | 10.13               | 0.28                                 | pass      | 0.23                   | pass  | 21.64     | 0.15          | 0.01             | 10                 |                               |
| Run 2 | zero    | 0.02                   | 0.15                | 0.60                                | pass      | 0.13                | 0.51                                 | pass      | 0.09                   | pass  |           |               |                  |                    |                               |
|       | upscale | 10.07                  | 10.08               | 0.05                                | pass      | 10.13               | 0.28                                 | pass      | 0.23                   | pass  | 21.64     | 0.10          | -0.04            | 10                 |                               |
| Run 3 | zero    | 0.02                   | 0.15                | 0.60                                | pass      | 0.13                | 0.51                                 | pass      | 0.09                   | pass  |           |               |                  |                    |                               |
|       | upscale | 10.07                  | 10.08               | 0.05                                | pass      | 10.13               | 0.28                                 | pass      | 0.23                   | pass  | 21.64     | 0.11          | -0.03            | 10                 |                               |
|       |         |                        |                     | < 5%*                               |           |                     | < 5%*                                |           |                        | < 3%* |           |               |                  |                    |                               |

| <i>ANALYZER CAL. ERROR</i> | Zero | Mid   | High  |
|----------------------------|------|-------|-------|
| Calibration gas standards  | 0    | 10    | 21.64 |
| Cal gas analyzer response  | 0.02 | 10.07 | 21.45 |
| Analyzer Cal. Error        | 0.09 | 0.32  | -0.88 |
| Analyzer Cal. Error < 2%*  | pass | pass  | pass  |

Note: All units are in %

\*Or < 0.5 % absolute difference

**Bison Engineering, Inc.**  
**Method 205 Dilution System Check**

|           |                |         |               |                      |     |
|-----------|----------------|---------|---------------|----------------------|-----|
| Company:  | SLR            | Source: | Baghouse #1   | Instrument Make:     | N/A |
| Facility: | Columbia Steel | Date:   | 12/16-17/2020 | Instrument Model:    | N/A |
| Location: | Portland, OR   |         |               | Instrument Serial #: | N/A |

| ANALYZER CAL. ERROR       | Zero | Mid   | High  |      |
|---------------------------|------|-------|-------|------|
| Calibration gas standards | 0    | 10.02 | 22.03 |      |
| Cal gas analyzer response | 0.04 | 10.03 | 22.07 |      |
| Analyzer Cal. Error       | 0.18 | 0.05  | 0.18  |      |
| Analyzer Cal. Error < 2%* | pass | pass  | pass  | PASS |

|                                         |                             | First | Second | Third | Average |
|-----------------------------------------|-----------------------------|-------|--------|-------|---------|
| High Level                              | % oxygen<br>dilution system | 9.96  | 9.96   | 9.98  | 9.97    |
| Percent diff from avg recorded value    |                             | -0.1% | -0.1%  | 0.1%  |         |
| Pass or Fail +/- 2%                     |                             | PASS  | PASS   | PASS  |         |
| Percent diff from target O <sub>2</sub> |                             | -0.4% | -0.4%  | -0.2% | -0.3%   |
| Pass or Fail +/- 2% from target value   |                             |       |        |       | PASS    |

|                                         |                             |      |      |       |      |
|-----------------------------------------|-----------------------------|------|------|-------|------|
| Mid Level                               | % oxygen<br>dilution system | 5.00 | 5.01 | 4.99  | 5.00 |
| Percent diff from avg recorded value    |                             | 0.0% | 0.2% | -0.2% |      |
| Pass or Fail +/- 2%                     |                             | PASS | PASS | PASS  |      |
| Percent diff from target O <sub>2</sub> |                             | 0.0% | 0.2% | -0.2% | 0.0% |
| Pass or Fail +/- 2% from target value   |                             |      |      |       | PASS |

|                             |             |                       |       |       |            |
|-----------------------------|-------------|-----------------------|-------|-------|------------|
|                             |             |                       |       |       | Tank value |
| Independent Mid Level Check | % oxygen    | 10.01                 | 10.01 | 10.01 | 10.020     |
|                             | independent | Percent diff from avg |       |       | -0.10%     |
|                             | tank check  | Pass or Fail < 2%     |       |       | PASS       |

## Summary - Method 205 - Verification of Gas Dilution Systems for Field Instrument Calibrations

A gas dilution system can provide known values of calibration gases through controlled dilution of high-level calibration gases with an appropriate dilution gas. The calibration gases with an appropriate dilution gas. The instrumental test methods in 40 CFR part 60 - e.g., Methods 3A, 6C, 7E, 10, 15, 16, 20, 25A and 25B require on-site, multi-point calibration using gases of known concentrations. A gas dilution system that produces known low level calibration gases from high-level calibration gases, with a degree of confidence similar to that for Protocol 1 gases, may be used for compliance tests in lieu of multiple calibration gases when the gas dilution system is demonstrated to meet the requirements of this method.

The gas dilution system shall be evaluated on one analyzer once during each field test. A precalibrated analyzer is chosen, at the discretion of the source owner or operator, to demonstrate that the gas dilution system produces predictable gas concentrations spanning a range of concentrations. After meeting the requirements of this method, the remaining analyzers may be calibrated with the dilution system in accordance to the requirements of the applicable method for the duration of the field test.

The gas dilution system shall produce calibration gases whose measured values are within  $\pm 2$  percent of the predicted values.

### Instructions from Method 205

3.2.2 Calculate the predicted concentration for each of the dilutions based on the flow rates through the gas dilution system (or the dilution ratios) and the certified concentration of the high-level supply gas.

3.2.3 Introduce each of the dilutions from Section 3.2.1 into the analyzer or monitor one at a time and determine the instrument response for each of the dilutions.

3.2.4 Repeat the procedure in Section 3.2.3 two times, i.e., until three injections are made at dilution level. Calculate the average instrument response for each triplicate injection at each dilution level. No single injection shall differ by more than  $\pm 2$  percent from the average instrument response for that dilution.

3.2.5 For each level of dilution, calculate the difference between the average concentration output recorded by the analyzer and the predicted concentration calculated in Section 3.2.2. The average concentration output from the analyzer shall be within  $\pm 2$  percent of the predicted value.

3.2.6 Introduce the mid - level supply gas directly into the analyzer, bypassing the gas dilution system. Repeat the procedure twice more, for a total of three mid-level supply gas injections.

Calculate the average analyzer output concentration for the mid-level supply gas. The difference between the certified concentration of the mid-level supply gas and the average instrument response shall be within  $\pm 2$  percent.

3.3 If the gas dilution system meets the criteria listed in Section 3.2, the gas dilution system may be used throughout that field test.

### Stratification Check

|                       |                    |                  |                      |                  |        |
|-----------------------|--------------------|------------------|----------------------|------------------|--------|
| Company SLR           |                    |                  |                      |                  |        |
| Location Portland, OR |                    |                  | Date 12/16-17/2020   |                  |        |
| Source Baghouse #1    |                    | Stack Dimensions |                      | 46               | inches |
| 3 POINT METHOD        |                    |                  |                      |                  |        |
| <u>% of diameter</u>  | <u>Pt location</u> | <u>O2%</u>       | <u>Diff (+/- 5%)</u> | <u>Pass/Fail</u> |        |
| 16.7%                 | 1                  | 7.68             | 21.24                | 0.03%            | PASS   |
| 50.0%                 | 2                  | 23.00            | 21.24                | 0.03%            | PASS   |
| 83.3%                 | 3                  | 38.32            | 21.22                | -0.06%           | PASS   |
| AVERAGE:              |                    |                  | 21.23                |                  |        |

**EPA Method 7E,  
Example Calculations**

**Client: SLR**  
**Location: Portland, OR**  
**Source: Baghouse #1**  
**Method: 7E**

**Run: 1**  
**Start Time: 21:13**  
**End Time: 23:09**  
**Date: 12/16/2020**

**EPA Method 7E:**

Analyzer Calibration Error (Mid)

$$1) \text{ ACE} = \left( \frac{C_{\text{Dir}} - C_V}{C_S} \right) \times 100 = -1.21 \%v$$

where  $C_{\text{Dir}}$ : 48.78 ppmv  
 $C_V$ : 50.00 ppmv  
 $C_S$ : 101.10 ppmv

System Bias (Upscale)

$$2) \text{ SB} = \left( \frac{C_S - C_{\text{Dir}}}{C_S} \right) \times 100 = -0.70 \%v$$

where  $C_{\text{Dir}}$ : 48.78 ppmv  
 $C_S$ : 48.07 ppmv  
 $C_S$ : 101.10 ppmv

Drift Assessment (Upscale)

$$3) \text{ D} = | \text{SB}_{\text{Final}} - \text{SB}_i | = 0.57 \%v$$

where  $\text{SB}_{\text{Final}}$ : -0.13 ppmv  
 $\text{SB}_i$ : -0.70 ppmv

Effluent Gas Concentration

$$4) \text{ C}_{\text{Gas}} = (C_{\text{Avg}} - C_O) \left( \frac{C_{\text{MA}}}{C_M - C_O} \right) = 18.47 \text{ ppmv}$$

where  $C_{\text{Avg}}$ : 18.03 ppmv  
 $C_O$ : 0.27 ppmv  
 $C_{\text{MA}}$ : 50.00 ppmv  
 $C_M$ : 48.36 ppmv

NO<sub>2</sub> - NO Conversion Efficiency

$$5) \text{ Eff}_{\text{NOx}} = \left( \frac{C_{\text{Dir}}}{C_V} \right) \times 100 = 94.3 \%v$$

where  $C_{\text{Dir}}$ : 49.30 ppmv  
 $C_V$ : 52.28 ppmv

**Emission Rates:**

$$\text{NO}_x \text{ 1) lb/hr} = (\text{Stack Flow}) (C) (46) (1.558 \times 10^{-7}) = 5.64 \text{ lb/hr}$$

O<sub>2</sub> Correction

$$C_{\text{@}\%O_2} = \left( \frac{20.9 - \%O_2}{20.9 - \text{Measured } O_2} \right) \times C =$$

**EPA Method 10,  
Example Calculations**

**Client:** SLR  
**Location:** Portland, OR  
**Source:** Baghouse #1  
**Method:** 10

**Run:** 1  
**Start Time:** 21:13  
**End Time:** 23:09  
**Date:** 12/16/2020

**EPA Method 10:**

Analyzer Calibration Error (Mid)

$$1) \text{ ACE} = \left( \frac{C_{\text{Dir}} - C_V}{C_S} \right) \times 100 = -0.22 \%v$$

where  $C_{\text{Dir}}$ : 49.78 ppmv  
 $C_V$ : 50.00 ppmv  
 $C_S$ : 101.40 ppmv

System Bias (Upscale)

$$2) \text{ SB} = \left( \frac{C_S - C_{\text{Dir}}}{C_S} \right) \times 100 = 0.01 \%v$$

where  $C_{\text{Dir}}$ : 49.78 ppmv  
 $C_S$ : 49.79 ppmv  
 $C_S$ : 101.40 ppmv

Drift Assessment (Upscale)

$$3) \text{ D} = | \text{SB}_{\text{Final}} - \text{SB}_i | = 0.39 \%v$$

where  $\text{SB}_{\text{Final}}$ : 0.40 ppmv  
 $\text{SB}_i$ : 0.01 ppmv

Effluent Gas Concentration

$$4) \text{ C}_{\text{Gas}} = (C_{\text{Avg}} - C_O) \left( \frac{C_{\text{MA}}}{C_M - C_O} \right) = 7.85 \text{ ppmv}$$

where  $C_{\text{Avg}}$ : 7.32 ppmv  
 $C_O$ : -0.63 ppmv  
 $C_{\text{MA}}$ : 50.00 ppmv  
 $C_M$ : 49.99 ppmv

**Emission Rates:**

$$\text{CO } 1) \text{ lb/hr} = (\text{Stack Flow}) (C) (28) (1.558 \times 10^{-7}) = 1.46 \text{ lb/hr}$$

$C$ : 7.85 ppm

Molecular Wt. CO: 28 g/g-mole  
 1.558E-07 Conv. Factor

**EPA Method 3A,  
Example Calculations**

**Client: SLR**  
**Location: Portland, OR**  
**Source: Baghouse #1**  
**Method: 3A**

**Run: 1**  
**Start Time: 21:13**  
**End Time: 23:09**  
**Date: 12/16/2020**

**EPA Method 3A (O<sub>2</sub>):**

Analyzer Calibration Error (Mid)

$$1) \text{ ACE} = \left( \frac{C_{\text{Dir}} - C_V}{C_S} \right) \times 100 = -0.09 \%v$$

where  $C_{\text{Dir}}$ : 9.98 %  
 $C_V$ : 10.00 %  
 $C_S$ : 22.03 %

System Bias (Upscale)

$$2) \text{ SB} = \left( \frac{C_S - C_{\text{Dir}}}{C_S} \right) \times 100 = -0.18 \%v$$

where  $C_{\text{Dir}}$ : 9.98 %  
 $C_S$ : 9.94 %  
 $C_S$ : 22.03 %

Drift Assessment (Upscale)

$$3) \text{ D} = | \text{SB}_{\text{Final}} - \text{SB}_i | = 0.27 \%v$$

where  $\text{SB}_{\text{Final}}$ : 0.09 %  
 $\text{SB}_i$ : -0.18 %

Effluent Gas Concentration

$$4) \text{ C}_{\text{Gas}} = (C_{\text{Avg}} - C_O) \left( \frac{C_{\text{MA}}}{C_M - C_O} \right) = 21.31 \%v$$

where  $C_{\text{Avg}}$ : 21.23 %  
 $C_O$ : 0.01 %  
 $C_{\text{MA}}$ : 10.00 %  
 $C_M$ : 9.97 %

**EPA Method 3A,  
Example Calculations**

**Client:** SLR  
**Location:** Portland, OR  
**Source:** Baghouse #1  
**Method:** 3A

**Run:** 1  
**Start Time:** 21:13  
**End Time:** 23:09  
**Date:** 12/16/2020

**EPA Method 3A (CO<sub>2</sub>):**

Analyzer Calibration Error (Mid)

$$1) \text{ ACE} = \left( \frac{C_{\text{Dir}} - C_V}{C_S} \right) \times 100 = 0.32 \%v$$

where  $C_{\text{Dir}}$ : 10.07 %  
 $C_V$ : 10.00 %  
 $C_S$ : 21.64 %

System Bias (Upscale)

$$2) \text{ SB} = \left( \frac{C_S - C_{\text{Dir}}}{C_S} \right) \times 100 = 0.05 \%v$$

where  $C_{\text{Dir}}$ : 10.07 %  
 $C_S$ : 10.08 %  
 $C_S$ : 21.64 %

Drift Assessment (Upscale)

$$3) \text{ D} = | \text{SB}_{\text{Final}} - \text{SB}_i | = 0.23 \%v$$

where  $\text{SB}_{\text{Final}}$ : 0.28 %  
 $\text{SB}_i$ : 0.05 %

Effluent Gas Concentration

$$4) \text{ C}_{\text{Gas}} = (C_{\text{Avg}} - C_O) \left( \frac{C_{\text{MA}}}{C_M - C_O} \right) = 0.01 \%v$$

where  $C_{\text{Avg}}$ : 0.15 %  
 $C_O$ : 0.14 %  
 $C_{\text{MA}}$ : 10.00 %  
 $C_M$ : 10.11 %

## BISON ENGINEERING GASEOUS TESTING SUMMARY

|          |                |        |               |
|----------|----------------|--------|---------------|
| Company  | SLR            | Source | Baghouse #2   |
| Facility | Columbia Steel | Date   | 12/10-15/2020 |
| Location | Portland OR    |        |               |

|                     |               |               |               |       |
|---------------------|---------------|---------------|---------------|-------|
| Run                 | 1             | 2             | 3             |       |
| Date                | 12/10-11/2020 | 12/14-15/2020 | 12/15-16/2020 |       |
| Run Start Time      | 22:20         | 22:18         | 22:02         |       |
| Run End Time        | 5:10          | 2:40          | 4:10          |       |
| Duration, min.      | 411           | 263           | 369           |       |
| CO <sub>2</sub> %vd | 0.13          | 0.13          | 0.00          | 0.09  |
| O <sub>2</sub> %vd  | 20.76         | 20.77         | 20.65         | 20.73 |

\*Negative concentrations are reported as zero.

**Bison Engineering, Inc.**  
**Method 3A Oxygen**  
*Calibration Error, System Bias and System Drift*

|                                 |                           |                                          |
|---------------------------------|---------------------------|------------------------------------------|
| Company: <b>SLR</b>             | Source <b>Baghouse #2</b> | Instrument Make: <b>Servomex</b>         |
| Facility: <b>Columbia Steel</b> | Date <b>12/10-15/2020</b> | Instrument Model: <b>1440</b>            |
| Location: <b>Portland OR</b>    |                           | Instrument Serial #: <b>01440D1-5041</b> |

|       |         | <i>Initial Values</i>        |                           |                                           |           | <i>Final Values</i>       |                                            |           |                           |           |                  | Raw Avg<br>Gas<br>Conc | Corrected<br>Gas<br>Conc | Instrument<br>Cal.<br>Reference<br>Gas |
|-------|---------|------------------------------|---------------------------|-------------------------------------------|-----------|---------------------------|--------------------------------------------|-----------|---------------------------|-----------|------------------|------------------------|--------------------------|----------------------------------------|
|       |         | Analyzer<br>Cal.<br>Response | System<br>Cal<br>Response | Pre test<br>System Cal. Bias<br>% of span | pass/fail | System<br>Cal<br>Response | Post test<br>System Cal. Bias<br>% of span | pass/fail | System Drift<br>% of span | pass/fail | Analyzer<br>Span |                        |                          |                                        |
| Run 1 | zero    | 0.01                         | 0.00                      | -0.05                                     | pass      | 0.07                      | 0.27                                       | pass      | 0.32                      | pass      |                  |                        |                          |                                        |
|       | upscale | 22.04                        | 22.02                     | -0.09                                     | pass      | 22.37                     | 1.50                                       | pass      | 1.59                      | pass      | 22.03            | 20.92                  | 20.76                    | 22.03                                  |
| Run 2 | zero    | 0.00                         | 0.03                      | 0.14                                      | pass      | 0.03                      | 0.14                                       | pass      | 0.00                      | pass      |                  |                        |                          |                                        |
|       | upscale | 22.01                        | 22.01                     | 0.00                                      | pass      | 22.12                     | 0.50                                       | pass      | 0.50                      | pass      | 22.03            | 20.80                  | 20.77                    | 22.03                                  |
| Run 3 | zero    | 0.03                         | 0.05                      | 0.09                                      | pass      | 0.04                      | 0.05                                       | pass      | 0.05                      | pass      |                  |                        |                          |                                        |
|       | upscale | 22.03                        | 22.03                     | 0.00                                      | pass      | 22.08                     | 0.23                                       | pass      | 0.23                      | pass      | 22.03            | 20.68                  | 20.65                    | 22.03                                  |
|       |         |                              |                           | < 5%*                                     |           | < 5%*                     |                                            | < 3%*     |                           |           |                  |                        |                          |                                        |

**12/10-11/2020 Run 1**

| <b>ANALYZER CAL. ERROR</b> | <b>Zero</b> | <b>Mid</b> | <b>High</b> |
|----------------------------|-------------|------------|-------------|
| Calibration gas standards  | 0           | 10.02      | 22.03       |
| Cal gas analyzer response  | 0.01        | 9.97       | 22.04       |
| Analyzer Cal. Error        | 0.05        | -0.23      | 0.05        |
| Analyzer Cal. Error < 2%*  | pass        | pass       | pass        |

**12/14-15/2020 Run 2**

| <b>ANALYZER CAL. ERROR</b> | <b>Zero</b> | <b>Mid</b> | <b>High</b> |
|----------------------------|-------------|------------|-------------|
| Calibration gas standards  | 0           | 10.02      | 22.03       |
| Cal gas analyzer response  | 0           | 9.96       | 22.01       |
| Analyzer Cal. Error        | 0.00        | -0.27      | -0.09       |
| Analyzer Cal. Error < 2%*  | pass        | pass       | pass        |

**12/15-16/2020 Run 3**

| <b>ANALYZER CAL. ERROR</b> | <b>Zero</b> | <b>Mid</b> | <b>High</b> |
|----------------------------|-------------|------------|-------------|
| Calibration gas standards  | 0           | 10.02      | 22.03       |
| Cal gas analyzer response  | 0.03        | 9.99       | 22.03       |
| Analyzer Cal. Error        | 0.14        | -0.14      | 0.00        |
| Analyzer Cal. Error < 2%*  | pass        | pass       | pass        |

Note: All units are in %

\*Or < 0.5 % absolute difference

**Bison Engineering, Inc.**  
**Method 3A CO2**  
*Calibration Error, System Bias and System Drift*

|                                 |                            |                                          |
|---------------------------------|----------------------------|------------------------------------------|
| Company: <b>SLR</b>             | Source: <b>Baghouse #2</b> | Instrument Make: <b>Servomex</b>         |
| Facility: <b>Columbia Steel</b> | Date: <b>12/10-15/2020</b> | Instrument Model: <b>1440</b>            |
| Location: <b>Portland OR</b>    |                            | Instrument Serial #: <b>01440D1-5041</b> |

|       |         |                        | Initial Values      |                                               |      |                     | Final Values                                   |      |                                  |       |               |                  |                    |                               |
|-------|---------|------------------------|---------------------|-----------------------------------------------|------|---------------------|------------------------------------------------|------|----------------------------------|-------|---------------|------------------|--------------------|-------------------------------|
|       |         | Analyzer Cal. Response | System Cal Response | Pre test System Cal. Bias % of span pass/fail |      | System Cal Response | Post test System Cal. Bias % of span pass/fail |      | System Drift % of span pass/fail |       | Analyzer Span | Raw Avg Gas Conc | Corrected Gas Conc | Instrument Cal. Reference Gas |
| Run 1 | zero    | -0.01                  | -0.04               | -0.14                                         | pass | 0.05                | 0.28                                           | pass | 0.42                             | pass  |               |                  |                    |                               |
|       | upscale | 9.85                   | 9.85                | 0.00                                          | pass | 9.94                | 0.42                                           | pass | 0.42                             | pass  | 21.64         | 0.13             | 0.13               | 10.01                         |
| Run 2 | zero    | 0.00                   | 0.03                | 0.14                                          | pass | 0.11                | 0.51                                           | pass | 0.37                             | pass  |               |                  |                    |                               |
|       | upscale | 9.80                   | 9.87                | 0.32                                          | pass | 9.77                | -0.14                                          | pass | 0.46                             | pass  | 21.64         | 0.20             | 0.13               | 10.01                         |
| Run 3 | zero    | 0.07                   | 0.00                | -0.32                                         | pass | 0.40                | 1.52                                           | pass | 1.85                             | pass  |               |                  |                    |                               |
|       | upscale | 9.84                   | 9.83                | -0.05                                         | pass | 9.97                | 0.60                                           | pass | 0.65                             | pass  | 21.64         | 0.14             | -0.06              | 10.01                         |
|       |         |                        |                     | < 5%*                                         |      |                     | < 5%*                                          |      |                                  | < 3%* |               |                  |                    |                               |

**12/10-11/2020 Run 1**

| <b>ANALYZER CAL. ERROR</b> | <b>Zero</b> | <b>Mid</b> | <b>High</b> |
|----------------------------|-------------|------------|-------------|
| Calibration gas standards  | 0           | 10.01      | 21.64       |
| Cal gas analyzer response  | -0.01       | 9.85       | 21.53       |
| Analyzer Cal. Error        | -0.05       | -0.74      | -0.51       |
| Analyzer Cal. Error < 2%*  | pass        | pass       | pass        |

**12/14-15/2020 Run 2**

| <b>ANALYZER CAL. ERROR</b> | <b>Zero</b> | <b>Mid</b> | <b>High</b> |
|----------------------------|-------------|------------|-------------|
| Calibration gas standards  | 0           | 10.01      | 21.64       |
| Cal gas analyzer response  | 0           | 9.8        | 21.66       |
| Analyzer Cal. Error        | 0.00        | -0.97      | 0.09        |
| Analyzer Cal. Error < 2%*  | pass        | pass       | pass        |

**12/15-16/2020 Run 3**

| <b>ANALYZER CAL. ERROR</b> | <b>Zero</b> | <b>Mid</b> | <b>High</b> |
|----------------------------|-------------|------------|-------------|
| Calibration gas standards  | 0           | 10.01      | 21.64       |
| Cal gas analyzer response  | 0.07        | 9.84       | 21.7        |
| Analyzer Cal. Error        | 0.32        | -0.79      | 0.28        |
| Analyzer Cal. Error < 2%*  | pass        | pass       | pass        |

Note: All units are in %

\*Or < 0.5 % absolute difference

**EPA Method 3A,  
Example Calculations**

**Client:** SLR  
**Location:** Portland OR  
**Source:** Baghouse #2  
**Method:** 3A

**Run:** 1  
**Start Time:** 22:20  
**End Time:** 5:10  
**Date:** 12/10-11/2020

**EPA Method 3A (O<sub>2</sub>):**

Analyzer Calibration Error (Mid)

$$1) \text{ ACE} = \left( \frac{C_{\text{Dir}} - C_V}{C_S} \right) \times 100 = -0.23 \%v$$

where  $C_{\text{Dir}}$ : 9.97 %  
 $C_V$ : 10.02 %  
 $C_S$ : 22.03 %

System Bias (Upscale)

$$2) \text{ SB} = \left( \frac{C_S - C_{\text{Dir}}}{C_S} \right) \times 100 = -0.09 \%v$$

where  $C_{\text{Dir}}$ : 22.04 %  
 $C_S$ : 22.02 %  
 $C_S$ : 22.03 %

Drift Assessment (Upscale)

$$3) \text{ D} = | \text{SB}_{\text{Final}} - \text{SB}_i | = 1.59 \%v$$

where  $\text{SB}_{\text{Final}}$ : 1.50 %  
 $\text{SB}_i$ : -0.09 %

Effluent Gas Concentration

$$4) \text{ C}_{\text{Gas}} = (C_{\text{Avg}} - C_O) \left( \frac{C_{\text{MA}}}{C_M - C_O} \right) = 20.76 \%v$$

where  $C_{\text{Avg}}$ : 20.92 %  
 $C_O$ : 0.04 %  
 $C_{\text{MA}}$ : 22.03 %  
 $C_M$ : 22.20 %

**EPA Method 3A,  
Example Calculations**

**Client: SLR**  
**Location: Portland OR**  
**Source: Baghouse #2**  
**Method: 3A**

**Run: 1**  
**Start Time: 22:20**  
**End Time: 5:10**  
**Date: 12/10-11/2020**

**EPA Method 3A (CO<sub>2</sub>):**

**Analyzer Calibration Error (Mid)**

$$1) \text{ ACE} = \left( \frac{C_{\text{Dir}} - C_V}{C_S} \right) \times 100 = -0.74 \%v$$

where  $C_{\text{Dir}}$ : 9.85 %  
 $C_V$ : 10.01 %  
 $C_S$ : 21.64 %

**System Bias (Upscale)**

$$2) \text{ SB} = \left( \frac{C_S - C_{\text{Dir}}}{C_S} \right) \times 100 = 0.00 \%v$$

where  $C_{\text{Dir}}$ : 9.85 %  
 $C_S$ : 9.85 %  
 $C_S$ : 21.64 %

**Drift Assessment (Upscale)**

$$3) \text{ D} = | \text{SB}_{\text{Final}} - \text{SB}_i | = 0.42 \%v$$

where  $\text{SB}_{\text{Final}}$ : 0.42 %  
 $\text{SB}_i$ : 0.00 %

**Effluent Gas Concentration**

$$4) \text{ C}_{\text{Gas}} = (C_{\text{Avg}} - C_O) \left( \frac{C_{\text{MA}}}{C_M - C_O} \right) = 0.13 \%v$$

where  $C_{\text{Avg}}$ : 0.13 %  
 $C_O$ : 0.01 %  
 $C_{\text{MA}}$ : 10.01 %  
 $C_M$ : 9.90 %

## BISON ENGINEERING GASEOUS TESTING SUMMARY

|          |                |        |               |
|----------|----------------|--------|---------------|
| Company  | SLR            | Source | Baghouse #2   |
| Facility | Columbia Steel | Date   | 12/16-17/2020 |
| Location | Portland, OR   |        |               |

| Run                              |                               |                      | 1          | 2          | 3          | Average |
|----------------------------------|-------------------------------|----------------------|------------|------------|------------|---------|
| Date                             |                               |                      | 12/16/2020 | 12/17/2020 | 12/17/2020 |         |
| Run Start Time                   |                               |                      | 22:37      | 0:18       | 1:56       |         |
| Run End Time                     |                               |                      | 23:46      | 1:28       | 3:06       |         |
| Duration, min.                   |                               |                      | 70         | 71         | 71         |         |
| Stack Diameter, in.              |                               |                      | 46.50      | 46.50      | 46.50      |         |
| Stack Area, sq.ft.               |                               |                      | 11.793     | 11.793     | 11.793     |         |
| Barometric Pressure, "Hg         |                               |                      | 29.65      | 29.65      | 29.65      |         |
| CO <sub>2</sub> %vd              |                               |                      | 0.11       | 0.09       | 0.11       |         |
| O <sub>2</sub> %vd               |                               |                      | 20.97      | 20.85      | 20.95      |         |
| H <sub>2</sub> O%v               |                               |                      | 1.31       | 0.77       | 0.68       |         |
| Wet Molecular Weight, lb/lb-mole |                               |                      | 28.72      | 28.77      | 28.79      |         |
| WSCFM                            |                               |                      | 32,973.2   | 32,400.1   | 33,772.8   |         |
| DSCFM                            |                               |                      | 32,369.4   | 31,719.7   | 33,099.7   |         |
| Nitrogen Oxides                  | Concentration, C <sub>s</sub> | ppmvd                | 0.40       | 0.58       | 1.75       |         |
|                                  | Mass                          | lb/hr                | 0.09       | 0.13       | 0.42       |         |
|                                  |                               | lb/ton metal melted  | 0.025      | 0.037      | 0.061      |         |
| Carbon Monoxide                  | Concentration, C <sub>s</sub> | ppmvd                | 92.58      | 40.61      | 43.04      |         |
|                                  | Mass                          | lb/hr                | 13.07      | 5.62       | 6.21       |         |
|                                  |                               | lb/ton metal melted  | 3.671      | 1.579      | 0.905      |         |
| Production Data                  |                               | tons/hr metal melted | 3.56       | 3.56       | 6.86       |         |

\*Negative concentrations are reported as zero.

Moisture and stack flow rates for lb/hr calculations are from the simultaneous ODEQ Method 5 sample runs.

**Bison Engineering, Inc.**  
**Method 7E Nitrogen Oxides**  
*Calibration Error, System Bias and System Drift*  
 NOx molecular weight of 46

|                                 |                            |                                              |
|---------------------------------|----------------------------|----------------------------------------------|
| Company: <b>SLR</b>             | Source: <b>Baghouse #2</b> | Instrument Make: <b>Thermo Environmental</b> |
| Facility: <b>Columbia Steel</b> | Date: <b>12/16-17/2020</b> | Instrument Model: <b>42i</b>                 |
| Location: <b>Portland, OR</b>   |                            | Instrument Serial #: <b>729825194</b>        |

|       |         | <i>Initial Values</i>        |                           |                                           |           | <i>Final Values</i>       |                                            |           |                           |           |                  | Raw Avg<br>Gas<br>Conc | Corrected<br>Gas<br>Conc | Instrument<br>Cal.<br>Reference<br>Gas |
|-------|---------|------------------------------|---------------------------|-------------------------------------------|-----------|---------------------------|--------------------------------------------|-----------|---------------------------|-----------|------------------|------------------------|--------------------------|----------------------------------------|
|       |         | Analyzer<br>Cal.<br>Response | System<br>Cal<br>Response | Pre test<br>System Cal. Bias<br>% of span | pass/fail | System<br>Cal<br>Response | Post test<br>System Cal. Bias<br>% of span | pass/fail | System Drift<br>% of span | pass/fail | Analyzer<br>Span |                        |                          |                                        |
| Run 1 | zero    | 0.27                         | 0.62                      | 0.35                                      | pass      | 0.26                      | -0.01                                      | pass      | 0.36                      | pass      |                  |                        |                          |                                        |
|       | upscale | 48.23                        | 48.54                     | 0.31                                      | pass      | 49.28                     | 1.04                                       | pass      | 0.73                      | pass      | 101.1            | 0.83                   | 0.40                     | 50                                     |
| Run 2 | zero    | 0.27                         | 0.62                      | 0.35                                      | pass      | 0.26                      | -0.01                                      | pass      | 0.36                      | pass      |                  |                        |                          |                                        |
|       | upscale | 48.23                        | 48.54                     | 0.31                                      | pass      | 49.28                     | 1.04                                       | pass      | 0.73                      | pass      | 101.1            | 1.00                   | 0.58                     | 50                                     |
| Run 3 | zero    | 0.27                         | 0.62                      | 0.35                                      | pass      | 0.26                      | -0.01                                      | pass      | 0.36                      | pass      |                  |                        |                          |                                        |
|       | upscale | 48.23                        | 48.54                     | 0.31                                      | pass      | 49.28                     | 1.04                                       | pass      | 0.73                      | pass      | 101.1            | 2.14                   | 1.75                     | 50                                     |
|       |         |                              |                           | < 5%*                                     |           | < 5%*                     |                                            | < 3%*     |                           |           |                  |                        |                          |                                        |

| <b>ANALYZER CAL. ERROR</b> | <b>Zero</b> | <b>Mid</b> | <b>High</b> |
|----------------------------|-------------|------------|-------------|
| Calibration gas standards  | 0           | 50         | 101.1       |
| Cal gas analyzer response  | 0.27        | 48.23      | 100.44      |
| Analyzer Cal. Error %      | 0.27        | -1.75      | -0.65       |
| Analyzer Cal. Error < 2%*  | pass        | pass       | pass        |

**NO2 CONVERTER TEST**

|                        |       |
|------------------------|-------|
| NO2 Tank Value (ppm)   | 52.28 |
| NO Check Value         | 49.85 |
| NO2 to NO Conversion % | 95.4% |
| NO2 Conversion > 90%   | pass  |

Note: All units are in ppm unless specified otherwise.

\*Or < 0.5 ppm absolute difference

**Bison Engineering, Inc.**  
**Method 10 Carbon Monoxide**  
*Calibration Error, System Bias and System Drift*  
CO molecular weight of 28

|                                 |                            |                                              |
|---------------------------------|----------------------------|----------------------------------------------|
| Company: <b>SLR</b>             | Source: <b>Baghouse #2</b> | Instrument Make: <b>Thermo Environmental</b> |
| Facility: <b>Columbia Steel</b> | Date: <b>12/16-17/2020</b> | Instrument Model: <b>48i HL</b>              |
| Location: <b>Portland, OR</b>   |                            | Instrument Serial #: <b>734025183</b>        |

|       |         | Initial Values         |                     |                  |           | Final Values        |                  |           |              |           |               |                  |                    |                               |
|-------|---------|------------------------|---------------------|------------------|-----------|---------------------|------------------|-----------|--------------|-----------|---------------|------------------|--------------------|-------------------------------|
|       |         | Analyzer Cal. Response | System Cal Response | Pre test         |           | System Cal Response | Post test        |           | System Drift |           | Analyzer Span | Raw Avg Gas Conc | Corrected Gas Conc | Instrument Cal. Reference Gas |
|       |         |                        |                     | System Cal. Bias |           |                     | System Cal. Bias |           |              |           |               |                  |                    |                               |
|       |         |                        |                     | % of span        | pass/fail |                     | % of span        | pass/fail | % of span    | pass/fail |               |                  |                    |                               |
| Run 1 | zero    | -0.48                  | -0.06               | 0.41             | pass      | -0.54               | -0.06            | pass      | 0.47         | pass      |               |                  |                    |                               |
|       | upscale | 50.70                  | 50.31               | -0.38            | pass      | 48.17               | -2.50            | pass      | 2.11         | pass      | 101.4         | 91.43            | 92.58              | 50                            |
| Run 2 | zero    | -0.48                  | -0.06               | 0.41             | pass      | -0.54               | -0.06            | pass      | 0.47         | pass      |               |                  |                    |                               |
|       | upscale | 50.70                  | 50.31               | -0.38            | pass      | 48.17               | -2.50            | pass      | 2.11         | pass      | 101.4         | 39.94            | 40.61              | 50                            |
| Run 3 | zero    | -0.48                  | -0.06               | 0.41             | pass      | -0.54               | -0.06            | pass      | 0.47         | pass      |               |                  |                    |                               |
|       | upscale | 50.70                  | 50.31               | -0.38            | pass      | 48.17               | -2.50            | pass      | 2.11         | pass      | 101.4         | 42.34            | 43.04              | 50                            |
|       |         |                        |                     | < 5%*            |           |                     | < 5%*            |           |              | < 3%*     |               |                  |                    |                               |

| <i>ANALYZER CAL. ERROR</i> | Zero  | Mid  | High  |
|----------------------------|-------|------|-------|
| Calibration gas standards  | 0     | 50   | 101.4 |
| Cal gas analyzer response  | -0.48 | 50.7 | 99.63 |
| Analyzer Cal. Error        | -0.47 | 0.69 | -1.75 |
| Analyzer Cal. Error < 2%*  | pass  | pass | pass  |

Note: All units are in ppm unless specified otherwise.

\*Or < 0.5 ppm absolute difference

**Bison Engineering, Inc.**  
**Method 3A Oxygen**  
*Calibration Error, System Bias and System Drift*

|                                 |                           |                                          |
|---------------------------------|---------------------------|------------------------------------------|
| Company: <b>SLR</b>             | Source <b>Baghouse #2</b> | Instrument Make: <b>Servomex</b>         |
| Facility: <b>Columbia Steel</b> | Date <b>12/16-17/2020</b> | Instrument Model: <b>1440</b>            |
| Location: <b>Portland, OR</b>   |                           | Instrument Serial #: <b>01440D1-5041</b> |

|       |         | <i>Initial Values</i>        |                           |                                           |           | <i>Final Values</i>       |                                            |           |                           |           |                  | Raw Avg<br>Gas<br>Conc | Corrected<br>Gas<br>Conc | Instrument<br>Cal.<br>Reference<br>Gas |
|-------|---------|------------------------------|---------------------------|-------------------------------------------|-----------|---------------------------|--------------------------------------------|-----------|---------------------------|-----------|------------------|------------------------|--------------------------|----------------------------------------|
|       |         | Analyzer<br>Cal.<br>Response | System<br>Cal<br>Response | Pre test<br>System Cal. Bias<br>% of span | pass/fail | System<br>Cal<br>Response | Post test<br>System Cal. Bias<br>% of span | pass/fail | System Drift<br>% of span | pass/fail | Analyzer<br>Span |                        |                          |                                        |
| Run 1 | zero    | -0.01                        | 0.03                      | 0.18                                      | pass      | 0.03                      | 0.18                                       | pass      | 0.00                      | pass      |                  |                        |                          |                                        |
|       | upscale | 9.97                         | 10.03                     | 0.27                                      | pass      | 9.95                      | -0.09                                      | pass      | 0.36                      | pass      | 22.03            | 20.92                  | 20.97                    | 10                                     |
| Run 2 | zero    | -0.01                        | 0.03                      | 0.18                                      | pass      | 0.03                      | 0.18                                       | pass      | 0.00                      | pass      |                  |                        |                          |                                        |
|       | upscale | 9.97                         | 10.03                     | 0.27                                      | pass      | 9.95                      | -0.09                                      | pass      | 0.36                      | pass      | 22.03            | 20.80                  | 20.85                    | 10                                     |
| Run 3 | zero    | -0.01                        | 0.03                      | 0.18                                      | pass      | 0.03                      | 0.18                                       | pass      | 0.00                      | pass      |                  |                        |                          |                                        |
|       | upscale | 9.97                         | 10.03                     | 0.27                                      | pass      | 9.95                      | -0.09                                      | pass      | 0.36                      | pass      | 22.03            | 20.90                  | 20.95                    | 10                                     |
|       |         |                              |                           | < 5%*                                     |           | < 5%*                     |                                            | < 3%*     |                           |           |                  |                        |                          |                                        |

| <i>ANALYZER CAL. ERROR</i> | Zero  | Mid   | High  |
|----------------------------|-------|-------|-------|
| Calibration gas standards  | 0     | 10    | 22.03 |
| Cal gas analyzer response  | -0.01 | 9.97  | 21.97 |
| Analyzer Cal. Error        | -0.05 | -0.14 | -0.27 |
| Analyzer Cal. Error < 2%*  | pass  | pass  | pass  |

Note: All units are in %  
 \*Or < 0.5 % absolute difference

# Bison Engineering, Inc.

## Method 3A CO2

Calibration Error, System Bias and System Drift

|                                 |                            |                                          |
|---------------------------------|----------------------------|------------------------------------------|
| Company: <b>SLR</b>             | Source: <b>Baghouse #2</b> | Instrument Make: <b>Servomex</b>         |
| Facility: <b>Columbia Steel</b> | Date: <b>12/16-17/2020</b> | Instrument Model: <b>1440</b>            |
| Location: <b>Portland, OR</b>   |                            | Instrument Serial #: <b>01440D1-5041</b> |

|       |         | Initial Values         |                     |                                     |           | Final Values        |                                      |           |                        |           |               |                  |                    |                               |
|-------|---------|------------------------|---------------------|-------------------------------------|-----------|---------------------|--------------------------------------|-----------|------------------------|-----------|---------------|------------------|--------------------|-------------------------------|
|       |         | Analyzer Cal. Response | System Cal Response | Pre test System Cal. Bias % of span | pass/fail | System Cal Response | Post test System Cal. Bias % of span | pass/fail | System Drift % of span | pass/fail | Analyzer Span | Raw Avg Gas Conc | Corrected Gas Conc | Instrument Cal. Reference Gas |
| Run 1 | zero    | 0.04                   | 0.01                | -0.14                               | pass      | 0.03                | -0.05                                | pass      | 0.09                   | pass      |               |                  |                    |                               |
|       | upscale | 9.79                   | 9.80                | 0.05                                | pass      | 9.90                | 0.51                                 | pass      | 0.46                   | pass      | 21.64         | 0.13             | 0.11               | 10                            |
| Run 2 | zero    | 0.04                   | 0.01                | -0.14                               | pass      | 0.03                | -0.05                                | pass      | 0.09                   | pass      |               |                  |                    |                               |
|       | upscale | 9.79                   | 9.80                | 0.05                                | pass      | 9.90                | 0.51                                 | pass      | 0.46                   | pass      | 21.64         | 0.11             | 0.09               | 10                            |
| Run 3 | zero    | 0.04                   | 0.01                | -0.14                               | pass      | 0.03                | -0.05                                | pass      | 0.09                   | pass      |               |                  |                    |                               |
|       | upscale | 9.79                   | 9.80                | 0.05                                | pass      | 9.90                | 0.51                                 | pass      | 0.46                   | pass      | 21.64         | 0.13             | 0.11               | 10                            |
|       |         |                        |                     | < 5%*                               |           |                     | < 5%*                                |           | < 3%*                  |           |               |                  |                    |                               |

| <b>ANALYZER CAL. ERROR</b> | <b>Zero</b> | <b>Mid</b> | <b>High</b> |
|----------------------------|-------------|------------|-------------|
| Calibration gas standards  | 0           | 10         | 21.64       |
| Cal gas analyzer response  | 0.04        | 9.79       | 21.67       |
| Analyzer Cal. Error        | 0.18        | -0.97      | 0.14        |
| Analyzer Cal. Error < 2%*  | pass        | pass       | pass        |

Note: All units are in %

\*Or < 0.5 % absolute difference

**Bison Engineering, Inc.**  
**Method 205 Dilution System Check**

|           |                |         |               |                      |            |
|-----------|----------------|---------|---------------|----------------------|------------|
| Company:  | SLR            | Source: | Baghouse #2   | Instrument Make:     | EnviroNics |
| Facility: | Columbia Steel | Date:   | 12/16-17/2020 | Instrument Model:    | 4040       |
| Location: | Portland, OR   |         |               | Instrument Serial #: | 3880       |

| ANALYZER CAL. ERROR       | Zero | Mid   | High  |      |
|---------------------------|------|-------|-------|------|
| Calibration gas standards | 0    | 10.02 | 22.03 |      |
| Cal gas analyzer response | 0.04 | 10.03 | 22.07 |      |
| Analyzer Cal. Error       | 0.18 | 0.05  | 0.18  |      |
| Analyzer Cal. Error < 2%* | pass | pass  | pass  | PASS |

|                                         |                             | First | Second | Third | Average |
|-----------------------------------------|-----------------------------|-------|--------|-------|---------|
| High Level                              | % oxygen<br>dilution system | 9.96  | 9.96   | 9.98  | 9.97    |
| Percent diff from avg recorded value    |                             | -0.1% | -0.1%  | 0.1%  |         |
| Pass or Fail +/- 2%                     |                             | PASS  | PASS   | PASS  |         |
| Percent diff from target O <sub>2</sub> |                             | -0.4% | -0.4%  | -0.2% | -0.3%   |
| Pass or Fail +/- 2% from target value   |                             |       |        |       | PASS    |

|                                         |                 |      |      |       |      |
|-----------------------------------------|-----------------|------|------|-------|------|
| Mid Level                               | dilution system | 5.00 | 5.01 | 4.99  | 5.00 |
| Percent diff from avg recorded value    |                 | 0.0% | 0.2% | -0.2% |      |
| Pass or Fail +/- 2%                     |                 | PASS | PASS | PASS  |      |
| Percent diff from target O <sub>2</sub> |                 | 0.0% | 0.2% | -0.2% | 0.0% |
| Pass or Fail +/- 2% from target value   |                 |      |      |       | PASS |

|                             |             |                       |       |       |            |
|-----------------------------|-------------|-----------------------|-------|-------|------------|
|                             |             |                       |       |       | Tank value |
| Independent Mid Level Check | % oxygen    | 10.01                 | 10.01 | 10.01 | 10.020     |
|                             | independent | Percent diff from avg |       |       | -0.10%     |
|                             | tank check  | Pass or Fail < 2%     |       |       | PASS       |

## Summary - Method 205 - Verification of Gas Dilution Systems for Field Instrument Calibrations

A gas dilution system can provide known values of calibration gases through controlled dilution of high-level calibration gases with an appropriate dilution gas. The calibration gases with an appropriate dilution gas. The instrumental test methods in 40 CFR part 60 - e.g., Methods 3A, 6C, 7E, 10, 15, 16, 20, 25A and 25B require on-site, multi-point point calibration using gases of known concentrations. A gas dilution system that produces known low level calibration gases from high-level calibration gases, with a degree of confidence similar to that for Protocol 1 gases, may be used for compliance tests in lieu of multiple calibration gases when the gas dilution system is demonstrated to meet the requirements of this method.

The gas dilution system shall be evaluated on one analyzer once during each field test. A precalibrated analyzer is chosen, at the discretion of the source owner or operator, to demonstrate that the gas dilution system produces predictable gas concentrations spanning a range of concentrations. After meeting the requirements of this method, the remaining analyzers may be calibrated with the dilution system in accordance to the requirements of the applicable method for the duration of the field test.

The gas dilution system shall produce calibration gases whose measured values are within  $\pm 2$  percent of the predicted values.

### Instructions from Method 205

3.2.2 Calculate the predicted concentration for each of the dilutions based on the flow rates through the gas dilution system (or the dilution ratios) and the certified concentration of the high-level supply gas.

3.2.3 Introduce each of the dilutions from Section 3.2.1 into the analyzer or monitor one at a time and determine the instrument response for each of the dilutions.

3.2.4 Repeat the procedure in Section 3.2.3 two times, i.e., until three injections are made at dilution level. Calculate the average instrument response for each triplicate injection at each dilution level. No single injection shall differ by more than  $\pm 2$  percent from the average instrument response for that dilution.

3.2.5 For each level of dilution, calculate the difference between the average concentration output recorded by the analyzer and the predicted concentration calculated in Section 3.2.2. The average concentration output from the analyzer shall be within  $\pm 2$  percent of the predicted value.

3.2.6 Introduce the mid - level supply gas directly into the analyzer, bypassing the gas dilution system. Repeat the procedure twice more, for a total of three mid-level supply gas injections.

Calculate the average analyzer output concentration for the mid-level supply gas. The difference between the certified concentration of the mid-level supply gas and the average instrument response shall be within  $\pm 2$  percent.

3.3 If the gas dilution system meets the criteria listed in Section 3.2, the gas dilution system may be used throughout that field test.

### Stratification Check

|                       |                    |                  |                      |                  |        |
|-----------------------|--------------------|------------------|----------------------|------------------|--------|
| Company SLR           |                    |                  |                      |                  |        |
| Location Portland, OR |                    |                  | Date 12/16-17/2020   |                  |        |
| Source Baghoue #2     |                    | Stack Dimensions |                      | 47               | inches |
| 3 POINT METHOD        |                    |                  |                      |                  |        |
| <u>% of diameter</u>  | <u>Pt location</u> | <u>O2%</u>       | <u>Diff (+/- 5%)</u> | <u>Pass/Fail</u> |        |
| 16.7%                 | 1                  | 7.77             | 21.02                | 0.45%            | PASS   |
| 50.0%                 | 2                  | 23.25            | 20.85                | -0.37%           | PASS   |
| 83.3%                 | 3                  | 38.73            | 20.91                | -0.08%           | PASS   |
|                       | AVERAGE:           |                  | 20.93                |                  |        |

**EPA Method 7E,  
Example Calculations**

**Client: SLR**  
**Location: Portland, OR**  
**Source: Baghouse #2**  
**Method: 7E**

**Run: 1**  
**Start Time: 22:37**  
**End Time: 23:46**  
**Date: 12/16/2020**

**EPA Method 7E:**

Analyzer Calibration Error (Mid)

$$1) \text{ ACE} = \left( \frac{C_{\text{Dir}} - C_V}{C_S} \right) \times 100 = -1.75 \%v$$

where  $C_{\text{Dir}}$ : 48.23 ppmv  
 $C_V$ : 50.00 ppmv  
 $C_S$ : 101.10 ppmv

System Bias (Upscale)

$$2) \text{ SB} = \left( \frac{C_S - C_{\text{Dir}}}{C_S} \right) \times 100 = 0.31 \%v$$

where  $C_{\text{Dir}}$ : 48.23 ppmv  
 $C_S$ : 48.54 ppmv  
 $C_S$ : 101.10 ppmv

Drift Assessment (Upscale)

$$3) \text{ D} = | \text{SB}_{\text{Final}} - \text{SB}_i | = 0.73 \%v$$

where  $\text{SB}_{\text{Final}}$ : 1.04 ppmv  
 $\text{SB}_i$ : 0.31 ppmv

Effluent Gas Concentration

$$4) \text{ C}_{\text{Gas}} = (C_{\text{Avg}} - C_O) \left( \frac{C_{\text{MA}}}{C_M - C_O} \right) = 0.40 \text{ ppmv}$$

where  $C_{\text{Avg}}$ : 0.83 ppmv  
 $C_O$ : 0.44 ppmv  
 $C_{\text{MA}}$ : 50.00 ppmv  
 $C_M$ : 48.91 ppmv

NO<sub>2</sub> - NO Conversion Efficiency

$$5) \text{ Eff}_{\text{NOx}} = \left( \frac{C_{\text{Dir}}}{C_V} \right) \times 100 = 95.4 \%v$$

where  $C_{\text{Dir}}$ : 49.85 ppmv  
 $C_V$ : 52.28 ppmv

**Emission Rates:**

$$\text{NO}_x \text{ 1) lb/hr} = (\text{Stack Flow}) (C) (46) (1.558 \times 10^{-7}) = 0.09 \text{ lb/hr}$$

O<sub>2</sub> Correction

**EPA Method 10,  
Example Calculations**

**Client:** SLR  
**Location:** Portland, OR  
**Source:** Baghouse #2  
**Method:** 10

**Run:** 1  
**Start Time:** 22:37  
**End Time:** 23:46  
**Date:** 12/16/2020

**EPA Method 10:**

Analyzer Calibration Error (Mid)

$$1) \text{ ACE} = \left( \frac{C_{\text{Dir}} - C_V}{C_S} \right) \times 100 = 0.69 \%v$$

where  $C_{\text{Dir}}$ : 50.70 ppmv  
 $C_V$ : 50.00 ppmv  
 $C_S$ : 101.40 ppmv

System Bias (Upscale)

$$2) \text{ SB} = \left( \frac{C_S - C_{\text{Dir}}}{C_S} \right) \times 100 = -0.38 \%v$$

where  $C_{\text{Dir}}$ : 50.70 ppmv  
 $C_S$ : 50.31 ppmv  
 $C_S$ : 101.40 ppmv

Drift Assessment (Upscale)

$$3) \text{ D} = | \text{SB}_{\text{Final}} - \text{SB}_i | = 2.11 \%v$$

where  $\text{SB}_{\text{Final}}$ : -2.50 ppmv  
 $\text{SB}_i$ : -0.38 ppmv

Effluent Gas Concentration

$$4) \text{ C}_{\text{Gas}} = (C_{\text{Avg}} - C_O) \left( \frac{C_{\text{MA}}}{C_M - C_O} \right) = 92.58 \text{ ppmv}$$

where  $C_{\text{Avg}}$ : 91.43 ppmv  
 $C_O$ : -0.30 ppmv  
 $C_{\text{MA}}$ : 50.00 ppmv  
 $C_M$ : 49.24 ppmv

**Emission Rates:**

$$\text{CO } 1) \text{ lb/hr} = (\text{Stack Flow}) (C) (28) (1.558 \times 10^{-7}) = 13.07 \text{ lb/hr}$$

C: 92.58 ppm

Molecular Wt. CO: 28 g/g-mole  
1.558E-07 Conv. Factor

**EPA Method 3A,  
Example Calculations**

**Client:** SLR  
**Location:** Portland, OR  
**Source:** Baghouse #2  
**Method:** 3A

**Run:** 1  
**Start Time:** 22:37  
**End Time:** 23:46  
**Date:** 12/16/2020

**EPA Method 3A (O<sub>2</sub>):**

Analyzer Calibration Error (Mid)

$$1) \text{ ACE} = \left( \frac{C_{\text{Dir}} - C_V}{C_S} \right) \times 100 = -0.14 \%v$$

where  $C_{\text{Dir}}$ : 9.97 %  
 $C_V$ : 10.00 %  
 $C_S$ : 22.03 %

System Bias (Upscale)

$$2) \text{ SB} = \left( \frac{C_S - C_{\text{Dir}}}{C_S} \right) \times 100 = 0.27 \%v$$

where  $C_{\text{Dir}}$ : 9.97 %  
 $C_S$ : 10.03 %  
 $C_S$ : 22.03 %

Drift Assessment (Upscale)

$$3) \text{ D} = | \text{SB}_{\text{Final}} - \text{SB}_i | = 0.36 \%v$$

where  $\text{SB}_{\text{Final}}$ : -0.09 %  
 $\text{SB}_i$ : 0.27 %

Effluent Gas Concentration

$$4) \text{ C}_{\text{Gas}} = (C_{\text{Avg}} - C_O) \left( \frac{C_{\text{MA}}}{C_M - C_O} \right) = 20.97 \%v$$

where  $C_{\text{Avg}}$ : 20.92 %  
 $C_O$ : 0.03 %  
 $C_{\text{MA}}$ : 10.00 %  
 $C_M$ : 9.99 %

**EPA Method 3A,  
Example Calculations**

**Client: SLR**  
**Location: Portland, OR**  
**Source: Baghouse #2**  
**Method: 3A**

**Run: 1**  
**Start Time: 22:37**  
**End Time: 23:46**  
**Date: 12/16/220**

**EPA Method 3A (CO<sub>2</sub>):**

Analyzer Calibration Error (Mid)

$$1) \text{ ACE} = \left( \frac{C_{\text{Dir}} - C_V}{C_S} \right) \times 100 = -0.97 \%v$$

where  $C_{\text{Dir}}$ : 9.79 %  
 $C_V$ : 10.00 %  
 $C_S$ : 21.64 %

System Bias (Upscale)

$$2) \text{ SB} = \left( \frac{C_S - C_{\text{Dir}}}{C_S} \right) \times 100 = 0.05 \%v$$

where  $C_{\text{Dir}}$ : 9.79 %  
 $C_S$ : 9.80 %  
 $C_S$ : 21.64 %

Drift Assessment (Upscale)

$$3) \text{ D} = | \text{SB}_{\text{Final}} - \text{SB}_i | = 0.46 \%v$$

where  $\text{SB}_{\text{Final}}$ : 0.51 %  
 $\text{SB}_i$ : 0.05 %

Effluent Gas Concentration

$$4) \text{ C}_{\text{Gas}} = (C_{\text{Avg}} - C_O) \left( \frac{C_{\text{MA}}}{C_M - C_O} \right) = 0.11 \%v$$

where  $C_{\text{Avg}}$ : 0.13 %  
 $C_O$ : 0.02 %  
 $C_{\text{MA}}$ : 10.00 %  
 $C_M$ : 9.85 %

**SLR**  
**Columbia Steel**  
**Method 3A Baghouse #1 and Baghouse #2**

| Date       | Time     | Baghouse #2 |         | Notes              | Time     | Baghouse #1 |         | Notes              |
|------------|----------|-------------|---------|--------------------|----------|-------------|---------|--------------------|
|            |          | O2 [%]      | CO2 [%] |                    |          | O2 [%]      | CO2 [%] |                    |
| 12/10/2020 | 19:58:26 | 7.71        | 0.03    |                    | 19:58:26 | 22.83       | 0.71    |                    |
| 12/10/2020 | 19:59:26 | 0.01        | -0.01   |                    | 19:59:26 | 22.83       | 0.71    |                    |
| 12/10/2020 | 20:00:26 | 0.01        | -0.01   | Analyzer Zero      | 20:00:26 | 22.83       | 0.71    |                    |
| 12/10/2020 | 20:01:26 | 21.24       | 23.17   |                    | 20:01:26 | 22.84       | 0.71    |                    |
| 12/10/2020 | 20:02:26 | 22.04       | 21.53   | Analyzer Span      | 20:02:26 | 22.84       | 0.70    |                    |
| 12/10/2020 | 20:03:26 | 22.02       | 21.71   |                    | 20:03:26 | 22.84       | 0.71    |                    |
| 12/10/2020 | 20:04:26 | 22.19       | 21.73   |                    | 20:04:26 | 22.84       | 0.71    |                    |
| 12/10/2020 | 20:05:26 | 21.94       | 21.75   |                    | 20:05:26 | 22.84       | 0.71    |                    |
| 12/10/2020 | 20:06:26 | 21.92       | 21.75   |                    | 20:06:26 | 22.84       | 0.70    |                    |
| 12/10/2020 | 20:07:26 | 21.90       | 21.75   |                    | 20:07:26 | 22.84       | 0.70    |                    |
| 12/10/2020 | 20:08:26 | 21.89       | 21.76   |                    | 20:08:26 | 22.84       | 0.71    |                    |
| 12/10/2020 | 20:09:26 | 13.79       | 13.82   |                    | 20:09:26 | 22.84       | 0.70    |                    |
| 12/10/2020 | 20:10:26 | 9.97        | 9.85    | Analyzer Mid       | 20:10:26 | 22.85       | 0.71    |                    |
| 12/10/2020 | 20:11:26 | 9.11        | 9.77    |                    | 20:11:26 | 22.85       | 0.70    |                    |
| 12/10/2020 | 20:12:26 | 8.71        | 9.72    |                    | 20:12:26 | 22.95       | 0.70    |                    |
| 12/10/2020 | 20:13:26 | 8.72        | 9.72    |                    | 20:13:26 | 23.07       | 0.73    |                    |
| 12/10/2020 | 20:14:26 | 8.72        | 9.71    |                    | 20:14:26 | 4.17        | 0.82    |                    |
| 12/10/2020 | 20:15:26 | 8.73        | 9.71    |                    | 20:15:26 | -0.76       | 0.83    |                    |
| 12/10/2020 | 20:16:26 | 8.74        | 9.70    |                    | 20:16:26 | -0.73       | 0.84    |                    |
| 12/10/2020 | 20:17:26 | 8.74        | 9.69    |                    | 20:17:26 | -0.69       | 0.84    |                    |
| 12/10/2020 | 20:18:26 | 8.75        | 9.68    |                    | 20:18:26 | -0.56       | 0.83    |                    |
| 12/10/2020 | 20:19:26 | 8.75        | 9.67    |                    | 20:19:26 | -0.42       | 0.83    |                    |
| 12/10/2020 | 20:20:26 | 8.76        | 9.66    |                    | 20:20:26 | 0.02        | 0.04    | Analyzer Zero      |
| 12/10/2020 | 20:21:26 | 8.77        | 9.65    |                    | 20:21:26 | 17.48       | 23.54   |                    |
| 12/10/2020 | 20:22:26 | 8.77        | 9.64    |                    | 20:22:26 | 22.86       | 25.38   |                    |
| 12/10/2020 | 20:23:26 | 8.78        | 9.64    |                    | 20:23:26 | 22.05       | 20.83   |                    |
| 12/10/2020 | 20:24:26 | 8.79        | 9.63    |                    | 20:24:26 | 22.05       | 20.88   |                    |
| 12/10/2020 | 20:25:26 | 8.80        | 9.63    |                    | 20:25:26 | 22.05       | 20.91   |                    |
| 12/10/2020 | 20:26:26 | 12.19       | 7.29    |                    | 20:26:26 | 22.06       | 21.65   |                    |
| 12/10/2020 | 20:27:26 | 20.60       | 0.11    |                    | 20:27:26 | 22.06       | 21.69   | Analyzer Span      |
| 12/10/2020 | 20:28:26 | 20.62       | 0.04    |                    | 20:28:26 | 18.09       | 17.23   |                    |
| 12/10/2020 | 20:29:26 | 20.24       | 0.03    |                    | 20:29:26 | 10.04       | 9.90    | Analyzer Mid       |
| 12/10/2020 | 20:30:26 | 20.79       | 0.02    |                    | 20:30:26 | 10.02       | 8.78    |                    |
| 12/10/2020 | 20:31:26 | 3.84        | 0.04    |                    | 20:31:26 | 18.03       | 4.29    |                    |
| 12/10/2020 | 20:32:26 | 0.00        | -0.04   |                    | 20:32:26 | 20.69       | 0.49    |                    |
| 12/10/2020 | 20:33:26 | 0.00        | -0.04   | System Zero        | 20:33:26 | 20.70       | 0.48    |                    |
| 12/10/2020 | 20:34:26 | 17.84       | 17.29   |                    | 20:34:26 | 20.70       | 0.48    |                    |
| 12/10/2020 | 20:35:26 | 22.02       | 21.64   | O2 System Upscale  | 20:35:26 | 20.75       | 0.47    |                    |
| 12/10/2020 | 20:36:26 | 22.00       | 21.67   |                    | 20:36:26 | 21.00       | 0.47    |                    |
| 12/10/2020 | 20:37:26 | 16.18       | 16.11   |                    | 20:37:26 | 21.00       | 0.47    |                    |
| 12/10/2020 | 20:38:26 | 9.97        | 9.85    | CO2 System Upscale | 20:38:26 | 21.00       | 0.47    |                    |
| 12/10/2020 | 20:39:26 | 11.02       | 9.02    |                    | 20:39:26 | 20.99       | 0.46    |                    |
| 12/10/2020 | 20:40:26 | 20.49       | 0.34    |                    | 20:40:26 | 3.38        | 0.44    |                    |
| 12/10/2020 | 20:41:26 | 20.74       | 0.07    |                    | 20:41:26 | 0.10        | 0.38    |                    |
| 12/10/2020 | 20:42:26 | 20.73       | 0.05    |                    | 20:42:26 | 0.06        | 0.31    |                    |
| 12/10/2020 | 20:43:26 | 20.72       | 0.04    |                    | 20:43:26 | 0.06        | 0.08    | System Zero        |
| 12/10/2020 | 20:44:26 | 20.89       | 0.04    |                    | 20:44:26 | 9.51        | 9.82    |                    |
| 12/10/2020 | 20:45:26 | 20.93       | 0.03    |                    | 20:45:26 | 21.99       | 22.02   | O2 System Upscale  |
| 12/10/2020 | 20:46:26 | 20.93       | 0.03    |                    | 20:46:26 | 17.93       | 17.73   |                    |
| 12/10/2020 | 20:47:26 | 20.93       | 0.03    |                    | 20:47:26 | 10.16       | 10.04   |                    |
| 12/10/2020 | 20:48:26 | 20.93       | 0.03    |                    | 20:48:26 | 10.07       | 9.96    | CO2 System Upscale |
| 12/10/2020 | 20:49:26 | 20.93       | 0.03    |                    | 20:49:26 | 14.73       | 5.50    |                    |
| 12/10/2020 | 20:50:26 | 20.92       | 0.03    |                    | 20:50:26 | 20.81       | 0.26    |                    |

**SLR**  
**Columbia Steel**  
**Method 3A Baghouse #1 and Baghouse #2**

| Date       | Time     | Baghouse #2 |         |       | Time     | Baghouse #1 |         |                      |
|------------|----------|-------------|---------|-------|----------|-------------|---------|----------------------|
|            |          | O2 [%]      | CO2 [%] | Notes |          | O2 [%]      | CO2 [%] | Notes                |
| 12/10/2020 | 20:51:26 | 20.92       | 0.02    |       | 20:51:26 | 20.86       | 0.22    |                      |
| 12/10/2020 | 20:52:26 | 20.92       | 0.02    |       | 20:52:26 | 20.87       | 0.20    |                      |
| 12/10/2020 | 20:53:26 | 20.92       | 0.02    |       | 20:53:26 | 20.88       | 0.20    |                      |
| 12/10/2020 | 20:54:26 | 20.92       | 0.02    |       | 20:54:26 | 20.88       | 0.18    |                      |
| 12/10/2020 | 20:55:26 | 20.92       | 0.02    |       | 20:55:26 | 20.88       | 0.18    |                      |
| 12/10/2020 | 20:56:26 | 20.92       | 0.02    |       | 20:56:26 | 20.87       | 0.17    |                      |
| 12/10/2020 | 20:57:26 | 20.92       | 0.02    |       | 20:57:26 | 20.81       | 0.16    |                      |
| 12/10/2020 | 20:58:26 | 20.92       | 0.02    |       | 20:58:26 | 20.82       | 0.15    |                      |
| 12/10/2020 | 20:59:26 | 20.91       | 0.01    |       | 20:59:26 | 20.82       | 0.14    | Stratification Check |
| 12/10/2020 | 21:00:26 | 20.91       | 0.01    |       | 21:00:26 | 20.83       | 0.13    | 20.84                |
| 12/10/2020 | 21:01:26 | 20.91       | 0.01    |       | 21:01:26 | 20.82       | 0.13    |                      |
| 12/10/2020 | 21:02:26 | 20.91       | 0.01    |       | 21:02:26 | 20.82       | 0.12    |                      |
| 12/10/2020 | 21:03:26 | 20.90       | 0.01    |       | 21:03:26 | 20.83       | 0.12    |                      |
| 12/10/2020 | 21:04:26 | 20.90       | 0.01    |       | 21:04:26 | 20.84       | 0.12    |                      |
| 12/10/2020 | 21:05:26 | 20.90       | 0.01    |       | 21:05:26 | 20.88       | 0.12    |                      |
| 12/10/2020 | 21:06:26 | 20.95       | 0.01    |       | 21:06:26 | 20.88       | 0.11    |                      |
| 12/10/2020 | 21:07:26 | 20.97       | 0.01    |       | 21:07:26 | 20.89       | 0.11    |                      |
| 12/10/2020 | 21:08:26 | 20.97       | 0.01    |       | 21:08:26 | 20.89       | 0.11    |                      |
| 12/10/2020 | 21:09:26 | 20.96       | 0.01    |       | 21:09:26 | 20.90       | 0.10    | 20.90                |
| 12/10/2020 | 21:10:26 | 20.96       | 0.01    |       | 21:10:26 | 20.90       | 0.10    |                      |
| 12/10/2020 | 21:11:26 | 20.97       | 0.01    |       | 21:11:26 | 20.90       | 0.09    |                      |
| 12/10/2020 | 21:12:26 | 20.96       | 0.01    |       | 21:12:26 | 20.90       | 0.09    |                      |
| 12/10/2020 | 21:13:26 | 20.96       | 0.01    |       | 21:13:26 | 20.90       | 0.09    |                      |
| 12/10/2020 | 21:14:26 | 20.96       | 0.02    |       | 21:14:26 | 20.90       | 0.08    |                      |
| 12/10/2020 | 21:15:26 | 20.96       | 0.02    |       | 21:15:26 | 20.91       | 0.07    |                      |
| 12/10/2020 | 21:16:26 | 20.84       | 0.02    |       | 21:16:26 | 20.91       | 0.07    |                      |
| 12/10/2020 | 21:17:26 | 20.82       | 0.02    |       | 21:17:26 | 20.91       | 0.06    |                      |
| 12/10/2020 | 21:18:26 | 20.82       | 0.02    |       | 21:18:26 | 20.92       | 0.06    | 21.01                |
| 12/10/2020 | 21:19:26 | 20.82       | 0.02    |       | 21:19:26 | 21.00       | 0.01    |                      |
| 12/10/2020 | 21:20:26 | 20.82       | 0.02    |       | 21:20:26 | 21.05       | -0.01   |                      |
| 12/10/2020 | 21:21:26 | 20.81       | 0.01    |       | 21:21:26 | 21.03       | -0.01   |                      |
| 12/10/2020 | 21:22:26 | 20.81       | 0.02    |       | 21:22:26 | 21.02       | -0.01   |                      |
| 12/10/2020 | 21:23:26 | 20.81       | 0.02    |       | 21:23:26 | 21.01       | -0.01   |                      |
| 12/10/2020 | 21:24:26 | 20.81       | 0.01    |       | 21:24:26 | 21.01       | -0.01   |                      |
| 12/10/2020 | 21:25:26 | 20.81       | 0.01    |       | 21:25:26 | 21.01       | -0.01   | Start Run 1 BH#1     |
| 12/10/2020 | 21:26:26 | 20.81       | 0.01    |       | 21:26:26 | 21.01       | -0.01   |                      |
| 12/10/2020 | 21:27:26 | 20.81       | 0.01    |       | 21:27:26 | 21.00       | -0.01   |                      |
| 12/10/2020 | 21:28:26 | 20.81       | 0.00    |       | 21:28:26 | 21.01       | -0.01   |                      |
| 12/10/2020 | 21:29:26 | 20.81       | 0.00    |       | 21:29:26 | 21.01       | -0.01   |                      |
| 12/10/2020 | 21:30:26 | 20.81       | 0.00    |       | 21:30:26 | 21.00       | -0.01   |                      |
| 12/10/2020 | 21:31:26 | 20.81       | 0.00    |       | 21:31:26 | 21.00       | -0.02   |                      |
| 12/10/2020 | 21:32:26 | 20.81       | 0.00    |       | 21:32:26 | 21.00       | -0.02   |                      |
| 12/10/2020 | 21:33:26 | 20.81       | 0.00    |       | 21:33:26 | 21.03       | -0.02   |                      |
| 12/10/2020 | 21:34:26 | 20.80       | 0.01    |       | 21:34:26 | 21.05       | -0.02   |                      |
| 12/10/2020 | 21:35:26 | 20.80       | 0.01    |       | 21:35:26 | 21.06       | -0.02   |                      |
| 12/10/2020 | 21:36:26 | 20.81       | 0.01    |       | 21:36:26 | 21.06       | -0.02   |                      |
| 12/10/2020 | 21:37:26 | 20.81       | 0.01    |       | 21:37:26 | 21.06       | -0.02   |                      |
| 12/10/2020 | 21:38:26 | 20.81       | 0.01    |       | 21:38:26 | 21.05       | -0.02   |                      |
| 12/10/2020 | 21:39:26 | 20.81       | 0.01    |       | 21:39:26 | 21.05       | -0.02   |                      |
| 12/10/2020 | 21:40:26 | 20.81       | 0.01    |       | 21:40:26 | 21.05       | -0.02   |                      |
| 12/10/2020 | 21:41:26 | 20.81       | 0.02    |       | 21:41:26 | 21.06       | -0.02   |                      |
| 12/10/2020 | 21:42:26 | 20.81       | 0.02    |       | 21:42:26 | 21.06       | -0.02   |                      |

**SLR**  
**Columbia Steel**  
**Method 3A Baghouse #1 and Baghouse #2**

| Date       | Time     | Baghouse #2 |         |                      | Time     | Baghouse #1 |         |       |
|------------|----------|-------------|---------|----------------------|----------|-------------|---------|-------|
|            |          | O2 [%]      | CO2 [%] | Notes                |          | O2 [%]      | CO2 [%] | Notes |
| 12/10/2020 | 21:43:26 | 20.81       | 0.02    |                      | 21:43:26 | 21.05       | -0.02   |       |
| 12/10/2020 | 21:44:26 | 20.80       | 0.02    |                      | 21:44:26 | 21.05       | -0.02   |       |
| 12/10/2020 | 21:45:26 | 20.80       | 0.02    |                      | 21:45:26 | 21.05       | -0.02   |       |
| 12/10/2020 | 21:46:26 | 20.80       | 0.02    |                      | 21:46:26 | 21.05       | -0.02   |       |
| 12/10/2020 | 21:47:26 | 20.80       | 0.02    |                      | 21:47:26 | 21.04       | -0.01   |       |
| 12/10/2020 | 21:48:26 | 20.80       | 0.02    |                      | 21:48:26 | 21.04       | -0.03   |       |
| 12/10/2020 | 21:49:26 | 20.80       | 0.02    |                      | 21:49:26 | 21.05       | -0.03   |       |
| 12/10/2020 | 21:50:26 | 20.80       | 0.02    |                      | 21:50:26 | 21.05       | -0.04   |       |
| 12/10/2020 | 21:51:26 | 20.80       | 0.01    |                      | 21:51:26 | 21.05       | -0.04   |       |
| 12/10/2020 | 21:52:26 | 20.80       | 0.01    |                      | 21:52:26 | 21.05       | -0.04   |       |
| 12/10/2020 | 21:53:26 | 20.79       | 0.01    |                      | 21:53:26 | 21.05       | -0.05   |       |
| 12/10/2020 | 21:54:26 | 20.79       | 0.01    |                      | 21:54:26 | 21.05       | -0.05   |       |
| 12/10/2020 | 21:55:26 | 20.79       | 0.01    |                      | 21:55:26 | 21.05       | -0.05   |       |
| 12/10/2020 | 21:56:26 | 20.79       | 0.01    |                      | 21:56:26 | 21.05       | -0.05   |       |
| 12/10/2020 | 21:57:26 | 20.79       | 0.01    |                      | 21:57:26 | 21.05       | -0.06   |       |
| 12/10/2020 | 21:58:26 | 20.79       | 0.01    |                      | 21:58:26 | 21.05       | -0.06   |       |
| 12/10/2020 | 21:59:26 | 20.79       | 0.01    |                      | 21:59:26 | 21.05       | -0.06   |       |
| 12/10/2020 | 22:00:26 | 20.79       | 0.01    |                      | 22:00:26 | 21.05       | -0.07   |       |
| 12/10/2020 | 22:01:26 | 20.79       | 0.01    |                      | 22:01:26 | 21.05       | -0.07   |       |
| 12/10/2020 | 22:02:26 | 20.79       | 0.01    |                      | 22:02:26 | 21.05       | -0.07   |       |
| 12/10/2020 | 22:03:26 | 20.79       | 0.01    |                      | 22:03:26 | 21.05       | -0.07   |       |
| 12/10/2020 | 22:04:26 | 20.79       | 0.01    |                      | 22:04:26 | 21.05       | -0.07   |       |
| 12/10/2020 | 22:05:26 | 20.79       | 0.01    |                      | 22:05:26 | 21.05       | -0.07   |       |
| 12/10/2020 | 22:06:26 | 20.79       | 0.01    |                      | 22:06:26 | 21.05       | -0.07   |       |
| 12/10/2020 | 22:07:26 | 20.78       | 0.02    |                      | 22:07:26 | 21.06       | -0.07   |       |
| 12/10/2020 | 22:08:26 | 20.79       | 0.02    |                      | 22:08:26 | 21.05       | -0.07   |       |
| 12/10/2020 | 22:09:26 | 20.92       | 0.02    |                      | 22:09:26 | 21.06       | -0.08   |       |
| 12/10/2020 | 22:10:26 | 20.98       | 0.02    |                      | 22:10:26 | 21.06       | -0.08   |       |
| 12/10/2020 | 22:11:26 | 20.98       | 0.02    |                      | 22:11:26 | 21.05       | -0.08   |       |
| 12/10/2020 | 22:12:26 | 20.98       | 0.02    |                      | 22:12:26 | 21.05       | -0.08   |       |
| 12/10/2020 | 22:13:26 | 20.98       | 0.02    |                      | 22:13:26 | 21.06       | -0.08   |       |
| 12/10/2020 | 22:14:26 | 20.98       | 0.02    |                      | 22:14:26 | 21.06       | -0.09   |       |
| 12/10/2020 | 22:15:26 | 20.98       | 0.02    |                      | 22:15:26 | 21.05       | -0.08   |       |
| 12/10/2020 | 22:16:26 | 20.98       | 0.02    |                      | 22:16:26 | 21.05       | -0.08   |       |
| 12/10/2020 | 22:17:26 | 20.98       | 0.02    |                      | 22:17:26 | 21.05       | -0.07   |       |
| 12/10/2020 | 22:18:26 | 20.96       | 0.03    |                      | 22:18:26 | 21.05       | -0.08   |       |
| 12/10/2020 | 22:19:26 | 20.92       | 0.06    |                      | 22:19:26 | 21.05       | -0.08   |       |
| 12/10/2020 | 22:20:26 | 20.90       | 0.07    | Start Run 1 BH#2     | 22:20:26 | 21.05       | -0.08   |       |
| 12/10/2020 | 22:21:26 | 20.89       | 0.07    |                      | 22:21:26 | 21.05       | -0.08   |       |
| 12/10/2020 | 22:22:26 | 20.87       | 0.07    | Stratification Check | 22:22:26 | 21.05       | -0.09   |       |
| 12/10/2020 | 22:23:26 | 20.87       | 0.07    |                      | 22:23:26 | 21.05       | -0.08   |       |
| 12/10/2020 | 22:24:26 | 20.87       | 0.07    |                      | 22:24:26 | 21.05       | -0.09   |       |
| 12/10/2020 | 22:25:26 | 20.88       | 0.07    |                      | 22:25:26 | 21.04       | -0.09   |       |
| 12/10/2020 | 22:26:26 | 20.88       | 0.07    |                      | 22:26:26 | 21.05       | -0.09   |       |
| 12/10/2020 | 22:27:26 | 20.88       | 0.07    |                      | 22:27:26 | 21.05       | -0.09   |       |
| 12/10/2020 | 22:28:26 | 20.88       | 0.07    |                      | 22:28:26 | 21.05       | -0.09   |       |
| 12/10/2020 | 22:29:26 | 20.88       | 0.08    |                      | 22:29:26 | 21.05       | -0.10   |       |
| 12/10/2020 | 22:30:26 | 20.86       | 0.10    |                      | 22:30:26 | 21.05       | -0.10   |       |
| 12/10/2020 | 22:31:26 | 20.85       | 0.11    |                      | 22:31:26 | 21.06       | -0.11   |       |
| 12/10/2020 | 22:32:26 | 20.85       | 0.11    |                      | 22:32:26 | 21.07       | -0.12   |       |
| 12/10/2020 | 22:33:26 | 20.86       | 0.12    |                      | 22:33:26 | 21.05       | -0.11   |       |
| 12/10/2020 | 22:34:26 | 20.86       | 0.11    |                      | 22:34:26 | 21.05       | -0.11   |       |

**SLR**  
**Columbia Steel**  
**Method 3A Baghouse #1 and Baghouse #2**

| Date       | Time     | Baghouse #2 |         |       | Time           | Baghouse #1 |         |       |
|------------|----------|-------------|---------|-------|----------------|-------------|---------|-------|
|            |          | O2 [%]      | CO2 [%] | Notes |                | O2 [%]      | CO2 [%] | Notes |
| 12/10/2020 | 22:35:26 | 20.87       | 0.11    |       | 22:35:26       | 21.05       | -0.10   |       |
| 12/10/2020 | 22:36:26 | 20.88       | 0.10    |       | 22:36:26       | 21.05       | -0.10   |       |
| 12/10/2020 | 22:37:26 | 20.86       | 0.11    |       | 22:37:26       | 21.05       | -0.10   |       |
| 12/10/2020 | 22:38:26 | 20.86       | 0.13    |       | 22:38:26       | 21.05       | -0.11   |       |
| 12/10/2020 | 22:39:26 | 20.87       | 0.13    |       | 22:39:26       | 21.05       | -0.11   |       |
| 12/10/2020 | 22:40:26 | 20.87       | 0.12    |       | 22:40:26       | 21.05       | -0.11   |       |
| 12/10/2020 | 22:41:26 | 20.87       | 0.13    |       | 22:41:26       | 21.04       | -0.11   |       |
| 12/10/2020 | 22:42:26 | 20.87       | 0.13    |       | 22:42:26       | 20.93       | 0.09    |       |
| 12/10/2020 | 22:43:26 | 20.88       | 0.12    |       | 20.88 22:43:26 | 20.95       | 0.05    |       |
| 12/10/2020 | 22:44:26 | 20.88       | 0.11    |       | 22:44:26       | 20.79       | 0.30    |       |
| 12/10/2020 | 22:45:26 | 20.88       | 0.11    |       | 22:45:26       | 20.67       | 0.45    |       |
| 12/10/2020 | 22:46:26 | 20.87       | 0.12    |       | 22:46:26       | 20.88       | 0.15    |       |
| 12/10/2020 | 22:47:26 | 20.87       | 0.11    |       | 22:47:26       | 21.00       | -0.07   |       |
| 12/10/2020 | 22:48:26 | 20.88       | 0.09    |       | 22:48:26       | 21.03       | -0.10   |       |
| 12/10/2020 | 22:49:26 | 20.89       | 0.08    |       | 22:49:26       | 21.02       | -0.06   |       |
| 12/10/2020 | 22:50:26 | 20.90       | 0.08    |       | 22:50:26       | 21.01       | -0.05   |       |
| 12/10/2020 | 22:51:26 | 20.90       | 0.08    |       | 22:51:26       | 21.01       | -0.04   |       |
| 12/10/2020 | 22:52:26 | 20.88       | 0.10    |       | 22:52:26       | 21.02       | -0.08   |       |
| 12/10/2020 | 22:53:26 | 20.89       | 0.09    |       | 22:53:26       | 21.04       | -0.11   |       |
| 12/10/2020 | 22:54:26 | 20.90       | 0.07    |       | 22:54:26       | 21.05       | -0.13   |       |
| 12/10/2020 | 22:55:26 | 20.89       | 0.07    |       | 22:55:26       | 21.05       | -0.13   |       |
| 12/10/2020 | 22:56:26 | 20.88       | 0.08    |       | 22:56:26       | 21.05       | -0.12   |       |
| 12/10/2020 | 22:57:26 | 20.89       | 0.09    |       | 22:57:26       | 21.05       | -0.13   |       |
| 12/10/2020 | 22:58:26 | 20.88       | 0.09    |       | 22:58:26       | 21.05       | -0.13   |       |
| 12/10/2020 | 22:59:26 | 20.89       | 0.09    |       | 22:59:26       | 21.06       | -0.14   |       |
| 12/10/2020 | 23:00:26 | 20.89       | 0.09    |       | 23:00:26       | 21.06       | -0.14   |       |
| 12/10/2020 | 23:01:26 | 20.89       | 0.10    |       | 23:01:26       | 21.05       | -0.14   |       |
| 12/10/2020 | 23:02:26 | 20.89       | 0.10    |       | 23:02:26       | 21.06       | -0.14   |       |
| 12/10/2020 | 23:03:26 | 20.90       | 0.09    |       | 23:03:26       | 21.06       | -0.14   |       |
| 12/10/2020 | 23:04:26 | 20.90       | 0.09    |       | 23:04:26       | 21.06       | -0.14   |       |
| 12/10/2020 | 23:05:26 | 20.89       | 0.10    |       | 23:05:26       | 21.05       | -0.15   |       |
| 12/10/2020 | 23:06:26 | 20.88       | 0.11    |       | 23:06:26       | 21.05       | -0.14   |       |
| 12/10/2020 | 23:07:26 | 20.88       | 0.12    |       | 23:07:26       | 21.05       | -0.15   |       |
| 12/10/2020 | 23:08:26 | 20.89       | 0.11    |       | 23:08:26       | 21.06       | -0.15   |       |
| 12/10/2020 | 23:09:26 | 20.90       | 0.10    |       | 23:09:26       | 21.06       | -0.15   |       |
| 12/10/2020 | 23:10:26 | 20.91       | 0.09    |       | 23:10:26       | 21.06       | -0.15   |       |
| 12/10/2020 | 23:11:26 | 20.90       | 0.09    |       | 23:11:26       | 21.06       | -0.15   |       |
| 12/10/2020 | 23:12:26 | 20.90       | 0.09    |       | 23:12:26       | 21.08       | -0.17   |       |
| 12/10/2020 | 23:13:26 | 20.91       | 0.08    |       | 23:13:26       | 21.09       | -0.17   |       |
| 12/10/2020 | 23:14:26 | 20.91       | 0.08    |       | 23:14:26       | 21.04       | -0.14   |       |
| 12/10/2020 | 23:15:26 | 20.91       | 0.08    |       | 23:15:26       | 21.04       | -0.13   |       |
| 12/10/2020 | 23:16:26 | 20.91       | 0.08    |       | 23:16:26       | 21.05       | -0.14   |       |
| 12/10/2020 | 23:17:26 | 20.91       | 0.08    |       | 23:17:26       | 21.05       | -0.14   |       |
| 12/10/2020 | 23:18:26 | 20.91       | 0.08    |       | 23:18:26       | 21.05       | -0.14   |       |
| 12/10/2020 | 23:19:26 | 20.91       | 0.09    |       | 23:19:26       | 21.07       | -0.15   |       |
| 12/10/2020 | 23:20:26 | 20.91       | 0.09    |       | 23:20:26       | 21.08       | -0.16   |       |
| 12/10/2020 | 23:21:26 | 20.91       | 0.09    |       | 23:21:26       | 21.09       | -0.17   |       |
| 12/10/2020 | 23:22:26 | 20.92       | 0.08    |       | 23:22:26       | 21.07       | -0.16   |       |
| 12/10/2020 | 23:23:26 | 20.92       | 0.08    |       | 23:23:26       | 21.05       | -0.15   |       |
| 12/10/2020 | 23:24:26 | 20.92       | 0.08    |       | 23:24:26       | 21.04       | -0.14   |       |
| 12/10/2020 | 23:25:26 | 20.93       | 0.08    |       | 23:25:26       | 21.06       | -0.15   |       |
| 12/10/2020 | 23:26:26 | 20.91       | 0.09    |       | 23:26:26       | 21.06       | -0.15   |       |

**SLR**  
**Columbia Steel**  
**Method 3A Baghouse #1 and Baghouse #2**

| Date       | Time     | Baghouse #2 |         |       | Time     | Baghouse #1 |         |       |
|------------|----------|-------------|---------|-------|----------|-------------|---------|-------|
|            |          | O2 [%]      | CO2 [%] | Notes |          | O2 [%]      | CO2 [%] | Notes |
| 12/10/2020 | 23:27:26 | 20.92       | 0.09    |       | 23:27:26 | 21.07       | -0.15   |       |
| 12/10/2020 | 23:28:26 | 20.92       | 0.09    |       | 23:28:26 | 21.07       | -0.16   |       |
| 12/10/2020 | 23:29:26 | 20.92       | 0.09    |       | 23:29:26 | 21.07       | -0.16   |       |
| 12/10/2020 | 23:30:26 | 20.93       | 0.08    |       | 23:30:26 | 21.07       | -0.16   |       |
| 12/10/2020 | 23:31:26 | 20.92       | 0.12    |       | 23:31:26 | 21.07       | -0.16   |       |
| 12/10/2020 | 23:32:26 | 20.97       | 0.19    |       | 23:32:26 | 21.05       | -0.16   |       |
| 12/10/2020 | 23:33:26 | 20.92       | 0.08    |       | 23:33:26 | 21.05       | -0.16   |       |
| 12/10/2020 | 23:34:26 | 20.92       | 0.08    |       | 23:34:26 | 21.05       | -0.16   |       |
| 12/10/2020 | 23:35:26 | 20.92       | 0.08    |       | 23:35:26 | 21.04       | -0.16   |       |
| 12/10/2020 | 23:36:26 | 20.93       | 0.08    |       | 23:36:26 | 21.04       | -0.16   |       |
| 12/10/2020 | 23:37:26 | 20.93       | 0.08    |       | 23:37:26 | 21.04       | -0.16   |       |
| 12/10/2020 | 23:38:26 | 20.93       | 0.08    |       | 23:38:26 | 21.04       | -0.16   |       |
| 12/10/2020 | 23:39:26 | 20.93       | 0.08    |       | 23:39:26 | 21.04       | -0.16   |       |
| 12/10/2020 | 23:40:26 | 20.94       | 0.07    |       | 23:40:26 | 21.04       | -0.15   |       |
| 12/10/2020 | 23:41:26 | 20.94       | 0.07    |       | 23:41:26 | 21.04       | -0.16   |       |
| 12/10/2020 | 23:42:26 | 20.94       | 0.07    |       | 23:42:26 | 21.04       | -0.15   |       |
| 12/10/2020 | 23:43:26 | 20.93       | 0.08    |       | 23:43:26 | 21.04       | -0.16   |       |
| 12/10/2020 | 23:44:26 | 20.92       | 0.10    |       | 23:44:26 | 21.04       | -0.15   |       |
| 12/10/2020 | 23:45:26 | 20.91       | 0.11    |       | 23:45:26 | 21.04       | -0.15   |       |
| 12/10/2020 | 23:46:26 | 20.87       | 0.13    |       | 23:46:26 | 21.04       | -0.14   |       |
| 12/10/2020 | 23:47:26 | 20.88       | 0.13    |       | 23:47:26 | 21.04       | -0.14   |       |
| 12/10/2020 | 23:48:26 | 20.89       | 0.10    |       | 23:48:26 | 21.04       | -0.15   |       |
| 12/10/2020 | 23:49:26 | 20.89       | 0.10    |       | 23:49:26 | 21.05       | -0.16   |       |
| 12/10/2020 | 23:50:26 | 20.89       | 0.10    |       | 23:50:26 | 21.05       | -0.16   |       |
| 12/10/2020 | 23:51:26 | 20.89       | 0.10    |       | 23:51:26 | 21.05       | -0.16   |       |
| 12/10/2020 | 23:52:26 | 20.91       | 0.09    |       | 23:52:26 | 21.05       | -0.16   |       |
| 12/10/2020 | 23:53:26 | 20.92       | 0.08    |       | 23:53:26 | 21.05       | -0.17   |       |
| 12/10/2020 | 23:54:26 | 20.92       | 0.09    |       | 23:54:26 | 21.05       | -0.17   |       |
| 12/10/2020 | 23:55:26 | 20.93       | 0.08    |       | 23:55:26 | 21.05       | -0.17   |       |
| 12/10/2020 | 23:56:26 | 20.93       | 0.08    |       | 23:56:26 | 21.05       | -0.17   |       |
| 12/10/2020 | 23:57:26 | 20.94       | 0.08    |       | 23:57:26 | 21.05       | -0.17   |       |
| 12/10/2020 | 23:58:26 | 20.93       | 0.09    |       | 23:58:26 | 21.06       | -0.17   |       |
| 12/10/2020 | 23:59:26 | 20.91       | 0.11    |       | 23:59:26 | 21.06       | -0.17   |       |
| 12/11/2020 | 0:00:26  | 20.95       | 0.06    |       | 0:00:26  | 21.05       | -0.17   |       |
| 12/11/2020 | 0:01:26  | 20.97       | 0.04    |       | 0:01:26  | 21.06       | -0.18   |       |
| 12/11/2020 | 0:02:26  | 20.97       | 0.04    |       | 0:02:26  | 21.05       | -0.18   |       |
| 12/11/2020 | 0:03:26  | 20.97       | 0.04    |       | 0:03:26  | 21.05       | -0.18   |       |
| 12/11/2020 | 0:04:26  | 20.97       | 0.03    |       | 0:04:26  | 21.05       | -0.18   |       |
| 12/11/2020 | 0:05:26  | 20.97       | 0.03    |       | 0:05:26  | 21.05       | -0.17   |       |
| 12/11/2020 | 0:06:26  | 20.97       | 0.02    |       | 0:06:26  | 21.05       | -0.18   |       |
| 12/11/2020 | 0:07:26  | 20.97       | 0.02    |       | 0:07:26  | 21.05       | -0.19   |       |
| 12/11/2020 | 0:08:26  | 20.98       | 0.03    |       | 0:08:26  | 21.05       | -0.18   |       |
| 12/11/2020 | 0:09:26  | 20.97       | 0.02    |       | 0:09:26  | 21.03       | -0.17   |       |
| 12/11/2020 | 0:10:26  | 20.97       | 0.03    |       | 0:10:26  | 21.05       | -0.19   |       |
| 12/11/2020 | 0:11:26  | 20.96       | 0.04    |       | 0:11:26  | 21.05       | -0.19   |       |
| 12/11/2020 | 0:12:26  | 20.91       | 0.10    |       | 0:12:26  | 21.05       | -0.19   |       |
| 12/11/2020 | 0:13:26  | 20.86       | 0.13    |       | 0:13:26  | 21.05       | -0.19   |       |
| 12/11/2020 | 0:14:26  | 20.88       | 0.11    |       | 0:14:26  | 21.06       | -0.19   |       |
| 12/11/2020 | 0:15:26  | 20.91       | 0.09    |       | 0:15:26  | 21.06       | -0.19   |       |
| 12/11/2020 | 0:16:26  | 20.87       | 0.12    |       | 0:16:26  | 21.06       | -0.19   |       |
| 12/11/2020 | 0:17:26  | 20.83       | 0.15    |       | 0:17:26  | 21.06       | -0.19   |       |
| 12/11/2020 | 0:18:26  | 20.83       | 0.16    |       | 0:18:26  | 21.06       | -0.19   |       |

**SLR**  
**Columbia Steel**  
**Method 3A Baghouse #1 and Baghouse #2**

| Date       | Time    | Baghouse #2 |         |       | Time    | Baghouse #1 |         |       |
|------------|---------|-------------|---------|-------|---------|-------------|---------|-------|
|            |         | O2 [%]      | CO2 [%] | Notes |         | O2 [%]      | CO2 [%] | Notes |
| 12/11/2020 | 0:19:26 | 20.84       | 0.17    |       | 0:19:26 | 21.07       | -0.19   |       |
| 12/11/2020 | 0:20:26 | 20.85       | 0.16    |       | 0:20:26 | 21.07       | -0.19   |       |
| 12/11/2020 | 0:21:26 | 20.84       | 0.17    |       | 0:21:26 | 21.07       | -0.19   |       |
| 12/11/2020 | 0:22:26 | 20.85       | 0.15    |       | 0:22:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 0:23:26 | 20.85       | 0.15    |       | 0:23:26 | 21.08       | -0.20   |       |
| 12/11/2020 | 0:24:26 | 20.86       | 0.14    |       | 0:24:26 | 21.08       | -0.20   |       |
| 12/11/2020 | 0:25:26 | 20.86       | 0.14    |       | 0:25:26 | 21.07       | -0.19   |       |
| 12/11/2020 | 0:26:26 | 20.96       | 0.17    |       | 0:26:26 | 21.07       | -0.19   |       |
| 12/11/2020 | 0:27:26 | 20.96       | 0.11    |       | 0:27:26 | 21.06       | -0.18   |       |
| 12/11/2020 | 0:28:26 | 20.92       | 0.11    |       | 0:28:26 | 21.05       | -0.18   |       |
| 12/11/2020 | 0:29:26 | 20.92       | 0.12    |       | 0:29:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 0:30:26 | 20.91       | 0.11    |       | 0:30:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 0:31:26 | 20.91       | 0.10    |       | 0:31:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 0:32:26 | 20.94       | 0.09    |       | 0:32:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 0:33:26 | 20.94       | 0.10    |       | 0:33:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 0:34:26 | 20.93       | 0.10    |       | 0:34:26 | 21.03       | -0.18   |       |
| 12/11/2020 | 0:35:26 | 20.93       | 0.11    |       | 0:35:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 0:36:26 | 20.94       | 0.12    |       | 0:36:26 | 21.03       | -0.19   |       |
| 12/11/2020 | 0:37:26 | 20.92       | 0.12    |       | 0:37:26 | 21.03       | -0.19   |       |
| 12/11/2020 | 0:38:26 | 20.93       | 0.12    |       | 0:38:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 0:39:26 | 20.91       | 0.11    |       | 0:39:26 | 21.03       | -0.19   |       |
| 12/11/2020 | 0:40:26 | 20.93       | 0.12    |       | 0:40:26 | 21.03       | -0.19   |       |
| 12/11/2020 | 0:41:26 | 20.94       | 0.10    |       | 0:41:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 0:42:26 | 20.95       | 0.10    |       | 0:42:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 0:43:26 | 20.95       | 0.10    |       | 0:43:26 | 21.03       | -0.19   |       |
| 12/11/2020 | 0:44:26 | 20.91       | 0.10    |       | 0:44:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 0:45:26 | 20.91       | 0.10    |       | 0:45:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 0:46:26 | 20.91       | 0.10    |       | 0:46:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 0:47:26 | 20.90       | 0.10    |       | 0:47:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 0:48:26 | 20.90       | 0.10    |       | 0:48:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 0:49:26 | 20.89       | 0.11    |       | 0:49:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 0:50:26 | 20.89       | 0.12    |       | 0:50:26 | 21.03       | -0.18   |       |
| 12/11/2020 | 0:51:26 | 20.90       | 0.11    |       | 0:51:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 0:52:26 | 20.91       | 0.12    |       | 0:52:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 0:53:26 | 20.91       | 0.12    |       | 0:53:26 | 21.03       | -0.19   |       |
| 12/11/2020 | 0:54:26 | 20.92       | 0.12    |       | 0:54:26 | 21.03       | -0.18   |       |
| 12/11/2020 | 0:55:26 | 20.93       | 0.12    |       | 0:55:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 0:56:26 | 20.93       | 0.12    |       | 0:56:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 0:57:26 | 20.93       | 0.11    |       | 0:57:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 0:58:26 | 20.93       | 0.11    |       | 0:58:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 0:59:26 | 20.94       | 0.10    |       | 0:59:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 1:00:26 | 20.95       | 0.10    |       | 1:00:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 1:01:26 | 20.95       | 0.10    |       | 1:01:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 1:02:26 | 20.94       | 0.11    |       | 1:02:26 | 21.05       | -0.18   |       |
| 12/11/2020 | 1:03:26 | 20.95       | 0.11    |       | 1:03:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 1:04:26 | 20.94       | 0.11    |       | 1:04:26 | 21.05       | -0.18   |       |
| 12/11/2020 | 1:05:26 | 20.93       | 0.12    |       | 1:05:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 1:06:26 | 20.94       | 0.12    |       | 1:06:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 1:07:26 | 20.94       | 0.11    |       | 1:07:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 1:08:26 | 20.94       | 0.11    |       | 1:08:26 | 21.05       | -0.18   |       |
| 12/11/2020 | 1:09:26 | 20.94       | 0.13    |       | 1:09:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 1:10:26 | 20.92       | 0.16    |       | 1:10:26 | 20.97       | -0.04   |       |

**SLR**  
**Columbia Steel**  
**Method 3A Baghouse #1 and Baghouse #2**

| Date       | Time    | Baghouse #2 |         |       | Time    | Baghouse #1 |         |       |
|------------|---------|-------------|---------|-------|---------|-------------|---------|-------|
|            |         | O2 [%]      | CO2 [%] | Notes |         | O2 [%]      | CO2 [%] | Notes |
| 12/11/2020 | 1:11:26 | 20.94       | 0.13    |       | 1:11:26 | 21.00       | -0.12   |       |
| 12/11/2020 | 1:12:26 | 20.94       | 0.12    |       | 1:12:26 | 20.82       | 0.16    |       |
| 12/11/2020 | 1:13:26 | 20.95       | 0.12    |       | 1:13:26 | 20.59       | 0.46    |       |
| 12/11/2020 | 1:14:26 | 20.96       | 0.12    |       | 1:14:26 | 20.65       | 0.39    |       |
| 12/11/2020 | 1:15:26 | 20.97       | 0.12    |       | 1:15:26 | 20.93       | -0.02   |       |
| 12/11/2020 | 1:16:26 | 20.95       | 0.12    |       | 1:16:26 | 21.02       | -0.18   |       |
| 12/11/2020 | 1:17:26 | 20.94       | 0.12    |       | 1:17:26 | 21.03       | -0.19   |       |
| 12/11/2020 | 1:18:26 | 20.93       | 0.12    |       | 1:18:26 | 21.03       | -0.17   |       |
| 12/11/2020 | 1:19:26 | 20.93       | 0.12    |       | 1:19:26 | 21.02       | -0.15   |       |
| 12/11/2020 | 1:20:26 | 20.93       | 0.11    |       | 1:20:26 | 21.01       | -0.12   |       |
| 12/11/2020 | 1:21:26 | 20.93       | 0.11    |       | 1:21:26 | 21.02       | -0.13   |       |
| 12/11/2020 | 1:22:26 | 20.94       | 0.11    |       | 1:22:26 | 21.01       | -0.11   |       |
| 12/11/2020 | 1:23:26 | 20.96       | 0.10    |       | 1:23:26 | 21.02       | -0.15   |       |
| 12/11/2020 | 1:24:26 | 20.97       | 0.10    |       | 1:24:26 | 21.03       | -0.17   |       |
| 12/11/2020 | 1:25:26 | 20.97       | 0.10    |       | 1:25:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 1:26:26 | 20.95       | 0.11    |       | 1:26:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 1:27:26 | 20.95       | 0.11    |       | 1:27:26 | 21.05       | -0.18   |       |
| 12/11/2020 | 1:28:26 | 20.95       | 0.11    |       | 1:28:26 | 21.04       | -0.17   |       |
| 12/11/2020 | 1:29:26 | 20.96       | 0.11    |       | 1:29:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 1:30:26 | 20.95       | 0.14    |       | 1:30:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 1:31:26 | 20.95       | 0.13    |       | 1:31:26 | 21.05       | -0.18   |       |
| 12/11/2020 | 1:32:26 | 20.96       | 0.12    |       | 1:32:26 | 21.05       | -0.18   |       |
| 12/11/2020 | 1:33:26 | 20.96       | 0.11    |       | 1:33:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 1:34:26 | 20.96       | 0.12    |       | 1:34:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 1:35:26 | 20.96       | 0.12    |       | 1:35:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 1:36:26 | 20.96       | 0.13    |       | 1:36:26 | 21.05       | -0.18   |       |
| 12/11/2020 | 1:37:26 | 20.96       | 0.13    |       | 1:37:26 | 21.07       | -0.20   |       |
| 12/11/2020 | 1:38:26 | 20.96       | 0.13    |       | 1:38:26 | 21.08       | -0.21   |       |
| 12/11/2020 | 1:39:26 | 20.96       | 0.13    |       | 1:39:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 1:40:26 | 20.96       | 0.13    |       | 1:40:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 1:41:26 | 20.96       | 0.13    |       | 1:41:26 | 21.05       | -0.18   |       |
| 12/11/2020 | 1:42:26 | 20.96       | 0.13    |       | 1:42:26 | 21.05       | -0.18   |       |
| 12/11/2020 | 1:43:26 | 20.96       | 0.13    |       | 1:43:26 | 21.05       | -0.17   |       |
| 12/11/2020 | 1:44:26 | 20.97       | 0.13    |       | 1:44:26 | 21.05       | -0.18   |       |
| 12/11/2020 | 1:45:26 | 20.97       | 0.13    |       | 1:45:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 1:46:26 | 20.96       | 0.12    |       | 1:46:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 1:47:26 | 20.95       | 0.12    |       | 1:47:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 1:48:26 | 20.94       | 0.12    |       | 1:48:26 | 21.08       | -0.21   |       |
| 12/11/2020 | 1:49:26 | 20.94       | 0.12    |       | 1:49:26 | 21.08       | -0.21   |       |
| 12/11/2020 | 1:50:26 | 20.96       | 0.12    |       | 1:50:26 | 21.08       | -0.22   |       |
| 12/11/2020 | 1:51:26 | 20.97       | 0.12    |       | 1:51:26 | 21.08       | -0.22   |       |
| 12/11/2020 | 1:52:26 | 20.93       | 0.15    |       | 1:52:26 | 21.09       | -0.21   |       |
| 12/11/2020 | 1:53:26 | 20.93       | 0.13    |       | 1:53:26 | 21.07       | -0.20   |       |
| 12/11/2020 | 1:54:26 | 20.95       | 0.12    |       | 1:54:26 | 21.07       | -0.20   |       |
| 12/11/2020 | 1:55:26 | 20.97       | 0.12    |       | 1:55:26 | 21.07       | -0.19   |       |
| 12/11/2020 | 1:56:26 | 20.94       | 0.12    |       | 1:56:26 | 21.07       | -0.19   |       |
| 12/11/2020 | 1:57:26 | 20.93       | 0.13    |       | 1:57:26 | 21.06       | -0.18   |       |
| 12/11/2020 | 1:58:26 | 20.92       | 0.14    |       | 1:58:26 | 21.06       | -0.18   |       |
| 12/11/2020 | 1:59:26 | 20.96       | 0.13    |       | 1:59:26 | 21.06       | -0.18   |       |
| 12/11/2020 | 2:00:26 | 20.93       | 0.13    |       | 2:00:26 | 21.06       | -0.18   |       |
| 12/11/2020 | 2:01:26 | 20.95       | 0.13    |       | 2:01:26 | 21.06       | -0.18   |       |
| 12/11/2020 | 2:02:26 | 20.96       | 0.14    |       | 2:02:26 | 21.06       | -0.18   |       |

**SLR**  
**Columbia Steel**  
**Method 3A Baghouse #1 and Baghouse #2**

| Date       | Time    | Baghouse #2 |         |       | Time    | Baghouse #1 |         |       |
|------------|---------|-------------|---------|-------|---------|-------------|---------|-------|
|            |         | O2 [%]      | CO2 [%] | Notes |         | O2 [%]      | CO2 [%] | Notes |
| 12/11/2020 | 2:03:26 | 20.90       | 0.24    |       | 2:03:26 | 21.06       | -0.18   |       |
| 12/11/2020 | 2:04:26 | 20.94       | 0.18    |       | 2:04:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 2:05:26 | 20.97       | 0.13    |       | 2:05:26 | 21.07       | -0.19   |       |
| 12/11/2020 | 2:06:26 | 20.94       | 0.14    |       | 2:06:26 | 21.07       | -0.19   |       |
| 12/11/2020 | 2:07:26 | 20.92       | 0.14    |       | 2:07:26 | 21.09       | -0.21   |       |
| 12/11/2020 | 2:08:26 | 20.95       | 0.14    |       | 2:08:26 | 21.09       | -0.22   |       |
| 12/11/2020 | 2:09:26 | 20.95       | 0.15    |       | 2:09:26 | 21.09       | -0.21   |       |
| 12/11/2020 | 2:10:26 | 20.95       | 0.13    |       | 2:10:26 | 21.09       | -0.21   |       |
| 12/11/2020 | 2:11:26 | 20.93       | 0.13    |       | 2:11:26 | 21.09       | -0.21   |       |
| 12/11/2020 | 2:12:26 | 20.92       | 0.14    |       | 2:12:26 | 21.09       | -0.21   |       |
| 12/11/2020 | 2:13:26 | 20.95       | 0.15    |       | 2:13:26 | 21.07       | -0.20   |       |
| 12/11/2020 | 2:14:26 | 20.92       | 0.14    |       | 2:14:26 | 21.07       | -0.20   |       |
| 12/11/2020 | 2:15:26 | 20.94       | 0.14    |       | 2:15:26 | 21.07       | -0.20   |       |
| 12/11/2020 | 2:16:26 | 20.93       | 0.14    |       | 2:16:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 2:17:26 | 20.93       | 0.13    |       | 2:17:26 | 21.07       | -0.20   |       |
| 12/11/2020 | 2:18:26 | 20.95       | 0.13    |       | 2:18:26 | 21.07       | -0.20   |       |
| 12/11/2020 | 2:19:26 | 20.94       | 0.12    |       | 2:19:26 | 21.07       | -0.20   |       |
| 12/11/2020 | 2:20:26 | 20.96       | 0.12    |       | 2:20:26 | 21.07       | -0.20   |       |
| 12/11/2020 | 2:21:26 | 20.94       | 0.12    |       | 2:21:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 2:22:26 | 20.95       | 0.13    |       | 2:22:26 | 21.07       | -0.20   |       |
| 12/11/2020 | 2:23:26 | 20.95       | 0.12    |       | 2:23:26 | 21.07       | -0.20   |       |
| 12/11/2020 | 2:24:26 | 20.96       | 0.12    |       | 2:24:26 | 21.07       | -0.20   |       |
| 12/11/2020 | 2:25:26 | 21.01       | 0.10    |       | 2:25:26 | 21.08       | -0.20   |       |
| 12/11/2020 | 2:26:26 | 21.00       | 0.08    |       | 2:26:26 | 21.09       | -0.21   |       |
| 12/11/2020 | 2:27:26 | 20.99       | 0.08    |       | 2:27:26 | 21.09       | -0.22   |       |
| 12/11/2020 | 2:28:26 | 20.99       | 0.09    |       | 2:28:26 | 21.09       | -0.21   |       |
| 12/11/2020 | 2:29:26 | 20.95       | 0.16    |       | 2:29:26 | 21.07       | -0.21   |       |
| 12/11/2020 | 2:30:26 | 20.89       | 0.19    |       | 2:30:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 2:31:26 | 20.89       | 0.20    |       | 2:31:26 | 21.05       | -0.20   |       |
| 12/11/2020 | 2:32:26 | 20.88       | 0.20    |       | 2:32:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 2:33:26 | 20.87       | 0.21    |       | 2:33:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 2:34:26 | 20.89       | 0.20    |       | 2:34:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 2:35:26 | 20.88       | 0.20    |       | 2:35:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 2:36:26 | 20.90       | 0.20    |       | 2:36:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 2:37:26 | 20.89       | 0.21    |       | 2:37:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 2:38:26 | 20.85       | 0.26    |       | 2:38:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 2:39:26 | 20.87       | 0.26    |       | 2:39:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 2:40:26 | 20.86       | 0.25    |       | 2:40:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 2:41:26 | 20.91       | 0.21    |       | 2:41:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 2:42:26 | 20.92       | 0.17    |       | 2:42:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 2:43:26 | 20.93       | 0.15    |       | 2:43:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 2:44:26 | 20.92       | 0.15    |       | 2:44:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 2:45:26 | 20.93       | 0.13    |       | 2:45:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 2:46:26 | 20.94       | 0.12    |       | 2:46:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 2:47:26 | 20.95       | 0.12    |       | 2:47:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 2:48:26 | 20.96       | 0.12    |       | 2:48:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 2:49:26 | 20.92       | 0.15    |       | 2:49:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 2:50:26 | 20.92       | 0.17    |       | 2:50:26 | 21.05       | -0.20   |       |
| 12/11/2020 | 2:51:26 | 20.92       | 0.19    |       | 2:51:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 2:52:26 | 20.94       | 0.20    |       | 2:52:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 2:53:26 | 20.94       | 0.20    |       | 2:53:26 | 21.05       | -0.20   |       |
| 12/11/2020 | 2:54:26 | 20.94       | 0.19    |       | 2:54:26 | 21.06       | -0.20   |       |

**SLR**  
**Columbia Steel**  
**Method 3A Baghouse #1 and Baghouse #2**

| Date       | Time    | Baghouse #2 |         |       | Time    | Baghouse #1 |         |       |
|------------|---------|-------------|---------|-------|---------|-------------|---------|-------|
|            |         | O2 [%]      | CO2 [%] | Notes |         | O2 [%]      | CO2 [%] | Notes |
| 12/11/2020 | 2:55:26 | 20.94       | 0.19    |       | 2:55:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 2:56:26 | 20.93       | 0.20    |       | 2:56:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 2:57:26 | 20.94       | 0.19    |       | 2:57:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 2:58:26 | 20.95       | 0.16    |       | 2:58:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 2:59:26 | 20.95       | 0.16    |       | 2:59:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 3:00:26 | 20.94       | 0.17    |       | 3:00:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 3:01:26 | 20.92       | 0.16    |       | 3:01:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 3:02:26 | 20.93       | 0.13    |       | 3:02:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 3:03:26 | 20.96       | 0.13    |       | 3:03:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 3:04:26 | 20.96       | 0.13    |       | 3:04:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 3:05:26 | 20.94       | 0.13    |       | 3:05:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 3:06:26 | 20.96       | 0.12    |       | 3:06:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 3:07:26 | 20.94       | 0.13    |       | 3:07:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 3:08:26 | 20.91       | 0.14    |       | 3:08:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 3:09:26 | 20.90       | 0.19    |       | 3:09:26 | 21.05       | -0.18   |       |
| 12/11/2020 | 3:10:26 | 20.93       | 0.16    |       | 3:10:26 | 21.05       | -0.17   |       |
| 12/11/2020 | 3:11:26 | 20.94       | 0.13    |       | 3:11:26 | 21.05       | -0.18   |       |
| 12/11/2020 | 3:12:26 | 20.94       | 0.13    |       | 3:12:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 3:13:26 | 20.95       | 0.13    |       | 3:13:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 3:14:26 | 20.93       | 0.14    |       | 3:14:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 3:15:26 | 20.91       | 0.14    |       | 3:15:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 3:16:26 | 20.89       | 0.15    |       | 3:16:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 3:17:26 | 20.93       | 0.14    |       | 3:17:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 3:18:26 | 20.93       | 0.15    |       | 3:18:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 3:19:26 | 20.94       | 0.14    |       | 3:19:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 3:20:26 | 20.91       | 0.16    |       | 3:20:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 3:21:26 | 20.91       | 0.16    |       | 3:21:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 3:22:26 | 20.95       | 0.15    |       | 3:22:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 3:23:26 | 20.94       | 0.15    |       | 3:23:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 3:24:26 | 20.95       | 0.15    |       | 3:24:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 3:25:26 | 20.89       | 0.20    |       | 3:25:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 3:26:26 | 20.88       | 0.18    |       | 3:26:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 3:27:26 | 20.89       | 0.17    |       | 3:27:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 3:28:26 | 20.92       | 0.16    |       | 3:28:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 3:29:26 | 20.95       | 0.14    |       | 3:29:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 3:30:26 | 20.95       | 0.14    |       | 3:30:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 3:31:26 | 20.94       | 0.14    |       | 3:31:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 3:32:26 | 20.94       | 0.14    |       | 3:32:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 3:33:26 | 20.96       | 0.13    |       | 3:33:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 3:34:26 | 20.96       | 0.12    |       | 3:34:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 3:35:26 | 20.97       | 0.12    |       | 3:35:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 3:36:26 | 20.95       | 0.12    |       | 3:36:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 3:37:26 | 20.96       | 0.12    |       | 3:37:26 | 20.87       | 0.12    |       |
| 12/11/2020 | 3:38:26 | 20.96       | 0.12    |       | 3:38:26 | 20.69       | 0.36    |       |
| 12/11/2020 | 3:39:26 | 20.96       | 0.13    |       | 3:39:26 | 20.71       | 0.34    |       |
| 12/11/2020 | 3:40:26 | 20.96       | 0.13    |       | 3:40:26 | 20.94       | -0.03   |       |
| 12/11/2020 | 3:41:26 | 20.90       | 0.20    |       | 3:41:26 | 21.03       | -0.17   |       |
| 12/11/2020 | 3:42:26 | 20.88       | 0.27    |       | 3:42:26 | 21.03       | -0.17   |       |
| 12/11/2020 | 3:43:26 | 20.90       | 0.22    |       | 3:43:26 | 21.02       | -0.13   |       |
| 12/11/2020 | 3:44:26 | 20.91       | 0.17    |       | 3:44:26 | 21.00       | -0.10   |       |
| 12/11/2020 | 3:45:26 | 20.91       | 0.17    |       | 3:45:26 | 21.02       | -0.14   |       |
| 12/11/2020 | 3:46:26 | 20.88       | 0.23    |       | 3:46:26 | 21.03       | -0.16   |       |

**SLR**  
**Columbia Steel**  
**Method 3A Baghouse #1 and Baghouse #2**

| Date       | Time    | Baghouse #2 |         |       | Time    | Baghouse #1 |         |       |
|------------|---------|-------------|---------|-------|---------|-------------|---------|-------|
|            |         | O2 [%]      | CO2 [%] | Notes |         | O2 [%]      | CO2 [%] | Notes |
| 12/11/2020 | 3:47:26 | 20.84       | 0.29    |       | 3:47:26 | 21.03       | -0.15   |       |
| 12/11/2020 | 3:48:26 | 20.81       | 0.33    |       | 3:48:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 3:49:26 | 20.80       | 0.36    |       | 3:49:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 3:50:26 | 20.80       | 0.33    |       | 3:50:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 3:51:26 | 20.87       | 0.21    |       | 3:51:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 3:52:26 | 20.90       | 0.17    |       | 3:52:26 | 21.05       | -0.20   |       |
| 12/11/2020 | 3:53:26 | 20.91       | 0.16    |       | 3:53:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 3:54:26 | 20.92       | 0.16    |       | 3:54:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 3:55:26 | 20.93       | 0.16    |       | 3:55:26 | 21.05       | -0.18   |       |
| 12/11/2020 | 3:56:26 | 20.93       | 0.16    |       | 3:56:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 3:57:26 | 20.94       | 0.16    |       | 3:57:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 3:58:26 | 20.93       | 0.16    |       | 3:58:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 3:59:26 | 20.93       | 0.16    |       | 3:59:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 4:00:26 | 20.93       | 0.15    |       | 4:00:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 4:01:26 | 20.95       | 0.14    |       | 4:01:26 | 21.06       | -0.20   |       |
| 12/11/2020 | 4:02:26 | 20.94       | 0.14    |       | 4:02:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 4:03:26 | 20.94       | 0.15    |       | 4:03:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 4:04:26 | 20.94       | 0.15    |       | 4:04:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 4:05:26 | 20.92       | 0.18    |       | 4:05:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 4:06:26 | 20.81       | 0.32    |       | 4:06:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 4:07:26 | 20.85       | 0.27    |       | 4:07:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 4:08:26 | 20.88       | 0.22    |       | 4:08:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 4:09:26 | 20.89       | 0.22    |       | 4:09:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 4:10:26 | 20.88       | 0.23    |       | 4:10:26 | 21.08       | -0.20   |       |
| 12/11/2020 | 4:11:26 | 20.91       | 0.20    |       | 4:11:26 | 21.09       | -0.20   |       |
| 12/11/2020 | 4:12:26 | 20.90       | 0.17    |       | 4:12:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 4:13:26 | 20.92       | 0.16    |       | 4:13:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 4:14:26 | 20.93       | 0.16    |       | 4:14:26 | 21.05       | -0.19   |       |
| 12/11/2020 | 4:15:26 | 20.92       | 0.16    |       | 4:15:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 4:16:26 | 20.93       | 0.16    |       | 4:16:26 | 21.08       | -0.21   |       |
| 12/11/2020 | 4:17:26 | 20.92       | 0.17    |       | 4:17:26 | 21.08       | -0.21   |       |
| 12/11/2020 | 4:18:26 | 20.93       | 0.17    |       | 4:18:26 | 21.08       | -0.21   |       |
| 12/11/2020 | 4:19:26 | 20.93       | 0.16    |       | 4:19:26 | 21.09       | -0.21   |       |
| 12/11/2020 | 4:20:26 | 20.94       | 0.16    |       | 4:20:26 | 21.07       | -0.20   |       |
| 12/11/2020 | 4:21:26 | 20.93       | 0.16    |       | 4:21:26 | 21.06       | -0.19   |       |
| 12/11/2020 | 4:22:26 | 20.94       | 0.15    |       | 4:22:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 4:23:26 | 20.88       | 0.21    |       | 4:23:26 | 21.03       | -0.18   |       |
| 12/11/2020 | 4:24:26 | 20.85       | 0.24    |       | 4:24:26 | 21.03       | -0.19   |       |
| 12/11/2020 | 4:25:26 | 20.79       | 0.29    |       | 4:25:26 | 21.04       | -0.20   |       |
| 12/11/2020 | 4:26:26 | 20.80       | 0.29    |       | 4:26:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 4:27:26 | 20.81       | 0.28    |       | 4:27:26 | 21.05       | -0.20   |       |
| 12/11/2020 | 4:28:26 | 20.82       | 0.26    |       | 4:28:26 | 21.05       | -0.20   |       |
| 12/11/2020 | 4:29:26 | 20.85       | 0.23    |       | 4:29:26 | 21.05       | -0.20   |       |
| 12/11/2020 | 4:30:26 | 20.85       | 0.23    |       | 4:30:26 | 21.05       | -0.20   |       |
| 12/11/2020 | 4:31:26 | 20.86       | 0.24    |       | 4:31:26 | 21.05       | -0.20   |       |
| 12/11/2020 | 4:32:26 | 20.87       | 0.22    |       | 4:32:26 | 21.05       | -0.20   |       |
| 12/11/2020 | 4:33:26 | 20.87       | 0.22    |       | 4:33:26 | 21.04       | -0.20   |       |
| 12/11/2020 | 4:34:26 | 20.89       | 0.21    |       | 4:34:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 4:35:26 | 20.89       | 0.20    |       | 4:35:26 | 21.04       | -0.20   |       |
| 12/11/2020 | 4:36:26 | 20.90       | 0.18    |       | 4:36:26 | 21.05       | -0.20   |       |
| 12/11/2020 | 4:37:26 | 20.95       | 0.31    |       | 4:37:26 | 21.04       | -0.20   |       |
| 12/11/2020 | 4:38:26 | 20.93       | 0.19    |       | 4:38:26 | 21.04       | -0.19   |       |

**SLR**  
**Columbia Steel**  
**Method 3A Baghouse #1 and Baghouse #2**

| Date       | Time    | Baghouse #2 |         |                    | Time    | Baghouse #1 |         |       |
|------------|---------|-------------|---------|--------------------|---------|-------------|---------|-------|
|            |         | O2 [%]      | CO2 [%] | Notes              |         | O2 [%]      | CO2 [%] | Notes |
| 12/11/2020 | 4:39:26 | 20.92       | 0.18    |                    | 4:39:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 4:40:26 | 20.90       | 0.20    |                    | 4:40:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 4:41:26 | 20.91       | 0.20    |                    | 4:41:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 4:42:26 | 20.91       | 0.19    |                    | 4:42:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 4:43:26 | 20.91       | 0.18    |                    | 4:43:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 4:44:26 | 20.92       | 0.16    |                    | 4:44:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 4:45:26 | 20.93       | 0.16    |                    | 4:45:26 | 21.03       | -0.18   |       |
| 12/11/2020 | 4:46:26 | 20.93       | 0.16    |                    | 4:46:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 4:47:26 | 20.93       | 0.17    |                    | 4:47:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 4:48:26 | 20.93       | 0.16    |                    | 4:48:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 4:49:26 | 20.93       | 0.16    |                    | 4:49:26 | 21.03       | -0.18   |       |
| 12/11/2020 | 4:50:26 | 20.94       | 0.15    |                    | 4:50:26 | 21.03       | -0.18   |       |
| 12/11/2020 | 4:51:26 | 20.95       | 0.15    |                    | 4:51:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 4:52:26 | 20.93       | 0.19    |                    | 4:52:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 4:53:26 | 20.93       | 0.18    |                    | 4:53:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 4:54:26 | 20.92       | 0.19    |                    | 4:54:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 4:55:26 | 20.92       | 0.18    |                    | 4:55:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 4:56:26 | 20.92       | 0.17    |                    | 4:56:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 4:57:26 | 20.91       | 0.17    |                    | 4:57:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 4:58:26 | 20.92       | 0.16    |                    | 4:58:26 | 21.03       | -0.19   |       |
| 12/11/2020 | 4:59:26 | 20.94       | 0.15    |                    | 4:59:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 5:00:26 | 20.95       | 0.13    |                    | 5:00:26 | 21.04       | -0.20   |       |
| 12/11/2020 | 5:01:26 | 20.96       | 0.13    |                    | 5:01:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 5:02:26 | 20.94       | 0.15    |                    | 5:02:26 | 21.03       | -0.19   |       |
| 12/11/2020 | 5:03:26 | 20.95       | 0.14    |                    | 5:03:26 | 21.04       | -0.20   |       |
| 12/11/2020 | 5:04:26 | 20.96       | 0.13    |                    | 5:04:26 | 21.04       | -0.20   |       |
| 12/11/2020 | 5:05:26 | 20.96       | 0.13    |                    | 5:05:26 | 21.03       | -0.19   |       |
| 12/11/2020 | 5:06:26 | 20.95       | 0.14    |                    | 5:06:26 | 21.03       | -0.19   |       |
| 12/11/2020 | 5:07:26 | 20.94       | 0.15    |                    | 5:07:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 5:08:26 | 20.95       | 0.15    |                    | 5:08:26 | 21.04       | -0.20   |       |
| 12/11/2020 | 5:09:26 | 20.95       | 0.16    |                    | 5:09:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 5:10:26 | 20.97       | 0.15    | End Run 1 BH#2     | 5:10:26 | 21.03       | -0.19   |       |
| 12/11/2020 |         | 20.92       | 0.13    | Average            | 5:11:26 | 21.03       | -0.19   |       |
| 12/11/2020 |         |             |         |                    | 5:12:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 5:11:26 | 21.01       | 0.11    |                    | 5:13:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 5:12:26 | 21.02       | 0.11    |                    | 5:14:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 5:13:26 | 21.03       | 0.11    |                    | 5:15:26 | 21.02       | -0.18   |       |
| 12/11/2020 | 5:14:26 | 21.03       | 0.10    |                    | 5:16:26 | 21.01       | -0.17   |       |
| 12/11/2020 | 5:15:26 | 12.59       | 0.21    |                    | 5:17:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 5:16:26 | 0.07        | 0.05    | System Zero        | 5:18:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 5:17:26 | 12.50       | 11.86   |                    | 5:19:26 | 21.03       | -0.19   |       |
| 12/11/2020 | 5:18:26 | 22.35       | 21.78   |                    | 5:20:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 5:19:26 | 22.37       | 21.84   |                    | 5:21:26 | 21.03       | -0.18   |       |
| 12/11/2020 | 5:20:26 | 22.37       | 21.86   | O2 System Upscale  | 5:22:26 | 21.03       | -0.18   |       |
| 12/11/2020 | 5:21:26 | 19.93       | 19.58   |                    | 5:23:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 5:22:26 | 10.09       | 10.10   |                    | 5:24:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 5:23:26 | 9.99        | 9.94    | CO2 System Upscale | 5:25:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 5:24:26 | 16.66       | 3.83    |                    | 5:26:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 5:25:26 | 20.95       | 0.29    |                    | 5:27:26 | 21.04       | -0.19   |       |
| 12/11/2020 | 5:26:26 | 21.07       | 0.24    |                    | 5:28:26 | 21.04       | -0.18   |       |
| 12/11/2020 | 5:27:26 | 11.97       | 1.00    |                    | 5:29:26 | 21.03       | -0.19   |       |
| 12/11/2020 | 5:28:26 | 17.71       | 0.40    |                    | 5:30:26 | 21.05       | -0.19   |       |

**SLR**  
**Columbia Steel**  
**Method 3A Baghouse #1 and Baghouse #2**

| Date       | Time    | Baghouse #2 |         | Notes | Time    | Baghouse #1 |         | Notes              |
|------------|---------|-------------|---------|-------|---------|-------------|---------|--------------------|
|            |         | O2 [%]      | CO2 [%] |       |         | O2 [%]      | CO2 [%] |                    |
| 12/11/2020 | 5:29:26 | 17.72       | 0.43    |       | 5:31:26 | 21.04       | -0.19   |                    |
| 12/11/2020 | 5:30:26 | 17.73       | 0.45    |       | 5:32:26 | 21.04       | -0.19   |                    |
| 12/11/2020 | 5:31:26 | 17.73       | 0.47    |       | 5:33:26 | 21.04       | -0.19   |                    |
| 12/11/2020 | 5:32:26 | 17.74       | 0.49    |       | 5:34:26 | 21.04       | -0.18   |                    |
| 12/11/2020 | 5:33:26 | 17.73       | 0.51    |       | 5:35:26 | 21.04       | -0.19   |                    |
| 12/11/2020 | 5:34:26 | 17.73       | 0.52    |       | 5:36:26 | 21.04       | -0.19   |                    |
| 12/11/2020 | 5:35:26 | 17.73       | 0.54    |       | 5:37:26 | 21.05       | -0.19   |                    |
| 12/11/2020 | 5:36:26 | 17.73       | 0.56    |       | 5:38:26 | 21.05       | -0.19   |                    |
| 12/11/2020 | 5:37:26 | 17.73       | 0.57    |       | 5:39:26 | 21.04       | -0.19   |                    |
| 12/11/2020 | 5:38:26 | 17.72       | 0.58    |       | 5:40:26 | 21.04       | -0.19   |                    |
| 12/11/2020 | 5:39:26 | 17.72       | 0.59    |       | 5:41:26 | 21.04       | -0.19   |                    |
| 12/11/2020 | 5:40:26 | 17.72       | 0.59    |       | 5:42:26 | 21.04       | -0.19   |                    |
| 12/11/2020 | 5:41:26 | 17.72       | 0.60    |       | 5:43:26 | 21.04       | -0.19   |                    |
| 12/11/2020 | 5:42:26 | 17.72       | 0.61    |       | 5:44:26 | 21.04       | -0.18   |                    |
| 12/11/2020 | 5:43:26 | 17.71       | 0.62    |       | 5:45:26 | 21.05       | -0.19   |                    |
| 12/11/2020 | 5:44:26 | 17.71       | 0.62    |       | 5:46:26 | 21.04       | -0.19   |                    |
| 12/11/2020 | 5:45:26 | 17.71       | 0.63    |       | 5:47:26 | 21.04       | -0.18   |                    |
| 12/11/2020 | 5:46:26 | 17.71       | 0.64    |       | 5:48:26 | 21.04       | -0.18   |                    |
| 12/11/2020 | 5:47:26 | 17.71       | 0.64    |       | 5:49:26 | 21.05       | -0.18   |                    |
| 12/11/2020 | 5:48:26 | 17.70       | 0.65    |       | 5:50:26 | 21.05       | -0.18   |                    |
| 12/11/2020 | 5:49:26 | 17.70       | 0.65    |       | 5:51:26 | 21.05       | -0.18   |                    |
| 12/11/2020 | 5:50:26 | 17.70       | 0.66    |       | 5:52:26 | 21.05       | -0.18   |                    |
| 12/11/2020 | 5:51:26 | 17.70       | 0.66    |       | 5:53:26 | 21.05       | -0.18   |                    |
| 12/11/2020 | 5:52:26 | 17.70       | 0.67    |       | 5:54:26 | 21.06       | -0.18   |                    |
| 12/11/2020 | 5:53:26 | 17.70       | 0.68    |       | 5:55:26 | 20.99       | -0.09   |                    |
| 12/11/2020 | 5:54:26 | 17.69       | 0.68    |       | 5:56:26 | 21.00       | -0.12   |                    |
| 12/11/2020 | 5:55:26 | 17.69       | 0.69    |       | 5:57:26 | 21.01       | -0.14   |                    |
| 12/11/2020 | 5:56:26 | 17.69       | 0.69    |       | 5:58:26 | 21.04       | -0.18   |                    |
| 12/11/2020 | 5:57:26 | 17.69       | 0.69    |       | 5:59:26 | 21.04       | -0.18   |                    |
| 12/11/2020 | 5:58:26 | 17.69       | 0.70    |       | 6:00:26 | 21.05       | -0.19   | End Run 1 BH#1     |
| 12/11/2020 | 5:59:26 | 17.68       | 0.70    |       |         | 21.04       | -0.15   | Average            |
| 12/11/2020 | 6:00:26 | 17.68       | 0.70    |       |         |             |         |                    |
| 12/11/2020 | 6:01:26 | 17.68       | 0.70    |       | 6:01:26 | 21.05       | -0.19   |                    |
| 12/11/2020 | 6:02:26 | 17.68       | 0.70    |       | 6:02:26 | 21.05       | -0.18   |                    |
| 12/11/2020 | 6:03:26 | 17.68       | 0.71    |       | 6:03:26 | 21.05       | -0.18   |                    |
| 12/11/2020 | 6:04:26 | 17.68       | 0.71    |       | 6:04:26 | 20.96       | -0.04   |                    |
| 12/11/2020 | 6:05:26 | 17.67       | 0.71    |       | 6:05:26 | 20.82       | 0.17    |                    |
| 12/11/2020 | 6:06:26 | 17.67       | 0.71    |       | 6:06:26 | 21.00       | -0.12   |                    |
| 12/11/2020 | 6:07:26 | 17.67       | 0.71    |       | 6:07:26 | 20.99       | -0.06   |                    |
| 12/11/2020 | 6:08:26 | 17.67       | 0.71    |       | 6:08:26 | 20.99       | -0.07   |                    |
| 12/11/2020 | 6:09:26 | 17.67       | 0.71    |       | 6:09:26 | 21.00       | -0.13   |                    |
| 12/11/2020 | 6:10:26 | 17.66       | 0.71    |       | 6:10:26 | 5.33        | -0.17   |                    |
| 12/11/2020 | 6:11:26 | 17.66       | 0.71    |       | 6:11:26 | 0.08        | -0.26   | System Zero        |
| 12/11/2020 | 6:12:26 | 17.66       | 0.71    |       | 6:12:26 | 2.16        | 1.82    |                    |
| 12/11/2020 | 6:13:26 | 17.66       | 0.72    |       | 6:13:26 | 9.76        | 8.90    |                    |
| 12/11/2020 | 6:14:26 | 17.66       | 0.72    |       | 6:14:26 | 10.07       | 9.21    |                    |
| 12/11/2020 | 6:15:26 | 17.66       | 0.72    |       | 6:15:26 | 10.07       | 9.52    |                    |
| 12/11/2020 | 6:16:26 | 17.66       | 0.72    |       | 6:16:26 | 10.07       | 9.93    | CO2 System Upscale |
| 12/11/2020 | 6:17:26 | 17.66       | 0.72    |       | 6:17:26 | 10.17       | 10.10   |                    |
| 12/11/2020 | 6:18:26 | 17.65       | 0.73    |       | 6:18:26 | 19.81       | 20.51   |                    |
| 12/11/2020 | 6:19:26 | 17.65       | 0.73    |       | 6:19:26 | 22.10       | 22.29   | O2 System Upscale  |
| 12/11/2020 | 6:20:26 | 17.65       | 0.73    |       | 6:20:26 | 22.11       | 21.72   |                    |

SLR  
Columbia Steel  
Method 3A Baghouse#1 and Baghouse #2

| Date       | Time     | Baghouse #2 |         | Notes              | Time     | Baghouse #1 |         | Notes              |
|------------|----------|-------------|---------|--------------------|----------|-------------|---------|--------------------|
|            |          | O2 [%]      | CO2 [%] |                    |          | O2 [%]      | CO2 [%] |                    |
| 12/14/2020 | 19:05:58 | 0.00        | 0.00    | Analyzer Zero      | 19:05:58 | 20.57       | -0.19   |                    |
| 12/14/2020 | 19:06:58 | 17.92       | 17.78   |                    | 19:06:58 | 20.57       | -0.20   |                    |
| 12/14/2020 | 19:07:58 | 22.01       | 21.66   | Analyzer Span      | 19:07:58 | 20.57       | -0.20   |                    |
| 12/14/2020 | 19:08:58 | 12.47       | 12.35   |                    | 19:08:58 | 20.58       | -0.20   |                    |
| 12/14/2020 | 19:09:58 | 9.96        | 9.80    | Analyzer Mid       | 19:09:58 | 20.57       | -0.20   |                    |
| 12/14/2020 | 19:10:58 | 8.87        | 9.71    |                    | 19:10:58 | 10.81       | -0.15   |                    |
| 12/14/2020 | 19:11:58 | 20.28       | 0.60    |                    | 19:11:58 | 0.06        | -0.19   |                    |
| 12/14/2020 | 19:12:58 | 20.49       | 0.23    |                    | 19:12:58 | 0.03        | 0.00    | Analyzer Zero      |
| 12/14/2020 | 19:13:58 | 20.44       | 0.23    |                    | 19:13:58 | 2.56        | 2.82    |                    |
| 12/14/2020 | 19:14:58 | 20.43       | 0.23    |                    | 19:14:58 | 22.18       | 21.34   |                    |
| 12/14/2020 | 19:15:58 | 20.43       | 0.23    |                    | 19:15:58 | 22.06       | 21.65   | Analyzer Span      |
| 12/14/2020 | 19:16:58 | 20.42       | 0.25    |                    | 19:16:58 | 14.15       | 13.55   |                    |
| 12/14/2020 | 19:17:58 | 20.41       | 0.25    |                    | 19:17:58 | 10.03       | 9.92    | Analyzer Mid       |
| 12/14/2020 | 19:18:58 | 20.41       | 0.25    |                    | 19:18:58 | 9.94        | 8.89    |                    |
| 12/14/2020 | 19:19:58 | 20.91       | 0.20    |                    | 19:19:58 | 9.91        | 8.21    |                    |
| 12/14/2020 | 19:20:58 | 9.80        | 0.18    |                    | 19:20:58 | 9.92        | 8.13    |                    |
| 12/14/2020 | 19:21:58 | 0.03        | 0.03    | System Zero        | 19:21:58 | 18.04       | 2.39    |                    |
| 12/14/2020 | 19:22:58 | 9.10        | 8.39    |                    | 19:22:58 | 20.72       | 0.32    |                    |
| 12/14/2020 | 19:23:58 | 22.01       | 21.47   | O2 System Upscale  | 19:23:58 | 20.88       | 0.21    |                    |
| 12/14/2020 | 19:24:58 | 18.51       | 17.70   |                    | 19:24:58 | 20.91       | 0.21    |                    |
| 12/14/2020 | 19:25:58 | 10.01       | 9.87    | CO2 System Upscale | 19:25:58 | 20.94       | 0.20    |                    |
| 12/14/2020 | 19:26:58 | 13.42       | 6.82    |                    | 19:26:58 | 20.94       | 0.20    |                    |
| 12/14/2020 | 19:27:58 | 20.70       | 0.20    |                    | 19:27:58 | 20.94       | 0.20    |                    |
| 12/14/2020 | 19:28:58 | 20.76       | 0.12    |                    | 19:28:58 | 20.94       | 0.20    |                    |
| 12/14/2020 | 19:29:58 | 20.76       | 0.11    |                    | 19:29:58 | 9.50        | 0.27    |                    |
| 12/14/2020 | 19:30:58 | 20.76       | 0.09    |                    | 19:30:58 | 0.08        | 0.15    | System Zero        |
| 12/14/2020 | 19:31:58 | 20.79       | 0.09    |                    | 19:31:58 | 7.14        | 7.51    |                    |
| 12/14/2020 | 19:32:58 | 20.92       | 0.08    |                    | 19:32:58 | 21.66       | 21.07   |                    |
| 12/14/2020 | 19:33:58 | 20.91       | 0.08    |                    | 19:33:58 | 21.94       | 21.39   | O2 System Upscale  |
| 12/14/2020 | 19:34:58 | 20.91       | 0.08    |                    | 19:34:58 | 19.83       | 19.20   |                    |
| 12/14/2020 | 19:35:58 | 20.92       | 0.08    |                    | 19:35:58 | 10.43       | 10.26   |                    |
| 12/14/2020 | 19:36:58 | 20.93       | 0.08    |                    | 19:36:58 | 9.99        | 9.88    | CO2 System Upscale |
| 12/14/2020 | 19:37:58 | 20.92       | 0.08    |                    | 19:37:58 | 13.38       | 6.63    |                    |
| 12/14/2020 | 19:38:58 | 20.92       | 0.08    |                    | 19:38:58 | 20.72       | 0.44    |                    |
| 12/14/2020 | 19:39:58 | 20.92       | 0.08    |                    | 19:39:58 | 20.91       | 0.32    |                    |
| 12/14/2020 | 19:40:58 | 20.92       | 0.08    |                    | 19:40:58 | 20.91       | 0.31    |                    |
| 12/14/2020 | 19:41:58 | 20.92       | 0.08    |                    | 19:41:58 | 20.92       | 0.29    |                    |
| 12/14/2020 | 19:42:58 | 20.92       | 0.08    |                    | 19:42:58 | 20.92       | 0.29    |                    |
| 12/14/2020 | 19:43:58 | 20.91       | 0.09    |                    | 19:43:58 | 20.92       | 0.29    |                    |
| 12/14/2020 | 19:44:58 | 20.92       | 0.09    |                    | 19:44:58 | 20.92       | 0.29    |                    |
| 12/14/2020 | 19:45:58 | 20.91       | 0.09    |                    | 19:45:58 | 20.92       | 0.28    |                    |
| 12/14/2020 | 19:46:58 | 20.91       | 0.09    |                    | 19:46:58 | 20.91       | 0.28    |                    |
| 12/14/2020 | 19:47:58 | 20.91       | 0.09    |                    | 19:47:58 | 20.92       | 0.28    |                    |
| 12/14/2020 | 19:48:58 | 20.91       | 0.09    |                    | 19:48:58 | 20.92       | 0.28    |                    |
| 12/14/2020 | 19:49:58 | 20.91       | 0.09    |                    | 19:49:58 | 20.92       | 0.27    |                    |
| 12/14/2020 | 19:50:58 | 20.91       | 0.09    |                    | 19:50:58 | 20.92       | 0.27    |                    |
| 12/14/2020 | 19:51:58 | 20.90       | 0.09    |                    | 19:51:58 | 20.92       | 0.27    |                    |
| 12/14/2020 | 19:52:58 | 20.90       | 0.09    |                    | 19:52:58 | 20.92       | 0.26    |                    |
| 12/14/2020 | 19:53:58 | 20.90       | 0.09    |                    | 19:53:58 | 20.92       | 0.26    |                    |
| 12/14/2020 | 19:54:58 | 20.90       | 0.09    |                    | 19:54:58 | 20.91       | 0.26    |                    |
| 12/14/2020 | 19:55:58 | 20.90       | 0.08    |                    | 19:55:58 | 20.91       | 0.26    |                    |
| 12/14/2020 | 19:56:58 | 20.90       | 0.08    |                    | 19:56:58 | 20.91       | 0.26    |                    |
| 12/14/2020 | 19:57:58 | 20.90       | 0.08    |                    | 19:57:58 | 20.91       | 0.26    |                    |
| 12/14/2020 | 19:58:58 | 20.91       | 0.08    |                    | 19:58:58 | 20.91       | 0.26    |                    |
| 12/14/2020 | 19:59:58 | 20.91       | 0.07    |                    | 19:59:58 | 20.91       | 0.25    |                    |
| 12/14/2020 | 20:00:58 | 20.91       | 0.08    |                    | 20:00:58 | 20.91       | 0.25    |                    |

## SLR

## Columbia Steel

## Method 3A Baghouse#1 and Baghouse #2

| Date       | Time     | Baghouse #2 |         |       | Time     | Baghouse #1 |         |       |
|------------|----------|-------------|---------|-------|----------|-------------|---------|-------|
|            |          | O2 [%]      | CO2 [%] | Notes |          | O2 [%]      | CO2 [%] | Notes |
| 12/14/2020 | 20:01:58 | 20.90       | 0.08    |       | 20:01:58 | 20.91       | 0.25    |       |
| 12/14/2020 | 20:02:58 | 20.91       | 0.08    |       | 20:02:58 | 20.91       | 0.24    |       |
| 12/14/2020 | 20:03:58 | 20.91       | 0.08    |       | 20:03:58 | 20.91       | 0.24    |       |
| 12/14/2020 | 20:04:58 | 20.91       | 0.08    |       | 20:04:58 | 20.91       | 0.24    |       |
| 12/14/2020 | 20:05:58 | 20.91       | 0.08    |       | 20:05:58 | 20.91       | 0.24    |       |
| 12/14/2020 | 20:06:58 | 20.90       | 0.08    |       | 20:06:58 | 20.91       | 0.23    |       |
| 12/14/2020 | 20:07:58 | 20.90       | 0.08    |       | 20:07:58 | 20.91       | 0.23    |       |
| 12/14/2020 | 20:08:58 | 20.90       | 0.08    |       | 20:08:58 | 20.91       | 0.23    |       |
| 12/14/2020 | 20:09:58 | 20.90       | 0.08    |       | 20:09:58 | 20.91       | 0.23    |       |
| 12/14/2020 | 20:10:58 | 20.90       | 0.09    |       | 20:10:58 | 20.91       | 0.23    |       |
| 12/14/2020 | 20:11:58 | 20.90       | 0.09    |       | 20:11:58 | 20.91       | 0.22    |       |
| 12/14/2020 | 20:12:58 | 20.90       | 0.09    |       | 20:12:58 | 20.90       | 0.22    |       |
| 12/14/2020 | 20:13:58 | 20.90       | 0.09    |       | 20:13:58 | 20.91       | 0.22    |       |
| 12/14/2020 | 20:14:58 | 20.90       | 0.09    |       | 20:14:58 | 20.90       | 0.21    |       |
| 12/14/2020 | 20:15:58 | 20.90       | 0.10    |       | 20:15:58 | 20.90       | 0.21    |       |
| 12/14/2020 | 20:16:58 | 20.90       | 0.09    |       | 20:16:58 | 20.90       | 0.21    |       |
| 12/14/2020 | 20:17:58 | 20.90       | 0.09    |       | 20:17:58 | 20.90       | 0.21    |       |
| 12/14/2020 | 20:18:58 | 20.90       | 0.09    |       | 20:18:58 | 20.90       | 0.21    |       |
| 12/14/2020 | 20:19:58 | 20.90       | 0.09    |       | 20:19:58 | 20.90       | 0.20    |       |
| 12/14/2020 | 20:20:58 | 20.90       | 0.09    |       | 20:20:58 | 20.90       | 0.20    |       |
| 12/14/2020 | 20:21:58 | 20.91       | 0.09    |       | 20:21:58 | 20.90       | 0.20    |       |
| 12/14/2020 | 20:22:58 | 20.91       | 0.08    |       | 20:22:58 | 20.90       | 0.20    |       |
| 12/14/2020 | 20:23:58 | 20.91       | 0.08    |       | 20:23:58 | 20.90       | 0.20    |       |
| 12/14/2020 | 20:24:58 | 20.91       | 0.08    |       | 20:24:58 | 20.89       | 0.20    |       |
| 12/14/2020 | 20:25:58 | 20.90       | 0.08    |       | 20:25:58 | 20.90       | 0.19    |       |
| 12/14/2020 | 20:26:58 | 20.91       | 0.08    |       | 20:26:58 | 20.89       | 0.20    |       |
| 12/14/2020 | 20:27:58 | 20.91       | 0.08    |       | 20:27:58 | 20.90       | 0.19    |       |
| 12/14/2020 | 20:28:58 | 20.91       | 0.08    |       | 20:28:58 | 20.90       | 0.19    |       |
| 12/14/2020 | 20:29:58 | 20.91       | 0.08    |       | 20:29:58 | 20.90       | 0.19    |       |
| 12/14/2020 | 20:30:58 | 20.91       | 0.08    |       | 20:30:58 | 20.90       | 0.19    |       |
| 12/14/2020 | 20:31:58 | 20.91       | 0.08    |       | 20:31:58 | 20.89       | 0.19    |       |
| 12/14/2020 | 20:32:58 | 20.91       | 0.08    |       | 20:32:58 | 20.89       | 0.19    |       |
| 12/14/2020 | 20:33:58 | 20.91       | 0.08    |       | 20:33:58 | 20.89       | 0.18    |       |
| 12/14/2020 | 20:34:58 | 20.91       | 0.08    |       | 20:34:58 | 20.89       | 0.18    |       |
| 12/14/2020 | 20:35:58 | 20.90       | 0.08    |       | 20:35:58 | 20.89       | 0.18    |       |
| 12/14/2020 | 20:36:58 | 20.91       | 0.09    |       | 20:36:58 | 20.89       | 0.17    |       |
| 12/14/2020 | 20:37:58 | 20.90       | 0.09    |       | 20:37:58 | 20.89       | 0.17    |       |
| 12/14/2020 | 20:38:58 | 20.90       | 0.09    |       | 20:38:58 | 20.89       | 0.18    |       |
| 12/14/2020 | 20:39:58 | 20.90       | 0.09    |       | 20:39:58 | 20.88       | 0.17    |       |
| 12/14/2020 | 20:40:58 | 20.90       | 0.09    |       | 20:40:58 | 20.89       | 0.17    |       |
| 12/14/2020 | 20:41:58 | 20.90       | 0.09    |       | 20:41:58 | 20.89       | 0.17    |       |
| 12/14/2020 | 20:42:58 | 20.90       | 0.09    |       | 20:42:58 | 20.89       | 0.17    |       |
| 12/14/2020 | 20:43:58 | 20.90       | 0.09    |       | 20:43:58 | 20.89       | 0.16    |       |
| 12/14/2020 | 20:44:58 | 20.90       | 0.09    |       | 20:44:58 | 20.89       | 0.16    |       |
| 12/14/2020 | 20:45:58 | 20.90       | 0.09    |       | 20:45:58 | 20.89       | 0.16    |       |
| 12/14/2020 | 20:46:58 | 20.91       | 0.09    |       | 20:46:58 | 20.89       | 0.16    |       |
| 12/14/2020 | 20:47:58 | 20.91       | 0.09    |       | 20:47:58 | 20.88       | 0.16    |       |
| 12/14/2020 | 20:48:58 | 20.91       | 0.09    |       | 20:48:58 | 20.88       | 0.16    |       |
| 12/14/2020 | 20:49:58 | 20.91       | 0.09    |       | 20:49:58 | 20.88       | 0.15    |       |
| 12/14/2020 | 20:50:58 | 20.91       | 0.08    |       | 20:50:58 | 20.88       | 0.15    |       |
| 12/14/2020 | 20:51:58 | 20.91       | 0.08    |       | 20:51:58 | 20.88       | 0.15    |       |
| 12/14/2020 | 20:52:58 | 20.91       | 0.08    |       | 20:52:58 | 20.88       | 0.15    |       |
| 12/14/2020 | 20:53:58 | 20.91       | 0.08    |       | 20:53:58 | 20.88       | 0.15    |       |
| 12/14/2020 | 20:54:58 | 20.91       | 0.08    |       | 20:54:58 | 20.88       | 0.15    |       |
| 12/14/2020 | 20:55:58 | 20.91       | 0.07    |       | 20:55:58 | 20.88       | 0.15    |       |
| 12/14/2020 | 20:56:58 | 20.91       | 0.08    |       | 20:56:58 | 20.88       | 0.14    |       |

## SLR

## Columbia Steel

## Method 3A Baghouse#1 and Baghouse #2

| Date       | Time     | Baghouse #2 |         |       | Time     | Baghouse #1 |         |       |
|------------|----------|-------------|---------|-------|----------|-------------|---------|-------|
|            |          | O2 [%]      | CO2 [%] | Notes |          | O2 [%]      | CO2 [%] | Notes |
| 12/14/2020 | 20:57:58 | 20.91       | 0.08    |       | 20:57:58 | 20.88       | 0.15    |       |
| 12/14/2020 | 20:58:58 | 20.91       | 0.08    |       | 20:58:58 | 20.88       | 0.15    |       |
| 12/14/2020 | 20:59:58 | 20.91       | 0.08    |       | 20:59:58 | 20.88       | 0.14    |       |
| 12/14/2020 | 21:00:58 | 20.91       | 0.09    |       | 21:00:58 | 20.88       | 0.14    |       |
| 12/14/2020 | 21:01:58 | 20.91       | 0.08    |       | 21:01:58 | 20.88       | 0.15    |       |
| 12/14/2020 | 21:02:58 | 20.91       | 0.08    |       | 21:02:58 | 20.88       | 0.14    |       |
| 12/14/2020 | 21:03:58 | 20.91       | 0.09    |       | 21:03:58 | 20.88       | 0.15    |       |
| 12/14/2020 | 21:04:58 | 20.91       | 0.09    |       | 21:04:58 | 20.88       | 0.15    |       |
| 12/14/2020 | 21:05:58 | 20.91       | 0.09    |       | 21:05:58 | 20.88       | 0.15    |       |
| 12/14/2020 | 21:06:58 | 20.91       | 0.10    |       | 21:06:58 | 20.87       | 0.14    |       |
| 12/14/2020 | 21:07:58 | 20.91       | 0.10    |       | 21:07:58 | 20.87       | 0.14    |       |
| 12/14/2020 | 21:08:58 | 20.91       | 0.09    |       | 21:08:58 | 20.87       | 0.14    |       |
| 12/14/2020 | 21:09:58 | 20.91       | 0.10    |       | 21:09:58 | 20.87       | 0.15    |       |
| 12/14/2020 | 21:10:58 | 20.91       | 0.09    |       | 21:10:58 | 20.87       | 0.14    |       |
| 12/14/2020 | 21:11:58 | 20.92       | 0.10    |       | 21:11:58 | 20.87       | 0.14    |       |
| 12/14/2020 | 21:12:58 | 20.92       | 0.09    |       | 21:12:58 | 20.87       | 0.14    |       |
| 12/14/2020 | 21:13:58 | 20.92       | 0.10    |       | 21:13:58 | 20.87       | 0.14    |       |
| 12/14/2020 | 21:14:58 | 20.91       | 0.09    |       | 21:14:58 | 20.87       | 0.13    |       |
| 12/14/2020 | 21:15:58 | 20.92       | 0.09    |       | 21:15:58 | 20.87       | 0.14    |       |
| 12/14/2020 | 21:16:58 | 20.92       | 0.09    |       | 21:16:58 | 20.87       | 0.13    |       |
| 12/14/2020 | 21:17:58 | 20.92       | 0.09    |       | 21:17:58 | 20.87       | 0.13    |       |
| 12/14/2020 | 21:18:58 | 20.92       | 0.09    |       | 21:18:58 | 20.87       | 0.13    |       |
| 12/14/2020 | 21:19:58 | 20.92       | 0.08    |       | 21:19:58 | 20.87       | 0.13    |       |
| 12/14/2020 | 21:20:58 | 20.92       | 0.08    |       | 21:20:58 | 20.87       | 0.13    |       |
| 12/14/2020 | 21:21:58 | 20.92       | 0.08    |       | 21:21:58 | 20.87       | 0.12    |       |
| 12/14/2020 | 21:22:58 | 20.92       | 0.09    |       | 21:22:58 | 20.86       | 0.13    |       |
| 12/14/2020 | 21:23:58 | 20.92       | 0.09    |       | 21:23:58 | 20.81       | 0.15    |       |
| 12/14/2020 | 21:24:58 | 20.92       | 0.08    |       | 21:24:58 | 20.80       | 0.15    |       |
| 12/14/2020 | 21:25:58 | 20.92       | 0.08    |       | 21:25:58 | 20.80       | 0.15    |       |
| 12/14/2020 | 21:26:58 | 20.92       | 0.09    |       | 21:26:58 | 20.80       | 0.15    |       |
| 12/14/2020 | 21:27:58 | 20.92       | 0.08    |       | 21:27:58 | 20.80       | 0.15    |       |
| 12/14/2020 | 21:28:58 | 20.92       | 0.09    |       | 21:28:58 | 20.80       | 0.15    |       |
| 12/14/2020 | 21:29:58 | 20.91       | 0.09    |       | 21:29:58 | 20.80       | 0.15    |       |
| 12/14/2020 | 21:30:58 | 20.91       | 0.09    |       | 21:30:58 | 20.80       | 0.15    |       |
| 12/14/2020 | 21:31:58 | 20.91       | 0.10    |       | 21:31:58 | 20.80       | 0.15    |       |
| 12/14/2020 | 21:32:58 | 20.91       | 0.10    |       | 21:32:58 | 20.79       | 0.15    |       |
| 12/14/2020 | 21:33:58 | 20.91       | 0.10    |       | 21:33:58 | 20.79       | 0.15    |       |
| 12/14/2020 | 21:34:58 | 20.91       | 0.10    |       | 21:34:58 | 20.80       | 0.15    |       |
| 12/14/2020 | 21:35:58 | 20.91       | 0.10    |       | 21:35:58 | 20.80       | 0.15    |       |
| 12/14/2020 | 21:36:58 | 20.91       | 0.10    |       | 21:36:58 | 20.80       | 0.15    |       |
| 12/14/2020 | 21:37:58 | 20.91       | 0.10    |       | 21:37:58 | 20.80       | 0.15    |       |
| 12/14/2020 | 21:38:58 | 20.91       | 0.10    |       | 21:38:58 | 20.80       | 0.15    |       |
| 12/14/2020 | 21:39:58 | 20.91       | 0.10    |       | 21:39:58 | 20.79       | 0.15    |       |
| 12/14/2020 | 21:40:58 | 20.91       | 0.09    |       | 21:40:58 | 20.80       | 0.15    |       |
| 12/14/2020 | 21:41:58 | 20.91       | 0.09    |       | 21:41:58 | 20.79       | 0.14    |       |
| 12/14/2020 | 21:42:58 | 20.91       | 0.09    |       | 21:42:58 | 20.79       | 0.15    |       |
| 12/14/2020 | 21:43:58 | 20.91       | 0.09    |       | 21:43:58 | 20.79       | 0.14    |       |
| 12/14/2020 | 21:44:58 | 20.91       | 0.09    |       | 21:44:58 | 20.79       | 0.15    |       |
| 12/14/2020 | 21:45:58 | 20.91       | 0.09    |       | 21:45:58 | 20.79       | 0.14    |       |
| 12/14/2020 | 21:46:58 | 20.91       | 0.09    |       | 21:46:58 | 20.79       | 0.14    |       |
| 12/14/2020 | 21:47:58 | 20.91       | 0.08    |       | 21:47:58 | 20.79       | 0.14    |       |
| 12/14/2020 | 21:48:58 | 20.91       | 0.09    |       | 21:48:58 | 20.79       | 0.14    |       |
| 12/14/2020 | 21:49:58 | 20.91       | 0.09    |       | 21:49:58 | 20.83       | 0.12    |       |
| 12/14/2020 | 21:50:58 | 20.91       | 0.09    |       | 21:50:58 | 20.85       | 0.11    |       |
| 12/14/2020 | 21:51:58 | 20.91       | 0.09    |       | 21:51:58 | 20.85       | 0.11    |       |
| 12/14/2020 | 21:52:58 | 20.91       | 0.09    |       | 21:52:58 | 20.85       | 0.11    |       |

**SLR**  
**Columbia Steel**  
**Method 3A Baghouse#1 and Baghouse #2**

| Date       | Time     | Baghouse #2 |         |                  | Time     | Baghouse #1 |         |                  |
|------------|----------|-------------|---------|------------------|----------|-------------|---------|------------------|
|            |          | O2 [%]      | CO2 [%] | Notes            |          | O2 [%]      | CO2 [%] | Notes            |
| 12/14/2020 | 21:53:58 | 20.91       | 0.09    |                  | 21:53:58 | 20.84       | 0.10    |                  |
| 12/14/2020 | 21:54:58 | 20.91       | 0.09    |                  | 21:54:58 | 20.84       | 0.11    |                  |
| 12/14/2020 | 21:55:58 | 20.91       | 0.09    |                  | 21:55:58 | 20.85       | 0.10    |                  |
| 12/14/2020 | 21:56:58 | 20.91       | 0.10    |                  | 21:56:58 | 20.86       | 0.10    |                  |
| 12/14/2020 | 21:57:58 | 20.91       | 0.10    |                  | 21:57:58 | 20.86       | 0.10    |                  |
| 12/14/2020 | 21:58:58 | 20.91       | 0.10    |                  | 21:58:58 | 20.86       | 0.10    |                  |
| 12/14/2020 | 21:59:58 | 20.91       | 0.10    |                  | 21:59:58 | 20.85       | 0.10    |                  |
| 12/14/2020 | 22:00:58 | 20.91       | 0.10    |                  | 22:00:58 | 20.85       | 0.10    |                  |
| 12/14/2020 | 22:01:58 | 20.91       | 0.10    |                  | 22:01:58 | 20.85       | 0.10    |                  |
| 12/14/2020 | 22:02:58 | 20.91       | 0.10    |                  | 22:02:58 | 20.85       | 0.10    |                  |
| 12/14/2020 | 22:03:58 | 20.91       | 0.10    |                  | 22:03:58 | 20.85       | 0.10    |                  |
| 12/14/2020 | 22:04:58 | 20.91       | 0.10    |                  | 22:04:58 | 20.85       | 0.10    |                  |
| 12/14/2020 | 22:05:58 | 20.90       | 0.10    |                  | 22:05:58 | 20.85       | 0.10    |                  |
| 12/14/2020 | 22:06:58 | 20.90       | 0.10    |                  | 22:06:58 | 20.85       | 0.10    |                  |
| 12/14/2020 | 22:07:58 | 20.90       | 0.10    |                  | 22:07:58 | 20.85       | 0.10    |                  |
| 12/14/2020 | 22:08:58 | 20.90       | 0.10    |                  | 22:08:58 | 20.84       | 0.10    |                  |
| 12/14/2020 | 22:09:58 | 20.90       | 0.10    |                  | 22:09:58 | 20.84       | 0.10    |                  |
| 12/14/2020 | 22:10:58 | 20.90       | 0.10    |                  | 22:10:58 | 20.84       | 0.10    |                  |
| 12/14/2020 | 22:11:58 | 20.90       | 0.09    |                  | 22:11:58 | 20.84       | 0.10    |                  |
| 12/14/2020 | 22:12:58 | 20.90       | 0.09    |                  | 22:12:58 | 20.85       | 0.10    |                  |
| 12/14/2020 | 22:13:58 | 20.90       | 0.09    |                  | 22:13:58 | 20.83       | 0.10    |                  |
| 12/14/2020 | 22:14:58 | 20.90       | 0.09    |                  | 22:14:58 | 20.82       | 0.11    |                  |
| 12/14/2020 | 22:15:58 | 20.90       | 0.09    |                  | 22:15:58 | 20.81       | 0.11    | Start Run 2 BH#1 |
| 12/14/2020 | 22:16:58 | 20.90       | 0.09    |                  | 22:16:58 | 20.81       | 0.11    |                  |
| 12/14/2020 | 22:17:58 | 20.86       | 0.12    |                  | 22:17:58 | 20.81       | 0.11    |                  |
| 12/14/2020 | 22:18:58 | 20.84       | 0.14    | Start Run 2 BH#2 | 22:18:58 | 20.82       | 0.11    |                  |
| 12/14/2020 | 22:19:58 | 20.83       | 0.14    |                  | 22:19:58 | 20.82       | 0.11    |                  |
| 12/14/2020 | 22:20:58 | 20.84       | 0.14    |                  | 22:20:58 | 20.81       | 0.11    |                  |
| 12/14/2020 | 22:21:58 | 20.83       | 0.14    |                  | 22:21:58 | 20.81       | 0.11    |                  |
| 12/14/2020 | 22:22:58 | 20.83       | 0.14    |                  | 22:22:58 | 20.82       | 0.11    |                  |
| 12/14/2020 | 22:23:58 | 20.83       | 0.14    |                  | 22:23:58 | 20.82       | 0.10    |                  |
| 12/14/2020 | 22:24:58 | 20.83       | 0.15    |                  | 22:24:58 | 20.82       | 0.11    |                  |
| 12/14/2020 | 22:25:58 | 20.81       | 0.16    |                  | 22:25:58 | 20.81       | 0.10    |                  |
| 12/14/2020 | 22:26:58 | 20.80       | 0.17    |                  | 22:26:58 | 20.82       | 0.10    |                  |
| 12/14/2020 | 22:27:58 | 20.81       | 0.16    |                  | 22:27:58 | 20.83       | 0.10    |                  |
| 12/14/2020 | 22:28:58 | 20.80       | 0.16    |                  | 22:28:58 | 20.83       | 0.11    |                  |
| 12/14/2020 | 22:29:58 | 20.80       | 0.18    |                  | 22:29:58 | 20.82       | 0.11    |                  |
| 12/14/2020 | 22:30:58 | 20.79       | 0.18    |                  | 22:30:58 | 20.82       | 0.11    |                  |
| 12/14/2020 | 22:31:58 | 20.80       | 0.17    |                  | 22:31:58 | 20.82       | 0.11    |                  |
| 12/14/2020 | 22:32:58 | 20.80       | 0.17    |                  | 22:32:58 | 20.82       | 0.11    |                  |
| 12/14/2020 | 22:33:58 | 20.81       | 0.17    |                  | 22:33:58 | 20.82       | 0.11    |                  |
| 12/14/2020 | 22:34:58 | 20.82       | 0.17    |                  | 22:34:58 | 20.82       | 0.11    |                  |
| 12/14/2020 | 22:35:58 | 20.81       | 0.17    |                  | 22:35:58 | 20.82       | 0.11    |                  |
| 12/14/2020 | 22:36:58 | 20.84       | 0.15    |                  | 22:36:58 | 20.82       | 0.11    |                  |
| 12/14/2020 | 22:37:58 | 20.85       | 0.14    |                  | 22:37:58 | 20.82       | 0.11    |                  |
| 12/14/2020 | 22:38:58 | 20.86       | 0.13    |                  | 22:38:58 | 20.82       | 0.11    |                  |
| 12/14/2020 | 22:39:58 | 20.86       | 0.13    |                  | 22:39:58 | 20.82       | 0.11    |                  |
| 12/14/2020 | 22:40:58 | 20.85       | 0.13    |                  | 22:40:58 | 20.82       | 0.11    |                  |
| 12/14/2020 | 22:41:58 | 20.89       | 0.11    |                  | 22:41:58 | 20.82       | 0.11    |                  |
| 12/14/2020 | 22:42:58 | 20.88       | 0.12    |                  | 22:42:58 | 20.82       | 0.11    |                  |
| 12/14/2020 | 22:43:58 | 20.84       | 0.14    |                  | 22:43:58 | 20.82       | 0.11    |                  |
| 12/14/2020 | 22:44:58 | 20.83       | 0.14    |                  | 22:44:58 | 20.81       | 0.11    |                  |
| 12/14/2020 | 22:45:58 | 20.80       | 0.15    |                  | 22:45:58 | 20.81       | 0.11    |                  |
| 12/14/2020 | 22:46:58 | 20.79       | 0.16    |                  | 22:46:58 | 20.81       | 0.11    |                  |
| 12/14/2020 | 22:47:58 | 20.77       | 0.17    |                  | 22:47:58 | 20.81       | 0.11    |                  |
| 12/14/2020 | 22:48:58 | 20.79       | 0.17    |                  | 22:48:58 | 20.81       | 0.12    |                  |

**SLR**  
**Columbia Steel**  
**Method 3A Baghouse#1 and Baghouse #2**

| Date       | Time     | Baghouse #2 |         |       | Time     | Baghouse #1 |         |       |
|------------|----------|-------------|---------|-------|----------|-------------|---------|-------|
|            |          | O2 [%]      | CO2 [%] | Notes |          | O2 [%]      | CO2 [%] | Notes |
| 12/14/2020 | 22:49:58 | 20.79       | 0.18    |       | 22:49:58 | 20.80       | 0.12    |       |
| 12/14/2020 | 22:50:58 | 20.81       | 0.18    |       | 22:50:58 | 20.80       | 0.12    |       |
| 12/14/2020 | 22:51:58 | 20.80       | 0.18    |       | 22:51:58 | 20.80       | 0.12    |       |
| 12/14/2020 | 22:52:58 | 20.80       | 0.19    |       | 22:52:58 | 20.80       | 0.12    |       |
| 12/14/2020 | 22:53:58 | 20.80       | 0.18    |       | 22:53:58 | 20.80       | 0.13    |       |
| 12/14/2020 | 22:54:58 | 20.80       | 0.18    |       | 22:54:58 | 20.80       | 0.12    |       |
| 12/14/2020 | 22:55:58 | 20.80       | 0.18    |       | 22:55:58 | 20.80       | 0.11    |       |
| 12/14/2020 | 22:56:58 | 20.80       | 0.18    |       | 22:56:58 | 20.80       | 0.11    |       |
| 12/14/2020 | 22:57:58 | 20.80       | 0.18    |       | 22:57:58 | 20.81       | 0.10    |       |
| 12/14/2020 | 22:58:58 | 20.79       | 0.18    |       | 22:58:58 | 20.81       | 0.10    |       |
| 12/14/2020 | 22:59:58 | 20.79       | 0.19    |       | 22:59:58 | 20.81       | 0.10    |       |
| 12/14/2020 | 23:00:58 | 20.83       | 0.17    |       | 23:00:58 | 20.81       | 0.10    |       |
| 12/14/2020 | 23:01:58 | 20.84       | 0.15    |       | 23:01:58 | 20.80       | 0.10    |       |
| 12/14/2020 | 23:02:58 | 20.78       | 0.18    |       | 23:02:58 | 20.80       | 0.11    |       |
| 12/14/2020 | 23:03:58 | 20.81       | 0.15    |       | 23:03:58 | 20.80       | 0.11    |       |
| 12/14/2020 | 23:04:58 | 20.83       | 0.15    |       | 23:04:58 | 20.80       | 0.11    |       |
| 12/14/2020 | 23:05:58 | 20.82       | 0.14    |       | 23:05:58 | 20.81       | 0.10    |       |
| 12/14/2020 | 23:06:58 | 20.80       | 0.16    |       | 23:06:58 | 20.81       | 0.10    |       |
| 12/14/2020 | 23:07:58 | 20.79       | 0.16    |       | 23:07:58 | 20.81       | 0.10    |       |
| 12/14/2020 | 23:08:58 | 20.77       | 0.17    |       | 23:08:58 | 20.81       | 0.10    |       |
| 12/14/2020 | 23:09:58 | 20.77       | 0.18    |       | 23:09:58 | 20.80       | 0.10    |       |
| 12/14/2020 | 23:10:58 | 20.76       | 0.19    |       | 23:10:58 | 20.80       | 0.11    |       |
| 12/14/2020 | 23:11:58 | 20.77       | 0.19    |       | 23:11:58 | 20.80       | 0.12    |       |
| 12/14/2020 | 23:12:58 | 20.78       | 0.18    |       | 23:12:58 | 20.80       | 0.11    |       |
| 12/14/2020 | 23:13:58 | 20.78       | 0.18    |       | 23:13:58 | 20.81       | 0.11    |       |
| 12/14/2020 | 23:14:58 | 20.77       | 0.19    |       | 23:14:58 | 20.82       | 0.10    |       |
| 12/14/2020 | 23:15:58 | 20.77       | 0.17    |       | 23:15:58 | 20.80       | 0.12    |       |
| 12/14/2020 | 23:16:58 | 20.75       | 0.20    |       | 23:16:58 | 20.80       | 0.12    |       |
| 12/14/2020 | 23:17:58 | 20.76       | 0.21    |       | 23:17:58 | 20.81       | 0.11    |       |
| 12/14/2020 | 23:18:58 | 20.78       | 0.19    |       | 23:18:58 | 20.80       | 0.11    |       |
| 12/14/2020 | 23:19:58 | 20.83       | 0.16    |       | 23:19:58 | 20.80       | 0.11    |       |
| 12/14/2020 | 23:20:58 | 20.84       | 0.16    |       | 23:20:58 | 20.80       | 0.11    |       |
| 12/14/2020 | 23:21:58 | 20.84       | 0.17    |       | 23:21:58 | 20.80       | 0.11    |       |
| 12/14/2020 | 23:22:58 | 20.79       | 0.18    |       | 23:22:58 | 20.80       | 0.11    |       |
| 12/14/2020 | 23:23:58 | 20.80       | 0.18    |       | 23:23:58 | 20.80       | 0.12    |       |
| 12/14/2020 | 23:24:58 | 20.83       | 0.16    |       | 23:24:58 | 20.80       | 0.11    |       |
| 12/14/2020 | 23:25:58 | 20.84       | 0.16    |       | 23:25:58 | 20.80       | 0.11    |       |
| 12/14/2020 | 23:26:58 | 20.85       | 0.16    |       | 23:26:58 | 20.80       | 0.12    |       |
| 12/14/2020 | 23:27:58 | 20.81       | 0.17    |       | 23:27:58 | 20.81       | 0.11    |       |
| 12/14/2020 | 23:28:58 | 20.76       | 0.20    |       | 23:28:58 | 20.81       | 0.10    |       |
| 12/14/2020 | 23:29:58 | 20.75       | 0.21    |       | 23:29:58 | 20.82       | 0.09    |       |
| 12/14/2020 | 23:30:58 | 20.77       | 0.21    |       | 23:30:58 | 20.81       | 0.10    |       |
| 12/14/2020 | 23:31:58 | 20.77       | 0.21    |       | 23:31:58 | 20.81       | 0.10    |       |
| 12/14/2020 | 23:32:58 | 20.78       | 0.20    |       | 23:32:58 | 20.81       | 0.10    |       |
| 12/14/2020 | 23:33:58 | 20.79       | 0.18    |       | 23:33:58 | 20.78       | 0.15    |       |
| 12/14/2020 | 23:34:58 | 20.79       | 0.19    |       | 23:34:58 | 20.53       | 0.51    |       |
| 12/14/2020 | 23:35:58 | 20.79       | 0.18    |       | 23:35:58 | 20.41       | 0.66    |       |
| 12/14/2020 | 23:36:58 | 20.78       | 0.18    |       | 23:36:58 | 20.46       | 0.58    |       |
| 12/14/2020 | 23:37:58 | 20.78       | 0.20    |       | 23:37:58 | 20.71       | 0.23    |       |
| 12/14/2020 | 23:38:58 | 20.76       | 0.20    |       | 23:38:58 | 20.79       | 0.13    |       |
| 12/14/2020 | 23:39:58 | 20.77       | 0.20    |       | 23:39:58 | 20.76       | 0.17    |       |
| 12/14/2020 | 23:40:58 | 20.78       | 0.20    |       | 23:40:58 | 20.74       | 0.20    |       |
| 12/14/2020 | 23:41:58 | 20.79       | 0.20    |       | 23:41:58 | 20.76       | 0.17    |       |
| 12/14/2020 | 23:42:58 | 20.79       | 0.20    |       | 23:42:58 | 20.80       | 0.12    |       |
| 12/14/2020 | 23:43:58 | 20.79       | 0.21    |       | 23:43:58 | 20.80       | 0.10    |       |
| 12/14/2020 | 23:44:58 | 20.79       | 0.21    |       | 23:44:58 | 20.81       | 0.10    |       |

**SLR**  
**Columbia Steel**  
**Method 3A Baghouse#1 and Baghouse #2**

| Date       | Time     | Baghouse #2 |         |       | Time     | Baghouse #1 |         |       |
|------------|----------|-------------|---------|-------|----------|-------------|---------|-------|
|            |          | O2 [%]      | CO2 [%] | Notes |          | O2 [%]      | CO2 [%] | Notes |
| 12/14/2020 | 23:45:58 | 20.79       | 0.20    |       | 23:45:58 | 20.81       | 0.11    |       |
| 12/14/2020 | 23:46:58 | 20.79       | 0.20    |       | 23:46:58 | 20.80       | 0.11    |       |
| 12/14/2020 | 23:47:58 | 20.78       | 0.20    |       | 23:47:58 | 20.81       | 0.11    |       |
| 12/14/2020 | 23:48:58 | 20.77       | 0.20    |       | 23:48:58 | 20.81       | 0.11    |       |
| 12/14/2020 | 23:49:58 | 20.77       | 0.20    |       | 23:49:58 | 20.81       | 0.11    |       |
| 12/14/2020 | 23:50:58 | 20.77       | 0.21    |       | 23:50:58 | 20.81       | 0.11    |       |
| 12/14/2020 | 23:51:58 | 20.79       | 0.21    |       | 23:51:58 | 20.82       | 0.10    |       |
| 12/14/2020 | 23:52:58 | 20.78       | 0.22    |       | 23:52:58 | 20.82       | 0.10    |       |
| 12/14/2020 | 23:53:58 | 20.79       | 0.19    |       | 23:53:58 | 20.82       | 0.10    |       |
| 12/14/2020 | 23:54:58 | 20.77       | 0.21    |       | 23:54:58 | 20.81       | 0.11    |       |
| 12/14/2020 | 23:55:58 | 20.76       | 0.25    |       | 23:55:58 | 20.81       | 0.10    |       |
| 12/14/2020 | 23:56:58 | 20.76       | 0.23    |       | 23:56:58 | 20.81       | 0.10    |       |
| 12/14/2020 | 23:57:58 | 20.78       | 0.21    |       | 23:57:58 | 20.81       | 0.10    |       |
| 12/14/2020 | 23:58:58 | 20.79       | 0.19    |       | 23:58:58 | 20.81       | 0.11    |       |
| 12/14/2020 | 23:59:58 | 20.79       | 0.19    |       | 23:59:58 | 20.80       | 0.10    |       |
| 12/15/2020 | 0:00:58  | 20.79       | 0.18    |       | 0:00:58  | 20.81       | 0.11    |       |
| 12/15/2020 | 0:01:58  | 20.79       | 0.17    |       | 0:01:58  | 20.82       | 0.09    |       |
| 12/15/2020 | 0:02:58  | 20.81       | 0.18    |       | 0:02:58  | 20.81       | 0.09    |       |
| 12/15/2020 | 0:03:58  | 20.81       | 0.18    |       | 0:03:58  | 20.81       | 0.09    |       |
| 12/15/2020 | 0:04:58  | 20.81       | 0.18    |       | 0:04:58  | 20.81       | 0.10    |       |
| 12/15/2020 | 0:05:58  | 20.81       | 0.18    |       | 0:05:58  | 20.81       | 0.09    |       |
| 12/15/2020 | 0:06:58  | 20.81       | 0.18    |       | 0:06:58  | 20.81       | 0.10    |       |
| 12/15/2020 | 0:07:58  | 20.80       | 0.19    |       | 0:07:58  | 20.81       | 0.09    |       |
| 12/15/2020 | 0:08:58  | 20.81       | 0.19    |       | 0:08:58  | 20.81       | 0.09    |       |
| 12/15/2020 | 0:09:58  | 20.81       | 0.19    |       | 0:09:58  | 20.82       | 0.08    |       |
| 12/15/2020 | 0:10:58  | 20.81       | 0.20    |       | 0:10:58  | 20.83       | 0.08    |       |
| 12/15/2020 | 0:11:58  | 20.81       | 0.21    |       | 0:11:58  | 20.82       | 0.08    |       |
| 12/15/2020 | 0:12:58  | 20.83       | 0.19    |       | 0:12:58  | 20.79       | 0.11    |       |
| 12/15/2020 | 0:13:58  | 20.83       | 0.18    |       | 0:13:58  | 20.79       | 0.11    |       |
| 12/15/2020 | 0:14:58  | 20.84       | 0.18    |       | 0:14:58  | 20.79       | 0.11    |       |
| 12/15/2020 | 0:15:58  | 20.83       | 0.19    |       | 0:15:58  | 20.79       | 0.11    |       |
| 12/15/2020 | 0:16:58  | 20.83       | 0.19    |       | 0:16:58  | 20.81       | 0.09    |       |
| 12/15/2020 | 0:17:58  | 20.81       | 0.20    |       | 0:17:58  | 20.83       | 0.08    |       |
| 12/15/2020 | 0:18:58  | 20.81       | 0.19    |       | 0:18:58  | 20.83       | 0.09    |       |
| 12/15/2020 | 0:19:58  | 20.81       | 0.20    |       | 0:19:58  | 20.83       | 0.09    |       |
| 12/15/2020 | 0:20:58  | 20.81       | 0.19    |       | 0:20:58  | 20.83       | 0.09    |       |
| 12/15/2020 | 0:21:58  | 20.82       | 0.21    |       | 0:21:58  | 20.83       | 0.08    |       |
| 12/15/2020 | 0:22:58  | 20.84       | 0.27    |       | 0:22:58  | 20.83       | 0.09    |       |
| 12/15/2020 | 0:23:58  | 20.82       | 0.18    |       | 0:23:58  | 20.83       | 0.09    |       |
| 12/15/2020 | 0:24:58  | 20.82       | 0.18    |       | 0:24:58  | 20.83       | 0.08    |       |
| 12/15/2020 | 0:25:58  | 20.80       | 0.19    |       | 0:25:58  | 20.83       | 0.08    |       |
| 12/15/2020 | 0:26:58  | 20.81       | 0.18    |       | 0:26:58  | 20.82       | 0.09    |       |
| 12/15/2020 | 0:27:58  | 20.82       | 0.18    |       | 0:27:58  | 20.80       | 0.09    |       |
| 12/15/2020 | 0:28:58  | 20.83       | 0.18    |       | 0:28:58  | 20.80       | 0.09    |       |
| 12/15/2020 | 0:29:58  | 20.82       | 0.18    |       | 0:29:58  | 20.80       | 0.09    |       |
| 12/15/2020 | 0:30:58  | 20.81       | 0.19    |       | 0:30:58  | 20.80       | 0.09    |       |
| 12/15/2020 | 0:31:58  | 20.82       | 0.19    |       | 0:31:58  | 20.80       | 0.10    |       |
| 12/15/2020 | 0:32:58  | 20.82       | 0.19    |       | 0:32:58  | 20.80       | 0.10    |       |
| 12/15/2020 | 0:33:58  | 20.83       | 0.19    |       | 0:33:58  | 20.80       | 0.10    |       |
| 12/15/2020 | 0:34:58  | 20.85       | 0.18    |       | 0:34:58  | 20.80       | 0.09    |       |
| 12/15/2020 | 0:35:58  | 20.88       | 0.14    |       | 0:35:58  | 20.81       | 0.09    |       |
| 12/15/2020 | 0:36:58  | 20.89       | 0.14    |       | 0:36:58  | 20.80       | 0.09    |       |
| 12/15/2020 | 0:37:58  | 20.89       | 0.14    |       | 0:37:58  | 20.80       | 0.09    |       |
| 12/15/2020 | 0:38:58  | 20.89       | 0.15    |       | 0:38:58  | 20.79       | 0.09    |       |
| 12/15/2020 | 0:39:58  | 20.88       | 0.15    |       | 0:39:58  | 20.79       | 0.10    |       |
| 12/15/2020 | 0:40:58  | 20.88       | 0.15    |       | 0:40:58  | 20.78       | 0.09    |       |

**SLR**  
**Columbia Steel**  
**Method 3A Baghouse#1 and Baghouse #2**

| Date       | Time    | Baghouse #2 |         |       | Time    | Baghouse #1 |         |       |
|------------|---------|-------------|---------|-------|---------|-------------|---------|-------|
|            |         | O2 [%]      | CO2 [%] | Notes |         | O2 [%]      | CO2 [%] | Notes |
| 12/15/2020 | 0:41:58 | 20.88       | 0.15    |       | 0:41:58 | 20.78       | 0.09    |       |
| 12/15/2020 | 0:42:58 | 20.88       | 0.15    |       | 0:42:58 | 20.78       | 0.09    |       |
| 12/15/2020 | 0:43:58 | 20.88       | 0.14    |       | 0:43:58 | 20.78       | 0.09    |       |
| 12/15/2020 | 0:44:58 | 20.88       | 0.14    |       | 0:44:58 | 20.78       | 0.10    |       |
| 12/15/2020 | 0:45:58 | 20.88       | 0.15    |       | 0:45:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 0:46:58 | 20.86       | 0.16    |       | 0:46:58 | 20.78       | 0.09    |       |
| 12/15/2020 | 0:47:58 | 20.84       | 0.18    |       | 0:47:58 | 20.78       | 0.09    |       |
| 12/15/2020 | 0:48:58 | 20.76       | 0.21    |       | 0:48:58 | 20.78       | 0.10    |       |
| 12/15/2020 | 0:49:58 | 20.75       | 0.21    |       | 0:49:58 | 20.78       | 0.10    |       |
| 12/15/2020 | 0:50:58 | 20.74       | 0.22    |       | 0:50:58 | 20.78       | 0.10    |       |
| 12/15/2020 | 0:51:58 | 20.73       | 0.22    |       | 0:51:58 | 20.78       | 0.10    |       |
| 12/15/2020 | 0:52:58 | 20.73       | 0.22    |       | 0:52:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 0:53:58 | 20.73       | 0.22    |       | 0:53:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 0:54:58 | 20.75       | 0.21    |       | 0:54:58 | 20.77       | 0.11    |       |
| 12/15/2020 | 0:55:58 | 20.76       | 0.20    |       | 0:55:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 0:56:58 | 20.76       | 0.19    |       | 0:56:58 | 20.76       | 0.10    |       |
| 12/15/2020 | 0:57:58 | 20.73       | 0.22    |       | 0:57:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 0:58:58 | 20.73       | 0.23    |       | 0:58:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 0:59:58 | 20.74       | 0.23    |       | 0:59:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 1:00:58 | 20.73       | 0.23    |       | 1:00:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 1:01:58 | 20.75       | 0.22    |       | 1:01:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 1:02:58 | 20.75       | 0.23    |       | 1:02:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 1:03:58 | 20.76       | 0.23    |       | 1:03:58 | 20.78       | 0.10    |       |
| 12/15/2020 | 1:04:58 | 20.76       | 0.23    |       | 1:04:58 | 20.78       | 0.10    |       |
| 12/15/2020 | 1:05:58 | 20.75       | 0.24    |       | 1:05:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 1:06:58 | 20.75       | 0.24    |       | 1:06:58 | 20.78       | 0.09    |       |
| 12/15/2020 | 1:07:58 | 20.77       | 0.22    |       | 1:07:58 | 20.77       | 0.09    |       |
| 12/15/2020 | 1:08:58 | 20.78       | 0.23    |       | 1:08:58 | 20.77       | 0.09    |       |
| 12/15/2020 | 1:09:58 | 20.78       | 0.23    |       | 1:09:58 | 20.77       | 0.09    |       |
| 12/15/2020 | 1:10:58 | 20.77       | 0.24    |       | 1:10:58 | 20.78       | 0.09    |       |
| 12/15/2020 | 1:11:58 | 20.78       | 0.24    |       | 1:11:58 | 20.77       | 0.09    |       |
| 12/15/2020 | 1:12:58 | 20.78       | 0.23    |       | 1:12:58 | 20.78       | 0.09    |       |
| 12/15/2020 | 1:13:58 | 20.78       | 0.22    |       | 1:13:58 | 20.77       | 0.09    |       |
| 12/15/2020 | 1:14:58 | 20.78       | 0.22    |       | 1:14:58 | 20.77       | 0.09    |       |
| 12/15/2020 | 1:15:58 | 20.78       | 0.21    |       | 1:15:58 | 20.77       | 0.09    |       |
| 12/15/2020 | 1:16:58 | 20.79       | 0.21    |       | 1:16:58 | 20.77       | 0.09    |       |
| 12/15/2020 | 1:17:58 | 20.79       | 0.21    |       | 1:17:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 1:18:58 | 20.79       | 0.21    |       | 1:18:58 | 20.76       | 0.10    |       |
| 12/15/2020 | 1:19:58 | 20.76       | 0.21    |       | 1:19:58 | 20.77       | 0.09    |       |
| 12/15/2020 | 1:20:58 | 20.74       | 0.20    |       | 1:20:58 | 20.76       | 0.10    |       |
| 12/15/2020 | 1:21:58 | 20.75       | 0.20    |       | 1:21:58 | 20.76       | 0.09    |       |
| 12/15/2020 | 1:22:58 | 20.76       | 0.21    |       | 1:22:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 1:23:58 | 20.76       | 0.21    |       | 1:23:58 | 20.76       | 0.10    |       |
| 12/15/2020 | 1:24:58 | 20.76       | 0.21    |       | 1:24:58 | 20.76       | 0.10    |       |
| 12/15/2020 | 1:25:58 | 20.76       | 0.21    |       | 1:25:58 | 20.76       | 0.10    |       |
| 12/15/2020 | 1:26:58 | 20.76       | 0.21    |       | 1:26:58 | 20.76       | 0.11    |       |
| 12/15/2020 | 1:27:58 | 20.75       | 0.23    |       | 1:27:58 | 20.76       | 0.10    |       |
| 12/15/2020 | 1:28:58 | 20.73       | 0.24    |       | 1:28:58 | 20.76       | 0.10    |       |
| 12/15/2020 | 1:29:58 | 20.74       | 0.22    |       | 1:29:58 | 20.76       | 0.11    |       |
| 12/15/2020 | 1:30:58 | 20.76       | 0.21    |       | 1:30:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 1:31:58 | 20.77       | 0.21    |       | 1:31:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 1:32:58 | 20.78       | 0.21    |       | 1:32:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 1:33:58 | 20.78       | 0.21    |       | 1:33:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 1:34:58 | 20.77       | 0.22    |       | 1:34:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 1:35:58 | 20.77       | 0.22    |       | 1:35:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 1:36:58 | 20.77       | 0.22    |       | 1:36:58 | 20.77       | 0.10    |       |

**SLR**  
**Columbia Steel**  
**Method 3A Baghouse#1 and Baghouse #2**

| Date       | Time    | Baghouse #2 |         |       | Time    | Baghouse #1 |         |       |
|------------|---------|-------------|---------|-------|---------|-------------|---------|-------|
|            |         | O2 [%]      | CO2 [%] | Notes |         | O2 [%]      | CO2 [%] | Notes |
| 12/15/2020 | 1:37:58 | 20.77       | 0.22    |       | 1:37:58 | 20.76       | 0.10    |       |
| 12/15/2020 | 1:38:58 | 20.77       | 0.22    |       | 1:38:58 | 20.70       | 0.20    |       |
| 12/15/2020 | 1:39:58 | 20.77       | 0.21    |       | 1:39:58 | 20.49       | 0.50    |       |
| 12/15/2020 | 1:40:58 | 20.78       | 0.21    |       | 1:40:58 | 20.45       | 0.55    |       |
| 12/15/2020 | 1:41:58 | 20.78       | 0.21    |       | 1:41:58 | 20.45       | 0.55    |       |
| 12/15/2020 | 1:42:58 | 20.78       | 0.21    |       | 1:42:58 | 20.60       | 0.33    |       |
| 12/15/2020 | 1:43:58 | 20.78       | 0.20    |       | 1:43:58 | 20.70       | 0.17    |       |
| 12/15/2020 | 1:44:58 | 20.78       | 0.21    |       | 1:44:58 | 20.73       | 0.14    |       |
| 12/15/2020 | 1:45:58 | 20.78       | 0.21    |       | 1:45:58 | 20.67       | 0.24    |       |
| 12/15/2020 | 1:46:58 | 20.78       | 0.21    |       | 1:46:58 | 20.66       | 0.25    |       |
| 12/15/2020 | 1:47:58 | 20.79       | 0.21    |       | 1:47:58 | 20.74       | 0.13    |       |
| 12/15/2020 | 1:48:58 | 20.78       | 0.21    |       | 1:48:58 | 20.76       | 0.10    |       |
| 12/15/2020 | 1:49:58 | 20.77       | 0.22    |       | 1:49:58 | 20.76       | 0.10    |       |
| 12/15/2020 | 1:50:58 | 20.77       | 0.24    |       | 1:50:58 | 20.76       | 0.10    |       |
| 12/15/2020 | 1:51:58 | 20.78       | 0.22    |       | 1:51:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 1:52:58 | 20.78       | 0.22    |       | 1:52:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 1:53:58 | 20.79       | 0.21    |       | 1:53:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 1:54:58 | 20.79       | 0.22    |       | 1:54:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 1:55:58 | 20.78       | 0.23    |       | 1:55:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 1:56:58 | 20.78       | 0.23    |       | 1:56:58 | 20.78       | 0.10    |       |
| 12/15/2020 | 1:57:58 | 20.79       | 0.23    |       | 1:57:58 | 20.78       | 0.10    |       |
| 12/15/2020 | 1:58:58 | 20.78       | 0.24    |       | 1:58:58 | 20.78       | 0.10    |       |
| 12/15/2020 | 1:59:58 | 20.77       | 0.24    |       | 1:59:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 2:00:58 | 20.78       | 0.24    |       | 2:00:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 2:01:58 | 20.78       | 0.24    |       | 2:01:58 | 20.77       | 0.11    |       |
| 12/15/2020 | 2:02:58 | 20.78       | 0.23    |       | 2:02:58 | 20.76       | 0.11    |       |
| 12/15/2020 | 2:03:58 | 20.79       | 0.23    |       | 2:03:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 2:04:58 | 20.79       | 0.23    |       | 2:04:58 | 20.76       | 0.11    |       |
| 12/15/2020 | 2:05:58 | 20.78       | 0.23    |       | 2:05:58 | 20.77       | 0.10    |       |
| 12/15/2020 | 2:06:58 | 20.79       | 0.21    |       | 2:06:58 | 20.76       | 0.10    |       |
| 12/15/2020 | 2:07:58 | 20.76       | 0.23    |       | 2:07:58 | 20.78       | 0.09    |       |
| 12/15/2020 | 2:08:58 | 20.78       | 0.22    |       | 2:08:58 | 20.78       | 0.08    |       |
| 12/15/2020 | 2:09:58 | 20.78       | 0.22    |       | 2:09:58 | 20.79       | 0.08    |       |
| 12/15/2020 | 2:10:58 | 20.79       | 0.21    |       | 2:10:58 | 20.79       | 0.08    |       |
| 12/15/2020 | 2:11:58 | 20.81       | 0.20    |       | 2:11:58 | 20.78       | 0.09    |       |
| 12/15/2020 | 2:12:58 | 20.80       | 0.21    |       | 2:12:58 | 20.78       | 0.09    |       |
| 12/15/2020 | 2:13:58 | 20.79       | 0.20    |       | 2:13:58 | 20.78       | 0.08    |       |
| 12/15/2020 | 2:14:58 | 20.79       | 0.21    |       | 2:14:58 | 20.79       | 0.08    |       |
| 12/15/2020 | 2:15:58 | 20.79       | 0.21    |       | 2:15:58 | 20.78       | 0.08    |       |
| 12/15/2020 | 2:16:58 | 20.79       | 0.21    |       | 2:16:58 | 20.80       | 0.07    |       |
| 12/15/2020 | 2:17:58 | 20.77       | 0.23    |       | 2:17:58 | 20.80       | 0.07    |       |
| 12/15/2020 | 2:18:58 | 20.77       | 0.23    |       | 2:18:58 | 20.80       | 0.07    |       |
| 12/15/2020 | 2:19:58 | 20.78       | 0.22    |       | 2:19:58 | 20.79       | 0.08    |       |
| 12/15/2020 | 2:20:58 | 20.79       | 0.22    |       | 2:20:58 | 20.80       | 0.07    |       |
| 12/15/2020 | 2:21:58 | 20.79       | 0.23    |       | 2:21:58 | 20.79       | 0.08    |       |
| 12/15/2020 | 2:22:58 | 20.79       | 0.23    |       | 2:22:58 | 20.77       | 0.09    |       |
| 12/15/2020 | 2:23:58 | 20.78       | 0.24    |       | 2:23:58 | 20.76       | 0.09    |       |
| 12/15/2020 | 2:24:58 | 20.80       | 0.23    |       | 2:24:58 | 20.76       | 0.09    |       |
| 12/15/2020 | 2:25:58 | 20.80       | 0.22    |       | 2:25:58 | 20.76       | 0.09    |       |
| 12/15/2020 | 2:26:58 | 20.81       | 0.22    |       | 2:26:58 | 20.76       | 0.09    |       |
| 12/15/2020 | 2:27:58 | 20.81       | 0.22    |       | 2:27:58 | 20.76       | 0.09    |       |
| 12/15/2020 | 2:28:58 | 20.80       | 0.22    |       | 2:28:58 | 20.76       | 0.09    |       |
| 12/15/2020 | 2:29:58 | 20.80       | 0.22    |       | 2:29:58 | 20.77       | 0.09    |       |
| 12/15/2020 | 2:30:58 | 20.79       | 0.22    |       | 2:30:58 | 20.77       | 0.09    |       |
| 12/15/2020 | 2:31:58 | 20.81       | 0.22    |       | 2:31:58 | 20.76       | 0.10    |       |
| 12/15/2020 | 2:32:58 | 20.82       | 0.33    |       | 2:32:58 | 20.76       | 0.10    |       |

**SLR**  
**Columbia Steel**  
**Method 3A Baghouse#1 and Baghouse #2**

| Date       | Time    | Baghouse #2 |         |                    | Time    | Baghouse #1 |         |       |
|------------|---------|-------------|---------|--------------------|---------|-------------|---------|-------|
|            |         | O2 [%]      | CO2 [%] | Notes              |         | O2 [%]      | CO2 [%] | Notes |
| 12/15/2020 | 2:33:58 | 20.84       | 0.21    |                    | 2:33:58 | 20.76       | 0.09    |       |
| 12/15/2020 | 2:34:58 | 20.82       | 0.20    |                    | 2:34:58 | 20.76       | 0.09    |       |
| 12/15/2020 | 2:35:58 | 20.81       | 0.20    |                    | 2:35:58 | 20.75       | 0.10    |       |
| 12/15/2020 | 2:36:58 | 20.81       | 0.20    |                    | 2:36:58 | 20.75       | 0.10    |       |
| 12/15/2020 | 2:37:58 | 20.80       | 0.21    |                    | 2:37:58 | 20.75       | 0.10    |       |
| 12/15/2020 | 2:38:58 | 20.80       | 0.21    |                    | 2:38:58 | 20.74       | 0.10    |       |
| 12/15/2020 | 2:39:58 | 20.80       | 0.21    |                    | 2:39:58 | 20.74       | 0.10    |       |
| 12/15/2020 | 2:40:58 | 20.80       | 0.22    | End Run 2 BH#2     | 2:40:58 | 20.75       | 0.10    |       |
|            |         | 20.80       | 0.20    | Average            | 2:41:58 | 20.75       | 0.10    |       |
|            |         |             |         |                    | 2:42:58 | 20.74       | 0.10    |       |
| 12/15/2020 | 2:41:58 | 20.79       | 0.23    |                    | 2:43:58 | 20.74       | 0.10    |       |
| 12/15/2020 | 2:42:58 | 20.78       | 0.22    |                    | 2:44:58 | 20.74       | 0.10    |       |
| 12/15/2020 | 2:43:58 | 6.72        | 0.26    |                    | 2:45:58 | 20.74       | 0.09    |       |
| 12/15/2020 | 2:44:58 | 0.03        | 0.11    | System Zero        | 2:46:58 | 20.74       | 0.10    |       |
| 12/15/2020 | 2:45:58 | 8.63        | 7.71    |                    | 2:47:58 | 20.74       | 0.10    |       |
| 12/15/2020 | 2:46:58 | 22.12       | 21.46   | O2 System Upscale  | 2:48:58 | 20.74       | 0.10    |       |
| 12/15/2020 | 2:47:58 | 20.77       | 11.31   |                    | 2:49:58 | 20.74       | 0.09    |       |
| 12/15/2020 | 2:48:58 | 17.85       | 2.77    |                    | 2:50:58 | 20.73       | 0.10    |       |
| 12/15/2020 | 2:49:58 | 10.02       | 9.77    | CO2 System Upscale | 2:51:58 | 20.74       | 0.10    |       |
| 12/15/2020 | 2:50:58 | 15.24       | 5.24    |                    | 2:52:58 | 20.73       | 0.10    |       |
| 12/15/2020 | 2:51:58 | 20.62       | 0.27    |                    | 2:53:58 | 20.73       | 0.09    |       |
| 12/15/2020 | 2:52:58 | 20.64       | 0.25    |                    | 2:54:58 | 20.73       | 0.10    |       |
| 12/15/2020 | 2:53:58 | 20.75       | 0.24    |                    | 2:55:58 | 20.74       | 0.09    |       |
| 12/15/2020 | 2:54:58 | 20.81       | 0.19    |                    | 2:56:58 | 20.73       | 0.10    |       |
| 12/15/2020 | 2:55:58 | 20.81       | 0.18    |                    | 2:57:58 | 20.73       | 0.10    |       |
| 12/15/2020 | 2:56:58 | 20.81       | 0.18    |                    | 2:58:58 | 20.74       | 0.10    |       |
| 12/15/2020 | 2:57:58 | 20.81       | 0.17    |                    | 2:59:58 | 20.73       | 0.10    |       |
| 12/15/2020 | 2:58:58 | 20.81       | 0.17    |                    | 3:00:58 | 20.74       | 0.10    |       |
| 12/15/2020 | 2:59:58 | 20.81       | 0.17    |                    | 3:01:58 | 20.74       | 0.10    |       |
| 12/15/2020 | 3:00:58 | 20.81       | 0.17    |                    | 3:02:58 | 20.74       | 0.10    |       |
| 12/15/2020 | 3:01:58 | 20.81       | 0.17    |                    | 3:03:58 | 20.75       | 0.10    |       |
| 12/15/2020 | 3:02:58 | 20.81       | 0.16    |                    | 3:04:58 | 20.74       | 0.11    |       |
| 12/15/2020 | 3:03:58 | 20.82       | 0.16    |                    | 3:05:58 | 20.75       | 0.10    |       |
| 12/15/2020 | 3:04:58 | 20.82       | 0.16    |                    | 3:06:58 | 20.74       | 0.10    |       |
| 12/15/2020 | 3:05:58 | 20.81       | 0.16    |                    | 3:07:58 | 20.73       | 0.11    |       |
| 12/15/2020 | 3:06:58 | 20.81       | 0.16    |                    | 3:08:58 | 20.73       | 0.10    |       |
| 12/15/2020 | 3:07:58 | 20.87       | 0.17    |                    | 3:09:58 | 20.73       | 0.11    |       |
| 12/15/2020 | 3:08:58 | 20.86       | 0.36    |                    | 3:10:58 | 20.73       | 0.11    |       |
| 12/15/2020 | 3:09:58 | 17.52       | 0.38    |                    | 3:11:58 | 20.73       | 0.11    |       |
| 12/15/2020 | 3:10:58 | 17.50       | 0.38    |                    | 3:12:58 | 20.73       | 0.11    |       |
| 12/15/2020 | 3:11:58 | 17.50       | 0.39    |                    | 3:13:58 | 20.73       | 0.11    |       |
| 12/15/2020 | 3:12:58 | 17.50       | 0.39    |                    | 3:14:58 | 20.73       | 0.11    |       |
| 12/15/2020 | 3:13:58 | 17.50       | 0.39    |                    | 3:15:58 | 20.73       | 0.11    |       |
| 12/15/2020 | 3:14:58 | 17.50       | 0.40    |                    | 3:16:58 | 20.73       | 0.11    |       |
| 12/15/2020 | 3:15:58 | 17.49       | 0.40    |                    | 3:17:58 | 20.73       | 0.11    |       |
| 12/15/2020 | 3:16:58 | 17.49       | 0.41    |                    | 3:18:58 | 20.73       | 0.11    |       |
| 12/15/2020 | 3:17:58 | 17.49       | 0.41    |                    | 3:19:58 | 20.69       | 0.16    |       |
| 12/15/2020 | 3:18:58 | 17.49       | 0.41    |                    | 3:20:58 | 20.53       | 0.40    |       |
| 12/15/2020 | 3:19:58 | 17.49       | 0.41    |                    | 3:21:58 | 20.43       | 0.54    |       |
| 12/15/2020 | 3:20:58 | 17.49       | 0.41    |                    | 3:22:58 | 20.43       | 0.55    |       |
| 12/15/2020 | 3:21:58 | 17.49       | 0.41    |                    | 3:23:58 | 20.53       | 0.38    |       |
| 12/15/2020 | 3:22:58 | 17.49       | 0.41    |                    | 3:24:58 | 20.67       | 0.16    |       |
| 12/15/2020 | 3:23:58 | 17.49       | 0.41    |                    | 3:25:58 | 20.70       | 0.15    |       |
| 12/15/2020 | 3:24:58 | 17.49       | 0.42    |                    | 3:26:58 | 20.65       | 0.23    |       |
| 12/15/2020 | 3:25:58 | 17.49       | 0.42    |                    | 3:27:58 | 20.68       | 0.18    |       |
| 12/15/2020 | 3:26:58 | 17.49       | 0.42    |                    | 3:28:58 | 20.71       | 0.12    |       |

SLR  
Columbia Steel  
Method 3A Baghouse#1 and Baghouse #2

| Date       | Time    | Baghouse #2 |         |       | Time    | Baghouse #1 |         |                    |
|------------|---------|-------------|---------|-------|---------|-------------|---------|--------------------|
|            |         | O2 [%]      | CO2 [%] | Notes |         | O2 [%]      | CO2 [%] | Notes              |
| 12/15/2020 | 3:27:58 | 17.49       | 0.42    |       | 3:29:58 | 20.73       | 0.11    |                    |
| 12/15/2020 | 3:28:58 | 17.49       | 0.41    |       | 3:30:58 | 20.72       | 0.11    |                    |
| 12/15/2020 | 3:29:58 | 17.49       | 0.41    |       | 3:31:58 | 20.72       | 0.13    |                    |
| 12/15/2020 | 3:30:58 | 17.49       | 0.41    |       | 3:32:58 | 20.72       | 0.11    |                    |
| 12/15/2020 | 3:31:58 | 17.49       | 0.41    |       | 3:33:58 | 20.73       | 0.12    |                    |
| 12/15/2020 | 3:32:58 | 17.49       | 0.42    |       | 3:34:58 | 20.73       | 0.11    |                    |
| 12/15/2020 | 3:33:58 | 17.49       | 0.42    |       | 3:35:58 | 20.73       | 0.11    |                    |
| 12/15/2020 | 3:34:58 | 17.49       | 0.42    |       | 3:36:58 | 20.74       | 0.11    |                    |
| 12/15/2020 | 3:35:58 | 17.49       | 0.42    |       | 3:37:58 | 20.74       | 0.11    |                    |
| 12/15/2020 | 3:36:58 | 17.49       | 0.42    |       | 3:38:58 | 20.74       | 0.12    |                    |
| 12/15/2020 | 3:37:58 | 17.49       | 0.42    |       | 3:39:58 | 20.73       | 0.12    |                    |
| 12/15/2020 | 3:38:58 | 17.49       | 0.43    |       | 3:40:58 | 20.73       | 0.12    |                    |
| 12/15/2020 | 3:39:58 | 17.49       | 0.43    |       | 3:41:58 | 20.73       | 0.12    |                    |
| 12/15/2020 | 3:40:58 | 17.49       | 0.43    |       | 3:42:58 | 20.72       | 0.12    |                    |
| 12/15/2020 | 3:41:58 | 17.49       | 0.43    |       | 3:43:58 | 20.72       | 0.12    |                    |
| 12/15/2020 | 3:42:58 | 17.49       | 0.43    |       | 3:44:58 | 20.73       | 0.12    |                    |
| 12/15/2020 | 3:43:58 | 17.49       | 0.44    |       | 3:45:58 | 20.72       | 0.11    |                    |
| 12/15/2020 | 3:44:58 | 17.49       | 0.44    |       | 3:46:58 | 20.73       | 0.11    |                    |
| 12/15/2020 | 3:45:58 | 17.48       | 0.44    |       | 3:47:58 | 20.72       | 0.11    |                    |
| 12/15/2020 | 3:46:58 | 17.48       | 0.44    |       | 3:48:58 | 20.74       | 0.11    |                    |
| 12/15/2020 | 3:47:58 | 17.49       | 0.44    |       | 3:49:58 | 20.72       | 0.11    |                    |
| 12/15/2020 | 3:48:58 | 17.48       | 0.44    |       | 3:50:58 | 20.73       | 0.11    |                    |
| 12/15/2020 | 3:49:58 | 17.48       | 0.44    |       | 3:51:58 | 20.76       | 0.09    |                    |
| 12/15/2020 | 3:50:58 | 17.49       | 0.44    |       | 3:52:58 | 20.76       | 0.08    | End Run 2 BH#1     |
| 12/15/2020 | 3:51:58 | 17.48       | 0.44    |       |         | 20.77       | 0.12    | Average            |
| 12/15/2020 | 3:52:58 | 17.48       | 0.44    |       |         |             |         |                    |
| 12/15/2020 | 3:53:58 | 17.48       | 0.44    |       | 3:53:58 | 15.79       | 0.16    |                    |
| 12/15/2020 | 3:54:58 | 17.48       | 0.43    |       | 3:54:58 | 0.73        | 0.05    |                    |
| 12/15/2020 | 3:55:58 | 17.48       | 0.43    |       | 3:55:58 | 0.01        | 0.03    | System Zero        |
| 12/15/2020 | 3:56:58 | 17.48       | 0.43    |       | 3:56:58 | 0.11        | 0.18    |                    |
| 12/15/2020 | 3:57:58 | 17.49       | 0.43    |       | 3:57:58 | 7.86        | 7.93    |                    |
| 12/15/2020 | 3:58:58 | 17.49       | 0.43    |       | 3:58:58 | 9.87        | 9.89    |                    |
| 12/15/2020 | 3:59:58 | 17.49       | 0.43    |       | 3:59:58 | 9.89        | 9.94    | CO2 System Upscale |
| 12/15/2020 | 4:00:58 | 17.49       | 0.43    |       | 4:00:58 | 13.07       | 13.43   |                    |
| 12/15/2020 | 4:01:58 | 17.49       | 0.43    |       | 4:01:58 | 21.40       | 21.63   |                    |
| 12/15/2020 | 4:02:58 | 17.49       | 0.43    |       | 4:02:58 | 21.63       | 18.99   | O2 System Upscale  |

## SLR

## Columbia Steel

## Method 3A Baghouse #1 and Baghouse #2

| Date       | Time     | Baghouse #2 |         |                    | Time     | Baghouse #1 |         |                    |
|------------|----------|-------------|---------|--------------------|----------|-------------|---------|--------------------|
|            |          | O2 [%]      | CO2 [%] | Notes              |          | O2 [%]      | CO2 [%] | Notes              |
| 12/15/2020 | 19:03:51 | 20.78       | 0.36    |                    | 19:03:51 | 20.49       | 0.29    |                    |
| 12/15/2020 | 19:04:51 | 17.40       | 0.33    |                    | 19:04:51 | 20.48       | 0.29    |                    |
| 12/15/2020 | 19:05:51 | 0.03        | 0.07    | Analyzer Zero      | 19:05:51 | 20.46       | 0.30    |                    |
| 12/15/2020 | 19:06:51 | 18.19       | 17.43   |                    | 19:06:51 | 20.45       | 0.30    |                    |
| 12/15/2020 | 19:07:51 | 22.03       | 21.70   | Analyzer Span      | 19:07:51 | 20.45       | 0.30    |                    |
| 12/15/2020 | 19:08:51 | 14.17       | 13.98   |                    | 19:08:51 | 20.44       | 0.30    |                    |
| 12/15/2020 | 19:09:51 | 9.99        | 9.84    | Analyzer Mid       | 19:09:51 | 20.44       | 0.30    |                    |
| 12/15/2020 | 19:10:51 | 17.79       | 2.99    |                    | 19:10:51 | 13.71       | 0.23    |                    |
| 12/15/2020 | 19:11:51 | 20.69       | 0.31    |                    | 19:11:51 | 0.02        | 0.03    | Analyzer Zero      |
| 12/15/2020 | 19:12:51 | 20.69       | 0.29    |                    | 19:12:51 | 15.94       | 16.25   |                    |
| 12/15/2020 | 19:13:51 | 20.70       | 0.29    |                    | 19:13:51 | 22.01       | 21.67   | Analyzer Span      |
| 12/15/2020 | 19:14:51 | 20.69       | 0.29    |                    | 19:14:51 | 12.64       | 11.95   |                    |
| 12/15/2020 | 19:15:51 | 20.69       | 0.28    |                    | 19:15:51 | 10.00       | 9.88    | Analyzer Mid       |
| 12/15/2020 | 19:16:51 | 20.69       | 0.28    |                    | 19:16:51 | 9.93        | 8.96    |                    |
| 12/15/2020 | 19:17:51 | 20.53       | 0.18    |                    | 19:17:51 | 9.88        | 8.12    |                    |
| 12/15/2020 | 19:18:51 | 20.80       | 0.04    |                    | 19:18:51 | 9.92        | 8.09    |                    |
| 12/15/2020 | 19:19:51 | 8.83        | 0.26    |                    | 19:19:51 | 14.71       | 4.64    |                    |
| 12/15/2020 | 19:20:51 | 0.05        | 0.00    | System Zero        | 19:20:51 | 20.46       | 0.38    |                    |
| 12/15/2020 | 19:21:51 | 10.82       | 10.19   |                    | 19:21:51 | 20.44       | 0.38    |                    |
| 12/15/2020 | 19:22:51 | 22.03       | 21.59   | O2 System Upscale  | 19:22:51 | 20.43       | 0.38    |                    |
| 12/15/2020 | 19:23:51 | 15.24       | 15.15   |                    | 19:23:51 | 20.41       | 0.38    |                    |
| 12/15/2020 | 19:24:51 | 9.95        | 9.83    | CO2 System Upscale | 19:24:51 | 20.41       | 0.38    |                    |
| 12/15/2020 | 19:25:51 | 16.30       | 4.31    |                    | 19:25:51 | 20.42       | 0.37    |                    |
| 12/15/2020 | 19:26:51 | 20.78       | 0.12    |                    | 19:26:51 | 6.53        | 0.47    |                    |
| 12/15/2020 | 19:27:51 | 20.79       | 0.09    |                    | 19:27:51 | 0.02        | 0.13    | System Zero        |
| 12/15/2020 | 19:28:51 | 20.79       | 0.08    |                    | 19:28:51 | 0.41        | 0.52    |                    |
| 12/15/2020 | 19:29:51 | 20.79       | 0.08    |                    | 19:29:51 | 18.88       | 19.31   |                    |
| 12/15/2020 | 19:30:51 | 20.79       | 0.07    |                    | 19:30:51 | 21.73       | 21.82   | O2 System Upscale  |
| 12/15/2020 | 19:31:51 | 20.79       | 0.07    |                    | 19:31:51 | 19.07       | 18.77   |                    |
| 12/15/2020 | 19:32:51 | 20.79       | 0.06    |                    | 19:32:51 | 10.12       | 10.11   |                    |
| 12/15/2020 | 19:33:51 | 20.79       | 0.07    |                    | 19:33:51 | 9.91        | 9.95    | CO2 System Upscale |
| 12/15/2020 | 19:34:51 | 20.79       | 0.05    |                    | 19:34:51 | 15.27       | 4.89    |                    |
| 12/15/2020 | 19:35:51 | 20.79       | 0.06    |                    | 19:35:51 | 20.68       | 0.35    |                    |
| 12/15/2020 | 19:36:51 | 20.79       | 0.06    |                    | 19:36:51 | 20.72       | 0.32    |                    |
| 12/15/2020 | 19:37:51 | 20.79       | 0.05    |                    | 19:37:51 | 20.74       | 0.32    |                    |
| 12/15/2020 | 19:38:51 | 20.78       | 0.04    |                    | 19:38:51 | 20.74       | 0.31    |                    |
| 12/15/2020 | 19:39:51 | 20.79       | 0.04    |                    | 19:39:51 | 20.74       | 0.31    |                    |
| 12/15/2020 | 19:40:51 | 20.78       | 0.04    |                    | 19:40:51 | 20.75       | 0.30    |                    |
| 12/15/2020 | 19:41:51 | 20.78       | 0.04    |                    | 19:41:51 | 20.75       | 0.30    |                    |
| 12/15/2020 | 19:42:51 | 20.78       | 0.04    |                    | 19:42:51 | 20.75       | 0.30    |                    |
| 12/15/2020 | 19:43:51 | 20.78       | 0.04    |                    | 19:43:51 | 20.75       | 0.30    |                    |
| 12/15/2020 | 19:44:51 | 20.77       | 0.05    |                    | 19:44:51 | 20.75       | 0.30    |                    |
| 12/15/2020 | 19:45:51 | 20.77       | 0.05    |                    | 19:45:51 | 20.75       | 0.29    |                    |
| 12/15/2020 | 19:46:51 | 20.77       | 0.04    |                    | 19:46:51 | 20.76       | 0.29    |                    |
| 12/15/2020 | 19:47:51 | 20.77       | 0.04    |                    | 19:47:51 | 20.75       | 0.29    |                    |
| 12/15/2020 | 19:48:51 | 20.77       | 0.05    |                    | 19:48:51 | 20.75       | 0.28    |                    |
| 12/15/2020 | 19:49:51 | 20.77       | 0.05    |                    | 19:49:51 | 20.75       | 0.28    |                    |
| 12/15/2020 | 19:50:51 | 20.77       | 0.05    |                    | 19:50:51 | 20.76       | 0.28    |                    |
| 12/15/2020 | 19:51:51 | 20.77       | 0.06    |                    | 19:51:51 | 20.75       | 0.28    |                    |
| 12/15/2020 | 19:52:51 | 20.77       | 0.06    |                    | 19:52:51 | 20.76       | 0.28    |                    |
| 12/15/2020 | 19:53:51 | 20.77       | 0.06    |                    | 19:53:51 | 20.76       | 0.27    |                    |
| 12/15/2020 | 19:54:51 | 20.77       | 0.07    |                    | 19:54:51 | 20.75       | 0.27    |                    |
| 12/15/2020 | 19:55:51 | 20.77       | 0.06    |                    | 19:55:51 | 20.76       | 0.27    |                    |
| 12/15/2020 | 19:56:51 | 20.77       | 0.06    |                    | 19:56:51 | 20.76       | 0.26    |                    |
| 12/15/2020 | 19:57:51 | 20.77       | 0.06    |                    | 19:57:51 | 20.76       | 0.26    |                    |
| 12/15/2020 | 19:58:51 | 20.77       | 0.06    |                    | 19:58:51 | 20.76       | 0.25    |                    |
| 12/15/2020 | 19:59:51 | 20.77       | 0.06    |                    | 19:59:51 | 20.76       | 0.25    |                    |
| 12/15/2020 | 20:00:51 | 20.77       | 0.06    |                    | 20:00:51 | 20.76       | 0.25    |                    |

## SLR

## Columbia Steel

## Method 3A Baghouse #1 and Baghouse #2

| Date       | Time     | Baghouse #2 |         |       | Time     | Baghouse #1 |         |       |
|------------|----------|-------------|---------|-------|----------|-------------|---------|-------|
|            |          | O2 [%]      | CO2 [%] | Notes |          | O2 [%]      | CO2 [%] | Notes |
| 12/15/2020 | 20:01:51 | 20.77       | 0.06    |       | 20:01:51 | 20.76       | 0.25    |       |
| 12/15/2020 | 20:02:51 | 20.77       | 0.05    |       | 20:02:51 | 20.76       | 0.24    |       |
| 12/15/2020 | 20:03:51 | 20.77       | 0.06    |       | 20:03:51 | 20.76       | 0.24    |       |
| 12/15/2020 | 20:04:51 | 20.77       | 0.05    |       | 20:04:51 | 20.76       | 0.24    |       |
| 12/15/2020 | 20:05:51 | 20.77       | 0.05    |       | 20:05:51 | 20.76       | 0.23    |       |
| 12/15/2020 | 20:06:51 | 20.77       | 0.05    |       | 20:06:51 | 20.76       | 0.23    |       |
| 12/15/2020 | 20:07:51 | 20.77       | 0.04    |       | 20:07:51 | 20.76       | 0.23    |       |
| 12/15/2020 | 20:08:51 | 20.77       | 0.04    |       | 20:08:51 | 20.76       | 0.23    |       |
| 12/15/2020 | 20:09:51 | 20.77       | 0.04    |       | 20:09:51 | 20.76       | 0.23    |       |
| 12/15/2020 | 20:10:51 | 20.77       | 0.04    |       | 20:10:51 | 20.76       | 0.23    |       |
| 12/15/2020 | 20:11:51 | 20.77       | 0.05    |       | 20:11:51 | 20.76       | 0.23    |       |
| 12/15/2020 | 20:12:51 | 20.77       | 0.05    |       | 20:12:51 | 20.76       | 0.23    |       |
| 12/15/2020 | 20:13:51 | 20.77       | 0.05    |       | 20:13:51 | 20.76       | 0.23    |       |
| 12/15/2020 | 20:14:51 | 20.78       | 0.05    |       | 20:14:51 | 20.76       | 0.23    |       |
| 12/15/2020 | 20:15:51 | 20.78       | 0.05    |       | 20:15:51 | 20.76       | 0.23    |       |
| 12/15/2020 | 20:16:51 | 20.78       | 0.05    |       | 20:16:51 | 20.76       | 0.22    |       |
| 12/15/2020 | 20:17:51 | 20.78       | 0.05    |       | 20:17:51 | 20.76       | 0.22    |       |
| 12/15/2020 | 20:18:51 | 20.78       | 0.06    |       | 20:18:51 | 20.76       | 0.22    |       |
| 12/15/2020 | 20:19:51 | 20.78       | 0.06    |       | 20:19:51 | 20.76       | 0.22    |       |
| 12/15/2020 | 20:20:51 | 20.78       | 0.06    |       | 20:20:51 | 20.76       | 0.22    |       |
| 12/15/2020 | 20:21:51 | 20.78       | 0.07    |       | 20:21:51 | 20.76       | 0.22    |       |
| 12/15/2020 | 20:22:51 | 20.78       | 0.06    |       | 20:22:51 | 20.76       | 0.21    |       |
| 12/15/2020 | 20:23:51 | 20.77       | 0.07    |       | 20:23:51 | 20.76       | 0.21    |       |
| 12/15/2020 | 20:24:51 | 20.77       | 0.06    |       | 20:24:51 | 20.76       | 0.21    |       |
| 12/15/2020 | 20:25:51 | 20.77       | 0.06    |       | 20:25:51 | 20.76       | 0.21    |       |
| 12/15/2020 | 20:26:51 | 20.77       | 0.06    |       | 20:26:51 | 20.76       | 0.21    |       |
| 12/15/2020 | 20:27:51 | 20.76       | 0.06    |       | 20:27:51 | 20.76       | 0.21    |       |
| 12/15/2020 | 20:28:51 | 20.76       | 0.06    |       | 20:28:51 | 20.76       | 0.21    |       |
| 12/15/2020 | 20:29:51 | 20.75       | 0.06    |       | 20:29:51 | 20.76       | 0.20    |       |
| 12/15/2020 | 20:30:51 | 20.75       | 0.05    |       | 20:30:51 | 20.75       | 0.20    |       |
| 12/15/2020 | 20:31:51 | 20.75       | 0.05    |       | 20:31:51 | 20.75       | 0.20    |       |
| 12/15/2020 | 20:32:51 | 20.75       | 0.05    |       | 20:32:51 | 20.75       | 0.20    |       |
| 12/15/2020 | 20:33:51 | 20.75       | 0.04    |       | 20:33:51 | 20.76       | 0.19    |       |
| 12/15/2020 | 20:34:51 | 20.75       | 0.04    |       | 20:34:51 | 20.75       | 0.19    |       |
| 12/15/2020 | 20:35:51 | 20.75       | 0.04    |       | 20:35:51 | 20.75       | 0.19    |       |
| 12/15/2020 | 20:36:51 | 20.75       | 0.04    |       | 20:36:51 | 20.75       | 0.19    |       |
| 12/15/2020 | 20:37:51 | 20.75       | 0.04    |       | 20:37:51 | 20.75       | 0.19    |       |
| 12/15/2020 | 20:38:51 | 20.75       | 0.05    |       | 20:38:51 | 20.75       | 0.19    |       |
| 12/15/2020 | 20:39:51 | 20.75       | 0.05    |       | 20:39:51 | 20.75       | 0.19    |       |
| 12/15/2020 | 20:40:51 | 20.75       | 0.04    |       | 20:40:51 | 20.74       | 0.19    |       |
| 12/15/2020 | 20:41:51 | 20.75       | 0.04    |       | 20:41:51 | 20.75       | 0.18    |       |
| 12/15/2020 | 20:42:51 | 20.75       | 0.05    |       | 20:42:51 | 20.74       | 0.19    |       |
| 12/15/2020 | 20:43:51 | 20.75       | 0.05    |       | 20:43:51 | 20.74       | 0.18    |       |
| 12/15/2020 | 20:44:51 | 20.75       | 0.05    |       | 20:44:51 | 20.74       | 0.19    |       |
| 12/15/2020 | 20:45:51 | 20.75       | 0.06    |       | 20:45:51 | 20.74       | 0.19    |       |
| 12/15/2020 | 20:46:51 | 20.74       | 0.06    |       | 20:46:51 | 20.74       | 0.19    |       |
| 12/15/2020 | 20:47:51 | 20.75       | 0.06    |       | 20:47:51 | 20.74       | 0.19    |       |
| 12/15/2020 | 20:48:51 | 20.74       | 0.05    |       | 20:48:51 | 20.74       | 0.19    |       |
| 12/15/2020 | 20:49:51 | 20.74       | 0.06    |       | 20:49:51 | 20.74       | 0.19    |       |
| 12/15/2020 | 20:50:51 | 20.74       | 0.06    |       | 20:50:51 | 20.73       | 0.18    |       |
| 12/15/2020 | 20:51:51 | 20.74       | 0.05    |       | 20:51:51 | 20.73       | 0.19    |       |
| 12/15/2020 | 20:52:51 | 20.75       | 0.05    |       | 20:52:51 | 20.73       | 0.18    |       |
| 12/15/2020 | 20:53:51 | 20.74       | 0.05    |       | 20:53:51 | 20.74       | 0.18    |       |
| 12/15/2020 | 20:54:51 | 20.74       | 0.05    |       | 20:54:51 | 20.73       | 0.18    |       |
| 12/15/2020 | 20:55:51 | 20.75       | 0.04    |       | 20:55:51 | 20.74       | 0.18    |       |
| 12/15/2020 | 20:56:51 | 20.74       | 0.04    |       | 20:56:51 | 20.73       | 0.17    |       |
| 12/15/2020 | 20:57:51 | 20.74       | 0.04    |       | 20:57:51 | 20.78       | 0.15    |       |
| 12/15/2020 | 20:58:51 | 20.75       | 0.03    |       | 20:58:51 | 20.85       | 0.11    |       |

## SLR

## Columbia Steel

## Method 3A Baghouse #1 and Baghouse #2

| Date       | Time     | Baghouse #2 |         |       | Time     | Baghouse #1 |         |                  |
|------------|----------|-------------|---------|-------|----------|-------------|---------|------------------|
|            |          | O2 [%]      | CO2 [%] | Notes |          | O2 [%]      | CO2 [%] | Notes            |
| 12/15/2020 | 20:59:51 | 20.74       | 0.03    |       | 20:59:51 | 20.85       | 0.11    |                  |
| 12/15/2020 | 21:00:51 | 20.74       | 0.03    |       | 21:00:51 | 20.85       | 0.11    |                  |
| 12/15/2020 | 21:01:51 | 20.73       | 0.03    |       | 21:01:51 | 20.85       | 0.11    |                  |
| 12/15/2020 | 21:02:51 | 20.73       | 0.03    |       | 21:02:51 | 20.85       | 0.11    |                  |
| 12/15/2020 | 21:03:51 | 20.74       | 0.03    |       | 21:03:51 | 20.85       | 0.11    |                  |
| 12/15/2020 | 21:04:51 | 20.74       | 0.03    |       | 21:04:51 | 20.85       | 0.10    |                  |
| 12/15/2020 | 21:05:51 | 20.74       | 0.03    |       | 21:05:51 | 20.85       | 0.11    |                  |
| 12/15/2020 | 21:06:51 | 20.74       | 0.03    |       | 21:06:51 | 20.85       | 0.10    |                  |
| 12/15/2020 | 21:07:51 | 20.74       | 0.03    |       | 21:07:51 | 20.85       | 0.10    |                  |
| 12/15/2020 | 21:08:51 | 20.74       | 0.03    |       | 21:08:51 | 20.85       | 0.10    |                  |
| 12/15/2020 | 21:09:51 | 20.73       | 0.04    |       | 21:09:51 | 20.84       | 0.10    |                  |
| 12/15/2020 | 21:10:51 | 20.73       | 0.04    |       | 21:10:51 | 20.84       | 0.10    |                  |
| 12/15/2020 | 21:11:51 | 20.73       | 0.04    |       | 21:11:51 | 20.85       | 0.10    |                  |
| 12/15/2020 | 21:12:51 | 20.73       | 0.04    |       | 21:12:51 | 20.84       | 0.10    |                  |
| 12/15/2020 | 21:13:51 | 20.73       | 0.05    |       | 21:13:51 | 20.84       | 0.10    |                  |
| 12/15/2020 | 21:14:51 | 20.73       | 0.05    |       | 21:14:51 | 20.84       | 0.10    |                  |
| 12/15/2020 | 21:15:51 | 20.73       | 0.05    |       | 21:15:51 | 20.84       | 0.10    |                  |
| 12/15/2020 | 21:16:51 | 20.73       | 0.05    |       | 21:16:51 | 20.84       | 0.10    |                  |
| 12/15/2020 | 21:17:51 | 20.73       | 0.05    |       | 21:17:51 | 20.84       | 0.10    |                  |
| 12/15/2020 | 21:18:51 | 20.73       | 0.04    |       | 21:18:51 | 20.82       | 0.12    |                  |
| 12/15/2020 | 21:19:51 | 20.73       | 0.05    |       | 21:19:51 | 20.80       | 0.13    |                  |
| 12/15/2020 | 21:20:51 | 20.73       | 0.05    |       | 21:20:51 | 20.79       | 0.13    | Start Run 3 BH#1 |
| 12/15/2020 | 21:21:51 | 20.73       | 0.04    |       | 21:21:51 | 20.79       | 0.13    |                  |
| 12/15/2020 | 21:22:51 | 20.73       | 0.04    |       | 21:22:51 | 20.80       | 0.12    |                  |
| 12/15/2020 | 21:23:51 | 20.73       | 0.03    |       | 21:23:51 | 20.79       | 0.13    |                  |
| 12/15/2020 | 21:24:51 | 20.73       | 0.03    |       | 21:24:51 | 20.79       | 0.13    |                  |
| 12/15/2020 | 21:25:51 | 20.73       | 0.03    |       | 21:25:51 | 20.80       | 0.12    |                  |
| 12/15/2020 | 21:26:51 | 20.73       | 0.03    |       | 21:26:51 | 20.79       | 0.12    |                  |
| 12/15/2020 | 21:27:51 | 20.73       | 0.03    |       | 21:27:51 | 20.80       | 0.12    |                  |
| 12/15/2020 | 21:28:51 | 20.73       | 0.03    |       | 21:28:51 | 20.79       | 0.12    |                  |
| 12/15/2020 | 21:29:51 | 20.73       | 0.03    |       | 21:29:51 | 20.79       | 0.12    |                  |
| 12/15/2020 | 21:30:51 | 20.73       | 0.03    |       | 21:30:51 | 20.79       | 0.12    |                  |
| 12/15/2020 | 21:31:51 | 20.73       | 0.03    |       | 21:31:51 | 20.80       | 0.11    |                  |
| 12/15/2020 | 21:32:51 | 20.73       | 0.03    |       | 21:32:51 | 20.79       | 0.11    |                  |
| 12/15/2020 | 21:33:51 | 20.73       | 0.03    |       | 21:33:51 | 20.78       | 0.11    |                  |
| 12/15/2020 | 21:34:51 | 20.73       | 0.04    |       | 21:34:51 | 20.79       | 0.11    |                  |
| 12/15/2020 | 21:35:51 | 20.73       | 0.04    |       | 21:35:51 | 20.79       | 0.11    |                  |
| 12/15/2020 | 21:36:51 | 20.73       | 0.04    |       | 21:36:51 | 20.79       | 0.12    |                  |
| 12/15/2020 | 21:37:51 | 20.73       | 0.05    |       | 21:37:51 | 20.79       | 0.11    |                  |
| 12/15/2020 | 21:38:51 | 20.73       | 0.05    |       | 21:38:51 | 20.78       | 0.11    |                  |
| 12/15/2020 | 21:39:51 | 20.73       | 0.05    |       | 21:39:51 | 20.78       | 0.11    |                  |
| 12/15/2020 | 21:40:51 | 20.73       | 0.05    |       | 21:40:51 | 20.77       | 0.12    |                  |
| 12/15/2020 | 21:41:51 | 20.73       | 0.05    |       | 21:41:51 | 20.78       | 0.11    |                  |
| 12/15/2020 | 21:42:51 | 20.74       | 0.05    |       | 21:42:51 | 20.78       | 0.11    |                  |
| 12/15/2020 | 21:43:51 | 20.73       | 0.05    |       | 21:43:51 | 20.78       | 0.11    |                  |
| 12/15/2020 | 21:44:51 | 20.73       | 0.05    |       | 21:44:51 | 20.78       | 0.11    |                  |
| 12/15/2020 | 21:45:51 | 20.73       | 0.04    |       | 21:45:51 | 20.78       | 0.11    |                  |
| 12/15/2020 | 21:46:51 | 20.74       | 0.05    |       | 21:46:51 | 20.78       | 0.11    |                  |
| 12/15/2020 | 21:47:51 | 20.73       | 0.04    |       | 21:47:51 | 20.78       | 0.11    |                  |
| 12/15/2020 | 21:48:51 | 20.74       | 0.05    |       | 21:48:51 | 20.78       | 0.13    |                  |
| 12/15/2020 | 21:49:51 | 20.74       | 0.04    |       | 21:49:51 | 20.77       | 0.15    |                  |
| 12/15/2020 | 21:50:51 | 20.74       | 0.04    |       | 21:50:51 | 20.77       | 0.13    |                  |
| 12/15/2020 | 21:51:51 | 20.74       | 0.03    |       | 21:51:51 | 20.78       | 0.13    |                  |
| 12/15/2020 | 21:52:51 | 20.73       | 0.03    |       | 21:52:51 | 20.78       | 0.12    |                  |
| 12/15/2020 | 21:53:51 | 20.74       | 0.03    |       | 21:53:51 | 20.76       | 0.15    |                  |
| 12/15/2020 | 21:54:51 | 20.73       | 0.04    |       | 21:54:51 | 20.76       | 0.14    |                  |
| 12/15/2020 | 21:55:51 | 20.74       | 0.04    |       | 21:55:51 | 20.77       | 0.13    |                  |
| 12/15/2020 | 21:56:51 | 20.73       | 0.04    |       | 21:56:51 | 20.77       | 0.12    |                  |

## SLR

## Columbia Steel

## Method 3A Baghouse #1 and Baghouse #2

| Date       | Time     | Baghouse #2 |         |                  | Time     | Baghouse #1 |         |       |
|------------|----------|-------------|---------|------------------|----------|-------------|---------|-------|
|            |          | O2 [%]      | CO2 [%] | Notes            |          | O2 [%]      | CO2 [%] | Notes |
| 12/15/2020 | 21:57:51 | 20.74       | 0.04    |                  | 21:57:51 | 20.78       | 0.11    |       |
| 12/15/2020 | 21:58:51 | 20.74       | 0.04    |                  | 21:58:51 | 20.78       | 0.11    |       |
| 12/15/2020 | 21:59:51 | 20.74       | 0.04    |                  | 21:59:51 | 20.78       | 0.11    |       |
| 12/15/2020 | 22:00:51 | 20.71       | 0.06    |                  | 22:00:51 | 20.78       | 0.10    |       |
| 12/15/2020 | 22:01:51 | 20.65       | 0.10    |                  | 22:01:51 | 20.78       | 0.11    |       |
| 12/15/2020 | 22:02:51 | 20.65       | 0.10    | Start Run 3 BH#2 | 22:02:51 | 20.79       | 0.10    |       |
| 12/15/2020 | 22:03:51 | 20.64       | 0.11    |                  | 22:03:51 | 20.79       | 0.10    |       |
| 12/15/2020 | 22:04:51 | 20.64       | 0.11    |                  | 22:04:51 | 20.79       | 0.11    |       |
| 12/15/2020 | 22:05:51 | 20.64       | 0.11    |                  | 22:05:51 | 20.78       | 0.12    |       |
| 12/15/2020 | 22:06:51 | 20.64       | 0.11    |                  | 22:06:51 | 20.79       | 0.10    |       |
| 12/15/2020 | 22:07:51 | 20.65       | 0.11    |                  | 22:07:51 | 20.79       | 0.10    |       |
| 12/15/2020 | 22:08:51 | 20.65       | 0.11    |                  | 22:08:51 | 20.79       | 0.10    |       |
| 12/15/2020 | 22:09:51 | 20.65       | 0.11    |                  | 22:09:51 | 20.79       | 0.10    |       |
| 12/15/2020 | 22:10:51 | 20.65       | 0.10    |                  | 22:10:51 | 20.79       | 0.10    |       |
| 12/15/2020 | 22:11:51 | 20.64       | 0.11    |                  | 22:11:51 | 20.79       | 0.10    |       |
| 12/15/2020 | 22:12:51 | 20.64       | 0.11    |                  | 22:12:51 | 20.79       | 0.10    |       |
| 12/15/2020 | 22:13:51 | 20.65       | 0.10    |                  | 22:13:51 | 20.79       | 0.10    |       |
| 12/15/2020 | 22:14:51 | 20.64       | 0.10    |                  | 22:14:51 | 20.79       | 0.10    |       |
| 12/15/2020 | 22:15:51 | 20.63       | 0.10    |                  | 22:15:51 | 20.79       | 0.10    |       |
| 12/15/2020 | 22:16:51 | 20.63       | 0.11    |                  | 22:16:51 | 20.79       | 0.10    |       |
| 12/15/2020 | 22:17:51 | 20.64       | 0.10    |                  | 22:17:51 | 20.79       | 0.10    |       |
| 12/15/2020 | 22:18:51 | 20.63       | 0.09    |                  | 22:18:51 | 20.79       | 0.10    |       |
| 12/15/2020 | 22:19:51 | 20.64       | 0.10    |                  | 22:19:51 | 20.79       | 0.11    |       |
| 12/15/2020 | 22:20:51 | 20.64       | 0.10    |                  | 22:20:51 | 20.80       | 0.11    |       |
| 12/15/2020 | 22:21:51 | 20.64       | 0.09    |                  | 22:21:51 | 20.79       | 0.11    |       |
| 12/15/2020 | 22:22:51 | 20.65       | 0.10    |                  | 22:22:51 | 20.80       | 0.10    |       |
| 12/15/2020 | 22:23:51 | 20.64       | 0.10    |                  | 22:23:51 | 20.80       | 0.10    |       |
| 12/15/2020 | 22:24:51 | 20.65       | 0.10    |                  | 22:24:51 | 20.79       | 0.11    |       |
| 12/15/2020 | 22:25:51 | 20.64       | 0.11    |                  | 22:25:51 | 20.80       | 0.11    |       |
| 12/15/2020 | 22:26:51 | 20.63       | 0.12    |                  | 22:26:51 | 20.80       | 0.11    |       |
| 12/15/2020 | 22:27:51 | 20.63       | 0.13    |                  | 22:27:51 | 20.79       | 0.11    |       |
| 12/15/2020 | 22:28:51 | 20.63       | 0.14    |                  | 22:28:51 | 20.64       | 0.32    |       |
| 12/15/2020 | 22:29:51 | 20.63       | 0.14    |                  | 22:29:51 | 20.50       | 0.52    |       |
| 12/15/2020 | 22:30:51 | 20.62       | 0.15    |                  | 22:30:51 | 20.63       | 0.33    |       |
| 12/15/2020 | 22:31:51 | 20.64       | 0.13    |                  | 22:31:51 | 20.76       | 0.13    |       |
| 12/15/2020 | 22:32:51 | 20.65       | 0.11    |                  | 22:32:51 | 20.79       | 0.11    |       |
| 12/15/2020 | 22:33:51 | 20.65       | 0.11    |                  | 22:33:51 | 20.77       | 0.13    |       |
| 12/15/2020 | 22:34:51 | 20.64       | 0.12    |                  | 22:34:51 | 20.77       | 0.13    |       |
| 12/15/2020 | 22:35:51 | 20.65       | 0.12    |                  | 22:35:51 | 20.72       | 0.21    |       |
| 12/15/2020 | 22:36:51 | 20.65       | 0.12    |                  | 22:36:51 | 20.72       | 0.19    |       |
| 12/15/2020 | 22:37:51 | 20.65       | 0.11    |                  | 22:37:51 | 20.79       | 0.11    |       |
| 12/15/2020 | 22:38:51 | 20.64       | 0.12    |                  | 22:38:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 22:39:51 | 20.63       | 0.11    |                  | 22:39:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 22:40:51 | 20.66       | 0.10    |                  | 22:40:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 22:41:51 | 20.66       | 0.09    |                  | 22:41:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 22:42:51 | 20.68       | 0.08    |                  | 22:42:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 22:43:51 | 20.69       | 0.07    |                  | 22:43:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 22:44:51 | 20.67       | 0.08    |                  | 22:44:51 | 20.86       | 0.06    |       |
| 12/15/2020 | 22:45:51 | 20.66       | 0.09    |                  | 22:45:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 22:46:51 | 20.66       | 0.10    |                  | 22:46:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 22:47:51 | 20.66       | 0.09    |                  | 22:47:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 22:48:51 | 20.63       | 0.11    |                  | 22:48:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 22:49:51 | 20.67       | 0.08    |                  | 22:49:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 22:50:51 | 20.66       | 0.10    |                  | 22:50:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 22:51:51 | 20.66       | 0.10    |                  | 22:51:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 22:52:51 | 20.66       | 0.10    |                  | 22:52:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 22:53:51 | 20.66       | 0.12    |                  | 22:53:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 22:54:51 | 20.68       | 0.09    |                  | 22:54:51 | 20.85       | 0.06    |       |

## SLR

## Columbia Steel

## Method 3A Baghouse #1 and Baghouse #2

| Date       | Time     | Baghouse #2 |         |       | Time     | Baghouse #1 |         |       |
|------------|----------|-------------|---------|-------|----------|-------------|---------|-------|
|            |          | O2 [%]      | CO2 [%] | Notes |          | O2 [%]      | CO2 [%] | Notes |
| 12/15/2020 | 22:55:51 | 20.69       | 0.10    |       | 22:55:51 | 20.84       | 0.06    |       |
| 12/15/2020 | 22:56:51 | 20.70       | 0.10    |       | 22:56:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 22:57:51 | 20.70       | 0.09    |       | 22:57:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 22:58:51 | 20.67       | 0.11    |       | 22:58:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 22:59:51 | 20.66       | 0.12    |       | 22:59:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 23:00:51 | 20.66       | 0.13    |       | 23:00:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 23:01:51 | 20.66       | 0.12    |       | 23:01:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:02:51 | 20.66       | 0.13    |       | 23:02:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 23:03:51 | 20.66       | 0.12    |       | 23:03:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:04:51 | 20.65       | 0.15    |       | 23:04:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:05:51 | 20.65       | 0.13    |       | 23:05:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:06:51 | 20.65       | 0.13    |       | 23:06:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:07:51 | 20.67       | 0.12    |       | 23:07:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:08:51 | 20.66       | 0.12    |       | 23:08:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:09:51 | 20.66       | 0.12    |       | 23:09:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:10:51 | 20.66       | 0.12    |       | 23:10:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:11:51 | 20.66       | 0.12    |       | 23:11:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:12:51 | 20.66       | 0.11    |       | 23:12:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:13:51 | 20.66       | 0.12    |       | 23:13:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:14:51 | 20.66       | 0.12    |       | 23:14:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:15:51 | 20.66       | 0.12    |       | 23:15:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:16:51 | 20.66       | 0.13    |       | 23:16:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:17:51 | 20.66       | 0.13    |       | 23:17:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:18:51 | 20.66       | 0.13    |       | 23:18:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:19:51 | 20.65       | 0.14    |       | 23:19:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:20:51 | 20.66       | 0.13    |       | 23:20:51 | 20.85       | 0.06    |       |
| 12/15/2020 | 23:21:51 | 20.66       | 0.13    |       | 23:21:51 | 20.84       | 0.05    |       |
| 12/15/2020 | 23:22:51 | 20.67       | 0.13    |       | 23:22:51 | 20.84       | 0.05    |       |
| 12/15/2020 | 23:23:51 | 20.67       | 0.13    |       | 23:23:51 | 20.84       | 0.05    |       |
| 12/15/2020 | 23:24:51 | 20.67       | 0.13    |       | 23:24:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:25:51 | 20.71       | 0.19    |       | 23:25:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:26:51 | 20.68       | 0.13    |       | 23:26:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:27:51 | 20.67       | 0.13    |       | 23:27:51 | 20.84       | 0.05    |       |
| 12/15/2020 | 23:28:51 | 20.66       | 0.14    |       | 23:28:51 | 20.84       | 0.05    |       |
| 12/15/2020 | 23:29:51 | 20.66       | 0.13    |       | 23:29:51 | 20.85       | 0.05    |       |
| 12/15/2020 | 23:30:51 | 20.68       | 0.12    |       | 23:30:51 | 20.84       | 0.05    |       |
| 12/15/2020 | 23:31:51 | 20.69       | 0.11    |       | 23:31:51 | 20.84       | 0.05    |       |
| 12/15/2020 | 23:32:51 | 20.69       | 0.11    |       | 23:32:51 | 20.84       | 0.05    |       |
| 12/15/2020 | 23:33:51 | 20.70       | 0.11    |       | 23:33:51 | 20.84       | 0.05    |       |
| 12/15/2020 | 23:34:51 | 20.70       | 0.11    |       | 23:34:51 | 20.84       | 0.04    |       |
| 12/15/2020 | 23:35:51 | 20.70       | 0.10    |       | 23:35:51 | 20.84       | 0.05    |       |
| 12/15/2020 | 23:36:51 | 20.70       | 0.10    |       | 23:36:51 | 20.84       | 0.04    |       |
| 12/15/2020 | 23:37:51 | 20.70       | 0.11    |       | 23:37:51 | 20.84       | 0.05    |       |
| 12/15/2020 | 23:38:51 | 20.70       | 0.11    |       | 23:38:51 | 20.84       | 0.04    |       |
| 12/15/2020 | 23:39:51 | 20.70       | 0.11    |       | 23:39:51 | 20.84       | 0.04    |       |
| 12/15/2020 | 23:40:51 | 20.69       | 0.13    |       | 23:40:51 | 20.84       | 0.05    |       |
| 12/15/2020 | 23:41:51 | 20.68       | 0.13    |       | 23:41:51 | 20.84       | 0.05    |       |
| 12/15/2020 | 23:42:51 | 20.68       | 0.13    |       | 23:42:51 | 20.84       | 0.04    |       |
| 12/15/2020 | 23:43:51 | 20.65       | 0.14    |       | 23:43:51 | 20.84       | 0.05    |       |
| 12/15/2020 | 23:44:51 | 20.65       | 0.14    |       | 23:44:51 | 20.84       | 0.04    |       |
| 12/15/2020 | 23:45:51 | 20.66       | 0.13    |       | 23:45:51 | 20.84       | 0.04    |       |
| 12/15/2020 | 23:46:51 | 20.69       | 0.11    |       | 23:46:51 | 20.84       | 0.04    |       |
| 12/15/2020 | 23:47:51 | 20.70       | 0.11    |       | 23:47:51 | 20.84       | 0.04    |       |
| 12/15/2020 | 23:48:51 | 20.70       | 0.11    |       | 23:48:51 | 20.84       | 0.04    |       |
| 12/15/2020 | 23:49:51 | 20.70       | 0.11    |       | 23:49:51 | 20.84       | 0.05    |       |
| 12/15/2020 | 23:50:51 | 20.70       | 0.11    |       | 23:50:51 | 20.83       | 0.05    |       |
| 12/15/2020 | 23:51:51 | 20.70       | 0.11    |       | 23:51:51 | 20.84       | 0.05    |       |
| 12/15/2020 | 23:52:51 | 20.70       | 0.11    |       | 23:52:51 | 20.84       | 0.05    |       |

## SLR

## Columbia Steel

## Method 3A Baghouse #1 and Baghouse #2

| Date       | Time     | Baghouse #2 |         |       | Time     | Baghouse #1 |         |       |
|------------|----------|-------------|---------|-------|----------|-------------|---------|-------|
|            |          | O2 [%]      | CO2 [%] | Notes |          | O2 [%]      | CO2 [%] | Notes |
| 12/15/2020 | 23:53:51 | 20.71       | 0.10    |       | 23:53:51 | 20.84       | 0.05    |       |
| 12/15/2020 | 23:54:51 | 20.71       | 0.10    |       | 23:54:51 | 20.84       | 0.05    |       |
| 12/15/2020 | 23:55:51 | 20.71       | 0.10    |       | 23:55:51 | 20.84       | 0.05    |       |
| 12/15/2020 | 23:56:51 | 20.70       | 0.11    |       | 23:56:51 | 20.84       | 0.05    |       |
| 12/15/2020 | 23:57:51 | 20.71       | 0.10    |       | 23:57:51 | 20.84       | 0.05    |       |
| 12/15/2020 | 23:58:51 | 20.75       | 0.07    |       | 23:58:51 | 20.83       | 0.05    |       |
| 12/15/2020 | 23:59:51 | 20.74       | 0.07    |       | 23:59:51 | 20.84       | 0.05    |       |
| 12/16/2020 | 0:00:51  | 20.74       | 0.07    |       | 0:00:51  | 20.84       | 0.05    |       |
| 12/16/2020 | 0:01:51  | 20.74       | 0.07    |       | 0:01:51  | 20.84       | 0.04    |       |
| 12/16/2020 | 0:02:51  | 20.74       | 0.07    |       | 0:02:51  | 20.84       | 0.05    |       |
| 12/16/2020 | 0:03:51  | 20.74       | 0.07    |       | 0:03:51  | 20.84       | 0.04    |       |
| 12/16/2020 | 0:04:51  | 20.74       | 0.07    |       | 0:04:51  | 20.83       | 0.05    |       |
| 12/16/2020 | 0:05:51  | 20.74       | 0.07    |       | 0:05:51  | 20.84       | 0.04    |       |
| 12/16/2020 | 0:06:51  | 20.69       | 0.11    |       | 0:06:51  | 20.84       | 0.04    |       |
| 12/16/2020 | 0:07:51  | 20.56       | 0.19    |       | 0:07:51  | 20.84       | 0.04    |       |
| 12/16/2020 | 0:08:51  | 20.52       | 0.21    |       | 0:08:51  | 20.84       | 0.04    |       |
| 12/16/2020 | 0:09:51  | 20.55       | 0.19    |       | 0:09:51  | 20.83       | 0.04    |       |
| 12/16/2020 | 0:10:51  | 20.56       | 0.18    |       | 0:10:51  | 20.83       | 0.04    |       |
| 12/16/2020 | 0:11:51  | 20.56       | 0.19    |       | 0:11:51  | 20.84       | 0.04    |       |
| 12/16/2020 | 0:12:51  | 20.59       | 0.19    |       | 0:12:51  | 20.83       | 0.04    |       |
| 12/16/2020 | 0:13:51  | 20.59       | 0.18    |       | 0:13:51  | 20.83       | 0.04    |       |
| 12/16/2020 | 0:14:51  | 20.59       | 0.18    |       | 0:14:51  | 20.83       | 0.04    |       |
| 12/16/2020 | 0:15:51  | 20.61       | 0.27    |       | 0:15:51  | 20.83       | 0.04    |       |
| 12/16/2020 | 0:16:51  | 20.61       | 0.18    |       | 0:16:51  | 20.83       | 0.04    |       |
| 12/16/2020 | 0:17:51  | 20.62       | 0.17    |       | 0:17:51  | 20.83       | 0.04    |       |
| 12/16/2020 | 0:18:51  | 20.61       | 0.18    |       | 0:18:51  | 20.83       | 0.04    |       |
| 12/16/2020 | 0:19:51  | 20.61       | 0.18    |       | 0:19:51  | 20.83       | 0.04    |       |
| 12/16/2020 | 0:20:51  | 20.61       | 0.18    |       | 0:20:51  | 20.83       | 0.05    |       |
| 12/16/2020 | 0:21:51  | 20.61       | 0.18    |       | 0:21:51  | 20.83       | 0.05    |       |
| 12/16/2020 | 0:22:51  | 20.62       | 0.18    |       | 0:22:51  | 20.83       | 0.05    |       |
| 12/16/2020 | 0:23:51  | 20.60       | 0.18    |       | 0:23:51  | 20.83       | 0.05    |       |
| 12/16/2020 | 0:24:51  | 20.61       | 0.17    |       | 0:24:51  | 20.83       | 0.05    |       |
| 12/16/2020 | 0:25:51  | 20.62       | 0.15    |       | 0:25:51  | 20.83       | 0.05    |       |
| 12/16/2020 | 0:26:51  | 20.62       | 0.16    |       | 0:26:51  | 20.82       | 0.05    |       |
| 12/16/2020 | 0:27:51  | 20.61       | 0.16    |       | 0:27:51  | 20.82       | 0.05    |       |
| 12/16/2020 | 0:28:51  | 20.62       | 0.15    |       | 0:28:51  | 20.82       | 0.05    |       |
| 12/16/2020 | 0:29:51  | 20.63       | 0.15    |       | 0:29:51  | 20.83       | 0.05    |       |
| 12/16/2020 | 0:30:51  | 20.62       | 0.16    |       | 0:30:51  | 20.83       | 0.04    |       |
| 12/16/2020 | 0:31:51  | 20.64       | 0.14    |       | 0:31:51  | 20.82       | 0.04    |       |
| 12/16/2020 | 0:32:51  | 20.62       | 0.15    |       | 0:32:51  | 20.82       | 0.04    |       |
| 12/16/2020 | 0:33:51  | 20.65       | 0.14    |       | 0:33:51  | 20.82       | 0.05    |       |
| 12/16/2020 | 0:34:51  | 20.63       | 0.15    |       | 0:34:51  | 20.82       | 0.04    |       |
| 12/16/2020 | 0:35:51  | 20.62       | 0.15    |       | 0:35:51  | 20.82       | 0.04    |       |
| 12/16/2020 | 0:36:51  | 20.64       | 0.13    |       | 0:36:51  | 20.82       | 0.04    |       |
| 12/16/2020 | 0:37:51  | 20.65       | 0.14    |       | 0:37:51  | 20.82       | 0.04    |       |
| 12/16/2020 | 0:38:51  | 20.63       | 0.16    |       | 0:38:51  | 20.82       | 0.04    |       |
| 12/16/2020 | 0:39:51  | 20.61       | 0.19    |       | 0:39:51  | 20.82       | 0.04    |       |
| 12/16/2020 | 0:40:51  | 20.65       | 0.14    |       | 0:40:51  | 20.82       | 0.04    |       |
| 12/16/2020 | 0:41:51  | 20.67       | 0.12    |       | 0:41:51  | 20.82       | 0.04    |       |
| 12/16/2020 | 0:42:51  | 20.63       | 0.14    |       | 0:42:51  | 20.82       | 0.04    |       |
| 12/16/2020 | 0:43:51  | 20.61       | 0.15    |       | 0:43:51  | 20.82       | 0.04    |       |
| 12/16/2020 | 0:44:51  | 20.62       | 0.15    |       | 0:44:51  | 20.82       | 0.04    |       |
| 12/16/2020 | 0:45:51  | 20.63       | 0.14    |       | 0:45:51  | 20.82       | 0.04    |       |
| 12/16/2020 | 0:46:51  | 20.62       | 0.15    |       | 0:46:51  | 20.82       | 0.04    |       |
| 12/16/2020 | 0:47:51  | 20.63       | 0.15    |       | 0:47:51  | 20.81       | 0.04    |       |
| 12/16/2020 | 0:48:51  | 20.63       | 0.16    |       | 0:48:51  | 20.82       | 0.04    |       |
| 12/16/2020 | 0:49:51  | 20.63       | 0.16    |       | 0:49:51  | 20.82       | 0.04    |       |
| 12/16/2020 | 0:50:51  | 20.64       | 0.15    |       | 0:50:51  | 20.82       | 0.04    |       |

## SLR

## Columbia Steel

## Method 3A Baghouse #1 and Baghouse #2

| Date       | Time    | Baghouse #2 |         |       | Time    | Baghouse #1 |         |       |
|------------|---------|-------------|---------|-------|---------|-------------|---------|-------|
|            |         | O2 [%]      | CO2 [%] | Notes |         | O2 [%]      | CO2 [%] | Notes |
| 12/16/2020 | 0:51:51 | 20.63       | 0.15    |       | 0:51:51 | 20.81       | 0.05    |       |
| 12/16/2020 | 0:52:51 | 20.63       | 0.15    |       | 0:52:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 0:53:51 | 20.63       | 0.15    |       | 0:53:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 0:54:51 | 20.64       | 0.15    |       | 0:54:51 | 20.81       | 0.05    |       |
| 12/16/2020 | 0:55:51 | 20.64       | 0.14    |       | 0:55:51 | 20.81       | 0.05    |       |
| 12/16/2020 | 0:56:51 | 20.64       | 0.14    |       | 0:56:51 | 20.82       | 0.05    |       |
| 12/16/2020 | 0:57:51 | 20.64       | 0.15    |       | 0:57:51 | 20.81       | 0.05    |       |
| 12/16/2020 | 0:58:51 | 20.64       | 0.14    |       | 0:58:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 0:59:51 | 20.64       | 0.14    |       | 0:59:51 | 20.81       | 0.05    |       |
| 12/16/2020 | 1:00:51 | 20.65       | 0.14    |       | 1:00:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:01:51 | 20.64       | 0.15    |       | 1:01:51 | 20.81       | 0.05    |       |
| 12/16/2020 | 1:02:51 | 20.65       | 0.15    |       | 1:02:51 | 20.81       | 0.05    |       |
| 12/16/2020 | 1:03:51 | 20.65       | 0.15    |       | 1:03:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:04:51 | 20.65       | 0.15    |       | 1:04:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:05:51 | 20.64       | 0.16    |       | 1:05:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:06:51 | 20.64       | 0.16    |       | 1:06:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:07:51 | 20.64       | 0.16    |       | 1:07:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:08:51 | 20.64       | 0.17    |       | 1:08:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:09:51 | 20.64       | 0.16    |       | 1:09:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:10:51 | 20.64       | 0.16    |       | 1:10:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:11:51 | 20.65       | 0.15    |       | 1:11:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:12:51 | 20.64       | 0.16    |       | 1:12:51 | 20.82       | 0.04    |       |
| 12/16/2020 | 1:13:51 | 20.65       | 0.15    |       | 1:13:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:14:51 | 20.65       | 0.15    |       | 1:14:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:15:51 | 20.65       | 0.15    |       | 1:15:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:16:51 | 20.65       | 0.15    |       | 1:16:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:17:51 | 20.64       | 0.15    |       | 1:17:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:18:51 | 20.64       | 0.15    |       | 1:18:51 | 20.82       | 0.04    |       |
| 12/16/2020 | 1:19:51 | 20.65       | 0.14    |       | 1:19:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:20:51 | 20.65       | 0.15    |       | 1:20:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:21:51 | 20.66       | 0.14    |       | 1:21:51 | 20.82       | 0.04    |       |
| 12/16/2020 | 1:22:51 | 20.67       | 0.13    |       | 1:22:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:23:51 | 20.67       | 0.13    |       | 1:23:51 | 20.82       | 0.04    |       |
| 12/16/2020 | 1:24:51 | 20.68       | 0.13    |       | 1:24:51 | 20.82       | 0.05    |       |
| 12/16/2020 | 1:25:51 | 20.68       | 0.13    |       | 1:25:51 | 20.82       | 0.05    |       |
| 12/16/2020 | 1:26:51 | 20.68       | 0.13    |       | 1:26:51 | 20.81       | 0.05    |       |
| 12/16/2020 | 1:27:51 | 20.68       | 0.13    |       | 1:27:51 | 20.81       | 0.05    |       |
| 12/16/2020 | 1:28:51 | 20.68       | 0.14    |       | 1:28:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:29:51 | 20.68       | 0.14    |       | 1:29:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:30:51 | 20.69       | 0.14    |       | 1:30:51 | 20.81       | 0.05    |       |
| 12/16/2020 | 1:31:51 | 20.68       | 0.14    |       | 1:31:51 | 20.81       | 0.05    |       |
| 12/16/2020 | 1:32:51 | 20.69       | 0.14    |       | 1:32:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:33:51 | 20.68       | 0.14    |       | 1:33:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:34:51 | 20.69       | 0.20    |       | 1:34:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:35:51 | 20.75       | 0.14    |       | 1:35:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:36:51 | 20.69       | 0.14    |       | 1:36:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:37:51 | 20.68       | 0.14    |       | 1:37:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:38:51 | 20.68       | 0.14    |       | 1:38:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:39:51 | 20.69       | 0.13    |       | 1:39:51 | 20.81       | 0.03    |       |
| 12/16/2020 | 1:40:51 | 20.74       | 0.08    |       | 1:40:51 | 20.81       | 0.03    |       |
| 12/16/2020 | 1:41:51 | 20.74       | 0.08    |       | 1:41:51 | 20.81       | 0.03    |       |
| 12/16/2020 | 1:42:51 | 20.70       | 0.11    |       | 1:42:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:43:51 | 20.67       | 0.13    |       | 1:43:51 | 20.80       | 0.03    |       |
| 12/16/2020 | 1:44:51 | 20.63       | 0.16    |       | 1:44:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:45:51 | 20.62       | 0.15    |       | 1:45:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:46:51 | 20.62       | 0.14    |       | 1:46:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:47:51 | 20.63       | 0.14    |       | 1:47:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:48:51 | 20.64       | 0.14    |       | 1:48:51 | 20.80       | 0.04    |       |

## SLR

## Columbia Steel

## Method 3A Baghouse #1 and Baghouse #2

| Date       | Time    | Baghouse #2 |         |       | Time    | Baghouse #1 |         |       |
|------------|---------|-------------|---------|-------|---------|-------------|---------|-------|
|            |         | O2 [%]      | CO2 [%] | Notes |         | O2 [%]      | CO2 [%] | Notes |
| 12/16/2020 | 1:49:51 | 20.63       | 0.15    |       | 1:49:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:50:51 | 20.66       | 0.13    |       | 1:50:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:51:51 | 20.65       | 0.15    |       | 1:51:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:52:51 | 20.64       | 0.16    |       | 1:52:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:53:51 | 20.64       | 0.15    |       | 1:53:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 1:54:51 | 20.65       | 0.15    |       | 1:54:51 | 20.80       | 0.04    |       |
| 12/16/2020 | 1:55:51 | 20.66       | 0.14    |       | 1:55:51 | 20.81       | 0.05    |       |
| 12/16/2020 | 1:56:51 | 20.67       | 0.14    |       | 1:56:51 | 20.80       | 0.04    |       |
| 12/16/2020 | 1:57:51 | 20.69       | 0.12    |       | 1:57:51 | 20.80       | 0.04    |       |
| 12/16/2020 | 1:58:51 | 20.69       | 0.11    |       | 1:58:51 | 20.80       | 0.04    |       |
| 12/16/2020 | 1:59:51 | 20.69       | 0.12    |       | 1:59:51 | 20.80       | 0.04    |       |
| 12/16/2020 | 2:00:51 | 20.69       | 0.12    |       | 2:00:51 | 20.80       | 0.04    |       |
| 12/16/2020 | 2:01:51 | 20.69       | 0.12    |       | 2:01:51 | 20.80       | 0.04    |       |
| 12/16/2020 | 2:02:51 | 20.70       | 0.12    |       | 2:02:51 | 20.80       | 0.04    |       |
| 12/16/2020 | 2:03:51 | 20.70       | 0.11    |       | 2:03:51 | 20.80       | 0.04    |       |
| 12/16/2020 | 2:04:51 | 20.70       | 0.11    |       | 2:04:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 2:05:51 | 20.70       | 0.12    |       | 2:05:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 2:06:51 | 20.71       | 0.11    |       | 2:06:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 2:07:51 | 20.72       | 0.10    |       | 2:07:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 2:08:51 | 20.74       | 0.08    |       | 2:08:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 2:09:51 | 20.72       | 0.08    |       | 2:09:51 | 20.81       | 0.03    |       |
| 12/16/2020 | 2:10:51 | 20.73       | 0.08    |       | 2:10:51 | 20.81       | 0.03    |       |
| 12/16/2020 | 2:11:51 | 20.73       | 0.08    |       | 2:11:51 | 20.82       | 0.03    |       |
| 12/16/2020 | 2:12:51 | 20.73       | 0.08    |       | 2:12:51 | 20.82       | 0.04    |       |
| 12/16/2020 | 2:13:51 | 20.73       | 0.08    |       | 2:13:51 | 20.82       | 0.03    |       |
| 12/16/2020 | 2:14:51 | 20.73       | 0.09    |       | 2:14:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 2:15:51 | 20.72       | 0.08    |       | 2:15:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 2:16:51 | 20.72       | 0.09    |       | 2:16:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 2:17:51 | 20.72       | 0.09    |       | 2:17:51 | 20.81       | 0.03    |       |
| 12/16/2020 | 2:18:51 | 20.73       | 0.09    |       | 2:18:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 2:19:51 | 20.73       | 0.09    |       | 2:19:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 2:20:51 | 20.72       | 0.09    |       | 2:20:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 2:21:51 | 20.71       | 0.11    |       | 2:21:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 2:22:51 | 20.68       | 0.13    |       | 2:22:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 2:23:51 | 20.59       | 0.19    |       | 2:23:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 2:24:51 | 20.52       | 0.25    |       | 2:24:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 2:25:51 | 20.52       | 0.24    |       | 2:25:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 2:26:51 | 20.51       | 0.25    |       | 2:26:51 | 20.81       | 0.05    |       |
| 12/16/2020 | 2:27:51 | 20.50       | 0.26    |       | 2:27:51 | 20.81       | 0.04    |       |
| 12/16/2020 | 2:28:51 | 20.49       | 0.27    |       | 2:28:51 | 20.81       | 0.05    |       |
| 12/16/2020 | 2:29:51 | 20.47       | 0.29    |       | 2:29:51 | 20.81       | 0.05    |       |
| 12/16/2020 | 2:30:51 | 20.44       | 0.29    |       | 2:30:51 | 20.80       | 0.04    |       |
| 12/16/2020 | 2:31:51 | 20.42       | 0.30    |       | 2:31:51 | 20.80       | 0.04    |       |
| 12/16/2020 | 2:32:51 | 20.42       | 0.30    |       | 2:32:51 | 20.80       | 0.04    |       |
| 12/16/2020 | 2:33:51 | 20.39       | 0.31    |       | 2:33:51 | 20.80       | 0.04    |       |
| 12/16/2020 | 2:34:51 | 20.41       | 0.30    |       | 2:34:51 | 20.80       | 0.04    |       |
| 12/16/2020 | 2:35:51 | 20.47       | 0.25    |       | 2:35:51 | 20.80       | 0.04    |       |
| 12/16/2020 | 2:36:51 | 20.55       | 0.26    |       | 2:36:51 | 20.80       | 0.04    |       |
| 12/16/2020 | 2:37:51 | 20.61       | 0.26    |       | 2:37:51 | 20.80       | 0.04    |       |
| 12/16/2020 | 2:38:51 | 20.60       | 0.27    |       | 2:38:51 | 20.80       | 0.04    |       |
| 12/16/2020 | 2:39:51 | 20.68       | 0.22    |       | 2:39:51 | 20.80       | 0.04    |       |
| 12/16/2020 | 2:40:51 | 20.66       | 0.34    |       | 2:40:51 | 20.80       | 0.04    |       |
| 12/16/2020 | 2:41:51 | 20.71       | 0.21    |       | 2:41:51 | 20.80       | 0.03    |       |
| 12/16/2020 | 2:42:51 | 20.71       | 0.21    |       | 2:42:51 | 20.79       | 0.04    |       |
| 12/16/2020 | 2:43:51 | 20.70       | 0.22    |       | 2:43:51 | 20.79       | 0.04    |       |
| 12/16/2020 | 2:44:51 | 20.70       | 0.23    |       | 2:44:51 | 20.80       | 0.03    |       |
| 12/16/2020 | 2:45:51 | 20.71       | 0.22    |       | 2:45:51 | 20.80       | 0.04    |       |
| 12/16/2020 | 2:46:51 | 20.72       | 0.21    |       | 2:46:51 | 20.80       | 0.04    |       |

## SLR

## Columbia Steel

## Method 3A Baghouse #1 and Baghouse #2

| Date       | Time    | Baghouse #2 |         | Notes | Time    | Baghouse #1 |         | Notes              |
|------------|---------|-------------|---------|-------|---------|-------------|---------|--------------------|
|            |         | O2 [%]      | CO2 [%] |       |         | O2 [%]      | CO2 [%] |                    |
| 12/16/2020 | 2:47:51 | 20.72       | 0.22    |       | 2:47:51 | 20.80       | 0.04    |                    |
| 12/16/2020 | 2:48:51 | 20.74       | 0.21    |       | 2:48:51 | 20.80       | 0.04    |                    |
| 12/16/2020 | 2:49:51 | 20.74       | 0.21    |       | 2:49:51 | 20.80       | 0.04    |                    |
| 12/16/2020 | 2:50:51 | 20.71       | 0.24    |       | 2:50:51 | 20.80       | 0.04    |                    |
| 12/16/2020 | 2:51:51 | 20.68       | 0.26    |       | 2:51:51 | 20.79       | 0.04    |                    |
| 12/16/2020 | 2:52:51 | 20.71       | 0.25    |       | 2:52:51 | 20.79       | 0.04    |                    |
| 12/16/2020 | 2:53:51 | 20.67       | 0.27    |       | 2:53:51 | 20.79       | 0.04    |                    |
| 12/16/2020 | 2:54:51 | 20.72       | 0.23    |       | 2:54:51 | 20.79       | 0.04    |                    |
| 12/16/2020 | 2:55:51 | 20.73       | 0.21    |       | 2:55:51 | 20.79       | 0.04    |                    |
| 12/16/2020 | 2:56:51 | 20.74       | 0.21    |       | 2:56:51 | 20.79       | 0.05    |                    |
| 12/16/2020 | 2:57:51 | 20.73       | 0.20    |       | 2:57:51 | 20.79       | 0.04    |                    |
| 12/16/2020 | 2:58:51 | 20.69       | 0.25    |       | 2:58:51 | 20.79       | 0.04    |                    |
| 12/16/2020 | 2:59:51 | 20.72       | 0.18    |       | 2:59:51 | 20.79       | 0.04    |                    |
| 12/16/2020 | 3:00:51 | 20.78       | 0.15    |       | 3:00:51 | 20.79       | 0.04    |                    |
| 12/16/2020 | 3:01:51 | 20.78       | 0.16    |       | 3:01:51 | 20.79       | 0.05    |                    |
| 12/16/2020 | 3:02:51 | 20.77       | 0.17    |       | 3:02:51 | 20.79       | 0.04    |                    |
| 12/16/2020 | 3:03:51 | 20.77       | 0.17    |       | 3:03:51 | 20.79       | 0.04    |                    |
| 12/16/2020 | 3:04:51 | 20.77       | 0.16    |       | 3:04:51 | 20.79       | 0.04    |                    |
| 12/16/2020 | 3:05:51 | 20.78       | 0.16    |       | 3:05:51 | 20.79       | 0.05    |                    |
| 12/16/2020 | 3:06:51 | 20.78       | 0.16    |       | 3:06:51 | 20.79       | 0.04    |                    |
| 12/16/2020 | 3:07:51 | 20.79       | 0.16    |       | 3:07:51 | 20.79       | 0.04    |                    |
| 12/16/2020 | 3:08:51 | 20.77       | 0.16    |       | 3:08:51 | 20.79       | 0.04    |                    |
| 12/16/2020 | 3:09:51 | 20.78       | 0.15    |       | 3:09:51 | 20.79       | 0.04    |                    |
| 12/16/2020 | 3:10:51 | 20.78       | 0.15    |       | 3:10:51 | 20.79       | 0.04    |                    |
| 12/16/2020 | 3:11:51 | 20.76       | 0.17    |       | 3:11:51 | 20.58       | 0.04    | End Run 3 BH#1     |
| 12/16/2020 | 3:12:51 | 20.79       | 0.15    |       |         | 20.81       | 0.06    | Average            |
| 12/16/2020 | 3:13:51 | 20.78       | 0.17    |       |         |             |         |                    |
| 12/16/2020 | 3:14:51 | 20.78       | 0.16    |       | 3:12:51 | 17.43       | 0.04    |                    |
| 12/16/2020 | 3:15:51 | 20.78       | 0.16    |       | 3:13:51 | 13.82       | 0.02    |                    |
| 12/16/2020 | 3:16:51 | 20.79       | 0.16    |       | 3:14:51 | 13.31       | 0.02    |                    |
| 12/16/2020 | 3:17:51 | 20.79       | 0.15    |       | 3:15:51 | 13.39       | 0.02    |                    |
| 12/16/2020 | 3:18:51 | 20.79       | 0.15    |       | 3:16:51 | 13.72       | 0.02    |                    |
| 12/16/2020 | 3:19:51 | 20.79       | 0.15    |       | 3:17:51 | 20.57       | 0.04    |                    |
| 12/16/2020 | 3:20:51 | 20.79       | 0.15    |       | 3:18:51 | 19.36       | 0.03    |                    |
| 12/16/2020 | 3:21:51 | 20.79       | 0.15    |       | 3:19:51 | 9.41        | 0.02    |                    |
| 12/16/2020 | 3:22:51 | 20.78       | 0.16    |       | 3:20:51 | 0.34        | 0.00    |                    |
| 12/16/2020 | 3:23:51 | 20.79       | 0.15    |       | 3:21:51 | -0.02       | 0.00    | System Zero        |
| 12/16/2020 | 3:24:51 | 20.80       | 0.15    |       | 3:22:51 | 6.66        | 7.03    |                    |
| 12/16/2020 | 3:25:51 | 20.81       | 0.14    |       | 3:23:51 | 21.51       | 21.48   |                    |
| 12/16/2020 | 3:26:51 | 20.80       | 0.14    |       | 3:24:51 | 21.80       | 21.80   | O2 System Upscale  |
| 12/16/2020 | 3:27:51 | 20.80       | 0.14    |       | 3:25:51 | 15.91       | 15.58   |                    |
| 12/16/2020 | 3:28:51 | 20.81       | 0.14    |       | 3:26:51 | 9.95        | 9.95    | CO2 System Upscale |
| 12/16/2020 | 3:29:51 | 20.80       | 0.20    |       | 3:27:51 | 9.93        | 9.92    |                    |
| 12/16/2020 | 3:30:51 | 20.85       | 0.15    |       | 3:28:51 | 9.94        | 9.93    |                    |
| 12/16/2020 | 3:31:51 | 20.81       | 0.13    |       | 3:29:51 | 16.34       | 3.96    |                    |
| 12/16/2020 | 3:32:51 | 20.80       | 0.13    |       | 3:30:51 | 20.83       | 0.24    |                    |
| 12/16/2020 | 3:33:51 | 20.81       | 0.14    |       | 3:31:51 | 20.55       | 0.38    |                    |
| 12/16/2020 | 3:34:51 | 20.81       | 0.14    |       | 3:32:51 | 20.38       | 0.44    |                    |
| 12/16/2020 | 3:35:51 | 20.81       | 0.14    |       | 3:33:51 | 20.40       | 0.44    |                    |
| 12/16/2020 | 3:36:51 | 20.81       | 0.14    |       | 3:34:51 | 20.40       | 0.44    |                    |
| 12/16/2020 | 3:37:51 | 20.81       | 0.15    |       | 3:35:51 | 20.24       | 0.41    |                    |
| 12/16/2020 | 3:38:51 | 20.81       | 0.15    |       | 3:36:51 | 20.16       | 0.41    |                    |
| 12/16/2020 | 3:39:51 | 20.81       | 0.15    |       | 3:37:51 | 20.17       | 0.43    |                    |
| 12/16/2020 | 3:40:51 | 20.78       | 0.18    |       | 3:38:51 | 20.16       | 0.44    |                    |
| 12/16/2020 | 3:41:51 | 20.76       | 0.20    |       | 3:39:51 | 20.17       | 0.46    |                    |
| 12/16/2020 | 3:42:51 | 20.76       | 0.20    |       | 3:40:51 | 20.17       | 0.47    |                    |
| 12/16/2020 | 3:43:51 | 20.78       | 0.16    |       | 3:41:51 | 20.16       | 0.48    |                    |
| 12/16/2020 | 3:44:51 | 20.80       | 0.15    |       | 3:42:51 | 20.16       | 0.49    |                    |

## SLR

## Columbia Steel

## Method 3A Baghouse #1 and Baghouse #2

| Date       | Time    | Baghouse #2 |         |                    | Time    | Baghouse #1 |         |       |
|------------|---------|-------------|---------|--------------------|---------|-------------|---------|-------|
|            |         | O2 [%]      | CO2 [%] | Notes              |         | O2 [%]      | CO2 [%] | Notes |
| 12/16/2020 | 3:45:51 | 20.80       | 0.15    |                    | 3:43:51 | 20.16       | 0.50    |       |
| 12/16/2020 | 3:46:51 | 20.80       | 0.15    |                    | 3:44:51 | 20.16       | 0.50    |       |
| 12/16/2020 | 3:47:51 | 20.80       | 0.15    |                    | 3:45:51 | 20.16       | 0.51    |       |
| 12/16/2020 | 3:48:51 | 20.80       | 0.15    |                    | 3:46:51 | 20.16       | 0.52    |       |
| 12/16/2020 | 3:49:51 | 20.80       | 0.15    |                    | 3:47:51 | 20.15       | 0.52    |       |
| 12/16/2020 | 3:50:51 | 20.80       | 0.15    |                    | 3:48:51 | 20.15       | 0.53    |       |
| 12/16/2020 | 3:51:51 | 20.79       | 0.15    |                    | 3:49:51 | 20.14       | 0.53    |       |
| 12/16/2020 | 3:52:51 | 20.79       | 0.15    |                    | 3:50:51 | 20.14       | 0.54    |       |
| 12/16/2020 | 3:53:51 | 20.80       | 0.14    |                    | 3:51:51 | 20.13       | 0.54    |       |
| 12/16/2020 | 3:54:51 | 20.81       | 0.13    |                    | 3:52:51 | 20.13       | 0.55    |       |
| 12/16/2020 | 3:55:51 | 20.81       | 0.14    |                    | 3:53:51 | 20.13       | 0.55    |       |
| 12/16/2020 | 3:56:51 | 20.82       | 0.14    |                    | 3:54:51 | 20.12       | 0.55    |       |
| 12/16/2020 | 3:57:51 | 20.82       | 0.14    |                    | 3:55:51 | 20.12       | 0.55    |       |
| 12/16/2020 | 3:58:51 | 20.82       | 0.14    |                    | 3:56:51 | 20.11       | 0.56    |       |
| 12/16/2020 | 3:59:51 | 20.82       | 0.14    |                    | 3:57:51 | 20.11       | 0.56    |       |
| 12/16/2020 | 4:00:51 | 20.82       | 0.14    |                    | 3:58:51 | 20.10       | 0.57    |       |
| 12/16/2020 | 4:01:51 | 20.82       | 0.14    |                    | 3:59:51 | 20.10       | 0.57    |       |
| 12/16/2020 | 4:02:51 | 20.83       | 0.14    |                    | 4:00:51 | 20.09       | 0.57    |       |
| 12/16/2020 | 4:03:51 | 20.80       | 0.16    |                    | 4:01:51 | 20.09       | 0.57    |       |
| 12/16/2020 | 4:04:51 | 20.79       | 0.17    |                    | 4:02:51 | 20.09       | 0.57    |       |
| 12/16/2020 | 4:05:51 | 20.79       | 0.17    |                    | 4:03:51 | 20.08       | 0.57    |       |
| 12/16/2020 | 4:06:51 | 20.82       | 0.15    |                    | 4:04:51 | 20.07       | 0.58    |       |
| 12/16/2020 | 4:07:51 | 20.83       | 0.13    |                    | 4:05:51 | 20.07       | 0.58    |       |
| 12/16/2020 | 4:08:51 | 20.84       | 0.12    |                    | 4:06:51 | 19.36       | 0.53    |       |
| 12/16/2020 | 4:09:51 | 20.84       | 0.12    |                    | 4:07:51 | -0.07       | -0.08   |       |
| 12/16/2020 | 4:10:51 | 20.83       | 0.13    | End Run 3 BH#2     | 4:08:51 | -0.02       | -0.02   |       |
|            |         | 20.68       | 0.14    | Average            | 4:09:51 | -0.02       | -0.02   |       |
| 12/16/2020 | 4:11:51 | 19.53       | 0.21    |                    | 4:10:51 | -0.02       | -0.02   |       |
| 12/16/2020 | 4:12:51 | 0.79        | 0.09    |                    | 4:11:51 | -0.02       | -0.02   |       |
| 12/16/2020 | 4:13:51 | 0.04        | 0.04    | System Zero        | 4:12:51 | -0.02       | -0.02   |       |
| 12/16/2020 | 4:14:51 | 8.94        | 8.46    |                    | 4:13:51 | -0.02       | -0.02   |       |
| 12/16/2020 | 4:15:51 | 21.83       | 21.56   |                    | 4:14:51 | -0.02       | -0.02   |       |
| 12/16/2020 | 4:16:51 | 22.08       | 21.66   | O2 System Upscale  | 4:15:51 | -0.02       | -0.02   |       |
| 12/16/2020 | 4:17:51 | 19.48       | 19.14   |                    | 4:16:51 | -0.02       | -0.02   |       |
| 12/16/2020 | 4:18:51 | 10.10       | 9.97    | CO2 System Upscale | 4:17:51 | -0.02       | -0.02   |       |
| 12/16/2020 | 4:19:51 | 10.00       | 9.85    |                    | 4:18:51 | -0.02       | -0.02   |       |
| 12/16/2020 | 4:20:51 | 12.55       | 7.28    |                    | 4:19:51 | -0.02       | -0.02   |       |
|            |         |             |         |                    | 4:20:51 | -0.02       | -0.01   |       |

## SLR

## Columbia Steel

## NOx, CO, O2 and CO2 Baghouse #1 and Baghouse #2

| Baghouse #2 |          |           |          |        |         | Baghouse #1                  |          |           |          |        |         |                                |
|-------------|----------|-----------|----------|--------|---------|------------------------------|----------|-----------|----------|--------|---------|--------------------------------|
| Date        | Time     | NOx [PPM] | CO [PPM] | O2 [%] | CO2 [%] | Notes                        | Time     | NOx [PPM] | CO [PPM] | O2 [%] | CO2 [%] | Notes                          |
| 12/16/2020  | 19:10:12 | 0.60      | 7.77     | 17.56  | 0.19    |                              | 19:10:12 | 0.14      | 2.36     | 20.44  | 0.20    |                                |
| 12/16/2020  | 19:11:12 | 0.59      | 7.41     | 17.55  | 0.20    |                              | 19:11:12 | 0.11      | 2.33     | 20.43  | 0.21    |                                |
| 12/16/2020  | 19:12:12 | 0.61      | 6.87     | 4.47   | 0.07    |                              | 19:12:12 | 0.17      | 2.24     | 20.43  | 0.20    |                                |
| 12/16/2020  | 19:13:12 | 0.28      | 6.72     | 0.04   | 0.00    | M205 Independent Calibration | 19:13:12 | 0.15      | 2.22     | 20.43  | 0.20    |                                |
| 12/16/2020  | 19:14:12 | 0.25      | 6.75     | 1.16   | 0.69    |                              | 19:14:12 | 0.21      | 2.22     | 20.42  | 0.20    |                                |
| 12/16/2020  | 19:15:12 | 0.25      | 7.40     | 21.53  | 21.00   |                              | 19:15:12 | 0.14      | 2.21     | 20.41  | 0.21    |                                |
| 12/16/2020  | 19:16:12 | 0.24      | 4.55     | 22.07  | 21.60   |                              | 19:16:12 | 0.12      | 2.21     | 20.40  | 0.21    |                                |
| 12/16/2020  | 19:17:12 | 0.24      | 5.06     | 13.12  | 13.05   |                              | 19:17:12 | 0.11      | 2.21     | 20.38  | 0.21    |                                |
| 12/16/2020  | 19:18:12 | 0.24      | 4.83     | 10.03  | 9.91    |                              | 19:18:12 | 0.10      | 2.21     | 20.39  | 0.21    |                                |
| 12/16/2020  | 19:19:12 | 0.24      | 5.33     | 8.87   | 9.23    |                              | 19:19:12 | 0.12      | 2.21     | 20.39  | 0.20    |                                |
| 12/16/2020  | 19:20:12 | 1.63      | 6.22     | 0.64   | 0.28    |                              | 19:20:12 | 0.11      | 2.21     | 20.39  | 0.20    |                                |
| 12/16/2020  | 19:21:12 | 3.35      | 6.07     | 0.89   | 0.21    |                              | 19:21:12 | 0.07      | 2.22     | 20.37  | 0.21    |                                |
| 12/16/2020  | 19:22:12 | 0.83      | 6.49     | 4.51   | 0.27    |                              | 19:22:12 | 0.14      | 2.22     | 20.39  | 0.18    |                                |
| 12/16/2020  | 19:23:12 | 0.94      | 6.61     | 16.11  | 0.41    |                              | 19:23:12 | 0.06      | 2.22     | 20.39  | 0.17    |                                |
| 12/16/2020  | 19:24:12 | 1.15      | 6.27     | 11.53  | 11.31   |                              | 19:24:12 | 0.17      | 2.21     | 20.40  | 0.16    |                                |
| 12/16/2020  | 19:25:12 | 0.70      | 4.55     | 9.96   | 9.81    | M205 Dilution Check          | 19:25:12 | 0.09      | 2.19     | 20.39  | 0.17    |                                |
| 12/16/2020  | 19:26:12 | 0.61      | 4.46     | 5.53   | 5.64    |                              | 19:26:12 | 0.14      | 2.19     | 20.38  | 0.17    |                                |
| 12/16/2020  | 19:27:12 | 0.61      | 4.40     | 5.00   | 5.08    |                              | 19:27:12 | 0.12      | 2.15     | 20.38  | 0.16    |                                |
| 12/16/2020  | 19:28:12 | 0.60      | 4.47     | 9.86   | 9.59    |                              | 19:28:12 | 0.16      | 2.09     | 20.42  | 0.13    |                                |
| 12/16/2020  | 19:29:12 | 0.60      | 4.17     | 9.96   | 9.81    |                              | 19:29:12 | 0.21      | 2.08     | 20.40  | 0.14    |                                |
| 12/16/2020  | 19:30:12 | 0.56      | 4.51     | 6.33   | 6.38    |                              | 19:30:12 | 0.20      | 2.08     | 20.39  | 0.15    |                                |
| 12/16/2020  | 19:31:12 | 0.25      | 4.85     | 5.01   | 5.07    |                              | 19:31:12 | 0.18      | 2.08     | 20.38  | 0.15    |                                |
| 12/16/2020  | 19:32:12 | 0.25      | 4.26     | 9.86   | 9.53    |                              | 19:32:12 | 0.21      | 2.08     | 20.37  | 0.15    |                                |
| 12/16/2020  | 19:33:12 | 0.26      | 3.48     | 9.98   | 9.80    |                              | 19:33:12 | 0.22      | 2.08     | 20.37  | 0.15    |                                |
| 12/16/2020  | 19:34:12 | 0.26      | 3.88     | 5.82   | 5.88    |                              | 19:34:12 | 0.29      | 2.09     | 20.36  | 0.15    |                                |
| 12/16/2020  | 19:35:12 | 0.25      | 4.03     | 4.99   | 5.06    |                              | 19:35:12 | 0.10      | 2.09     | 20.36  | 0.15    |                                |
| 12/16/2020  | 19:36:12 | 0.26      | 4.77     | 1.07   | 1.12    |                              | 19:36:12 | 0.18      | 2.09     | 20.35  | 0.15    |                                |
| 12/16/2020  | 19:37:12 | 0.25      | 5.39     | -0.02  | 0.01    | M205 Independent Check       | 19:37:12 | 0.18      | 2.08     | 20.34  | 0.16    |                                |
| 12/16/2020  | 19:38:12 | 0.26      | 5.06     | 5.83   | 5.64    |                              | 19:38:12 | 0.15      | 2.08     | 20.33  | 0.16    |                                |
| 12/16/2020  | 19:39:12 | 0.27      | 3.51     | 9.99   | 9.86    |                              | 19:39:12 | 0.14      | 2.09     | 20.32  | 0.16    |                                |
| 12/16/2020  | 19:40:12 | 0.28      | 3.69     | 1.11   | 1.18    |                              | 19:40:12 | 0.14      | 2.08     | 20.34  | 0.15    |                                |
| 12/16/2020  | 19:41:12 | 0.25      | 4.29     | -0.02  | 0.01    |                              | 19:41:12 | 0.12      | 2.09     | 20.32  | 0.15    |                                |
| 12/16/2020  | 19:42:12 | 0.52      | 3.06     | 8.68   | 7.96    |                              | 19:42:12 | 0.19      | 2.09     | 20.31  | 0.16    |                                |
| 12/16/2020  | 19:43:12 | 0.36      | 0.04     | 10.01  | 9.86    |                              | 19:43:12 | 0.22      | 2.08     | 20.30  | 0.16    |                                |
| 12/16/2020  | 19:44:12 | 0.27      | 0.22     | 6.08   | 6.06    |                              | 19:44:12 | 0.23      | 2.09     | 20.29  | 0.17    |                                |
| 12/16/2020  | 19:45:12 | 0.26      | 1.18     | -0.02  | 0.02    |                              | 19:45:12 | 0.17      | 2.09     | 20.29  | 0.17    |                                |
| 12/16/2020  | 19:46:12 | 0.26      | 0.82     | 8.77   | 8.51    |                              | 19:46:12 | 0.23      | 2.09     | 20.29  | 0.17    |                                |
| 12/16/2020  | 19:47:12 | 0.25      | -0.90    | 10.01  | 9.86    |                              | 19:47:12 | 0.21      | 2.09     | 20.28  | 0.18    |                                |
| 12/16/2020  | 19:48:12 | 0.25      | 0.10     | 6.90   | 7.48    |                              | 19:48:12 | 0.20      | 2.09     | 20.27  | 0.19    |                                |
| 12/16/2020  | 19:49:12 | 0.25      | 1.32     | -0.01  | 0.04    | O2, CO2 Analyzer Zero        | 19:49:12 | 0.18      | 2.09     | 20.29  | 0.17    |                                |
| 12/16/2020  | 19:50:12 | 0.25      | 1.43     | 7.55   | 7.08    |                              | 19:50:12 | 0.21      | 2.06     | 20.27  | 0.19    |                                |
| 12/16/2020  | 19:51:12 | 0.32      | 0.72     | 21.97  | 21.67   | O2, CO2 Analyzer High        | 19:51:12 | 0.13      | 1.98     | 20.26  | 0.20    |                                |
| 12/16/2020  | 19:52:12 | 0.25      | -1.81    | 18.32  | 18.20   |                              | 19:52:12 | 0.15      | 2.00     | 20.25  | 0.21    |                                |
| 12/16/2020  | 19:53:12 | 0.25      | -0.83    | 9.90   | 9.77    |                              | 19:53:12 | 0.24      | 1.98     | 20.26  | 0.20    |                                |
| 12/16/2020  | 19:54:12 | 0.25      | -1.21    | 9.97   | 9.79    | O2, CO2 Analyzer Mid         | 19:54:12 | 0.25      | 1.96     | 20.26  | 0.20    |                                |
| 12/16/2020  | 19:55:12 | 0.27      | -0.48    | 9.48   | 9.76    | NOx, CO Analyzer Zero        | 19:55:12 | 0.20      | 1.96     | 20.26  | 0.20    |                                |
| 12/16/2020  | 19:56:12 | 0.26      | 1.03     | 8.90   | 9.73    |                              | 19:56:12 | 0.13      | 1.96     | 20.26  | 0.20    |                                |
| 12/16/2020  | 19:57:12 | 1.42      | 9.88     | 6.42   | 5.39    |                              | 19:57:12 | 0.16      | 1.96     | 20.26  | 0.20    |                                |
| 12/16/2020  | 19:58:12 | 87.37     | 87.51    | 0.01   | 0.03    |                              | 19:58:12 | 0.18      | 1.96     | 20.25  | 0.20    |                                |
| 12/16/2020  | 19:59:12 | 105.11    | 93.49    | 0.00   | 0.00    |                              | 19:59:12 | 0.21      | 1.96     | 20.24  | 0.21    |                                |
| 12/16/2020  | 20:00:12 | 100.44    | 99.63    | -0.01  | -0.01   | NOx, CO Analyzer High        | 20:00:12 | 0.12      | 1.96     | 20.24  | 0.21    |                                |
| 12/16/2020  | 20:01:12 | 99.82     | 102.33   | -0.01  | -0.02   |                              | 20:01:12 | 0.22      | 1.96     | 20.23  | 0.21    |                                |
| 12/16/2020  | 20:02:12 | 99.60     | 102.37   | 0.02   | -0.02   |                              | 20:02:12 | 0.19      | 1.95     | 20.23  | 0.22    |                                |
| 12/16/2020  | 20:03:12 | 84.23     | 67.02    | -0.02  | -0.03   |                              | 20:03:12 | 0.19      | 1.95     | 20.22  | 0.22    |                                |
| 12/16/2020  | 20:04:12 | 47.98     | 51.11    | -0.03  | -0.03   |                              | 20:04:12 | 0.20      | 1.96     | 20.21  | 0.23    |                                |
| 12/16/2020  | 20:05:12 | 48.23     | 50.70    | -0.03  | -0.03   | NOx, CO Analyzer Mid         | 20:05:12 | 0.14      | 1.96     | 20.20  | 0.23    |                                |
| 12/16/2020  | 20:06:12 | 48.35     | 39.18    | 10.74  | 0.21    |                              | 20:06:12 | 0.22      | 1.96     | 20.19  | 0.23    |                                |
| 12/16/2020  | 20:07:12 | 44.71     | 2.07     | 20.87  | -0.04   |                              | 20:07:12 | 0.23      | 1.96     | 20.19  | 0.23    |                                |
| 12/16/2020  | 20:08:12 | 49.85     | 0.50     | 20.84  | -0.04   | NO2 Converter Check          | 20:08:12 | 0.19      | 1.96     | 20.19  | 0.24    |                                |
| 12/16/2020  | 20:09:12 | 38.85     | 0.35     | 20.73  | 0.18    |                              | 20:09:12 | 0.24      | 1.96     | 20.14  | 0.24    |                                |
| 12/16/2020  | 20:10:12 | 2.00      | 0.11     | 20.77  | 0.24    |                              | 20:10:12 | 0.72      | 2.04     | 7.23   | 0.13    |                                |
| 12/16/2020  | 20:11:12 | 0.80      | -0.22    | 20.77  | 0.25    |                              | 20:11:12 | 0.15      | 0.59     | 0.01   | 0.02    | Analyzer Zero                  |
| 12/16/2020  | 20:12:12 | 0.60      | 0.09     | 20.79  | 0.24    |                              | 20:12:12 | 1.89      | 0.35     | 16.58  | 16.36   |                                |
| 12/16/2020  | 20:13:12 | 0.60      | 0.54     | 20.77  | 0.25    |                              | 20:13:12 | 0.32      | -0.59    | 22.00  | 21.45   | O2, CO2 Analyzer High          |
| 12/16/2020  | 20:14:12 | 0.61      | 0.98     | 20.79  | 0.25    |                              | 20:14:12 | 0.05      | -0.62    | 16.54  | 15.55   |                                |
| 12/16/2020  | 20:15:12 | 0.60      | 0.31     | 20.77  | 0.26    |                              | 20:15:12 | 0.16      | -0.45    | 9.94   | 9.77    |                                |
| 12/16/2020  | 20:16:12 | 0.61      | 0.29     | 20.76  | 0.26    |                              | 20:16:12 | 0.07      | -0.41    | 9.98   | 10.07   | O2, CO2 Analyzer Mid           |
| 12/16/2020  | 20:17:12 | 0.61      | -0.23    | 20.76  | 0.26    |                              | 20:17:12 | 10.03     | 4.74     | 6.41   | 5.58    |                                |
| 12/16/2020  | 20:18:12 | 0.60      | -0.16    | 20.76  | 0.25    |                              | 20:18:12 | 75.53     | 82.20    | -0.01  | 0.16    |                                |
| 12/16/2020  | 20:19:12 | 0.60      | 0.19     | 20.75  | 0.26    |                              | 20:19:12 | 100.37    | 96.77    | -0.01  | 0.15    |                                |
| 12/16/2020  | 20:20:12 | 0.61      | 0.57     | 20.74  | 0.27    |                              | 20:20:12 | 100.50    | 100.37   | -0.02  | 0.15    | NOx, CO Analyzer High          |
| 12/16/2020  | 20:21:12 | 0.61      | 0.46     | 20.78  | 0.23    |                              | 20:21:12 | 84.94     | 79.10    | -0.01  | 0.15    |                                |
| 12/16/2020  | 20:22:12 | 0.61      | 0.10     | 20.76  | 0.24    |                              | 20:22:12 | 48.78     | 49.78    | -0.03  | 0.14    | NOx, CO Analyzer Mid           |
| 12/16/2020  | 20:23:12 | 0.61      | -0.29    | 20.75  | 0.25    |                              | 20:23:12 | 48.17     | 38.31    | 6.01   | 5.28    |                                |
| 12/16/2020  | 20:24:12 | 0.61      | -0.53    | 20.78  | 0.22    |                              | 20:24:12 | 45.96     | 0.97     | 20.97  | 0.16    |                                |
| 12/16/2020  | 20:25:12 | 0.61      | 0.32     | 20.75  | 0.25    |                              | 20:25:12 | 49.30     | 0.00     | 21.23  | 0.14    | NO2 Converter Check            |
| 12/16/2020  | 20:26:12 | 0.62      | 0.31     | 20.61  | 0.32    |                              | 20:26:12 | 46.70     | 0.22     | 20.84  | 0.27    |                                |
| 12/16/2020  | 20:27:12 | 0.61      | 0.39     | 20.87  | 0.11    |                              | 20:27:12 | 2.29      | 0.33     | 20.60  | 0.36    |                                |
| 12/16/2020  | 20:28:12 | 0.62      | -0.06    | 20.93  | 0.04    | NOx, CO System Zero          | 20:28:12 | 0.38      | 0.38     | 20.56  | 0.37    |                                |
| 12/16/2020  | 20:29:12 | 0.97      | -0.14    | 12.44  | 6.08    |                              | 20:29:12 | 0.31      | 0.34     | 20.59  | 0.35    |                                |
| 12/16/2020  | 20:30:12 | 0.77      | -2.19    | 10.03  | 9.80    | O2, CO2 System Upscale       | 20:30:12 | 0.20      | 0.34     | 20.57  | 0.37    |                                |
| 12/16/2020  | 20:31:12 | 0.49      | -1.36    | 11.63  | 5.77    |                              | 20:31:12 | 0.19      | 0.37     | 20.59  | 0.35    |                                |
| 12/16/2020  | 20:32:12 | 22.47     | 39.11    | 0.47   | 0.15    |                              | 20:32:12 | 0.68      | 2.87     | 20.54  | 0.34    |                                |
| 12/16/2020  | 20:33:12 | 48.05     | 56.18    | 0.03   | 0.02    |                              | 20:33:12 | 0.95      | 4.30     | 20.54  | 0.34    |                                |
| 12/16/2020  | 20:34:12 | 48.70     | 54.79    | 0.03   | 0.01    | O2, CO2 System Zero          | 20:34:12 | 0.95      | 4.31     | 20.55  | 0.34    |                                |
| 12/16/2020  | 20:35:12 | 48.54     | 50.31    | 5.62   | 0.01    | NOx, CO System Upscale       | 20:35:12 | 1.03      | 4.31     | 20.14  | 0.48    |                                |
| 12/16/2020  | 20:36:12 | 22.62     | 9.61     | 20.78  | 0.06    |                              | 20:36:12 | 1.74      | 2.39     | 10.37  | 8.73    |                                |
| 12/16/2020  | 20:37:12 | 0.84      | -0.17    | 21.04  | 0.06    |                              | 20:37:12 | 0.27      | -0.37    | 9.94   | 10.08   | NOx, CO System Zero/           |
| 12/16/2020  | 20:38:12 | 0.61      | -0.14    | 21.05  | 0.06    |                              | 20:38:12 | 0.10      | 3.19     | 7.19   | 5.59    | O2, CO2 Upscale                |
| 12/16/2020  | 20:39:12 | 0.61      | 0.02     | 21.05  | 0.06    |                              | 20:39:12 | 44.30     | 43.52    | 0.07   | 0.19    |                                |
| 12/16/2020  | 20:40:12 | 0.60      | -0.38    | 21.05  | 0.06    |                              | 20:40:12 | 47.96     | 49.79    | -0.01  | 0.15    | CO System Upscale/O2, CO2 Zero |
| 12/16/2020  | 20:41:12 | 0.60      | -0.56    | 21.05  | 0.06    |                              | 20:41:12 | 48.07     | 45.84    | 8.00   | 0.24    | NOx System Upscale             |
| 12/16/2020  | 20:42:12 | 0.59      | -0.82    | 21.05  | 0.06    |                              |          |           |          |        |         |                                |

SLR  
Columbia Steel  
NOx, CO, O2 and CO2 Baghouse #1 and Baghouse #2

| Baghouse #2 |          |           |          |        |         | Baghouse #1 |          |           |          |        |         |                      |
|-------------|----------|-----------|----------|--------|---------|-------------|----------|-----------|----------|--------|---------|----------------------|
| Date        | Time     | NOx [PPM] | CO [PPM] | O2 [%] | CO2 [%] | Notes       | Time     | NOx [PPM] | CO [PPM] | O2 [%] | CO2 [%] | Notes                |
| 12/16/2020  | 20:46:12 | 0.60      | -0.25    | 21.05  | 0.04    |             | 20:46:12 | 0.99      | 4.44     | 20.81  | 0.35    |                      |
| 12/16/2020  | 20:47:12 | 0.62      | -0.61    | 21.05  | 0.04    |             | 20:47:12 | 0.98      | 4.44     | 20.82  | 0.35    |                      |
| 12/16/2020  | 20:48:12 | 0.61      | -0.87    | 21.05  | 0.04    |             | 20:48:12 | 0.98      | 4.44     | 20.83  | 0.35    |                      |
| 12/16/2020  | 20:49:12 | 0.60      | -0.78    | 21.05  | 0.04    |             | 20:49:12 | 0.97      | 4.43     | 20.84  | 0.35    |                      |
| 12/16/2020  | 20:50:12 | 0.49      | -0.50    | 21.05  | 0.04    |             | 20:50:12 | 0.95      | 3.77     | 21.01  | 0.26    |                      |
| 12/16/2020  | 20:51:12 | 0.61      | -0.20    | 21.05  | 0.04    |             | 20:51:12 | 0.33      | 1.37     | 21.15  | 0.20    |                      |
| 12/16/2020  | 20:52:12 | 0.61      | -0.67    | 21.05  | 0.04    |             | 20:52:12 | 0.17      | 1.26     | 21.17  | 0.20    |                      |
| 12/16/2020  | 20:53:12 | 0.45      | -0.66    | 21.05  | 0.03    |             | 20:53:12 | 0.10      | 0.55     | 21.20  | 0.18    |                      |
| 12/16/2020  | 20:54:12 | 0.49      | -1.03    | 21.03  | 0.04    |             | 20:54:12 | 0.05      | 0.92     | 21.20  | 0.18    |                      |
| 12/16/2020  | 20:55:12 | 0.37      | -0.87    | 21.03  | 0.03    |             | 20:55:12 | 0.09      | 0.59     | 21.21  | 0.18    |                      |
| 12/16/2020  | 20:56:12 | 0.51      | -0.61    | 21.03  | 0.04    |             | 20:56:12 | 0.12      | 0.52     | 21.22  | 0.17    |                      |
| 12/16/2020  | 20:57:12 | 0.31      | -0.35    | 21.03  | 0.04    |             | 20:57:12 | 0.11      | 0.43     | 21.22  | 0.18    |                      |
| 12/16/2020  | 20:58:12 | 0.39      | -0.19    | 21.03  | 0.05    |             | 20:58:12 | 0.14      | 0.40     | 21.23  | 0.17    |                      |
| 12/16/2020  | 20:59:12 | 0.35      | -0.68    | 21.02  | 0.05    |             | 20:59:12 | 0.15      | 0.42     | 21.23  | 0.17    |                      |
| 12/16/2020  | 21:00:12 | 0.45      | -1.15    | 21.03  | 0.05    |             | 21:00:12 | 0.08      | 0.48     | 21.23  | 0.17    |                      |
| 12/16/2020  | 21:01:12 | 0.25      | -1.01    | 21.02  | 0.05    |             | 21:01:12 | 0.14      | 0.62     | 21.24  | 0.17    |                      |
| 12/16/2020  | 21:02:12 | 0.25      | -0.57    | 21.02  | 0.06    |             | 21:02:12 | 0.17      | 0.75     | 21.24  | 0.16    |                      |
| 12/16/2020  | 21:03:12 | 0.25      | -0.32    | 21.02  | 0.06    |             | 21:03:12 | 0.09      | 0.80     | 21.24  | 0.16    |                      |
| 12/16/2020  | 21:04:12 | 0.25      | -0.36    | 21.02  | 0.06    |             | 21:04:12 | 0.12      | 0.71     | 21.25  | 0.16    |                      |
| 12/16/2020  | 21:05:12 | 0.26      | -0.74    | 21.02  | 0.06    |             | 21:05:12 | 0.15      | 0.77     | 21.25  | 0.16    |                      |
| 12/16/2020  | 21:06:12 | 0.27      | -1.22    | 21.02  | 0.06    |             | 21:06:12 | 0.03      | 0.77     | 21.25  | 0.16    |                      |
| 12/16/2020  | 21:07:12 | 0.24      | -1.12    | 21.02  | 0.06    |             | 21:07:12 | 0.05      | 0.73     | 21.25  | 0.16    |                      |
| 12/16/2020  | 21:08:12 | 0.26      | -0.81    | 21.02  | 0.06    |             | 21:08:12 | 0.10      | 0.61     | 21.25  | 0.16    |                      |
| 12/16/2020  | 21:09:12 | 0.25      | -0.57    | 21.02  | 0.05    |             | 21:09:12 | 0.11      | 0.62     | 21.25  | 0.16    |                      |
| 12/16/2020  | 21:10:12 | 0.25      | -0.46    | 21.02  | 0.05    |             | 21:10:12 | 0.10      | 0.65     | 21.26  | 0.15    |                      |
| 12/16/2020  | 21:11:12 | 0.25      | -0.68    | 21.02  | 0.05    |             | 21:11:12 | 0.11      | 0.73     | 21.25  | 0.15    |                      |
| 12/16/2020  | 21:12:12 | 0.24      | -1.16    | 21.02  | 0.05    |             | 21:12:12 | 0.09      | 0.80     | 21.26  | 0.15    |                      |
| 12/16/2020  | 21:13:12 | 0.25      | -1.09    | 21.02  | 0.04    |             | 21:13:12 | 0.09      | 0.92     | 21.25  | 0.15    | Start Run 1 BH#1     |
| 12/16/2020  | 21:14:12 | 0.36      | -0.96    | 21.02  | 0.03    |             | 21:14:12 | 0.06      | 1.06     | 21.26  | 0.15    | Stratification Check |
| 12/16/2020  | 21:15:12 | 0.25      | -0.56    | 21.02  | 0.04    |             | 21:15:12 | 0.08      | 0.78     | 21.26  | 0.15    | 21.24                |
| 12/16/2020  | 21:16:12 | 0.25      | -0.49    | 21.02  | 0.04    |             | 21:16:12 | 0.12      | 0.73     | 21.26  | 0.15    |                      |
| 12/16/2020  | 21:17:12 | 0.27      | -0.79    | 21.02  | 0.04    |             | 21:17:12 | 1.12      | 0.77     | 21.26  | 0.15    |                      |
| 12/16/2020  | 21:18:12 | 0.26      | -1.01    | 21.02  | 0.04    |             | 21:18:12 | 23.30     | 0.92     | 21.23  | 0.15    |                      |
| 12/16/2020  | 21:19:12 | 0.26      | -1.29    | 21.03  | 0.04    |             | 21:19:12 | 39.95     | 0.94     | 21.23  | 0.15    |                      |
| 12/16/2020  | 21:20:12 | 0.25      | -1.21    | 21.02  | 0.04    |             | 21:20:12 | 35.32     | 0.87     | 21.22  | 0.15    |                      |
| 12/16/2020  | 21:21:12 | 0.25      | -0.63    | 21.01  | 0.04    |             | 21:21:12 | 32.01     | 1.17     | 21.23  | 0.16    |                      |
| 12/16/2020  | 21:22:12 | 0.25      | -0.85    | 21.01  | 0.05    |             | 21:22:12 | 24.84     | 1.26     | 21.23  | 0.15    |                      |
| 12/16/2020  | 21:23:12 | 0.25      | -0.99    | 21.02  | 0.05    |             | 21:23:12 | 27.34     | 0.92     | 21.23  | 0.15    |                      |
| 12/16/2020  | 21:24:12 | 0.26      | -1.25    | 21.01  | 0.06    |             | 21:24:12 | 26.54     | 0.97     | 21.23  | 0.15    |                      |
| 12/16/2020  | 21:25:12 | 0.25      | -1.58    | 21.01  | 0.06    |             | 21:25:12 | 23.08     | 1.04     | 21.23  | 0.15    | 21.24                |
| 12/16/2020  | 21:26:12 | 0.25      | -1.23    | 21.01  | 0.06    |             | 21:26:12 | 12.26     | 1.21     | 21.23  | 0.16    |                      |
| 12/16/2020  | 21:27:12 | 0.30      | -0.92    | 21.01  | 0.07    |             | 21:27:12 | 6.39      | 1.34     | 21.24  | 0.16    |                      |
| 12/16/2020  | 21:28:12 | 0.49      | -0.73    | 21.01  | 0.07    |             | 21:28:12 | 16.17     | 0.49     | 21.24  | 0.16    |                      |
| 12/16/2020  | 21:29:12 | 0.24      | -1.30    | 21.01  | 0.07    |             | 21:29:12 | 20.89     | 0.42     | 21.24  | 0.16    |                      |
| 12/16/2020  | 21:30:12 | 0.25      | -1.66    | 21.01  | 0.07    |             | 21:30:12 | 17.38     | 0.62     | 21.24  | 0.15    |                      |
| 12/16/2020  | 21:31:12 | 0.48      | -1.77    | 21.00  | 0.07    |             | 21:31:12 | 14.05     | 0.99     | 21.24  | 0.15    |                      |
| 12/16/2020  | 21:32:12 | 0.37      | -1.24    | 21.01  | 0.06    |             | 21:32:12 | 11.71     | 1.65     | 21.24  | 0.15    |                      |
| 12/16/2020  | 21:33:12 | 0.38      | -0.77    | 21.01  | 0.06    |             | 21:33:12 | 15.62     | 3.53     | 21.23  | 0.16    |                      |
| 12/16/2020  | 21:34:12 | 0.29      | -1.14    | 21.01  | 0.06    |             | 21:34:12 | 16.62     | 2.98     | 21.23  | 0.16    |                      |
| 12/16/2020  | 21:35:12 | 0.59      | -1.22    | 21.01  | 0.06    |             | 21:35:12 | 18.28     | 1.78     | 21.22  | 0.16    | 21.22                |
| 12/16/2020  | 21:36:12 | 0.59      | -1.42    | 21.01  | 0.06    |             | 21:36:12 | 17.86     | 2.32     | 21.23  | 0.16    |                      |
| 12/16/2020  | 21:37:12 | 0.59      | -1.78    | 21.01  | 0.05    |             | 21:37:12 | 20.95     | 1.48     | 21.23  | 0.15    |                      |
| 12/16/2020  | 21:38:12 | 0.28      | -1.46    | 21.01  | 0.05    |             | 21:38:12 | 24.88     | 0.97     | 21.22  | 0.15    |                      |
| 12/16/2020  | 21:39:12 | 0.58      | -1.24    | 21.01  | 0.05    |             | 21:39:12 | 22.27     | 1.10     | 21.22  | 0.15    |                      |
| 12/16/2020  | 21:40:12 | 0.45      | -1.01    | 21.01  | 0.05    |             | 21:40:12 | 14.73     | 1.88     | 21.22  | 0.15    |                      |
| 12/16/2020  | 21:41:12 | 0.59      | -1.22    | 21.01  | 0.05    |             | 21:41:12 | 12.63     | 2.43     | 21.23  | 0.15    |                      |
| 12/16/2020  | 21:42:12 | 0.33      | -1.68    | 21.01  | 0.05    |             | 21:42:12 | 14.81     | 2.26     | 21.22  | 0.14    |                      |
| 12/16/2020  | 21:43:12 | 0.44      | -1.71    | 21.01  | 0.05    |             | 21:43:12 | 17.85     | 1.24     | 21.23  | 0.14    |                      |
| 12/16/2020  | 21:44:12 | 0.48      | -1.84    | 21.02  | 0.05    |             | 21:44:12 | 15.30     | 0.91     | 21.23  | 0.14    |                      |
| 12/16/2020  | 21:45:12 | 0.34      | -1.58    | 21.01  | 0.05    |             | 21:45:12 | 16.63     | 1.45     | 21.23  | 0.14    |                      |
| 12/16/2020  | 21:46:12 | 0.54      | -1.17    | 21.01  | 0.06    |             | 21:46:12 | 13.17     | 1.83     | 21.23  | 0.14    |                      |
| 12/16/2020  | 21:47:12 | 0.46      | -1.30    | 21.02  | 0.05    |             | 21:47:12 | 19.08     | 0.85     | 21.22  | 0.14    |                      |
| 12/16/2020  | 21:48:12 | 0.56      | -1.43    | 21.02  | 0.06    |             | 21:48:12 | 20.92     | 0.70     | 21.23  | 0.13    |                      |
| 12/16/2020  | 21:49:12 | 0.32      | -1.95    | 21.02  | 0.07    |             | 21:49:12 | 15.10     | 0.86     | 21.23  | 0.14    |                      |
| 12/16/2020  | 21:50:12 | 0.60      | -1.97    | 21.02  | 0.07    |             | 21:50:12 | 13.13     | 0.78     | 21.22  | 0.14    |                      |
| 12/16/2020  | 21:51:12 | 0.60      | -1.74    | 21.02  | 0.07    |             | 21:51:12 | 11.66     | 1.43     | 21.22  | 0.15    |                      |
| 12/16/2020  | 21:52:12 | 0.44      | -1.30    | 21.02  | 0.07    |             | 21:52:12 | 11.90     | 2.40     | 21.22  | 0.15    |                      |
| 12/16/2020  | 21:53:12 | 0.26      | -1.56    | 21.02  | 0.07    |             | 21:53:12 | 12.40     | 2.05     | 21.23  | 0.14    |                      |
| 12/16/2020  | 21:54:12 | 0.25      | -1.73    | 21.02  | 0.07    |             | 21:54:12 | 17.14     | 3.68     | 21.23  | 0.14    |                      |
| 12/16/2020  | 21:55:12 | 0.47      | -1.90    | 21.02  | 0.07    |             | 21:55:12 | 14.98     | 2.08     | 21.23  | 0.13    |                      |
| 12/16/2020  | 21:56:12 | 0.32      | -2.05    | 21.02  | 0.06    |             | 21:56:12 | 12.25     | 0.83     | 21.23  | 0.14    |                      |
| 12/16/2020  | 21:57:12 | 0.30      | -1.94    | 21.02  | 0.06    |             | 21:57:12 | 15.11     | 2.64     | 21.22  | 0.15    |                      |
| 12/16/2020  | 21:58:12 | 0.35      | -1.55    | 21.02  | 0.06    |             | 21:58:12 | 21.46     | 1.27     | 21.23  | 0.14    |                      |
| 12/16/2020  | 21:59:12 | 0.27      | -1.44    | 21.02  | 0.06    |             | 21:59:12 | 26.31     | 0.85     | 21.23  | 0.14    |                      |
| 12/16/2020  | 22:00:12 | 0.31      | -1.67    | 21.02  | 0.06    |             | 22:00:12 | 28.53     | 0.75     | 21.24  | 0.14    |                      |
| 12/16/2020  | 22:01:12 | 0.61      | -2.44    | 21.02  | 0.05    |             | 22:01:12 | 11.20     | 0.64     | 21.24  | 0.14    |                      |
| 12/16/2020  | 22:02:12 | 0.29      | -2.28    | 21.02  | 0.05    |             | 22:02:12 | 30.78     | 0.42     | 21.23  | 0.14    |                      |
| 12/16/2020  | 22:03:12 | 0.28      | -1.88    | 21.02  | 0.05    |             | 22:03:12 | 30.05     | 0.49     | 21.23  | 0.14    |                      |
| 12/16/2020  | 22:04:12 | 0.28      | -1.49    | 21.02  | 0.04    |             | 22:04:12 | 28.85     | 0.40     | 21.23  | 0.13    |                      |
| 12/16/2020  | 22:05:12 | 0.43      | -1.85    | 21.02  | 0.05    |             | 22:05:12 | 29.21     | 0.40     | 21.23  | 0.14    |                      |
| 12/16/2020  | 22:06:12 | 0.34      | -2.34    | 21.03  | 0.05    |             | 22:06:12 | 28.89     | 0.40     | 21.23  | 0.13    |                      |
| 12/16/2020  | 22:07:12 | 0.26      | -2.64    | 21.02  | 0.05    |             | 22:07:12 | 27.86     | 0.31     | 21.23  | 0.13    |                      |
| 12/16/2020  | 22:08:12 | 0.54      | -2.17    | 21.02  | 0.05    |             | 22:08:12 | 28.42     | 0.42     | 21.24  | 0.13    |                      |
| 12/16/2020  | 22:09:12 | 0.29      | -1.62    | 21.02  | 0.04    |             | 22:09:12 | 27.38     | 0.44     | 21.24  | 0.13    |                      |
| 12/16/2020  | 22:10:12 | 0.42      | -1.79    | 21.02  | 0.05    |             | 22:10:12 | 12.82     | 1.23     | 21.26  | 0.12    |                      |
| 12/16/2020  | 22:11:12 | 0.39      | -2.19    | 21.02  | 0.05    |             | 22:11:12 | 8.72      | 1.05     | 21.25  | 0.12    |                      |
| 12/16/2020  | 22:12:12 | 0.37      | -2.23    | 21.02  | 0.05    |             | 22:12:12 | 29.22     | 0.51     | 21.24  | 0.13    |                      |
| 12/16/2020  | 22:13:12 | 0.41      | -2.71    | 21.02  | 0.06    |             | 22:13:12 | 28.37     | 0.39     | 21.24  | 0.13    |                      |
| 12/16/2020  | 22:14:12 | 0.33      | -2.29    | 21.02  | 0.06    |             | 22:14:12 | 24.06     | 0.41     | 21.23  | 0.13    |                      |
| 12/16/2020  | 22:15:12 | 0.32      | -1.83    | 21.02  | 0.07    |             | 22:15:12 | 22.42     | 0.44     | 21.24  | 0.13    |                      |
| 12/16/2020  | 22:16:12 | 0.38      | -1.67    | 21.02  | 0.07    |             | 22:16:12 | 24.16     | 0.39     | 21.24  | 0.13    |                      |
| 12/16/2020  | 22:17:12 | 0.27      | -1.99    | 21.02  | 0.07    |             | 22:17:12 | 23.26     | 0.45     | 21.24  | 0.12    |                      |
| 12/16/2020  | 22:18:12 | 0.47      | -2.16    | 21.02  | 0.07    |             | 22:18:12 | 22.97     | 0.51     | 21.24  | 0.12    |                      |
| 12/16/2020  | 22:19:12 | 0.61      | -2.41    | 21.02  | 0.07    | </          |          |           |          |        |         |                      |

SLR  
Columbia Steel  
NOx, CO, O2 and CO2 Baghouse #1 and Baghouse #2

| Baghouse #2 |          |           |          |        |         | Baghouse #1          |          |           |          |        |         |                  |
|-------------|----------|-----------|----------|--------|---------|----------------------|----------|-----------|----------|--------|---------|------------------|
| Date        | Time     | NOx [PPM] | CO [PPM] | O2 [%] | CO2 [%] | Notes                | Time     | NOx [PPM] | CO [PPM] | O2 [%] | CO2 [%] | Notes            |
| 12/16/2020  | 22:22:12 | 0.52      | -1.85    | 21.01  | 0.07    |                      | 22:22:12 | 23.88     | 1.07     | 21.24  | 0.12    |                  |
| 12/16/2020  | 22:23:12 | 0.38      | -2.07    | 21.02  | 0.06    |                      | 22:23:12 | 20.70     | 1.67     | 21.25  | 0.11    |                  |
| 12/16/2020  | 22:24:12 | 0.36      | -2.36    | 21.02  | 0.06    |                      | 22:24:12 | 19.12     | 0.99     | 21.24  | 0.12    |                  |
| 12/16/2020  | 22:25:12 | 0.61      | -2.83    | 21.02  | 0.06    |                      | 22:25:12 | 24.58     | 0.91     | 21.24  | 0.12    |                  |
| 12/16/2020  | 22:26:12 | 0.50      | -2.60    | 21.01  | 0.06    |                      | 22:26:12 | 28.35     | 0.96     | 21.24  | 0.13    |                  |
| 12/16/2020  | 22:27:12 | 0.47      | -2.32    | 21.01  | 0.05    |                      | 22:27:12 | 22.59     | 1.29     | 21.24  | 0.13    |                  |
| 12/16/2020  | 22:28:12 | 0.28      | -1.90    | 21.01  | 0.05    |                      | 22:28:12 | 23.04     | 1.34     | 21.24  | 0.12    |                  |
| 12/16/2020  | 22:29:12 | 0.27      | -1.56    | 21.02  | 0.05    |                      | 22:29:12 | 18.76     | 2.16     | 21.25  | 0.12    |                  |
| 12/16/2020  | 22:30:12 | 0.28      | -2.26    | 21.02  | 0.05    |                      | 22:30:12 | 4.50      | 3.28     | 21.25  | 0.12    |                  |
| 12/16/2020  | 22:31:12 | 0.28      | -2.83    | 21.01  | 0.05    |                      | 22:31:12 | 7.00      | 2.67     | 21.25  | 0.12    |                  |
| 12/16/2020  | 22:32:12 | 0.27      | -2.46    | 21.01  | 0.05    |                      | 22:32:12 | 24.66     | 1.41     | 21.24  | 0.12    |                  |
| 12/16/2020  | 22:33:12 | 0.27      | -2.12    | 21.02  | 0.05    |                      | 22:33:12 | 25.10     | 1.31     | 21.24  | 0.13    |                  |
| 12/16/2020  | 22:34:12 | 0.27      | -2.32    | 21.01  | 0.05    |                      | 22:34:12 | 27.48     | 1.31     | 21.24  | 0.13    |                  |
| 12/16/2020  | 22:35:12 | 0.28      | -2.24    | 21.02  | 0.05    |                      | 22:35:12 | 18.45     | 1.62     | 21.24  | 0.13    |                  |
| 12/16/2020  | 22:36:12 | 0.26      | -2.56    | 21.02  | 0.06    |                      | 22:36:12 | 8.87      | 4.22     | 21.25  | 0.12    |                  |
| 12/16/2020  | 22:37:12 | 0.27      | -2.94    | 21.02  | 0.06    | Start Run 1 BH#2     | 22:37:12 | 0.93      | 5.89     | 21.24  | 0.15    |                  |
| 12/16/2020  | 22:38:12 | 0.26      | -2.79    | 21.02  | 0.06    | Stratification Check | 22:38:12 | 0.59      | 46.33    | 21.08  | 0.37    |                  |
| 12/16/2020  | 22:39:12 | 0.27      | -2.42    | 21.02  | 0.07    |                      | 22:39:12 | 0.52      | 112.44   | 20.94  | 0.55    |                  |
| 12/16/2020  | 22:40:12 | 0.28      | -2.07    | 21.02  | 0.07    |                      | 22:40:12 | 0.65      | 157.76   | 20.90  | 0.60    |                  |
| 12/16/2020  | 22:41:12 | 0.29      | -2.40    | 21.02  | 0.07    |                      | 22:41:12 | 1.39      | 147.59   | 20.94  | 0.55    |                  |
| 12/16/2020  | 22:42:12 | 0.28      | -3.01    | 21.02  | 0.07    |                      | 22:42:12 | 1.21      | 86.36    | 21.16  | 0.22    |                  |
| 12/16/2020  | 22:43:12 | 0.29      | -2.93    | 21.02  | 0.07    |                      | 22:43:12 | 0.67      | 19.15    | 21.21  | 0.14    |                  |
| 12/16/2020  | 22:44:12 | 0.26      | -2.61    | 21.02  | 0.07    |                      | 22:44:12 | 0.36      | 11.29    | 21.24  | 0.12    |                  |
| 12/16/2020  | 22:45:12 | 0.39      | -1.67    | 21.00  | 0.07    |                      | 22:45:12 | 6.23      | 23.98    | 21.21  | 0.18    |                  |
| 12/16/2020  | 22:46:12 | 7.59      | 57.75    | 20.80  | 0.20    |                      | 22:46:12 | 1.94      | 49.57    | 21.19  | 0.20    |                  |
| 12/16/2020  | 22:47:12 | 2.02      | 77.05    | 20.83  | 0.18    |                      | 22:47:12 | 5.88      | 44.70    | 21.22  | 0.14    |                  |
| 12/16/2020  | 22:48:12 | 1.73      | 126.61   | 20.88  | 0.13    |                      | 22:48:12 | 16.45     | 6.97     | 21.24  | 0.11    |                  |
| 12/16/2020  | 22:49:12 | 1.80      | 94.81    | 20.82  | 0.17    |                      | 22:49:12 | 19.74     | 0.88     | 21.25  | 0.11    |                  |
| 12/16/2020  | 22:50:12 | 1.48      | 127.51   | 20.81  | 0.18    |                      | 22:50:12 | 21.19     | 0.59     | 21.25  | 0.11    |                  |
| 12/16/2020  | 22:51:12 | 1.52      | 107.82   | 20.83  | 0.17    |                      | 22:51:12 | 23.07     | 0.77     | 21.25  | 0.11    |                  |
| 12/16/2020  | 22:52:12 | 0.72      | 45.10    | 20.85  | 0.17    |                      | 22:52:12 | 20.83     | 1.05     | 21.24  | 0.11    |                  |
| 12/16/2020  | 22:53:12 | 0.64      | 47.76    | 20.87  | 0.15    |                      | 22:53:12 | 20.23     | 0.99     | 21.25  | 0.11    |                  |
| 12/16/2020  | 22:54:12 | 0.63      | 71.90    | 20.87  | 0.15    |                      | 22:54:12 | 20.61     | 1.06     | 21.25  | 0.11    |                  |
| 12/16/2020  | 22:55:12 | 0.63      | 61.44    | 20.89  | 0.14    |                      | 22:55:12 | 24.03     | 1.06     | 21.25  | 0.11    |                  |
| 12/16/2020  | 22:56:12 | 0.64      | 61.69    | 20.91  | 0.13    |                      | 22:56:12 | 28.59     | 1.84     | 21.25  | 0.11    |                  |
| 12/16/2020  | 22:57:12 | 0.64      | 74.47    | 20.92  | 0.12    |                      | 22:57:12 | 14.16     | 4.52     | 21.26  | 0.10    |                  |
| 12/16/2020  | 22:58:12 | 0.64      | 75.75    | 20.91  | 0.13    |                      | 22:58:12 | 14.76     | 2.37     | 21.26  | 0.10    |                  |
| 12/16/2020  | 22:59:12 | 0.62      | 70.79    | 20.92  | 0.13    |                      | 22:59:12 | 25.13     | 1.19     | 21.26  | 0.11    |                  |
| 12/16/2020  | 23:00:12 | 0.62      | 73.08    | 20.91  | 0.13    |                      | 23:00:12 | 26.64     | 1.18     | 21.26  | 0.11    |                  |
| 12/16/2020  | 23:01:12 | 0.63      | 100.96   | 20.91  | 0.13    |                      | 23:01:12 | 28.10     | 1.22     | 21.26  | 0.11    |                  |
| 12/16/2020  | 23:02:12 | 0.44      | 116.86   | 20.90  | 0.14    |                      | 23:02:12 | 28.16     | 1.25     | 21.26  | 0.11    |                  |
| 12/16/2020  | 23:03:12 | 0.29      | 119.27   | 20.91  | 0.14    |                      | 23:03:12 | 25.68     | 1.49     | 21.26  | 0.11    |                  |
| 12/16/2020  | 23:04:12 | 0.49      | 112.32   | 20.92  | 0.14    |                      | 23:04:12 | 26.52     | 1.48     | 21.25  | 0.11    |                  |
| 12/16/2020  | 23:05:12 | 0.48      | 80.24    | 20.91  | 0.14    |                      | 23:05:12 | 25.76     | 3.38     | 21.25  | 0.12    |                  |
| 12/16/2020  | 23:06:12 | 0.37      | 159.08   | 20.90  | 0.12    |                      | 23:06:12 | 24.72     | 2.27     | 21.25  | 0.12    |                  |
| 12/16/2020  | 23:07:12 | 0.63      | 88.45    | 20.93  | 0.11    |                      | 23:07:12 | 14.05     | 4.78     | 21.26  | 0.11    |                  |
| 12/16/2020  | 23:08:12 | 0.47      | 91.48    | 20.93  | 0.12    |                      | 23:08:12 | 9.71      | 4.51     | 21.26  | 0.11    |                  |
| 12/16/2020  | 23:09:12 | 0.28      | 100.97   | 20.92  | 0.14    |                      | 23:09:12 | 11.51     | 2.09     | 21.26  | 0.11    | End Run 1 BH#1   |
| 12/16/2020  | 23:10:12 | 0.28      | 129.91   | 20.92  | 0.13    |                      |          | 18.03     | 7.32     | 21.23  | 0.15    | Average          |
| 12/16/2020  | 23:11:12 | 0.55      | 95.58    | 20.91  | 0.12    |                      |          |           |          |        |         |                  |
| 12/16/2020  | 23:12:12 | 0.61      | 150.44   | 20.91  | 0.13    |                      | 23:10:12 | 18.19     | 1.18     | 21.26  | 0.11    |                  |
| 12/16/2020  | 23:13:12 | 0.83      | 95.45    | 20.90  | 0.13    |                      | 23:11:12 | 17.49     | 1.27     | 21.27  | 0.10    |                  |
| 12/16/2020  | 23:14:12 | 0.96      | 116.41   | 20.90  | 0.13    |                      | 23:12:12 | 11.82     | 1.35     | 21.28  | 0.09    |                  |
| 12/16/2020  | 23:15:12 | 0.87      | 86.99    | 20.90  | 0.11    |                      | 23:13:12 | 2.32      | 0.98     | 21.29  | 0.08    |                  |
| 12/16/2020  | 23:16:12 | 0.62      | 147.93   | 20.92  | 0.11    |                      | 23:14:12 | 1.81      | 1.57     | 21.27  | 0.09    |                  |
| 12/16/2020  | 23:17:12 | 0.59      | 156.44   | 20.92  | 0.13    |                      | 23:15:12 | 1.88      | 2.83     | 21.27  | 0.09    |                  |
| 12/16/2020  | 23:18:12 | 0.28      | 143.78   | 20.92  | 0.13    |                      | 23:16:12 | 0.59      | 2.89     | 21.28  | 0.09    |                  |
| 12/16/2020  | 23:19:12 | 0.55      | 143.98   | 20.92  | 0.12    |                      | 23:17:12 | 0.41      | 2.01     | 21.29  | 0.08    |                  |
| 12/16/2020  | 23:20:12 | 0.43      | 74.93    | 20.92  | 0.12    |                      | 23:18:12 | 0.38      | 0.05     | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:21:12 | 0.60      | 119.55   | 20.93  | 0.12    |                      | 23:19:12 | 0.28      | -0.08    | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:22:12 | 0.63      | 179.31   | 20.91  | 0.12    |                      | 23:20:12 | 0.32      | -0.13    | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:23:12 | 0.64      | 149.53   | 20.87  | 0.13    |                      | 23:21:12 | 0.24      | -0.13    | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:24:12 | 0.66      | 9.70     | 20.92  | 0.10    |                      | 23:22:12 | 0.24      | -0.12    | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:25:12 | 0.76      | 25.29    | 20.92  | 0.13    |                      | 23:23:12 | 0.26      | -0.08    | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:26:12 | 0.62      | 129.99   | 20.92  | 0.13    |                      | 23:24:12 | 0.15      | -0.12    | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:27:12 | 0.63      | 162.73   | 20.91  | 0.14    |                      | 23:25:12 | 0.23      | -0.12    | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:28:12 | 0.83      | 188.67   | 20.92  | 0.14    |                      | 23:26:12 | 0.19      | -0.12    | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:29:12 | 0.64      | 128.04   | 20.91  | 0.14    |                      | 23:27:12 | 0.14      | -0.11    | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:30:12 | 1.45      | 99.72    | 20.97  | 0.22    |                      | 23:28:12 | 0.21      | -0.10    | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:31:12 | 1.46      | 160.29   | 20.94  | 0.14    |                      | 23:29:12 | 0.22      | 0.00     | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:32:12 | 0.28      | 171.52   | 20.92  | 0.15    |                      | 23:30:12 | 0.26      | 0.01     | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:33:12 | 0.48      | 125.36   | 20.90  | 0.16    |                      | 23:31:12 | 0.14      | 0.11     | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:34:12 | 0.30      | 163.32   | 20.90  | 0.15    |                      | 23:32:12 | 0.18      | 0.00     | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:35:12 | 0.43      | 152.06   | 20.90  | 0.15    |                      | 23:33:12 | 0.22      | 0.00     | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:36:12 | 0.62      | 109.17   | 20.89  | 0.18    |                      | 23:34:12 | 0.16      | -0.01    | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:37:12 | 0.95      | 91.87    | 20.90  | 0.17    |                      | 23:35:12 | 0.18      | -0.13    | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:38:12 | 0.71      | 105.42   | 20.91  | 0.16    |                      | 23:36:12 | 0.13      | -0.02    | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:39:12 | 0.89      | 90.45    | 20.91  | 0.15    |                      | 23:37:12 | 0.18      | 0.00     | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:40:12 | 0.99      | 86.84    | 20.91  | 0.15    |                      | 23:38:12 | 0.15      | -0.10    | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:41:12 | 0.92      | 84.10    | 20.91  | 0.15    |                      | 23:39:12 | 0.21      | -0.13    | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:42:12 | 1.09      | 80.84    | 20.91  | 0.16    |                      | 23:40:12 | 0.22      | -0.11    | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:43:12 | 1.11      | 86.77    | 20.91  | 0.15    |                      | 23:41:12 | 0.15      | -0.08    | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:44:12 | 1.84      | 84.47    | 20.90  | 0.16    |                      | 23:42:12 | 0.12      | -0.27    | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:45:12 | 1.74      | 80.81    | 20.90  | 0.17    |                      | 23:43:12 | 0.15      | -0.07    | 21.31  | 0.07    |                  |
| 12/16/2020  | 23:46:12 | 1.55      | 71.94    | 20.90  | 0.16    | End Run 1 BH#2       | 23:44:12 | 0.15      | -0.08    | 21.31  | 0.07    |                  |
| 12/16/2020  |          | 0.83      | 91.43    | 20.92  | 0.13    | Average              | 23:45:12 | 0.15      | -0.13    | 21.31  | 0.07    |                  |
| 12/16/2020  |          |           |          |        |         |                      | 23:46:12 | 0.10      | -0.13    | 21.31  | 0.06    |                  |
| 12/16/2020  | 23:47:12 | 2.12      | 64.59    | 20.90  | 0.16    |                      | 23:47:12 | 0.06      | -0.13    | 21.31  | 0.06    | Start Run 2 BH#1 |
| 12/16/2020  | 23:48:12 | 1.84      | 62.90    | 20.91  | 0.16    |                      | 23:48:12 | 0.14      | -0.12    | 21.31  | 0.06    |                  |
| 12/16/2020  | 23:49:12 | 1.34      | 57.68    | 20.92  | 0.16    |                      | 23:49:12 | 0.02      | -0.12    | 21.31  | 0.06    |                  |
| 12/16/2020  | 23:50:12 | 1.14      | 51.92    | 20.93  | 0.15    |                      | 23:50:12 | 0.07      | -0.12    | 21.32  | 0.06    |                  |
| 12/16/2020  | 23:51:12 | 2.02      | 57.50    | 20.92  | 0.16    |                      | 23:51:12 | 0.13      | -0.14    | 21.32  | 0.06    |                  |
| 12/16/2020  | 23:52:12 | 0.93      | 51.24    | 20.91  | 0.19    |                      | 23:52:12 | 0.10      | -0.11    | 21.32  | 0.06    |                  |
| 12/16/2020  | 23:53:12 | 0.64      | 56.92    |        |         |                      |          |           |          |        |         |                  |

SLR  
Columbia Steel  
NOx, CO, O2 and CO2 Baghouse #1 and Baghouse #2

| Baghouse #2 |          |           |          |        |         | Baghouse #1      |          |           |          |        |         |       |
|-------------|----------|-----------|----------|--------|---------|------------------|----------|-----------|----------|--------|---------|-------|
| Date        | Time     | NOx [PPM] | CO [PPM] | O2 [%] | CO2 [%] | Notes            | Time     | NOx [PPM] | CO [PPM] | O2 [%] | CO2 [%] | Notes |
| 12/16/2020  | 23:56:12 | 3.45      | 26.24    | 20.92  | 0.13    |                  | 23:56:12 | 0.07      | -0.12    | 21.32  | 0.06    |       |
| 12/16/2020  | 23:57:12 | 1.69      | 18.93    | 20.93  | 0.13    |                  | 23:57:12 | 0.12      | -0.12    | 21.32  | 0.06    |       |
| 12/16/2020  | 23:58:12 | 1.28      | 17.53    | 20.94  | 0.12    |                  | 23:58:12 | 0.11      | -0.12    | 21.32  | 0.06    |       |
| 12/16/2020  | 23:59:12 | 0.97      | 15.94    | 20.95  | 0.12    |                  | 23:59:12 | 0.17      | -0.10    | 21.32  | 0.06    |       |
| 12/16/2020  | 0:00:12  | 0.97      | 15.28    | 20.95  | 0.12    |                  | 0:00:12  | 0.07      | 0.03     | 21.32  | 0.06    |       |
| 12/16/2020  | 0:01:12  | 0.96      | 14.52    | 20.95  | 0.11    |                  | 0:01:12  | 0.08      | -0.16    | 21.32  | 0.06    |       |
| 12/16/2020  | 0:02:12  | 0.97      | 14.26    | 20.95  | 0.11    |                  | 0:02:12  | 0.11      | -0.27    | 21.32  | 0.06    |       |
| 12/16/2020  | 0:03:12  | 0.77      | 14.02    | 20.95  | 0.11    |                  | 0:03:12  | 0.12      | -0.28    | 21.32  | 0.06    |       |
| 12/16/2020  | 0:04:12  | 0.63      | 14.44    | 20.96  | 0.11    |                  | 0:04:12  | 0.12      | -0.27    | 21.32  | 0.06    |       |
| 12/16/2020  | 0:05:12  | 0.62      | 13.61    | 20.96  | 0.11    |                  | 0:05:12  | 0.12      | -0.15    | 21.31  | 0.06    |       |
| 12/16/2020  | 0:06:12  | 0.61      | 12.73    | 20.96  | 0.11    |                  | 0:06:12  | 0.07      | -0.12    | 21.32  | 0.06    |       |
| 12/16/2020  | 0:07:12  | 0.60      | 10.87    | 20.97  | 0.10    |                  | 0:07:12  | 0.19      | -0.10    | 21.31  | 0.07    |       |
| 12/16/2020  | 0:08:12  | 0.61      | 11.82    | 20.97  | 0.11    |                  | 0:08:12  | 0.21      | -0.12    | 21.32  | 0.07    |       |
| 12/16/2020  | 0:09:12  | 0.62      | 14.04    | 20.97  | 0.10    |                  | 0:09:12  | 0.18      | -0.27    | 21.32  | 0.06    |       |
| 12/17/2020  | 0:10:12  | 0.63      | 11.95    | 20.97  | 0.11    |                  | 0:10:12  | 0.06      | -0.28    | 21.32  | 0.07    |       |
| 12/17/2020  | 0:11:12  | 0.64      | 9.57     | 20.98  | 0.11    |                  | 0:11:12  | 0.07      | -0.19    | 21.32  | 0.06    |       |
| 12/17/2020  | 0:12:12  | 0.64      | 9.38     | 20.98  | 0.11    |                  | 0:12:12  | 0.22      | -0.13    | 21.32  | 0.07    |       |
| 12/17/2020  | 0:13:12  | 0.65      | 10.22    | 20.98  | 0.11    |                  | 0:13:12  | 0.12      | -0.18    | 21.32  | 0.06    |       |
| 12/17/2020  | 0:14:12  | 0.63      | 9.03     | 20.98  | 0.11    |                  | 0:14:12  | 0.13      | -0.02    | 21.32  | 0.07    |       |
| 12/17/2020  | 0:15:12  | 0.63      | 8.38     | 20.99  | 0.11    |                  | 0:15:12  | 0.30      | 0.44     | 21.32  | 0.06    |       |
| 12/17/2020  | 0:16:12  | 0.59      | 7.22     | 20.99  | 0.12    |                  | 0:16:12  | 0.21      | -0.01    | 21.32  | 0.06    |       |
| 12/17/2020  | 0:17:12  | 0.27      | 6.42     | 20.87  | 0.11    |                  | 0:17:12  | 0.22      | -0.13    | 21.32  | 0.06    |       |
| 12/17/2020  | 0:18:12  | 0.27      | 5.33     | 20.83  | 0.11    | Start Run 2 BH#2 | 0:18:12  | 0.13      | -0.12    | 21.32  | 0.06    |       |
| 12/17/2020  | 0:19:12  | 0.27      | 5.22     | 20.83  | 0.11    |                  | 0:19:12  | 0.09      | -0.13    | 21.32  | 0.06    |       |
| 12/17/2020  | 0:20:12  | 0.27      | 4.77     | 20.83  | 0.11    |                  | 0:20:12  | 0.17      | -0.12    | 21.32  | 0.07    |       |
| 12/17/2020  | 0:21:12  | 0.82      | 4.51     | 20.77  | 0.13    |                  | 0:21:12  | 0.16      | -0.13    | 21.32  | 0.06    |       |
| 12/17/2020  | 0:22:12  | 1.18      | 17.57    | 20.76  | 0.14    |                  | 0:22:12  | 0.22      | -0.13    | 21.32  | 0.06    |       |
| 12/17/2020  | 0:23:12  | 1.26      | 20.43    | 20.77  | 0.14    |                  | 0:23:12  | 0.12      | -0.13    | 21.32  | 0.06    |       |
| 12/17/2020  | 0:24:12  | 0.96      | 39.17    | 20.77  | 0.13    |                  | 0:24:12  | 0.08      | -0.12    | 21.32  | 0.06    |       |
| 12/17/2020  | 0:25:12  | 0.97      | 44.74    | 20.77  | 0.12    |                  | 0:25:12  | 0.09      | -0.12    | 21.32  | 0.06    |       |
| 12/17/2020  | 0:26:12  | 0.93      | 55.91    | 20.76  | 0.13    |                  | 0:26:12  | 0.16      | -0.12    | 21.32  | 0.06    |       |
| 12/17/2020  | 0:27:12  | 0.56      | 125.59   | 20.76  | 0.13    |                  | 0:27:12  | 0.14      | -0.13    | 21.32  | 0.06    |       |
| 12/17/2020  | 0:28:12  | 0.74      | 242.81   | 20.76  | 0.11    |                  | 0:28:12  | 0.20      | -0.12    | 21.32  | 0.06    |       |
| 12/17/2020  | 0:29:12  | 2.01      | 87.01    | 20.77  | 0.12    |                  | 0:29:12  | 0.09      | -0.13    | 21.32  | 0.06    |       |
| 12/17/2020  | 0:30:12  | 1.31      | 66.72    | 20.77  | 0.12    |                  | 0:30:12  | 7.21      | 5.56     | 21.26  | 0.10    |       |
| 12/17/2020  | 0:31:12  | 0.93      | 53.76    | 20.79  | 0.11    |                  | 0:31:12  | 14.81     | 9.42     | 21.26  | 0.10    |       |
| 12/17/2020  | 0:32:12  | 1.04      | 21.13    | 20.80  | 0.10    |                  | 0:32:12  | 14.09     | 8.98     | 21.26  | 0.10    |       |
| 12/17/2020  | 0:33:12  | 0.62      | 6.94     | 20.80  | 0.10    |                  | 0:33:12  | 16.06     | 6.88     | 21.26  | 0.09    |       |
| 12/17/2020  | 0:34:12  | 0.61      | 4.93     | 20.80  | 0.10    |                  | 0:34:12  | 18.38     | 6.30     | 21.26  | 0.09    |       |
| 12/17/2020  | 0:35:12  | 0.62      | 4.04     | 20.80  | 0.09    |                  | 0:35:12  | 21.86     | 5.05     | 21.26  | 0.09    |       |
| 12/17/2020  | 0:36:12  | 0.62      | 3.46     | 20.81  | 0.10    |                  | 0:36:12  | 23.05     | 3.12     | 21.26  | 0.10    |       |
| 12/17/2020  | 0:37:12  | 0.61      | 2.85     | 20.81  | 0.09    |                  | 0:37:12  | 25.27     | 3.28     | 21.26  | 0.09    |       |
| 12/17/2020  | 0:38:12  | 0.61      | 20.59    | 20.81  | 0.11    |                  | 0:38:12  | 25.29     | 3.49     | 21.26  | 0.10    |       |
| 12/17/2020  | 0:39:12  | 0.40      | 69.19    | 20.81  | 0.12    |                  | 0:39:12  | 24.93     | 5.85     | 21.26  | 0.09    |       |
| 12/17/2020  | 0:40:12  | 0.26      | 51.41    | 20.80  | 0.14    |                  | 0:40:12  | 24.70     | 5.77     | 21.27  | 0.09    |       |
| 12/17/2020  | 0:41:12  | 0.47      | 47.00    | 20.77  | 0.17    |                  | 0:41:12  | 12.02     | 12.06    | 21.27  | 0.09    |       |
| 12/17/2020  | 0:42:12  | 0.62      | 74.12    | 20.76  | 0.16    |                  | 0:42:12  | 14.17     | 6.19     | 21.27  | 0.09    |       |
| 12/17/2020  | 0:43:12  | 0.61      | 63.53    | 20.78  | 0.15    |                  | 0:43:12  | 29.19     | 3.02     | 21.27  | 0.09    |       |
| 12/17/2020  | 0:44:12  | 0.61      | 45.81    | 20.77  | 0.16    |                  | 0:44:12  | 28.01     | 3.89     | 21.27  | 0.10    |       |
| 12/17/2020  | 0:45:12  | 0.61      | 62.14    | 20.76  | 0.17    |                  | 0:45:12  | 27.06     | 4.64     | 21.27  | 0.10    |       |
| 12/17/2020  | 0:46:12  | 0.61      | 60.85    | 20.76  | 0.17    |                  | 0:46:12  | 25.78     | 3.40     | 21.27  | 0.10    |       |
| 12/17/2020  | 0:47:12  | 0.65      | 76.06    | 20.75  | 0.17    |                  | 0:47:12  | 23.81     | 2.72     | 21.27  | 0.10    |       |
| 12/17/2020  | 0:48:12  | 3.67      | 38.10    | 20.74  | 0.14    |                  | 0:48:12  | 21.33     | 4.71     | 21.27  | 0.11    |       |
| 12/17/2020  | 0:49:12  | 1.87      | -0.08    | 20.85  | 0.07    |                  | 0:49:12  | 19.78     | 5.01     | 21.27  | 0.10    |       |
| 12/17/2020  | 0:50:12  | 0.61      | -0.83    | 20.78  | 0.12    |                  | 0:50:12  | 19.67     | 4.82     | 21.27  | 0.09    |       |
| 12/17/2020  | 0:51:12  | 0.99      | 19.46    | 20.72  | 0.17    |                  | 0:51:12  | 20.32     | 2.85     | 21.28  | 0.10    |       |
| 12/17/2020  | 0:52:12  | 0.63      | 36.90    | 20.71  | 0.17    |                  | 0:52:12  | 19.00     | 2.87     | 21.28  | 0.10    |       |
| 12/17/2020  | 0:53:12  | 0.62      | 70.67    | 20.73  | 0.14    |                  | 0:53:12  | 19.27     | 4.36     | 21.28  | 0.09    |       |
| 12/17/2020  | 0:54:12  | 0.62      | 80.59    | 20.75  | 0.14    |                  | 0:54:12  | 21.68     | 4.81     | 21.28  | 0.09    |       |
| 12/17/2020  | 0:55:12  | 0.65      | 86.71    | 20.73  | 0.14    |                  | 0:55:12  | 19.46     | 5.49     | 21.28  | 0.09    |       |
| 12/17/2020  | 0:56:12  | 2.18      | 65.63    | 20.75  | 0.12    |                  | 0:56:12  | 18.20     | 4.34     | 21.27  | 0.10    |       |
| 12/17/2020  | 0:57:12  | 0.86      | 34.58    | 20.76  | 0.13    |                  | 0:57:12  | 20.72     | 5.03     | 21.27  | 0.10    |       |
| 12/17/2020  | 0:58:12  | 0.59      | 29.80    | 20.76  | 0.15    |                  | 0:58:12  | 20.17     | 5.05     | 21.28  | 0.10    |       |
| 12/17/2020  | 0:59:12  | 0.60      | 68.80    | 20.75  | 0.13    |                  | 0:59:12  | 19.90     | 5.67     | 21.28  | 0.10    |       |
| 12/17/2020  | 1:00:12  | 0.60      | 213.75   | 20.77  | 0.11    |                  | 1:00:12  | 19.90     | 6.15     | 21.27  | 0.10    |       |
| 12/17/2020  | 1:01:12  | 0.55      | 207.64   | 20.78  | 0.10    |                  | 1:01:12  | 19.41     | 6.25     | 21.28  | 0.10    |       |
| 12/17/2020  | 1:02:12  | 1.57      | 135.82   | 20.80  | 0.11    |                  | 1:02:12  | 18.85     | 7.15     | 21.27  | 0.10    |       |
| 12/17/2020  | 1:03:12  | 0.63      | 116.01   | 20.81  | 0.12    |                  | 1:03:12  | 19.24     | 7.37     | 21.28  | 0.10    |       |
| 12/17/2020  | 1:04:12  | 1.27      | 100.75   | 20.80  | 0.12    |                  | 1:04:12  | 19.24     | 7.98     | 21.28  | 0.10    |       |
| 12/17/2020  | 1:05:12  | 5.70      | 28.36    | 20.81  | 0.11    |                  | 1:05:12  | 18.44     | 6.62     | 21.28  | 0.10    |       |
| 12/17/2020  | 1:06:12  | 4.94      | 14.75    | 20.81  | 0.11    |                  | 1:06:12  | 21.77     | 5.83     | 21.28  | 0.09    |       |
| 12/17/2020  | 1:07:12  | 3.46      | 11.66    | 20.82  | 0.11    |                  | 1:07:12  | 6.94      | 5.41     | 21.29  | 0.09    |       |
| 12/17/2020  | 1:08:12  | 2.34      | 11.22    | 20.82  | 0.10    |                  | 1:08:12  | 12.95     | 3.57     | 21.29  | 0.10    |       |
| 12/17/2020  | 1:09:12  | 1.45      | 6.32     | 20.83  | 0.10    |                  | 1:09:12  | 22.72     | 3.53     | 21.28  | 0.10    |       |
| 12/17/2020  | 1:10:12  | 1.28      | 13.64    | 20.82  | 0.10    |                  | 1:10:12  | 20.38     | 3.30     | 21.28  | 0.10    |       |
| 12/17/2020  | 1:11:12  | 1.28      | 10.69    | 20.82  | 0.10    |                  | 1:11:12  | 20.65     | 3.86     | 21.29  | 0.10    |       |
| 12/17/2020  | 1:12:12  | 1.29      | 10.40    | 20.82  | 0.10    |                  | 1:12:12  | 21.59     | 4.87     | 21.28  | 0.10    |       |
| 12/17/2020  | 1:13:12  | 1.14      | 10.08    | 20.82  | 0.10    |                  | 1:13:12  | 23.11     | 5.44     | 21.29  | 0.10    |       |
| 12/17/2020  | 1:14:12  | 0.94      | 9.89     | 20.83  | 0.10    |                  | 1:14:12  | 16.57     | 6.46     | 21.28  | 0.10    |       |
| 12/17/2020  | 1:15:12  | 0.95      | 8.97     | 20.83  | 0.09    |                  | 1:15:12  | 2.23      | 5.50     | 21.28  | 0.12    |       |
| 12/17/2020  | 1:16:12  | 0.95      | 8.89     | 20.82  | 0.09    |                  | 1:16:12  | 0.85      | 72.59    | 21.00  | 0.51    |       |
| 12/17/2020  | 1:17:12  | 0.95      | 7.48     | 20.82  | 0.09    |                  | 1:17:12  | 0.68      | 189.42   | 20.89  | 0.64    |       |
| 12/17/2020  | 1:18:12  | 0.62      | 5.41     | 20.82  | 0.09    |                  | 1:18:12  | 1.21      | 197.90   | 20.99  | 0.49    |       |
| 12/17/2020  | 1:19:12  | 0.59      | 4.48     | 20.80  | 0.11    |                  | 1:19:12  | 2.47      | 51.11    | 21.21  | 0.17    |       |
| 12/17/2020  | 1:20:12  | 0.57      | -0.47    | 20.87  | 0.06    |                  | 1:20:12  | 2.61      | 15.48    | 21.26  | 0.13    |       |
| 12/17/2020  | 1:21:12  | 0.25      | -2.22    | 20.88  | 0.06    |                  | 1:21:12  | 1.82      | 94.49    | 21.18  | 0.24    |       |
| 12/17/2020  | 1:22:12  | 0.25      | -2.30    | 20.88  | 0.06    |                  | 1:22:12  | 2.79      | 331.81   | 21.18  | 0.24    |       |
| 12/17/2020  | 1:23:12  | 0.25      | -2.38    | 20.88  | 0.06    |                  | 1:23:12  | 2.14      | 110.17   | 21.25  | 0.15    |       |
| 12/17/2020  | 1:24:12  | 0.25      | -2.30    | 20.88  | 0.06    |                  | 1:24:12  | 1.63      | 32.88    | 21.28  | 0.11    |       |
| 12/17/2020  | 1:25:12  | 0.24      | -2.31    | 20.88  | 0.07    |                  | 1:25:12  | 9.70      | 24.02    | 21.29  | 0.09    |       |
| 12/17/2020  | 1:26:12  | 0.25      | -2.69    | 20.88  | 0.07    |                  | 1:26:12  | 12.13     | 8.78     | 21.29  | 0.09    |       |
| 12/17/2020  | 1:27:12  | 0.25      | -2.22    | 20.88  | 0.07    |                  | 1:27:12  | 16.45     | 5.56     | 21.30  | 0.09    |       |
| 12/17/2020  | 1:28:12  | 0.26      | -1.51    | 20.88  | 0.07    | End Run 2 BH#2   | 1:28:12  | 20.34     | 4.09     | 21.29  | 0.09    |       |
| 12/17/2020  |          | 1.00      | 39.94    | 20.80  | 0.11    | Average          | 1:29:12  | 17.68     | 5.93     | 21.30  | 0.09    |       |
| 12/17/2020  |          |           |          |        |         |                  | 1:30:12  | 9.24      | 7.54     |        |         |       |

SLR  
Columbia Steel  
NOx, CO, O2 and CO2 Baghouse #1 and Baghouse #2

| Baghouse #2 |         |           |          |        |         | Baghouse #1      |         |           |          |        |         |                  |
|-------------|---------|-----------|----------|--------|---------|------------------|---------|-----------|----------|--------|---------|------------------|
| Date        | Time    | NOx [PPM] | CO [PPM] | O2 [%] | CO2 [%] | Notes            | Time    | NOx [PPM] | CO [PPM] | O2 [%] | CO2 [%] | Notes            |
| 12/17/2020  | 1:30:12 | 0.25      | -1.11    | 20.88  | 0.08    |                  | 1:32:12 | 19.85     | 3.73     | 21.30  | 0.09    |                  |
| 12/17/2020  | 1:31:12 | 0.25      | -0.62    | 20.88  | 0.08    |                  | 1:33:12 | 21.97     | 3.64     | 21.30  | 0.09    |                  |
| 12/17/2020  | 1:32:12 | 0.99      | 5.36     | 20.86  | 0.21    |                  | 1:34:12 | 18.87     | 3.84     | 21.30  | 0.09    |                  |
| 12/17/2020  | 1:33:12 | 3.93      | 16.89    | 20.93  | 0.11    |                  | 1:35:12 | 17.13     | 3.23     | 21.30  | 0.10    |                  |
| 12/17/2020  | 1:34:12 | 0.47      | 13.75    | 20.86  | 0.10    |                  | 1:36:12 | 16.84     | 3.44     | 21.30  | 0.10    |                  |
| 12/17/2020  | 1:35:12 | 0.26      | 24.11    | 20.85  | 0.12    |                  | 1:37:12 | 18.53     | 3.75     | 21.30  | 0.10    |                  |
| 12/17/2020  | 1:36:12 | 0.25      | 33.77    | 20.84  | 0.12    |                  | 1:38:12 | 19.66     | 4.20     | 21.30  | 0.10    |                  |
| 12/17/2020  | 1:37:12 | 0.24      | 35.37    | 20.85  | 0.11    |                  | 1:39:12 | 13.63     | 6.94     | 21.30  | 0.10    |                  |
| 12/17/2020  | 1:38:12 | 0.25      | 36.52    | 20.85  | 0.11    |                  | 1:40:12 | 10.55     | 5.62     | 21.31  | 0.09    | End Run 2 BH#1   |
| 12/17/2020  | 1:39:12 | 0.24      | 38.58    | 20.85  | 0.11    |                  |         | 10.29     | 12.58    | 21.28  | 0.10    | Average          |
| 12/17/2020  | 1:40:12 | 0.24      | 39.44    | 20.85  | 0.11    |                  |         |           |          |        |         |                  |
| 12/17/2020  | 1:41:12 | 0.24      | 40.03    | 20.85  | 0.10    |                  | 1:41:12 | 13.00     | 3.43     | 21.32  | 0.09    |                  |
| 12/17/2020  | 1:42:12 | 0.23      | 40.31    | 20.86  | 0.10    |                  | 1:42:12 | 8.84      | 2.91     | 21.33  | 0.08    |                  |
| 12/17/2020  | 1:43:12 | 0.24      | 39.88    | 20.86  | 0.09    |                  | 1:43:12 | 1.44      | 2.35     | 21.34  | 0.08    |                  |
| 12/17/2020  | 1:44:12 | 0.24      | 38.33    | 20.87  | 0.09    |                  | 1:44:12 | 2.52      | 3.29     | 21.31  | 0.10    |                  |
| 12/17/2020  | 1:45:12 | 0.25      | 36.27    | 20.87  | 0.09    |                  | 1:45:12 | 1.05      | 5.37     | 21.32  | 0.11    |                  |
| 12/17/2020  | 1:46:12 | 0.25      | 34.60    | 20.87  | 0.09    |                  | 1:46:12 | 0.49      | 5.97     | 21.32  | 0.11    |                  |
| 12/17/2020  | 1:47:12 | 0.25      | 33.08    | 20.87  | 0.09    |                  | 1:47:12 | 0.34      | 6.32     | 21.32  | 0.10    |                  |
| 12/17/2020  | 1:48:12 | 0.25      | 31.47    | 20.88  | 0.09    |                  | 1:48:12 | 0.33      | 4.97     | 21.35  | 0.08    |                  |
| 12/17/2020  | 1:49:12 | 0.27      | 28.94    | 20.88  | 0.09    |                  | 1:49:12 | 0.26      | 2.11     | 21.36  | 0.08    |                  |
| 12/17/2020  | 1:50:12 | 0.27      | 26.39    | 20.88  | 0.09    |                  | 1:50:12 | 0.25      | 4.05     | 21.36  | 0.08    |                  |
| 12/17/2020  | 1:51:12 | 0.25      | 23.90    | 20.89  | 0.09    |                  | 1:51:12 | 0.29      | 7.69     | 21.36  | 0.08    |                  |
| 12/17/2020  | 1:52:12 | 0.25      | 21.45    | 20.90  | 0.08    |                  | 1:52:12 | 0.22      | 5.02     | 21.36  | 0.07    |                  |
| 12/17/2020  | 1:53:12 | 0.27      | 19.62    | 20.89  | 0.09    |                  | 1:53:12 | 0.29      | 4.12     | 21.36  | 0.07    |                  |
| 12/17/2020  | 1:54:12 | 0.26      | 18.18    | 20.90  | 0.09    |                  | 1:54:12 | 0.22      | 3.64     | 21.37  | 0.07    |                  |
| 12/17/2020  | 1:55:12 | 0.27      | 16.78    | 20.90  | 0.09    |                  | 1:55:12 | 0.24      | 3.39     | 21.37  | 0.07    |                  |
| 12/17/2020  | 1:56:12 | 0.25      | 17.71    | 20.90  | 0.09    | Start Run 3 BH#2 | 1:56:12 | 0.24      | 18.34    | 21.35  | 0.08    |                  |
| 12/17/2020  | 1:57:12 | 0.27      | 16.48    | 20.90  | 0.09    |                  | 1:57:12 | 0.14      | 27.84    | 21.35  | 0.08    |                  |
| 12/17/2020  | 1:58:12 | 0.26      | 14.30    | 20.90  | 0.08    |                  | 1:58:12 | 0.28      | 28.20    | 21.35  | 0.08    |                  |
| 12/17/2020  | 1:59:12 | 0.28      | 12.02    | 20.90  | 0.08    |                  | 1:59:12 | 0.20      | 25.84    | 21.36  | 0.07    |                  |
| 12/17/2020  | 2:00:12 | 0.28      | 11.06    | 20.90  | 0.08    |                  | 2:00:12 | 0.19      | 21.79    | 21.36  | 0.07    |                  |
| 12/17/2020  | 2:01:12 | 0.27      | 10.61    | 20.91  | 0.08    |                  | 2:01:12 | 0.15      | 17.89    | 21.37  | 0.07    |                  |
| 12/17/2020  | 2:02:12 | 0.27      | 9.28     | 20.91  | 0.07    |                  | 2:02:12 | 0.23      | 14.16    | 21.37  | 0.07    |                  |
| 12/17/2020  | 2:03:12 | 0.27      | 8.54     | 20.91  | 0.07    |                  | 2:03:12 | 0.26      | 11.21    | 21.37  | 0.07    |                  |
| 12/17/2020  | 2:04:12 | 9.84      | 17.03    | 20.85  | 0.10    |                  | 2:04:12 | 0.18      | 8.89     | 21.37  | 0.07    |                  |
| 12/17/2020  | 2:05:12 | 15.76     | 131.01   | 20.82  | 0.11    |                  | 2:05:12 | 0.18      | 7.21     | 21.38  | 0.07    |                  |
| 12/17/2020  | 2:06:12 | 2.46      | 168.46   | 20.83  | 0.20    |                  | 2:06:12 | 0.21      | 5.86     | 21.38  | 0.06    |                  |
| 12/17/2020  | 2:07:12 | 3.15      | 86.23    | 20.85  | 0.15    |                  | 2:07:12 | 0.21      | 4.82     | 21.38  | 0.06    |                  |
| 12/17/2020  | 2:08:12 | 0.64      | 39.43    | 20.81  | 0.14    |                  | 2:08:12 | 0.15      | 4.38     | 21.38  | 0.06    |                  |
| 12/17/2020  | 2:09:12 | 0.62      | 39.69    | 20.77  | 0.18    |                  | 2:09:12 | 0.23      | 4.24     | 21.38  | 0.07    |                  |
| 12/17/2020  | 2:10:12 | 0.62      | 38.40    | 20.77  | 0.18    |                  | 2:10:12 | 0.17      | 4.11     | 21.38  | 0.07    | Start Run 3 BH#1 |
| 12/17/2020  | 2:11:12 | 0.62      | 38.64    | 20.75  | 0.19    |                  | 2:11:12 | 0.10      | 3.72     | 21.38  | 0.07    |                  |
| 12/17/2020  | 2:12:12 | 0.64      | 36.72    | 20.76  | 0.18    |                  | 2:12:12 | 0.16      | 3.48     | 21.38  | 0.07    |                  |
| 12/17/2020  | 2:13:12 | 0.63      | 31.02    | 20.76  | 0.20    |                  | 2:13:12 | 0.16      | 3.26     | 21.38  | 0.07    |                  |
| 12/17/2020  | 2:14:12 | 0.64      | 33.14    | 20.76  | 0.19    |                  | 2:14:12 | 0.21      | 3.05     | 21.38  | 0.07    |                  |
| 12/17/2020  | 2:15:12 | 0.62      | 29.64    | 20.78  | 0.18    |                  | 2:15:12 | 0.14      | 3.02     | 21.38  | 0.07    |                  |
| 12/17/2020  | 2:16:12 | 0.61      | 28.65    | 20.80  | 0.17    |                  | 2:16:12 | 0.28      | 3.25     | 21.38  | 0.07    |                  |
| 12/17/2020  | 2:17:12 | 0.60      | 23.35    | 20.81  | 0.17    |                  | 2:17:12 | 0.14      | 3.40     | 21.38  | 0.07    |                  |
| 12/17/2020  | 2:18:12 | 0.60      | 23.44    | 20.89  | 0.17    |                  | 2:18:12 | 0.16      | 3.82     | 21.38  | 0.07    |                  |
| 12/17/2020  | 2:19:12 | 0.60      | 30.33    | 20.92  | 0.16    |                  | 2:19:12 | 2.80      | 3.44     | 21.37  | 0.07    |                  |
| 12/17/2020  | 2:20:12 | 0.60      | 30.00    | 20.91  | 0.16    |                  | 2:20:12 | 26.79     | 2.57     | 21.35  | 0.08    |                  |
| 12/17/2020  | 2:21:12 | 0.61      | 33.63    | 20.91  | 0.16    |                  | 2:21:12 | 36.72     | 2.49     | 21.34  | 0.08    |                  |
| 12/17/2020  | 2:22:12 | 0.61      | 36.52    | 20.92  | 0.16    |                  | 2:22:12 | 34.12     | 2.21     | 21.34  | 0.09    |                  |
| 12/17/2020  | 2:23:12 | 0.61      | 38.27    | 20.91  | 0.16    |                  | 2:23:12 | 31.05     | 2.11     | 21.33  | 0.09    |                  |
| 12/17/2020  | 2:24:12 | 0.60      | 41.66    | 20.91  | 0.16    |                  | 2:24:12 | 26.53     | 2.97     | 21.33  | 0.09    |                  |
| 12/17/2020  | 2:25:12 | 0.60      | 45.53    | 20.91  | 0.16    |                  | 2:25:12 | 17.62     | 3.59     | 21.33  | 0.09    |                  |
| 12/17/2020  | 2:26:12 | 0.59      | 54.56    | 20.91  | 0.16    |                  | 2:26:12 | 17.91     | 4.56     | 21.33  | 0.09    |                  |
| 12/17/2020  | 2:27:12 | 0.60      | 61.89    | 20.91  | 0.15    |                  | 2:27:12 | 16.45     | 3.41     | 21.34  | 0.09    |                  |
| 12/17/2020  | 2:28:12 | 0.60      | 59.68    | 20.91  | 0.16    |                  | 2:28:12 | 9.69      | 3.30     | 21.34  | 0.09    |                  |
| 12/17/2020  | 2:29:12 | 0.60      | 60.27    | 20.91  | 0.13    |                  | 2:29:12 | 4.50      | 3.50     | 21.34  | 0.09    |                  |
| 12/17/2020  | 2:30:12 | 0.63      | 75.64    | 20.91  | 0.14    |                  | 2:30:12 | 7.38      | 2.91     | 21.34  | 0.08    |                  |
| 12/17/2020  | 2:31:12 | 0.85      | 73.60    | 20.91  | 0.14    |                  | 2:31:12 | 14.19     | 3.22     | 21.34  | 0.08    |                  |
| 12/17/2020  | 2:32:12 | 0.60      | 77.21    | 20.91  | 0.13    |                  | 2:32:12 | 16.33     | 2.58     | 21.34  | 0.08    |                  |
| 12/17/2020  | 2:33:12 | 0.60      | 74.24    | 20.91  | 0.13    |                  | 2:33:12 | 15.23     | 2.38     | 21.34  | 0.08    |                  |
| 12/17/2020  | 2:34:12 | 0.59      | 87.26    | 20.91  | 0.13    |                  | 2:34:12 | 18.01     | 2.05     | 21.34  | 0.08    |                  |
| 12/17/2020  | 2:35:12 | 0.56      | 91.12    | 20.90  | 0.13    |                  | 2:35:12 | 20.53     | 1.92     | 21.33  | 0.08    |                  |
| 12/17/2020  | 2:36:12 | 0.41      | 92.45    | 20.86  | 0.13    |                  | 2:36:12 | 20.95     | 2.06     | 21.33  | 0.09    |                  |
| 12/17/2020  | 2:37:12 | 0.69      | 30.78    | 20.92  | 0.09    |                  | 2:37:12 | 20.83     | 2.27     | 21.33  | 0.09    |                  |
| 12/17/2020  | 2:38:12 | 0.60      | 78.60    | 20.92  | 0.11    |                  | 2:38:12 | 15.96     | 2.57     | 21.33  | 0.09    |                  |
| 12/17/2020  | 2:39:12 | 0.29      | 86.11    | 20.92  | 0.12    |                  | 2:39:12 | 16.03     | 2.47     | 21.33  | 0.09    |                  |
| 12/17/2020  | 2:40:12 | 1.00      | 69.32    | 20.92  | 0.12    |                  | 2:40:12 | 15.88     | 2.84     | 21.33  | 0.09    |                  |
| 12/17/2020  | 2:41:12 | 1.59      | 43.00    | 20.93  | 0.12    |                  | 2:41:12 | 15.54     | 2.87     | 21.33  | 0.09    |                  |
| 12/17/2020  | 2:42:12 | 1.40      | 45.79    | 20.93  | 0.12    |                  | 2:42:12 | 13.11     | 3.41     | 21.33  | 0.10    |                  |
| 12/17/2020  | 2:43:12 | 1.52      | 43.09    | 20.93  | 0.12    |                  | 2:43:12 | 7.73      | 2.92     | 21.33  | 0.10    |                  |
| 12/17/2020  | 2:44:12 | 1.21      | 46.11    | 20.93  | 0.12    |                  | 2:44:12 | 13.97     | 2.78     | 21.33  | 0.09    |                  |
| 12/17/2020  | 2:45:12 | 1.81      | 50.17    | 20.93  | 0.12    |                  | 2:45:12 | 19.51     | 2.54     | 21.33  | 0.09    |                  |
| 12/17/2020  | 2:46:12 | 4.07      | 37.04    | 20.94  | 0.11    |                  | 2:46:12 | 19.67     | 2.18     | 21.34  | 0.09    |                  |
| 12/17/2020  | 2:47:12 | 3.63      | 37.96    | 20.94  | 0.12    |                  | 2:47:12 | 14.31     | 2.18     | 21.34  | 0.09    |                  |
| 12/17/2020  | 2:48:12 | 2.91      | 42.00    | 20.94  | 0.11    |                  | 2:48:12 | 11.13     | 3.00     | 21.33  | 0.10    |                  |
| 12/17/2020  | 2:49:12 | 4.79      | 32.29    | 20.95  | 0.11    |                  | 2:49:12 | 17.55     | 3.44     | 21.34  | 0.09    |                  |
| 12/17/2020  | 2:50:12 | 4.59      | 36.40    | 20.94  | 0.11    |                  | 2:50:12 | 17.00     | 2.96     | 21.34  | 0.09    |                  |
| 12/17/2020  | 2:51:12 | 2.88      | 28.12    | 20.94  | 0.11    |                  | 2:51:12 | 16.13     | 4.10     | 21.33  | 0.09    |                  |
| 12/17/2020  | 2:52:12 | 4.27      | 25.24    | 20.95  | 0.10    |                  | 2:52:12 | 15.95     | 4.35     | 21.33  | 0.09    |                  |
| 12/17/2020  | 2:53:12 | 5.36      | 32.00    | 20.96  | 0.10    |                  | 2:53:12 | 16.38     | 5.07     | 21.33  | 0.09    |                  |
| 12/17/2020  | 2:54:12 | 4.53      | 29.76    | 20.95  | 0.10    |                  | 2:54:12 | 17.72     | 6.25     | 21.33  | 0.09    |                  |
| 12/17/2020  | 2:55:12 | 6.44      | 24.79    | 20.95  | 0.10    |                  | 2:55:12 | 17.02     | 8.37     | 21.33  | 0.09    |                  |
| 12/17/2020  | 2:56:12 | 5.42      | 23.81    | 20.95  | 0.10    |                  | 2:56:12 | 17.49     | 9.29     | 21.33  | 0.09    |                  |
| 12/17/2020  | 2:57:12 | 5.23      | 23.89    | 20.95  | 0.10    |                  | 2:57:12 | 12.02     | 8.03     | 21.33  | 0.09    |                  |
| 12/17/2020  | 2:58:12 | 6.51      | 28.01    | 20.95  | 0.10    |                  | 2:58:12 | 16.21     | 8.49     | 21.33  | 0.09    |                  |
| 12/17/2020  | 2:59:12 | 7.15      | 35.25    | 20.96  | 0.10    |                  | 2:59:12 | 16.60     | 7.49     | 21.33  | 0.10    |                  |
| 12/17/2020  | 3:00:12 | 4.38      | 42.20    | 20.96  | 0.11    |                  | 3:00:12 | 18.04     | 6.81     | 21.34  | 0.09    |                  |
| 12/17/2020  | 3:01:12 | 4.83      | 35.77    | 20.94  | 0.10    |                  | 3:01:12 | 22.41     | 6.10     | 21.34  | 0.09    |                  |
| 12/17/2020  | 3:02:12 | 3.64      | 18.38    | 20.93  | 0.11    |                  | 3:02:12 | 19.71     | 5.98     | 21.34  | 0.09    |                  |
| 12/17/2020  | 3:03:12 | 2.06      | 15.87    | 20.94  | 0.10    |                  | 3:03:12 | 21.43     | 8.17     | 21.34  | 0.09    |                  |
| 12/17/2020  | 3:04:12 | 1.68      | 14.05    | 20.95  | 0.10    |                  | 3:04:   |           |          |        |         |                  |

SLR  
Columbia Steel  
NOx, CO, O2 and CO2 Baghouse #1 and Baghouse #2

| Baghouse #2 |         |           |          |        |         |                         | Baghouse #1 |           |          |        |         |                         |  |
|-------------|---------|-----------|----------|--------|---------|-------------------------|-------------|-----------|----------|--------|---------|-------------------------|--|
| Date        | Time    | NOx [PPM] | CO [PPM] | O2 [%] | CO2 [%] | Notes                   | Time        | NOx [PPM] | CO [PPM] | O2 [%] | CO2 [%] | Notes                   |  |
| 12/17/2020  | 3:06:12 | 4.74      | 11.04    | 20.95  | 0.11    | End Run 3 BH#2          | 3:06:12     | 15.34     | 7.51     | 21.34  | 0.09    |                         |  |
| 12/17/2020  |         | 2.14      | 42.34    | 20.90  | 0.13    | Average                 | 3:07:12     | 25.05     | 7.10     | 21.33  | 0.09    |                         |  |
| 12/17/2020  |         |           |          |        |         |                         | 3:08:12     | 23.68     | 9.01     | 21.33  | 0.09    |                         |  |
| 12/17/2020  | 3:07:12 | 12.23     | 23.59    | 20.93  | 0.13    |                         | 3:09:12     | 22.70     | 10.61    | 21.33  | 0.09    |                         |  |
| 12/17/2020  | 3:08:12 | 11.09     | 35.61    | 16.00  | 3.33    |                         | 3:10:12     | 21.84     | 11.55    | 21.33  | 0.09    |                         |  |
| 12/17/2020  | 3:09:12 | 5.92      | 0.10     | 10.08  | 9.86    |                         | 3:11:12     | 20.91     | 12.99    | 21.34  | 0.09    |                         |  |
| 12/17/2020  | 3:10:12 | 0.53      | -0.85    | 9.95   | 9.89    |                         | 3:12:12     | 16.57     | 12.36    | 21.33  | 0.10    |                         |  |
| 12/17/2020  | 3:11:12 | 0.26      | -0.54    | 9.95   | 9.90    | NOx, CO System Zero/    | 3:13:12     | 17.67     | 14.46    | 21.33  | 0.10    |                         |  |
| 12/17/2020  | 3:12:12 | 5.35      | 19.67    | 4.43   | 2.25    | O2,CO2 Upscale          | 3:14:12     | 21.09     | 11.78    | 21.33  | 0.10    |                         |  |
| 12/17/2020  | 3:13:12 | 44.29     | 46.29    | 0.04   | 0.06    |                         | 3:15:12     | 22.49     | 11.26    | 21.33  | 0.10    |                         |  |
| 12/17/2020  | 3:14:12 | 49.28     | 48.17    | 0.03   | 0.03    | NOx, CO System Upscale/ | 3:16:12     | 22.64     | 9.50     | 21.33  | 0.10    |                         |  |
| 12/17/2020  | 3:15:12 | 49.39     | 48.80    | 0.02   | 0.02    | O2, CO2 Zero            | 3:17:12     | 21.72     | 10.29    | 21.33  | 0.10    |                         |  |
| 12/17/2020  | 3:16:12 | 43.16     | 33.03    | 15.18  | 0.15    |                         | 3:18:12     | 12.75     | 11.01    | 21.34  | 0.09    |                         |  |
| 12/17/2020  | 3:17:12 | 4.64      | -4.56    | 21.09  | 0.23    |                         | 3:19:12     | 7.36      | 7.60     | 21.35  | 0.10    |                         |  |
| 12/17/2020  | 3:18:12 | 0.58      | -5.31    | 20.86  | 0.20    |                         | 3:20:12     | 21.23     | 8.11     | 21.34  | 0.10    |                         |  |
| 12/17/2020  | 3:19:12 | 0.59      | -4.95    | 20.85  | 0.21    |                         | 3:21:12     | 20.46     | 9.95     | 21.34  | 0.10    |                         |  |
| 12/17/2020  | 3:20:12 | 0.58      | -5.18    | 20.86  | 0.20    |                         | 3:22:12     | 20.91     | 12.30    | 21.34  | 0.10    |                         |  |
| 12/17/2020  | 3:21:12 | 0.58      | -5.53    | 20.86  | 0.20    |                         | 3:23:12     | 20.01     | 12.03    | 21.34  | 0.10    |                         |  |
| 12/17/2020  | 3:22:12 | 0.58      | -5.75    | 20.88  | 0.19    |                         | 3:24:12     | 11.60     | 10.00    | 21.33  | 0.11    |                         |  |
| 12/17/2020  | 3:23:12 | 0.58      | -5.70    | 20.88  | 0.19    |                         | 3:25:12     | 1.77      | 14.74    | 21.27  | 0.22    |                         |  |
| 12/17/2020  | 3:24:12 | 0.59      | -5.22    | 20.89  | 0.19    |                         | 3:26:12     | 0.63      | 121.87   | 21.05  | 0.54    |                         |  |
| 12/17/2020  | 3:25:12 | 0.60      | -4.95    | 20.89  | 0.18    |                         | 3:27:12     | 1.09      | 212.00   | 20.94  | 0.67    |                         |  |
| 12/17/2020  | 3:26:12 | 0.59      | -5.05    | 20.90  | 0.18    |                         | 3:28:12     | 2.65      | 196.86   | 20.99  | 0.59    |                         |  |
| 12/17/2020  | 3:27:12 | 0.58      | -5.25    | 20.91  | 0.17    |                         | 3:29:12     | 2.69      | 69.00    | 21.26  | 0.19    |                         |  |
| 12/17/2020  | 3:28:12 | 0.58      | -5.28    | 20.93  | 0.16    |                         | 3:30:12     | 0.96      | 19.40    | 21.31  | 0.12    |                         |  |
| 12/17/2020  | 3:29:12 | 0.60      | -5.82    | 20.93  | 0.17    |                         | 3:31:12     | 2.60      | 11.30    | 21.33  | 0.11    |                         |  |
| 12/17/2020  | 3:30:12 | 0.59      | -5.38    | 20.93  | 0.17    |                         | 3:32:12     | 6.88      | 23.50    | 21.32  | 0.13    |                         |  |
| 12/17/2020  | 3:31:12 | 0.59      | -4.91    | 20.93  | 0.17    |                         | 3:33:12     | 2.49      | 69.53    | 21.29  | 0.16    |                         |  |
| 12/17/2020  | 3:32:12 | 0.59      | -4.98    | 20.93  | 0.17    |                         | 3:34:12     | 0.75      | 189.35   | 21.28  | 0.18    |                         |  |
| 12/17/2020  | 3:33:12 | 0.58      | -5.03    | 20.94  | 0.17    |                         | 3:35:12     | 3.79      | 113.30   | 21.31  | 0.12    |                         |  |
| 12/17/2020  | 3:34:12 | 0.61      | -5.13    | 20.94  | 0.17    |                         | 3:36:12     | 10.46     | 26.72    | 21.33  | 0.10    |                         |  |
| 12/17/2020  | 3:35:12 | 0.61      | -5.39    | 20.94  | 0.16    |                         | 3:37:12     | 16.28     | 8.03     | 21.33  | 0.10    |                         |  |
| 12/17/2020  | 3:36:12 | 15.67     | 9.81     | 5.00   | -0.26   |                         | 3:38:12     | 19.00     | 6.76     | 21.34  | 0.10    |                         |  |
| 12/17/2020  | 3:37:12 | -12.66    | -11.57   | -0.02  | -0.29   |                         | 3:39:12     | 19.10     | 6.51     | 21.34  | 0.10    |                         |  |
| 12/17/2020  | 3:38:12 | -12.76    | -11.78   | -0.02  | -0.28   |                         | 3:40:12     | 20.23     | 5.94     | 21.34  | 0.10    |                         |  |
| 12/17/2020  | 3:39:12 | -12.72    | -11.91   | -0.02  | -0.28   |                         | 3:41:12     | 18.17     | 8.02     | 21.34  | 0.09    |                         |  |
| 12/17/2020  | 3:40:12 | -12.71    | -12.04   | -0.02  | -0.28   |                         | 3:42:12     | 10.04     | 10.08    | 21.35  | 0.09    |                         |  |
| 12/17/2020  | 3:41:12 | -12.67    | -12.15   | -0.02  | -0.28   |                         | 3:43:12     | 8.47      | 7.45     | 21.35  | 0.10    |                         |  |
| 12/17/2020  | 3:42:12 | -12.66    | -12.25   | -0.02  | -0.28   |                         | 3:44:12     | 13.34     | 5.43     | 21.34  | 0.10    |                         |  |
| 12/17/2020  | 3:43:12 | -12.62    | -12.34   | -0.02  | -0.27   |                         | 3:45:12     | 13.93     | 5.74     | 21.34  | 0.10    |                         |  |
| 12/17/2020  | 3:44:12 | -12.61    | -12.44   | -0.02  | -0.28   |                         | 3:46:12     | 16.31     | 5.96     | 21.34  | 0.10    |                         |  |
| 12/17/2020  | 3:45:12 | -12.58    | -12.51   | -0.01  | -0.28   |                         | 3:47:12     | 17.38     | 6.60     | 21.34  | 0.10    |                         |  |
| 12/17/2020  | 3:46:12 | -12.57    | -12.58   | -0.02  | -0.28   |                         | 3:48:12     | 17.27     | 6.15     | 21.35  | 0.10    |                         |  |
| 12/17/2020  | 3:47:12 | -12.54    | -12.68   | -0.01  | -0.28   |                         | 3:49:12     | 18.10     | 5.88     | 21.35  | 0.10    |                         |  |
| 12/17/2020  | 3:48:12 | -12.53    | -12.75   | -0.02  | -0.28   |                         | 3:50:12     | 16.98     | 6.65     | 21.34  | 0.10    |                         |  |
| 12/17/2020  | 3:49:12 | -12.50    | -12.82   | -0.02  | -0.28   |                         | 3:51:12     | 17.63     | 6.71     | 21.35  | 0.10    |                         |  |
| 12/17/2020  | 3:50:12 | -12.51    | -12.88   | -0.02  | -0.27   |                         | 3:52:12     | 17.68     | 11.84    | 21.34  | 0.12    |                         |  |
| 12/17/2020  | 3:51:12 | -12.49    | -12.93   | -0.02  | -0.27   |                         | 3:53:12     | 15.52     | 26.29    | 21.34  | 0.11    |                         |  |
| 12/17/2020  | 3:52:12 | -12.49    | -12.99   | -0.02  | -0.27   |                         | 3:54:12     | 19.42     | 7.81     | 21.34  | 0.11    |                         |  |
| 12/17/2020  | 3:53:12 | -12.48    | -13.05   | -0.02  | -0.27   |                         | 3:55:12     | 18.55     | 7.59     | 21.34  | 0.11    | End Run 3 BH#1          |  |
| 12/17/2020  | 3:54:12 | -12.47    | -13.10   | -0.02  | -0.27   |                         |             | 14.50     | 15.58    | 21.33  | 0.11    | Average                 |  |
| 12/17/2020  | 3:55:12 | -12.46    | -13.14   | -0.02  | -0.27   |                         | 3:56:12     | 18.43     | 8.14     | 21.35  | 0.10    |                         |  |
| 12/17/2020  | 3:56:12 | -12.46    | -13.18   | -0.02  | -0.27   |                         | 3:57:12     | 18.33     | 7.45     | 21.35  | 0.10    |                         |  |
| 12/17/2020  | 3:57:12 | -12.44    | -13.22   | -0.02  | -0.28   |                         | 3:58:12     | 18.25     | 7.58     | 21.35  | 0.10    |                         |  |
| 12/17/2020  | 3:58:12 | -12.43    | -13.26   | -0.02  | -0.28   |                         | 3:59:12     | 18.73     | 7.14     | 21.35  | 0.11    |                         |  |
| 12/17/2020  | 3:59:12 | -12.41    | -13.29   | -0.02  | -0.28   |                         | 4:00:12     | 15.85     | 10.98    | 21.35  | 0.11    |                         |  |
| 12/17/2020  | 4:00:12 | -12.41    | -13.32   | -0.01  | -0.28   |                         | 4:01:12     | 12.38     | 11.28    | 21.35  | 0.11    |                         |  |
| 12/17/2020  | 4:01:12 | -12.40    | -13.35   | -0.01  | -0.28   |                         | 4:02:12     | 9.99      | 11.72    | 21.35  | 0.11    |                         |  |
| 12/17/2020  | 4:02:12 | -12.38    | -13.37   | -0.02  | -0.28   |                         | 4:03:12     | 7.92      | 10.15    | 21.34  | 0.12    |                         |  |
| 12/17/2020  | 4:03:12 | -12.37    | -13.40   | -0.02  | -0.26   |                         | 4:04:12     | 7.63      | 9.99     | 21.35  | 0.12    |                         |  |
| 12/17/2020  | 4:04:12 | -12.38    | -13.43   | -0.02  | -0.27   |                         | 4:05:12     | 6.85      | 12.13    | 21.35  | 0.12    |                         |  |
| 12/17/2020  | 4:05:12 | -12.39    | -13.46   | -0.02  | -0.26   |                         | 4:06:12     | 6.17      | 14.30    | 18.90  | 0.73    |                         |  |
| 12/17/2020  | 4:06:12 | -12.40    | -13.45   | 10.71  | 1.04    |                         | 4:07:12     | 3.96      | 5.42     | 9.69   | 9.31    |                         |  |
| 12/17/2020  | 4:07:12 | -12.30    | -13.54   | 17.96  | 0.19    |                         | 4:08:12     | 0.26      | -0.89    | 10.00  | 10.13   | NOx, CO System Zero/    |  |
| 12/17/2020  | 4:08:12 | -12.31    | -13.56   | 18.12  | 0.20    |                         | 4:09:12     | 10.34     | 5.86     | 6.68   | 4.53    | O2,CO2 Upscale          |  |
| 12/17/2020  | 4:09:12 | -12.34    | -13.57   | 18.24  | 0.20    |                         | 4:10:12     | 43.12     | 28.82    | 5.60   | 0.12    |                         |  |
| 12/17/2020  | 4:10:12 | -12.36    | -13.57   | 18.31  | 0.20    |                         | 4:11:12     | 48.65     | 50.19    | 0.03   | 0.13    | NOx, CO System Upscale/ |  |
| 12/17/2020  | 4:11:12 | -12.24    | -13.78   | 18.35  | 0.18    |                         |             |           |          |        |         | O2, CO2 Zero            |  |

## **APPENDIX G: LABORATORY REPORTS**

---

BISON ENGINEERING

PROJECT: SLR220430

CLIENT # B020  
REPORT # 20-503

SUBMITTED BY:

***CHESTER LabNet***

12242 S.W. GARDEN PLACE

TIGARD, OR 97223

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[www.ChesterLab.Net](http://www.ChesterLab.Net)

# CHESTER LabNet

12242 SW Garden Place ♦ Tigard, OR97223-8246 ♦ USA  
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## Case Narrative

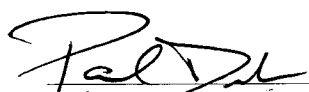
Date: January 4, 2021

## General Information

Client: Bison Engineering  
Client Number: B020  
Report Number: 20-503  
Sample Description: Impinger Trains  
Sample Numbers: 20-S2276 – 20-S2293

## Analysis

Analytes: Hexavalent Chromium, As, Cr, Pb, Mn, Ni  
Analytical Protocols: SW-846 Method 0061 (revision 0, December 1996)  
EPA Method 29 (8/2/17 version)  
Analytical Notes: No problems were encountered during the analyses. The results have not been blank corrected.  
QA/QC Review: All of the data have been reviewed by the analysts performing the analyses and the project manager. All of the quality control and sample-specific information in this package is complete and meets or exceeds the minimum requirements for acceptability.  
Comments: If you have any questions or concerns regarding this analysis, please feel free to contact the project manager.  
Disclaimer: This report shall not be reproduced, except in full, without the written approval of the laboratory. The results only represent that of the samples as received into the laboratory. All data are reported to the detection limit. Results <5x DL must be considered to have a higher degree of uncertainty associated with them. Due to the statistical process of detection limit determination, data in this report should not be used for statistical analysis as the data has been censored in such a manner as to bias statistical analyses high.

  
Project Manager  
Paul Duda

1/4/21  
Date

Client: B020 - Bison Engineering  
Report Number: 20-503

---

Lab ID: 20-S2276  
Client ID: Run 1 Cont #1  
Source: BH-15  
Sample Date: 12/ 7/20  
Sample Volume: 475. mL

| Analyte | $\mu\text{g/L}$ |       | $\mu\text{g/sample}$ |        |
|---------|-----------------|-------|----------------------|--------|
|         | Conc.           | DL    | Conc.                | DL     |
| Cr VI   | 0.422           | 0.010 | 0.200                | 0.0048 |

---

Lab ID: 20-S2277  
Client ID: Run 2 Cont #1  
Source: BH-15  
Sample Date: 12/ 8/20  
Sample Volume: 441. mL

| Analyte | $\mu\text{g/L}$ |       | $\mu\text{g/sample}$ |        |
|---------|-----------------|-------|----------------------|--------|
|         | Conc.           | DL    | Conc.                | DL     |
| Cr VI   | 0.0840          | 0.010 | 0.0370               | 0.0044 |

---

Lab ID: 20-S2278  
Client ID: Run 3 Cont #1  
Source: BH-15  
Sample Date: 12/ 9/20  
Sample Volume: 441. mL

| Analyte | $\mu\text{g/L}$ |       | $\mu\text{g/sample}$ |        |
|---------|-----------------|-------|----------------------|--------|
|         | Conc.           | DL    | Conc.                | DL     |
| Cr VI   | 0.396           | 0.010 | 0.175                | 0.0044 |

---

Lab ID: 20-S2279  
Client ID: Run 1 Cont #1  
Source: BH-1  
Sample Date: 12/11/20  
Sample Volume: 475. mL

| Analyte | $\mu\text{g/L}$ |       | $\mu\text{g/sample}$ |        |
|---------|-----------------|-------|----------------------|--------|
|         | Conc.           | DL    | Conc.                | DL     |
| Cr VI   | 2.12            | 0.010 | 1.01                 | 0.0048 |

---

Lab ID: 20-S2280  
Client ID: Run 1 Cont #1  
Source: BH-2  
Sample Date: 12/11/20  
Sample Volume: 445. mL

| Analyte | $\mu\text{g/L}$ |       | $\mu\text{g/sample}$ |        |
|---------|-----------------|-------|----------------------|--------|
|         | Conc.           | DL    | Conc.                | DL     |
| Cr VI   | 0.347           | 0.010 | 0.154                | 0.0044 |

---

Analysis performed by: **CHESTER LabNet**

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Client: B020 - Bison Engineering  
Report Number: 20-503

---

Lab ID: 20-S2281  
Client ID: Field Train Blank  
Source: BH-15  
Sample Date: 12/ 9/20  
Sample Volume: 455. mL

| Analyte | $\mu\text{g/L}$ |       | $\mu\text{g/sample}$ |        |
|---------|-----------------|-------|----------------------|--------|
|         | Conc.           | DL    | Conc.                | DL     |
| Cr VI   | 0.0590          | 0.010 | 0.0268               | 0.0046 |

---

Lab ID: 20-S2282  
Client ID: Field Train Blank  
Source: Arc Furnace  
Sample Date: 12/11/20  
Sample Volume: 433. mL

| Analyte | $\mu\text{g/L}$ |       | $\mu\text{g/sample}$ |        |
|---------|-----------------|-------|----------------------|--------|
|         | Conc.           | DL    | Conc.                | DL     |
| Cr VI   | 0.0720          | 0.010 | 0.0312               | 0.0043 |

---

Lab ID: 20-S2283  
Client ID: KOH Blank  
Source: Arc Furnace  
Sample Date: 12/ 9/20  
Sample Volume: 293. mL

| Analyte | $\mu\text{g/L}$ |       | $\mu\text{g/sample}$ |        |
|---------|-----------------|-------|----------------------|--------|
|         | Conc.           | DL    | Conc.                | DL     |
| Cr VI   | 0.0930          | 0.010 | 0.0272               | 0.0029 |

---

Lab ID: 20-S2284  
Client ID: DI H2O Blank  
Source: Arc Furnace  
Sample Date: 12/ 9/20  
Sample Volume: 213. mL

| Analyte | $\mu\text{g/L}$ |       | $\mu\text{g/sample}$ |        |
|---------|-----------------|-------|----------------------|--------|
|         | Conc.           | DL    | Conc.                | DL     |
| Cr VI   | < DL            | 0.010 | < DL                 | 0.0021 |

---

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Client: B020 - Bison Engineering  
Report Number: 20-503

---

Lab ID: 20-S2285  
Client ID: R1 FH Cont. 1 & 3  
Source: BH-15  
Sample Date: 12/ 7/20

| Analyte        | Result | DL    | Units     |
|----------------|--------|-------|-----------|
| Arsenic, ICP   | 3.91   | 1.75  | µg/sample |
| Chromium, ICP  | 12.6   | 0.200 | µg/sample |
| Lead, ICP      | < DL   | 1.25  | µg/sample |
| Manganese, ICP | 316.   | 0.075 | µg/sample |
| Nickel, ICP    | 13.4   | 0.750 | µg/sample |

---

Lab ID: 20-S2286  
Client ID: R1 BH Cont. 4  
Source: BH-15  
Sample Date: 12/ 7/20

| Analyte        | Result | DL    | Units     |
|----------------|--------|-------|-----------|
| Arsenic, ICP   | < DL   | 0.700 | µg/sample |
| Chromium, ICP  | 0.539  | 0.080 | µg/sample |
| Lead, ICP      | < DL   | 0.500 | µg/sample |
| Manganese, ICP | 1.04   | 0.030 | µg/sample |
| Nickel, ICP    | < DL   | 0.300 | µg/sample |

---

Lab ID: 20-S2287  
Client ID: R2 FH Cont. 1 & 3  
Source: BH-15  
Sample Date: 12/ 8/20

| Analyte        | Result | DL    | Units     |
|----------------|--------|-------|-----------|
| Arsenic, ICP   | 2.73   | 1.75  | µg/sample |
| Chromium, ICP  | 4.37   | 0.200 | µg/sample |
| Lead, ICP      | < DL   | 1.25  | µg/sample |
| Manganese, ICP | 85.7   | 0.075 | µg/sample |
| Nickel, ICP    | 8.48   | 0.750 | µg/sample |

---

Lab ID: 20-S2288  
Client ID: R2 BH Cont. 4  
Source: BH-15  
Sample Date: 12/ 8/20

| Analyte        | Result | DL    | Units     |
|----------------|--------|-------|-----------|
| Arsenic, ICP   | < DL   | 0.700 | µg/sample |
| Chromium, ICP  | 0.550  | 0.080 | µg/sample |
| Lead, ICP      | 0.652  | 0.500 | µg/sample |
| Manganese, ICP | 4.78   | 0.030 | µg/sample |
| Nickel, ICP    | 0.321  | 0.300 | µg/sample |

---

Analysis performed by: **CHESTER LabNet**

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Client: B020 - Bison Engineering  
Report Number: 20-503

---

Lab ID: 20-S2289  
Client ID: R3 FH Cont. 1 & 3  
Source: BH-15  
Sample Date: 12/ 9/20

| Analyte        | Result | DL    | Units     |
|----------------|--------|-------|-----------|
| Arsenic, ICP   | 4.63   | 1.75  | µg/sample |
| Chromium, ICP  | 4.56   | 0.200 | µg/sample |
| Lead, ICP      | < DL   | 1.25  | µg/sample |
| Manganese, ICP | 119.   | 0.075 | µg/sample |
| Nickel, ICP    | 8.75   | 0.750 | µg/sample |

---

Lab ID: 20-S2290  
Client ID: R3 BH Cont. 4  
Source: BH-15  
Sample Date: 12/ 9/20

| Analyte        | Result | DL    | Units     |
|----------------|--------|-------|-----------|
| Arsenic, ICP   | < DL   | 0.700 | µg/sample |
| Chromium, ICP  | 0.457  | 0.080 | µg/sample |
| Lead, ICP      | 0.688  | 0.500 | µg/sample |
| Manganese, ICP | 1.50   | 0.030 | µg/sample |
| Nickel, ICP    | < DL   | 0.300 | µg/sample |

---

Lab ID: 20-S2291  
Client ID: Cont 8a 0.1N HNO3 Blank  
Source: BH-15  
Sample Date: 12/ 9/20

| Analyte        | Result | DL    | Units     |
|----------------|--------|-------|-----------|
| Arsenic, ICP   | < DL   | 1.75  | µg/sample |
| Chromium, ICP  | 0.209  | 0.200 | µg/sample |
| Lead, ICP      | < DL   | 1.25  | µg/sample |
| Manganese, ICP | < DL   | 0.075 | µg/sample |
| Nickel, ICP    | < DL   | 0.750 | µg/sample |

---

Lab ID: 20-S2292  
Client ID: Cont 12 Filter Blank  
Source: BH-15  
Sample Date: 12/ 9/20

| Analyte        | Result | DL    | Units     |
|----------------|--------|-------|-----------|
| Arsenic, ICP   | 5.84   | 1.75  | µg/sample |
| Chromium, ICP  | 1.74   | 0.200 | µg/sample |
| Lead, ICP      | < DL   | 1.25  | µg/sample |
| Manganese, ICP | 1.23   | 0.075 | µg/sample |
| Nickel, ICP    | 7.06   | 0.750 | µg/sample |

---

Analysis performed by: **CHESTER LabNet**

12242 SW Garden Place ♦ Tigard, OR 97223 ♦ (503) 624-2183 ♦ [www.chesterlab.net](http://www.chesterlab.net)

Client: B020 - Bison Engineering  
Report Number: 20-503

---

Lab ID: 20-S2293  
Client ID: Cont 9 H2O2/HNO3 Blank  
Source: BH-15  
Sample Date: 12/ 9/20

| Analyte        | Result | DL    | Units     |
|----------------|--------|-------|-----------|
| Arsenic, ICP   | < DL   | 0.700 | µg/sample |
| Chromium, ICP  | 0.343  | 0.080 | µg/sample |
| Lead, ICP      | < DL   | 0.500 | µg/sample |
| Manganese, ICP | 0.376  | 0.030 | µg/sample |
| Nickel, ICP    | < DL   | 0.300 | µg/sample |

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Analysis performed by: **CHESTER LabNet**

12242 SW Garden Place ♦ Tigard, OR 97223 ♦ (503) 624-2183 ♦ [www.chesterlab.net](http://www.chesterlab.net)

SLR220430

2020 Columbia Steel Casting Co., Inc.

## QA/QC Report

Client Name: Bison Engineering  
Project Number: B020  
Analytical Technique: IC-PCR  
Sample Description: SW-846 0061  
Report Number: 20-503  
=====

### Blank Data

| Analyte | Sample ID | Measured Conc. µg/L | DL Conc. µg/L |
|---------|-----------|---------------------|---------------|
| Cr VI   | ICB       | < DL                | 0.010         |
| Cr VI   | CCB       | < DL                | 0.010         |
| Cr VI   | CCB       | < DL                | 0.010         |

\*: Sample Media Blank (SM\_Blk) concentration in µg/filter  
ICB: Initial Calibration Blank CCB: Continuing Calibration Blank  
Method Blank is in control if Method Blank results are <10% of sample results

### Calibration QC

| Analyte | Sample ID | Standard Conc. µg/L | Measured Conc. µg/L | Percent Recovery |
|---------|-----------|---------------------|---------------------|------------------|
| Cr VI   | ICV       | 0.500               | 0.495               | 99.0             |
| Cr VI   | LL-LCS    | 0.030               | 0.029               | 96.7             |
| Cr VI   | CCV       | 0.500               | 0.500               | 100.0            |
| Cr VI   | CCV       | 0.500               | 0.485               | 97.0             |

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification  
Calibration Verification Limits: 90% - 110% Recovery  
LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery  
LL-LCS Limits: 50% - 150% Recovery  
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

### Duplicate Data

| Analyte | Sample ID | Sample Conc. µg/L | Duplicate Conc. µg/L | RPD  |
|---------|-----------|-------------------|----------------------|------|
| Cr VI   | 20-S2276  | 0.422             | 0.416                | 1.43 |

$RPD = \frac{(sample - duplicate)}{[(sample + duplicate) / 2]} \times 100$   
N/C: RPD is not calculated when sample or duplicate is below detection limit  
#: per EPA CLP protocol, control limits do not apply if sample and/or duplicate concentration is less than 5x the detection limit

### Laboratory Control Sample/Matrix Spike Analysis

| Analyte | Sample ID | Sample Conc. µg/L | Spike Conc. µg/L | Spike Amount µg/L | Percent Recovery |
|---------|-----------|-------------------|------------------|-------------------|------------------|
| Cr VI   | 20-S2277  | 0.084             | 0.576            | 0.500             | 98.4             |

\*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

## QA/QC Report

Client Name: Bison Engineering  
 Project Number: B020  
 Analytical Technique: ICP - Optima 8300  
 Sample Description: EPA 29 Cont. 1&3  
 Report Number: 20-503

### Blank Data

| Analyte | Sample ID | Measured Conc. µg/L | DL Conc. µg/L |
|---------|-----------|---------------------|---------------|
| As      | ICB       | < DL                | 7.00          |
| As      | Meth_Blkc | < DL                | 7.00          |
| As      | CCB       | < DL                | 7.00          |
| As      | CCB       | < DL                | 7.00          |
| Cr      | ICB       | < DL                | 0.800         |
| Cr      | Meth_Blkc | < DL                | 0.800         |
| Cr      | CCB       | < DL                | 0.800         |
| Cr      | CCB       | < DL                | 0.800         |
| Mn      | ICB       | < DL                | 0.300         |
| Mn      | Meth_Blkc | < DL                | 0.300         |
| Mn      | CCB       | < DL                | 0.300         |
| Mn      | CCB       | < DL                | 0.300         |
| Ni      | ICB       | < DL                | 3.00          |
| Ni      | Meth_Blkc | < DL                | 3.00          |
| Ni      | CCB       | < DL                | 3.00          |
| Ni      | CCB       | < DL                | 3.00          |
| Pb      | ICB       | < DL                | 5.00          |
| Pb      | Meth_Blkc | < DL                | 5.00          |
| Pb      | CCB       | < DL                | 5.00          |
| Pb      | CCB       | < DL                | 5.00          |

\*: Sample Media Blank (SM\_Blkc) concentration in µg/filter

ICB: Initial Calibration Blank CCB: Continuing Calibration Blank

Method Blank is in control if Method Blank results are <10% of sample results

### Calibration QC

| Analyte | Sample ID | Standard Conc. µg/L | Measured Conc. µg/L | Percent Recovery |
|---------|-----------|---------------------|---------------------|------------------|
| As      | ICV       | 2500                | 2560                | 102.4            |
| As      | LL-CCV    | 35.0                | 28.0                | 80.1             |
| As      | LL-LCS    | 20.0                | 23.6                | 118.0            |
| As      | CCV       | 2500                | 2390                | 95.4             |
| As      | CCV       | 2500                | 2410                | 96.6             |
| Cr      | ICV       | 2500                | 2610                | 104.5            |
| Cr      | LL-CCV    | 4.00                | 3.98                | 99.4             |
| Cr      | LL-LCS    | 2.00                | 2.01                | 100.4            |
| Cr      | CCV       | 2500                | 2490                | 99.6             |
| Cr      | CCV       | 2500                | 2470                | 98.7             |
| Mn      | ICV       | 2500                | 2600                | 103.8            |
| Mn      | LL-CCV    | 1.50                | 1.34                | 89.7             |
| Mn      | LL-LCS    | 1.00                | 0.771               | 77.1             |
| Mn      | CCV       | 2500                | 2480                | 99.3             |
| Mn      | CCV       | 2500                | 2460                | 98.2             |
| Ni      | ICV       | 2500                | 2530                | 101.3            |
| Ni      | LL-CCV    | 15.0                | 12.9                | 86.2             |
| Ni      | LL-LCS    | 6.00                | 6.86                | 114.4            |
| Ni      | CCV       | 2500                | 2410                | 96.2             |
| Ni      | CCV       | 2500                | 2390                | 95.5             |
| Pb      | ICV       | 2500                | 2560                | 102.5            |
| Pb      | LL-CCV    | 25.0                | 22.7                | 90.6             |
| Pb      | LL-LCS    | 15.0                | 11.6                | 77.6             |
| Pb      | CCV       | 2500                | 2390                | 95.4             |

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification

Calibration Verification Limits: 90% - 110% Recovery

LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery

LL-LCS Limits: 50% - 150% Recovery

LL-LCS results are not significant if sample results are >10x LL-LCS concentration

## QA/QC Report

Client Name: Bison Engineering  
 Project Number: B020  
 Analytical Technique: ICP - Optima 8300  
 Sample Description: EPA 29 Cont. 1&3  
 Report Number: 20-503  
 =====

### Calibration QC

| Analyte | Sample ID | Standard Conc. µg/L | Measured Conc. µg/L | Percent Recovery |
|---------|-----------|---------------------|---------------------|------------------|
| Pb      | CCV       | 2500                | 2410                | 96.4             |

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification  
 Calibration Verification Limits: 90% - 110% Recovery  
 LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery  
 LL-LCS Limits: 50% - 150% Recovery  
 LL-LCS results are not significant if sample results are >10x LL-LCS concentration

### Replicate Data

| Analyte | Sample ID | Sample Conc. µg/L | Replicate Conc. µg/L | RPD    |
|---------|-----------|-------------------|----------------------|--------|
| As      | 20-S2285  | 15.65             | 17.96                | 13.7 # |
| Cr      | 20-S2285  | 50.54             | 50.23                | 0.62   |
| Mn      | 20-S2285  | 1264.             | 1255.                | 0.71   |
| Ni      | 20-S2285  | 53.42             | 51.49                | 3.68   |
| Pb      | 20-S2285  | < 5               | < 5                  | N/C #  |

N/C: RPD is not calculated when sample or replicate is below detection limit  
 Replicate Limit: 20% RPD  
 #: per EPA CLP protocol, control limits do not apply if sample and/or replicate concentration is less than 5x the detection limit

### Laboratory Control Sample/Post Digestion Spike Analysis

| Analyte | Sample ID | Sample Conc. µg/L | Spike Conc. µg/L | Spike Amount µg/L | Percent Recovery |
|---------|-----------|-------------------|------------------|-------------------|------------------|
| As      | LCS       | < 7               | 2399.            | 2500.             | 96.0             |
| As      | LCS       | < 7               | 2471.            | 2500.             | 98.8             |
| As      | 20-S2287  | 10.93             | 2279.            | 2500.             | 90.7             |
| Cr      | LCS       | < 0.8             | 2366.            | 2500.             | 94.6             |
| Cr      | LCS       | < 0.8             | 2420.            | 2500.             | 96.8             |
| Cr      | 20-S2287  | 17.47             | 2305.            | 2500.             | 91.5             |
| Mn      | LCS       | < 0.3             | 2300.            | 2500.             | 92.0             |
| Mn      | LCS       | < 0.3             | 2369.            | 2500.             | 94.8             |
| Mn      | 20-S2287  | 342.8             | 2555.            | 2500.             | 88.5             |
| Ni      | LCS       | < 3               | 2361.            | 2500.             | 94.4             |
| Ni      | LCS       | < 3               | 2421.            | 2500.             | 96.8             |
| Ni      | 20-S2287  | 33.90             | 2199.            | 2500.             | 86.6             |
| Pb      | LCS       | < 5               | 2408.            | 2500.             | 96.3             |
| Pb      | LCS       | < 5               | 2465.            | 2500.             | 98.6             |
| Pb      | 20-S2287  | < 5               | 2015.            | 2500.             | 80.6             |

LCS Limit: 80% - 120% Recovery Spike Limit: 75% - 125% Recovery  
 \*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

### Laboratory Control Sample Duplicate Data

| Analyte | Sample ID | Spike Conc. µg/L | Duplicate Conc. µg/L | RPD  |
|---------|-----------|------------------|----------------------|------|
| As      | LCS-DUP   | 2400             | 2470                 | 2.96 |
| Cr      | LCS-DUP   | 2370             | 2420                 | 2.26 |

Duplicate Limit: 20% RPD

## QA/QC Report

Client Name: Bison Engineering  
Project Number: B020  
Analytical Technique: ICP - Optima 8300  
Sample Description: EPA 29 Cont. 1&3  
Report Number: 20-503  
=====

### Laboratory Control Sample Duplicate Data

| Analyte | Sample ID | Spike Conc. µg/L | Duplicate Conc. µg/L | RPD  |
|---------|-----------|------------------|----------------------|------|
| Mn      | LCS-DUP   | 2300             | 2370                 | 2.96 |
| Ni      | LCS-DUP   | 2360             | 2420                 | 2.51 |
| Pb      | LCS-DUP   | 2410             | 2460                 | 2.34 |

Duplicate Limit: 20% RPD

## QA/QC Report

Client Name: Bison Engineering  
 Project Number: B020  
 Analytical Technique: ICP - Optima 8300  
 Sample Description: EPA 29 Cont. 4  
 Report Number: 20-503

### Blank Data

| Analyte | Sample ID | Measured Conc. µg/L | DL Conc. µg/L |
|---------|-----------|---------------------|---------------|
| As      | ICB       | < DL                | 7.00          |
| As      | Meth_Blkc | < DL                | 7.00          |
| As      | CCB       | < DL                | 7.00          |
| As      | CCB       | < DL                | 7.00          |
| Cr      | ICB       | < DL                | 0.800         |
| Cr      | Meth_Blkc | < DL                | 0.800         |
| Cr      | CCB       | < DL                | 0.800         |
| Cr      | CCB       | < DL                | 0.800         |
| Mn      | ICB       | < DL                | 0.300         |
| Mn      | Meth_Blkc | < DL                | 0.300         |
| Mn      | CCB       | < DL                | 0.300         |
| Mn      | CCB       | < DL                | 0.300         |
| Ni      | ICB       | < DL                | 3.00          |
| Ni      | Meth_Blkc | < DL                | 3.00          |
| Ni      | CCB       | < DL                | 3.00          |
| Ni      | CCB       | < DL                | 3.00          |
| Pb      | ICB       | < DL                | 5.00          |
| Pb      | Meth_Blkc | < DL                | 5.00          |
| Pb      | CCB       | < DL                | 5.00          |
| Pb      | CCB       | < DL                | 5.00          |

\*: Sample Media Blank (SM\_Blkc) concentration in µg/filter

ICB: Initial Calibration Blank CCB: Continuing Calibration Blank

Method Blank is in control if Method Blank results are <10% of sample results

### Calibration QC

| Analyte | Sample ID | Standard Conc. µg/L | Measured Conc. µg/L | Percent Recovery |
|---------|-----------|---------------------|---------------------|------------------|
| As      | ICV       | 2500                | 2560                | 102.6            |
| As      | LL-CCV    | 35.0                | 41.8                | 119.5            |
| As      | LL-LCS    | 20.0                | 19.6                | 98.0             |
| As      | CCV       | 2500                | 2480                | 99.2             |
| As      | CCV       | 2500                | 2490                | 99.6             |
| Cr      | ICV       | 2500                | 2650                | 106.0            |
| Cr      | LL-CCV    | 4.00                | 4.26                | 106.6            |
| Cr      | LL-LCS    | 2.00                | 1.84                | 91.8             |
| Cr      | CCV       | 2500                | 2540                | 101.7            |
| Cr      | CCV       | 2500                | 2510                | 100.5            |
| Mn      | ICV       | 2500                | 2400                | 96.0             |
| Mn      | LL-CCV    | 1.50                | 1.27                | 84.9             |
| Mn      | LL-LCS    | 1.00                | 0.958               | 95.8             |
| Mn      | CCV       | 2500                | 2380                | 95.2             |
| Mn      | CCV       | 2500                | 2400                | 96.0             |
| Ni      | ICV       | 2500                | 2330                | 93.1             |
| Ni      | LL-CCV    | 15.0                | 12.4                | 82.9             |
| Ni      | LL-LCS    | 6.00                | 4.23                | 70.6             |
| Ni      | CCV       | 2500                | 2320                | 92.8             |
| Ni      | CCV       | 2500                | 2330                | 93.3             |
| Pb      | ICV       | 2500                | 2550                | 102.2            |
| Pb      | LL-CCV    | 25.0                | 29.1                | 116.4            |
| Pb      | LL-LCS    | 15.0                | 10.7                | 71.4             |
| Pb      | CCV       | 2500                | 2500                | 99.9             |

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification

Calibration Verification Limits: 90% - 110% Recovery

LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery

LL-LCS Limits: 50% - 150% Recovery

LL-LCS results are not significant if sample results are >10x LL-LCS concentration

## QA/QC Report

Client Name: Bison Engineering  
Project Number: B020  
Analytical Technique: ICP - Optima 8300  
Sample Description: EPA 29 Cont. 4  
Report Number: 20-503  
=====

### Calibration QC

| Analyte | Sample ID | Standard Conc. µg/L | Measured Conc. µg/L | Percent Recovery |
|---------|-----------|---------------------|---------------------|------------------|
| Pb      | CCV       | 2500                | 2500                | 100.0            |

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification  
Calibration Verification Limits: 90% - 110% Recovery  
LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery  
LL-LCS Limits: 50% - 150% Recovery  
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

### Replicate Data

| Analyte | Sample ID | Sample Conc. µg/L | Replicate Conc. µg/L | RPD   |
|---------|-----------|-------------------|----------------------|-------|
| As      | 20-S2286  | < 7               | < 7                  | N/C # |
| Cr      | 20-S2286  | 5.386             | 5.409                | 0.43  |
| Mn      | 20-S2286  | 10.38             | 10.31                | 0.68  |
| Ni      | 20-S2286  | < 3               | < 3                  | N/C # |
| Pb      | 20-S2286  | < 5               | < 5                  | N/C # |

N/C: RPD is not calculated when sample or replicate is below detection limit  
Replicate Limit: 20% RPD  
#: per EPA CLP protocol, control limits do not apply if sample and/or replicate concentration is less than 5x the detection limit

### Laboratory Control Sample/Post Digestion Spike Analysis

| Analyte | Sample ID | Sample Conc. µg/L | Spike Conc. µg/L | Spike Amount µg/L | Percent Recovery |
|---------|-----------|-------------------|------------------|-------------------|------------------|
| As      | LCS       | < 7               | 2219.            | 2500.             | 88.8             |
| As      | LCS       | < 7               | 2217.            | 2500.             | 88.7             |
| As      | 20-S2288  | < 7               | 2039.            | 2500.             | 81.6             |
| Cr      | LCS       | < 0.8             | 2293.            | 2500.             | 91.7             |
| Cr      | LCS       | < 0.8             | 2284.            | 2500.             | 91.4             |
| Cr      | 20-S2288  | 5.497             | 2110.            | 2500.             | 84.2             |
| Mn      | LCS       | < 0.3             | 2453.            | 2500.             | 98.1             |
| Mn      | LCS       | < 0.3             | 2415.            | 2500.             | 96.6             |
| Mn      | 20-S2288  | 47.76             | 2322.            | 2500.             | 91.0             |
| Ni      | LCS       | < 3               | 2336.            | 2500.             | 93.4             |
| Ni      | LCS       | < 3               | 2418.            | 2500.             | 96.7             |
| Ni      | 20-S2288  | 3.211             | 2138.            | 2500.             | 85.4             |
| Pb      | LCS       | < 5               | 2210.            | 2500.             | 88.4             |
| Pb      | LCS       | < 5               | 2208.            | 2500.             | 88.3             |
| Pb      | 20-S2288  | 6.521             | 2029.            | 2500.             | 80.9             |

LCS Limit: 80% - 120% Recovery Spike Limit: 75% - 125% Recovery  
\*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

### Laboratory Control Sample Duplicate Data

| Analyte | Sample ID | Spike Conc. µg/L | Duplicate Conc. µg/L | RPD  |
|---------|-----------|------------------|----------------------|------|
| As      | LCS-DUP   | 2220             | 2220                 | 0.09 |
| Cr      | LCS-DUP   | 2290             | 2280                 | 0.39 |

Duplicate Limit: 20% RPD

## QA/QC Report

Client Name: Bison Engineering  
Project Number: B020  
Analytical Technique: ICP - Optima 8300  
Sample Description: EPA 29 Cont. 4  
Report Number: 20-503  
=====

### Laboratory Control Sample Duplicate Data

| Analyte | Sample ID | Spike Conc. µg/L | Duplicate Conc. µg/L | RPD  |
|---------|-----------|------------------|----------------------|------|
| Mn      | LCS-DUP   | 2450             | 2420                 | 1.56 |
| Ni      | LCS-DUP   | 2340             | 2420                 | 3.45 |
| Pb      | LCS-DUP   | 2210             | 2210                 | 0.09 |

Duplicate Limit: 20% RPD

**CHESTER LABNET**  
**SOURCE SAMPLE RECEIPT CHECKLIST**

|                                                               |                        |
|---------------------------------------------------------------|------------------------|
| Client <u>Bison Engineering</u>                               | Date <u>12/11/20</u>   |
| # Runs <u>M29 3 + Blanks</u><br><u>0061 - 5 Runs + Blanks</u> | Report # <u>20-503</u> |

Custody Seals Inspected, If Present

NA

Chain-of-Custody Form Inspected

**CoC present with samples?**

CoC indicate analytical methodology to be used? (eg M29 etc)

CoC indicate if compliance testing? (esp. M26)

M26 samples have Thiosulfate added in field?

M29 indicate FH/BH separate or combined?

Has Form Been Signed?

Have Date and Time Custody Released Been Noted on Form?

|           |    |
|-----------|----|
| ✓         |    |
| ✓         | *  |
| M29, 0061 | !! |
| Not State | !! |
| NA        | !! |
| Separate  | !! |
| ✓         |    |
| ✓         |    |

per Quok

All Sample Containers Inspected

Does Number of Samples Match Number on CoC Form?

Do All Sample ID Numbers Match Those on the CoC Form?

**Did client mark sample volumes prior to shipment?**

If required by method, did client vent samples prior to shipment?

Are the Sample Containers Intact?

**Are signs of leakage present?**

|    |    |
|----|----|
| ✓  |    |
| ✓  | !! |
| ✓  | !! |
| ✓  | *  |
| NA |    |
| ✓  | !! |
| ✓  | *  |

Chain-of-Custody Form Signed and Dated by CLN

✓

Corrective Actions

Client Contacted Due to Mismatching Sample ID Numbers

Client Contacted Due to Broken Sample Container(s)

Client Contacted Due to Leaking Sample Container(s)

Client contacted for verification of methodology?

Corrective Actions Documented?

Corrective Actions Accomplished?

|   |
|---|
| ✓ |
| ✓ |
| ✓ |
| ✓ |
| ✓ |
| ✓ |
| ✓ |

Items marked !! shall be addressed prior to any analytical work being started.

Items marked \* shall be noted in case narrative upon reporting of results to client.

Signed

Jim Ball

Notes

Client confirmed metals on additional piece of  
paper while dropping off samples.



|                                                |                    |                              |  |
|------------------------------------------------|--------------------|------------------------------|--|
| Company Name<br><b>Bison Engineering, Inc.</b> |                    | Phone<br><b>406-239-5956</b> |  |
| Contact<br><b>Adam Bender</b>                  |                    | Fax                          |  |
| E-Mail Address<br><b>abender@bison-eng.com</b> |                    |                              |  |
| Report Address<br><b>3143 E. Lyndale Ave.</b>  |                    |                              |  |
| City<br><b>Helena</b>                          | State<br><b>MT</b> | Zip<br><b>59601</b>          |  |
| Billing Address<br><b>11</b>                   |                    |                              |  |
| City<br><b>11</b>                              | State<br><b>11</b> | Zip<br><b>11</b>             |  |
| PO #                                           |                    | Project<br><b>SLR220430</b>  |  |

**CHESTER LabNet**

12242 SW Garden Place  
Tigard, OR 97223  
(503) 624-2183  
Fax (503) 624-2653  
cln@chesterlab.net

## CHAIN-OF-CUSTODY RECORD

Page \_\_\_\_ of \_\_\_\_

| LabNet ID | Field Sample ID                   | Site  | Sample Date | Volume (m³) | Particle Size | Analysis Requested |  |  |  |  |  |  |  |  |  | Turn Around Time<br><input type="checkbox"/> Standard<br><input type="checkbox"/> Rush _____ Specify _____ | Remarks |
|-----------|-----------------------------------|-------|-------------|-------------|---------------|--------------------|--|--|--|--|--|--|--|--|--|------------------------------------------------------------------------------------------------------------|---------|
|           |                                   |       |             |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                            |         |
| 2052285   | M-29 cont #1<br>Run 1 filter      | BH-15 | 12/17/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                            |         |
| 52286     | M-29 cont #1<br>Run 2 filter      | 11    | 12/18/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                            |         |
| 52287     | M-29 cont #1<br>Run 3 filter      | 11    | 12/17/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                            |         |
| 52192     | M-29 filter blank                 | 11    | 12/17/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                            |         |
|           | M-29 cont #3<br>Run 1 probe rinse | 11    | 12/17/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                            |         |
|           | M-29 cont #3<br>Run 2 probe rinse | 11    | 12/17/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                            |         |
|           | M-29 cont #3<br>Run 3 probe rinse | 11    | 12/17/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                            |         |
| 2052286   | M-29 cont #4<br>Run 1             |       | 12/17/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                            |         |
| 52288     | M-29 cont #4<br>Run 2             |       | 12/17/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                            |         |
| 52290     | M-29 cont #4<br>Run 3             |       | 12/17/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                            |         |
| 52291     | 0.1M HNO3 blank                   |       | 12/17/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                            |         |
| 52293     | 5% HNO3 probe blank               |       | 12/17/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                            |         |

Notes: /

Received By: (Signature) Date/Time  
 Received By: (Signature) Date/Time

D.I. H2O blank

• TSM M-29

BH-15 sm: As, Pb, Cr, Ni, Mn also for allminerals

BH 1/2: full metals + Al and vanadium

Cr 16

201, 00005

Cr = 100%

BISON ENGINEERING

PROJECT: SLR220430

CLIENT # B020  
REPORT # 20-513

SUBMITTED BY:

***CHESTER LabNet***

12242 S.W. GARDEN PLACE

TIGARD, OR 97223

(503)624-2183/FAX (503)624-2653

[www.ChesterLab.Net](http://www.ChesterLab.Net)

# ***CHESTER LabNet***

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## **Case Narrative**

Date: January 15, 2021

### **General Information**

Client: Bison Engineering

Client Number: B020

Report Number: 20-513

Sample Description: Impinger Trains

Sample Numbers: 20-C314 – 20-C331, 20-S2311 – 20-S2364, 20-U205 – 20-U207, 20-U209 – 20-U211, 20-U423, 20-U424, 20-U427 – 20-U440, 20-U590 – 20-U593

### **Analysis**

Analytes: Hexavalent Chromium, Particulate Mass, Al, Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Ni, P, Se, Ag, Tl, V, Zn

Analytical Protocols: ASTM D7614-20  
SW-846 Method 0061 (revision 0, December 1996)  
EPA Method 201A (5/11/20 version)  
Oregon DEQ Method 5 (November 2018 version)  
EPA Method 29 (8/2/17 version)

Analytical Notes: The method 0061 samples required dilutions to resolve matrix interference. The detection limits have been raised accordingly.

One of the ODEQ method 5 samples was partially spilled during the DCM extraction. The results for that sample are most likely biased low.

There were a few issues with the method 29 analysis. The Ag LCS for the front half and the LCS duplicate for the back half both had low recoveries. Ag is notorious for low recoveries because the analyte tends to plate out in the sample introduction system. The back half low level LCS for Al was far above the control limit. There may have been some Al contamination that caused the high recovery. Be was not detected in the back half low level LCS. The spiking solution contained metals other than Be that all had acceptable recoveries. The spectra were visually verified. Reason for QC failure is unknown. The samples were digested in their entirety so redigestion was not possible.

The minvol samples, 20-U423, etc., were digested and analyzed by ICP per US EPA Method 29.

The results have not been blank corrected.

QA/QC Review: All of the data have been reviewed by the analysts performing the analyses and the project manager. All of the quality control and sample-specific information in this package is complete and meets or exceeds the minimum requirements for acceptability.

Comments: If you have any questions or concerns regarding this analysis, please feel free to contact the project manager.

Disclaimer: This report shall not be reproduced, except in full, without the written approval of the laboratory. The results only represent that of the samples as received into the laboratory. All data are reported to the detection limit. Results  $<5\times$  DL must be considered to have a higher degree of uncertainty associated with them. Due to the statistical process of detection limit determination, data in this report should not be used for statistical analysis as the data has been censored in such a manner as to bias statistical analyses high.

 1/15/21  
Project Manager Date  
Paul Duda

Client: B020 - Bison Engineering  
Report Number: 20-513

---

Lab ID: 20-C314  
Client ID: Vent 9  
Site: Bldg 11  
Sample Date: 12/ 7/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter<br>Conc. | DL       |
|---------|--------------------|----------|
| IC      |                    |          |
| Cr VI   | 0.189              | 0.000200 |

---

Lab ID: 20-C315  
Client ID: Vent 8  
Site: Bldg 11  
Sample Date: 12/ 7/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter<br>Conc. | DL       |
|---------|--------------------|----------|
| IC      |                    |          |
| Cr VI   | 0.359              | 0.000200 |

---

Lab ID: 20-C317  
Client ID: Vent 8  
Site: Bldg 11  
Sample Date: 12/ 8/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter<br>Conc. | DL       |
|---------|--------------------|----------|
| IC      |                    |          |
| Cr VI   | 0.417              | 0.000200 |

---

Lab ID: 20-C318  
Client ID: Vent 9  
Site: Bldg 11  
Sample Date: 12/ 8/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter<br>Conc. | DL       |
|---------|--------------------|----------|
| IC      |                    |          |
| Cr VI   | 0.0592             | 0.000200 |

---

Lab ID: 20-C322  
Client ID: Vent 5  
Site: Bldg 11  
Sample Date: 12/ 9/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter<br>Conc. | DL       |
|---------|--------------------|----------|
| IC      |                    |          |
| Cr VI   | 1.97               | 0.000200 |

---

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Client: B020 - Bison Engineering  
Report Number: 20-513

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Lab ID: 20-C323  
Client ID: Vent 7  
Site: Bldg 11  
Sample Date: 12/ 9/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter<br>Conc. | DL       |
|---------|--------------------|----------|
| IC      |                    |          |
| Cr VI   | 0.202              | 0.000200 |

---

Lab ID: 20-C316  
Client ID: Vent 5  
Site: Bldg 11  
Sample Date: 12/10/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter<br>Conc. | DL       |
|---------|--------------------|----------|
| IC      |                    |          |
| Cr VI   | 2.60               | 0.000200 |

---

Lab ID: 20-C319  
Client ID: Vent 4  
Site: Bldg 11  
Sample Date: 12/10/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter<br>Conc. | DL       |
|---------|--------------------|----------|
| IC      |                    |          |
| Cr VI   | 1.57               | 0.000200 |

---

Lab ID: 20-C321  
Client ID: Vent 7  
Site: Bldg 8  
Sample Date: 12/13/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter<br>Conc. | DL       |
|---------|--------------------|----------|
| IC      |                    |          |
| Cr VI   | 0.00772            | 0.000200 |

---

Lab ID: 20-C320  
Client ID: Vent 1  
Site: Bldg 8  
Sample Date: 12/13/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter<br>Conc. | DL       |
|---------|--------------------|----------|
| IC      |                    |          |
| Cr VI   | 0.0728             | 0.000200 |

---

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Client: B020 - Bison Engineering  
Report Number: 20-513

---

Lab ID: 20-C324  
Client ID: Vent 1  
Site: Bldg 11  
Sample Date: 12/14/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter<br>Conc. | DL       |
|---------|--------------------|----------|
| IC      |                    |          |
| Cr VI   | 0.112              | 0.000200 |

---

Lab ID: 20-C325  
Client ID: Vent 4  
Site: Bldg 11  
Sample Date: 12/14/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter<br>Conc. | DL       |
|---------|--------------------|----------|
| IC      |                    |          |
| Cr VI   | 1.06               | 0.000200 |

---

Lab ID: 20-C326  
Client ID: Vent 7  
Site: Bldg 11  
Sample Date: 12/15/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter<br>Conc. | DL       |
|---------|--------------------|----------|
| IC      |                    |          |
| Cr VI   | 0.721              | 0.000200 |

---

Lab ID: 20-C327  
Client ID: Vent 5  
Site: Bldg 11  
Sample Date: 12/15/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter<br>Conc. | DL       |
|---------|--------------------|----------|
| IC      |                    |          |
| Cr VI   | 7.70               | 0.000200 |

---

Lab ID: 20-C328  
Client ID: Vent 8  
Site: Bldg 11  
Sample Date: 12/16/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter<br>Conc. | DL       |
|---------|--------------------|----------|
| IC      |                    |          |
| Cr VI   | 7.90               | 0.000200 |

---

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Client: B020 - Bison Engineering  
Report Number: 20-513

---

Lab ID: 20-C329  
Client ID: Vent 9  
Site: Bldg 11  
Sample Date: 12/16/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter<br>Conc. | DL       |
|---------|--------------------|----------|
| IC      |                    |          |
| Cr VI   | 0.568              | 0.000200 |

---

Lab ID: 20-C330  
Client ID: Vent 5  
Site: Bldg 11  
Sample Date: 12/17/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter<br>Conc. | DL       |
|---------|--------------------|----------|
| IC      |                    |          |
| Cr VI   | 5.56               | 0.000200 |

---

Lab ID: 20-C331  
Client ID: Vent 8  
Site: Bldg 11  
Sample Date: 12/17/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter<br>Conc. | DL       |
|---------|--------------------|----------|
| IC      |                    |          |
| Cr VI   | 0.361              | 0.000200 |

---

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Client: B020 - Bison Engineering  
Report Number: 20-513

---

Lab ID: 20-S2311  
Client ID: Run 2 Cont #1  
Source: BH1  
Sample Date: 12/14/20  
Comments: Diluted 5x  
Sample Volume: 410. mL

| Analyte | $\mu\text{g/L}$ |       | $\mu\text{g/sample}$ |        |
|---------|-----------------|-------|----------------------|--------|
|         | Conc.           | DL    | Conc.                | DL     |
| Cr VI   | 1.06            | 0.050 | 0.433                | 0.0205 |

---

Lab ID: 20-S2312  
Client ID: Run 3 Cont #1  
Source: BH1  
Sample Date: 12/15/20  
Comments: Diluted 5x  
Sample Volume: 467. mL

| Analyte | $\mu\text{g/L}$ |       | $\mu\text{g/sample}$ |        |
|---------|-----------------|-------|----------------------|--------|
|         | Conc.           | DL    | Conc.                | DL     |
| Cr VI   | 1.81            | 0.050 | 0.845                | 0.0234 |

---

Lab ID: 20-S2313  
Client ID: Run 2 Cont #1  
Source: BH2  
Sample Date: 12/14/20  
Comments: Diluted 2x  
Sample Volume: 380. mL

| Analyte | $\mu\text{g/L}$ |       | $\mu\text{g/sample}$ |        |
|---------|-----------------|-------|----------------------|--------|
|         | Conc.           | DL    | Conc.                | DL     |
| Cr VI   | 0.180           | 0.020 | 0.0684               | 0.0076 |

---

Lab ID: 20-S2314  
Client ID: Run 3 Cont #1  
Source: BH2  
Sample Date: 12/15/20  
Comments: Diluted 2x  
Sample Volume: 450. mL

| Analyte | $\mu\text{g/L}$ |       | $\mu\text{g/sample}$ |        |
|---------|-----------------|-------|----------------------|--------|
|         | Conc.           | DL    | Conc.                | DL     |
| Cr VI   | 0.0660          | 0.020 | 0.0297               | 0.0090 |

---

Lab ID: 20-S2315  
Client ID: Stainless Cont. 1  
Source: BH1  
Sample Date: 12/17/20  
Sample Volume: 540. mL

| Analyte | $\mu\text{g/L}$ |       | $\mu\text{g/sample}$ |        |
|---------|-----------------|-------|----------------------|--------|
|         | Conc.           | DL    | Conc.                | DL     |
| Cr VI   | 1.70            | 0.010 | 0.915                | 0.0054 |

---

Analysis performed by: **CHESTER LabNet**

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**Bison Engineering**  
**Project: SLR220430**  
**EPA Method 201A Data - Report # 20-513**

| Sample ID | Client ID        | Source | Sample Date | Sample Volume (mL) | Net Weight (mg)     |        | Comments |
|-----------|------------------|--------|-------------|--------------------|---------------------|--------|----------|
|           |                  |        |             |                    | Acetone Probe Rinse | Filter |          |
| Lab_Bl    |                  |        |             |                    | -0.04               |        |          |
| Meth_Bl   |                  |        |             |                    | -0.01               |        |          |
| 20-S2316  | R1 PM2.5 Acetone | BH-1   | 12/16/20    | 75                 | 2.12                |        |          |
| 20-S2317  | R1 PM10 Acetone  | BH-1   | 12/16/20    | 89                 | 0.88                |        |          |
| 20-U442   | R1 PM2.5 Filter  | BH-1   | 12/16/20    |                    |                     | 0.09   |          |
| 20-S2318  | R2 PM2.5 Acetone | BH-1   | 12/16/20    | 74                 | 0.61                |        |          |
| 20-S2319  | R2 PM10 Acetone  | BH-1   | 12/16/20    | 64                 | 0.69                |        |          |
| 20-U443   | R2 PM2.5 Filter  | BH-1   | 12/16/20    |                    |                     | 0.22   |          |
| 20-S2320  | R3 PM2.5 Acetone | BH-1   | 12/16/20    | 72                 | 0.24                |        |          |
| 20-S2321  | R3 PM10 Acetone  | BH-1   | 12/16/20    | 68                 | 0.65                |        |          |
| 20-U444   | R3 PM2.5 Filter  | BH-1   | 12/16/20    |                    |                     | 0.21   |          |
| 20-S2322  | R1 PM2.5 Acetone | BH-2   | 12/16/20    | 64                 | 1.40                |        |          |
| 20-S2323  | R1 PM10 Acetone  | BH-2   | 12/16/20    | 61                 | 0.21                |        |          |
| 20-U445   | R1 PM2.5 Filter  | BH-2   | 12/16/20    |                    |                     | -1.94  |          |
| 20-S2324  | R2 PM2.5 Acetone | BH-2   | 12/16/20    | 61                 | 0.54                |        |          |
| 20-S2325  | R2 PM10 Acetone  | BH-2   | 12/16/20    | 70                 | -0.05               |        |          |
| 20-U446   | R2 PM2.5 Filter  | BH-2   | 12/16/20    |                    |                     | -0.47  |          |
| 20-S2326  | R3 PM2.5 Acetone | BH-2   | 12/16/20    | 55                 | 0.11                |        |          |
| 20-S2327  | R3 PM10 Acetone  | BH-2   | 12/16/20    | 80                 | 0.21                |        |          |
| 20-U447   | R3 PM2.5 Filter  | BH-2   | 12/16/20    |                    |                     | 0.08   |          |

**Bison Engineering**  
**Project: SLR220430**  
**ODEQ Method 5 Data - Report # 20-513**

| Sample ID | Client ID            | Source | Sample Date | Sample Volume (mL) | Net Weight (mg) |        | Aqueous Phase | Organic Phase | Comments                   |
|-----------|----------------------|--------|-------------|--------------------|-----------------|--------|---------------|---------------|----------------------------|
|           |                      |        |             |                    | Acetone         | Filter |               |               |                            |
| Lab_Bl    |                      |        |             |                    | -0.02           |        |               |               |                            |
| Meth_Bl   |                      |        |             |                    | -0.29           |        |               |               |                            |
| Lab_Bl    |                      |        |             |                    |                 |        | -0.16         | 0.09          |                            |
| Meth_Bl   |                      |        |             |                    |                 |        | 0.70          | 0.13          |                            |
| 20-U205   | M5 R1 Filter         | BH-2   | 12/16/20    |                    |                 | -0.01  |               |               |                            |
| 20-S2328  | R1 Cont 2 FH Acetone | BH-2   | 12/16/20    | 97                 | -0.02           |        |               |               |                            |
| 20-S2329  | R1-Cont 4 H2O        | BH-2   | 12/16/20    | 256                |                 |        | 2.05          | 0.30          |                            |
| 20-S2330  | R1-Cont 5 BH Acetone | BH-2   | 12/16/20    | 94                 | 0.58            |        |               |               |                            |
| 20-U206   | M5 R2 Filter         | BH-2   | 12/16/20    |                    |                 | -1.04  |               |               |                            |
| 20-S2331  | R2 Cont 2 FH Acetone | BH-2   | 12/16/20    | 89                 | 1.19            |        |               |               |                            |
| 20-S2332  | R2-Cont 4 H2O        | BH-2   | 12/16/20    | 260                |                 |        | 4.74          | 0.27          |                            |
| 20-S2333  | R2-Cont 5 BH Acetone | BH-2   | 12/16/20    | 128                | 0.48            |        |               |               |                            |
| 20-U207   | M5 R3 Filter         | BH-2   | 12/16/20    |                    |                 | -1.08  |               |               |                            |
| 20-S2334  | R3 Cont 2 FH Acetone | BH-2   | 12/16/20    | 141                | 0.74            |        |               |               |                            |
| 20-S2335  | R3-Cont 4 H2O        | BH-2   | 12/16/20    | 257                |                 |        | 3.68          | 0.64          |                            |
| 20-S2336  | R3-Cont 5 BH Acetone | BH-2   | 12/16/20    | 102                | 1.90            |        |               |               |                            |
| 20-S2337  | Acetone Blank        | BH-2   | 12/16/20    | 170                | 0.45            |        |               |               |                            |
| 20-S2338  | Water Blank          | BH-2   | 12/16/20    | 216                |                 |        | 0.26          |               |                            |
| 20-U209   | M5 R1 Filter         | BH-1   | 12/16/20    |                    |                 | -0.72  |               |               |                            |
| 20-S2339  | R1 Cont 2 FH Acetone | BH-1   | 12/16/20    | 95                 | 1.46            |        |               |               |                            |
| 20-S2340  | R1-Cont 4 H2O        | BH-1   | 12/16/20    | 231                |                 |        | 5.01          | 0.43          | some of the sample spilled |
| 20-S2341  | R1-Cont 5 BH Acetone | BH-1   | 12/16/20    | 116                | 1.38            |        |               |               |                            |
| 20-U210   | M5 R2 Filter         | BH-1   | 12/16/20    |                    |                 | -0.75  |               |               |                            |
| 20-S2342  | R2 Cont 2 FH Acetone | BH-1   | 12/16/20    | 114                | 0.82            |        |               |               |                            |
| 20-S2343  | R2-Cont 4 H2O        | BH-1   | 12/16/20    | 303                |                 |        | 3.80          | 0.87          |                            |
| 20-S2344  | R2-Cont 5 BH Acetone | BH-1   | 12/16/20    | 161                | 1.11            |        |               |               |                            |
| 20-U211   | M5 R3 Filter         | BH-1   | 12/16/20    |                    |                 | -0.74  |               |               |                            |
| 20-S2345  | R3 Cont 2 FH Acetone | BH-1   | 12/16/20    | 119                | 0.29            |        |               |               |                            |
| 20-S2346  | R3-Cont 4 H2O        | BH-1   | 12/16/20    | 286                |                 |        | 5.30          | 0.44          |                            |
| 20-S2347  | R3-Cont 5 BH Acetone | BH-1   | 12/16/20    | 139                | 0.76            |        |               |               |                            |

Some of the water from sample 20-S2340 spilled while draining from the separatory funnel during the DCM extraction. Received volume was 285 mL and only 231 mL of water was remaining after the spill.

Client: B020 - Bison Engineering  
Report Number: 20-513

Lab ID: 20-S2348  
Client ID: R1 Cont. 1 & 3  
Source: BH-1  
Sample Date: 12/16/20

Note: Actual sample dates were  
12/10/20-12/11/20. Sample was  
delivered to Chester LabNet on  
12/16/20.

| Analyte         | Result | DL    | Units     |
|-----------------|--------|-------|-----------|
| Aluminum, ICP   | 114.   | 3.75  | µg/sample |
| Antimony, ICP   | < DL   | 1.25  | µg/sample |
| Arsenic, ICP    | 4.26   | 1.75  | µg/sample |
| Barium, ICP     | 2.32   | 0.125 | µg/sample |
| Beryllium, ICP  | < DL   | 0.050 | µg/sample |
| Cadmium, ICP    | 0.258  | 0.100 | µg/sample |
| Chromium, ICP   | 23.6   | 0.200 | µg/sample |
| Cobalt, ICP     | < DL   | 0.125 | µg/sample |
| Copper, ICP     | 5.00   | 1.25  | µg/sample |
| Lead, ICP       | 1.89   | 1.25  | µg/sample |
| Manganese, ICP  | 185.   | 0.075 | µg/sample |
| Nickel, ICP     | 4.77   | 0.750 | µg/sample |
| Phosphorus, ICP | 14.1   | 5.00  | µg/sample |
| Selenium, ICP   | < DL   | 3.75  | µg/sample |
| Silver, ICP     | < DL   | 0.500 | µg/sample |
| Thallium, ICP   | < DL   | 2.50  | µg/sample |
| Vanadium, ICP   | 0.590  | 0.250 | µg/sample |
| Zinc, ICP       | 15.5   | 0.750 | µg/sample |

(LED-Bison 1/28/21)

Lab ID: 20-S2349  
Client ID: R1 Cont. 4  
Source: BH-1  
Sample Date: 12/16/20

Note: Actual sample dates were  
12/10/20-12/11/20. Sample was  
delivered to Chester LabNet on  
12/16/20.

| Analyte         | Result | DL    | Units     |
|-----------------|--------|-------|-----------|
| Aluminum, ICP   | 19.6   | 1.50  | µg/sample |
| Antimony, ICP   | < DL   | 0.500 | µg/sample |
| Arsenic, ICP    | < DL   | 0.700 | µg/sample |
| Barium, ICP     | 4.83   | 0.050 | µg/sample |
| Beryllium, ICP  | < DL   | 0.020 | µg/sample |
| Cadmium, ICP    | < DL   | 0.040 | µg/sample |
| Chromium, ICP   | 0.700  | 0.080 | µg/sample |
| Cobalt, ICP     | < DL   | 0.050 | µg/sample |
| Copper, ICP     | 3.67   | 0.500 | µg/sample |
| Lead, ICP       | 0.724  | 0.500 | µg/sample |
| Manganese, ICP  | 3.24   | 0.030 | µg/sample |
| Nickel, ICP     | 0.503  | 0.300 | µg/sample |
| Phosphorus, ICP | 4.43   | 2.00  | µg/sample |
| Selenium, ICP   | < DL   | 1.50  | µg/sample |
| Silver, ICP     | < DL   | 0.200 | µg/sample |
| Thallium, ICP   | < DL   | 1.00  | µg/sample |
| Vanadium, ICP   | < DL   | 0.100 | µg/sample |
| Zinc, ICP       | 3.51   | 0.300 | µg/sample |

(LED-Bison 1/28/21)

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Client: B020 - Bison Engineering  
Report Number: 20-513

Lab ID: 20-S2350  
Client ID: R2 Cont. 1 & 3  
Source: BH-1  
Sample Date: 12/16/20

Note: Actual sample dates were 12/14/20-12/15/20. Sample was delivered to Chester LabNet on 12/16/20.

(LED-Bison 1/28/21)

| Analyte         | Result | DL    | Units     |
|-----------------|--------|-------|-----------|
| Aluminum, ICP   | 105.   | 3.75  | µg/sample |
| Antimony, ICP   | < DL   | 1.25  | µg/sample |
| Arsenic, ICP    | 5.28   | 1.75  | µg/sample |
| Barium, ICP     | 1.57   | 0.125 | µg/sample |
| Beryllium, ICP  | < DL   | 0.050 | µg/sample |
| Cadmium, ICP    | 0.110  | 0.100 | µg/sample |
| Chromium, ICP   | 6.86   | 0.200 | µg/sample |
| Cobalt, ICP     | < DL   | 0.125 | µg/sample |
| Copper, ICP     | 3.20   | 1.25  | µg/sample |
| Lead, ICP       | 1.48   | 1.25  | µg/sample |
| Manganese, ICP  | 52.2   | 0.075 | µg/sample |
| Nickel, ICP     | 1.63   | 0.750 | µg/sample |
| Phosphorus, ICP | 9.28   | 5.00  | µg/sample |
| Selenium, ICP   | < DL   | 3.75  | µg/sample |
| Silver, ICP     | < DL   | 0.500 | µg/sample |
| Thallium, ICP   | < DL   | 2.50  | µg/sample |
| Vanadium, ICP   | < DL   | 0.250 | µg/sample |
| Zinc, ICP       | 6.56   | 0.750 | µg/sample |

Lab ID: 20-S2351  
Client ID: R2 Cont. 4  
Source: BH-1  
Sample Date: 12/16/20

Note: Actual sample dates were 12/14/20-12/15/20. Sample was delivered to Chester LabNet on 12/16/20.

(LED-Bison 1/28/21)

| Analyte         | Result | DL    | Units     |
|-----------------|--------|-------|-----------|
| Aluminum, ICP   | 10.5   | 1.50  | µg/sample |
| Antimony, ICP   | 0.507  | 0.500 | µg/sample |
| Arsenic, ICP    | < DL   | 0.700 | µg/sample |
| Barium, ICP     | 0.961  | 0.050 | µg/sample |
| Beryllium, ICP  | < DL   | 0.020 | µg/sample |
| Cadmium, ICP    | < DL   | 0.040 | µg/sample |
| Chromium, ICP   | 0.592  | 0.080 | µg/sample |
| Cobalt, ICP     | < DL   | 0.050 | µg/sample |
| Copper, ICP     | 4.19   | 0.500 | µg/sample |
| Lead, ICP       | 1.07   | 0.500 | µg/sample |
| Manganese, ICP  | 3.10   | 0.030 | µg/sample |
| Nickel, ICP     | 0.484  | 0.300 | µg/sample |
| Phosphorus, ICP | < DL   | 2.00  | µg/sample |
| Selenium, ICP   | < DL   | 1.50  | µg/sample |
| Silver, ICP     | < DL   | 0.200 | µg/sample |
| Thallium, ICP   | < DL   | 1.00  | µg/sample |
| Vanadium, ICP   | < DL   | 0.100 | µg/sample |
| Zinc, ICP       | 13.4   | 0.300 | µg/sample |

Analysis performed by: **CHESTER LabNet**

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Lab ID: 20-S2352  
Client ID: R3 Cont. 1 & 3  
Source: BH-1  
Sample Date: 12/16/20

| Analyte         | Result | DL    | Units     |
|-----------------|--------|-------|-----------|
| Aluminum, ICP   | 117.   | 3.75  | µg/sample |
| Antimony, ICP   | < DL   | 1.25  | µg/sample |
| Arsenic, ICP    | 4.14   | 1.75  | µg/sample |
| Barium, ICP     | 2.30   | 0.125 | µg/sample |
| Beryllium, ICP  | 0.056  | 0.050 | µg/sample |
| Cadmium, ICP    | 0.233  | 0.100 | µg/sample |
| Chromium, ICP   | 40.2   | 0.200 | µg/sample |
| Cobalt, ICP     | < DL   | 0.125 | µg/sample |
| Copper, ICP     | 6.28   | 1.25  | µg/sample |
| Lead, ICP       | 2.51   | 1.25  | µg/sample |
| Manganese, ICP  | 341.   | 0.075 | µg/sample |
| Nickel, ICP     | 7.21   | 0.750 | µg/sample |
| Phosphorus, ICP | 20.7   | 5.00  | µg/sample |
| Selenium, ICP   | < DL   | 3.75  | µg/sample |
| Silver, ICP     | < DL   | 0.500 | µg/sample |
| Thallium, ICP   | < DL   | 2.50  | µg/sample |
| Vanadium, ICP   | 0.715  | 0.250 | µg/sample |
| Zinc, ICP       | 25.9   | 0.750 | µg/sample |

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Lab ID: 20-S2353  
Client ID: R3 Cont. 4  
Source: BH-1  
Sample Date: 12/16/20

| Analyte         | Result | DL    | Units     |
|-----------------|--------|-------|-----------|
| Aluminum, ICP   | 18.4   | 1.50  | µg/sample |
| Antimony, ICP   | < DL   | 0.500 | µg/sample |
| Arsenic, ICP    | < DL   | 0.700 | µg/sample |
| Barium, ICP     | 0.927  | 0.050 | µg/sample |
| Beryllium, ICP  | < DL   | 0.020 | µg/sample |
| Cadmium, ICP    | < DL   | 0.040 | µg/sample |
| Chromium, ICP   | 0.527  | 0.080 | µg/sample |
| Cobalt, ICP     | 0.103  | 0.050 | µg/sample |
| Copper, ICP     | 2.45   | 0.500 | µg/sample |
| Lead, ICP       | 0.746  | 0.500 | µg/sample |
| Manganese, ICP  | 2.85   | 0.030 | µg/sample |
| Nickel, ICP     | 0.420  | 0.300 | µg/sample |
| Phosphorus, ICP | < DL   | 2.00  | µg/sample |
| Selenium, ICP   | < DL   | 1.50  | µg/sample |
| Silver, ICP     | < DL   | 0.200 | µg/sample |
| Thallium, ICP   | < DL   | 1.00  | µg/sample |
| Vanadium, ICP   | < DL   | 0.100 | µg/sample |
| Zinc, ICP       | 7.18   | 0.300 | µg/sample |

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Client: B020 - Bison Engineering  
Report Number: 20-513

Lab ID: 20-S2359  
Client ID: R1 Cont. 1 & 3  
Source: BH-2  
Sample Date: 12/16/20

Note: Actual sample dates were 12/10/20-12/11/20. Sample was delivered to Chester LabNet on 12/16/20.

| Analyte         | Result | DL    | Units     |
|-----------------|--------|-------|-----------|
| Aluminum, ICP   | 122.   | 3.75  | µg/sample |
| Antimony, ICP   | < DL   | 1.25  | µg/sample |
| Arsenic, ICP    | 3.05   | 1.75  | µg/sample |
| Barium, ICP     | 2.18   | 0.125 | µg/sample |
| Beryllium, ICP  | < DL   | 0.050 | µg/sample |
| Cadmium, ICP    | 0.486  | 0.100 | µg/sample |
| Chromium, ICP   | 2.82   | 0.200 | µg/sample |
| Cobalt, ICP     | < DL   | 0.125 | µg/sample |
| Copper, ICP     | 3.43   | 1.25  | µg/sample |
| Lead, ICP       | 1.88   | 1.25  | µg/sample |
| Manganese, ICP  | 150.   | 0.075 | µg/sample |
| Nickel, ICP     | 0.922  | 0.750 | µg/sample |
| Phosphorus, ICP | 12.6   | 5.00  | µg/sample |
| Selenium, ICP   | < DL   | 3.75  | µg/sample |
| Silver, ICP     | < DL   | 0.500 | µg/sample |
| Thallium, ICP   | < DL   | 2.50  | µg/sample |
| Vanadium, ICP   | < DL   | 0.250 | µg/sample |
| Zinc, ICP       | 9.29   | 0.750 | µg/sample |

(LED-Bison 1/28/21)

Lab ID: 20-S2360  
Client ID: R1 Cont. 4  
Source: BH-2  
Sample Date: 12/16/20

Note: Actual sample dates were 12/10/20-12/11/20. Sample was delivered to Chester LabNet on 12/16/20.

| Analyte         | Result | DL    | Units     |
|-----------------|--------|-------|-----------|
| Aluminum, ICP   | 35.1   | 1.50  | µg/sample |
| Antimony, ICP   | 1.04   | 0.500 | µg/sample |
| Arsenic, ICP    | < DL   | 0.700 | µg/sample |
| Barium, ICP     | 1.44   | 0.050 | µg/sample |
| Beryllium, ICP  | < DL   | 0.020 | µg/sample |
| Cadmium, ICP    | < DL   | 0.040 | µg/sample |
| Chromium, ICP   | 0.783  | 0.080 | µg/sample |
| Cobalt, ICP     | 0.778  | 0.050 | µg/sample |
| Copper, ICP     | 5.47   | 0.500 | µg/sample |
| Lead, ICP       | 1.17   | 0.500 | µg/sample |
| Manganese, ICP  | 3.41   | 0.030 | µg/sample |
| Nickel, ICP     | 0.428  | 0.300 | µg/sample |
| Phosphorus, ICP | < DL   | 2.00  | µg/sample |
| Selenium, ICP   | < DL   | 1.50  | µg/sample |
| Silver, ICP     | < DL   | 0.200 | µg/sample |
| Thallium, ICP   | < DL   | 1.00  | µg/sample |
| Vanadium, ICP   | < DL   | 0.100 | µg/sample |
| Zinc, ICP       | 5.36   | 0.300 | µg/sample |

(LED-Bison 1/28/21)

Analysis performed by: **CHESTER LabNet**

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Lab ID: 20-S2361  
Client ID: R2 Cont. 1 & 3  
Source: BH-2  
Sample Date: 12/16/20

Note: Actual sample dates were 12/14/20-12/15/20. Sample was delivered to Chester LabNet on 12/16/20.

(LED-Bison 1/28/21)

| Analyte         | Result | DL    | Units     |
|-----------------|--------|-------|-----------|
| Aluminum, ICP   | 182.   | 3.75  | µg/sample |
| Antimony, ICP   | < DL   | 1.25  | µg/sample |
| Arsenic, ICP    | 5.24   | 1.75  | µg/sample |
| Barium, ICP     | 3.42   | 0.125 | µg/sample |
| Beryllium, ICP  | < DL   | 0.050 | µg/sample |
| Cadmium, ICP    | 0.434  | 0.100 | µg/sample |
| Chromium, ICP   | 2.94   | 0.200 | µg/sample |
| Cobalt, ICP     | < DL   | 0.125 | µg/sample |
| Copper, ICP     | 3.41   | 1.25  | µg/sample |
| Lead, ICP       | 2.46   | 1.25  | µg/sample |
| Manganese, ICP  | 137.   | 0.075 | µg/sample |
| Nickel, ICP     | 0.991  | 0.750 | µg/sample |
| Phosphorus, ICP | 15.6   | 5.00  | µg/sample |
| Selenium, ICP   | 6.04   | 3.75  | µg/sample |
| Silver, ICP     | < DL   | 0.500 | µg/sample |
| Thallium, ICP   | < DL   | 2.50  | µg/sample |
| Vanadium, ICP   | < DL   | 0.250 | µg/sample |
| Zinc, ICP       | 16.7   | 0.750 | µg/sample |

Lab ID: 20-S2362  
Client ID: R2 Cont. 4  
Source: BH-2  
Sample Date: 12/16/20

Note: Actual sample dates were 12/14/20-12/15/20. Sample was delivered to Chester LabNet on 12/16/20.

(LED-Bison 1/28/21)

| Analyte         | Result | DL    | Units     |
|-----------------|--------|-------|-----------|
| Aluminum, ICP   | 24.4   | 1.50  | µg/sample |
| Antimony, ICP   | < DL   | 0.500 | µg/sample |
| Arsenic, ICP    | < DL   | 0.700 | µg/sample |
| Barium, ICP     | 2.01   | 0.050 | µg/sample |
| Beryllium, ICP  | < DL   | 0.020 | µg/sample |
| Cadmium, ICP    | < DL   | 0.040 | µg/sample |
| Chromium, ICP   | 0.688  | 0.080 | µg/sample |
| Cobalt, ICP     | 0.629  | 0.050 | µg/sample |
| Copper, ICP     | 2.97   | 0.500 | µg/sample |
| Lead, ICP       | 0.681  | 0.500 | µg/sample |
| Manganese, ICP  | 3.56   | 0.030 | µg/sample |
| Nickel, ICP     | 0.666  | 0.300 | µg/sample |
| Phosphorus, ICP | < DL   | 2.00  | µg/sample |
| Selenium, ICP   | < DL   | 1.50  | µg/sample |
| Silver, ICP     | < DL   | 0.200 | µg/sample |
| Thallium, ICP   | < DL   | 1.00  | µg/sample |
| Vanadium, ICP   | < DL   | 0.100 | µg/sample |
| Zinc, ICP       | 6.53   | 0.300 | µg/sample |

Client: B020 - Bison Engineering  
Report Number: 20-513

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Lab ID: 20-S2363  
Client ID: R3 Cont. 1 & 3  
Source: BH-2  
Sample Date: 12/16/20

| Analyte         | Result | DL    | Units     |
|-----------------|--------|-------|-----------|
| Aluminum, ICP   | 115.   | 3.75  | µg/sample |
| Antimony, ICP   | < DL   | 1.25  | µg/sample |
| Arsenic, ICP    | 3.06   | 1.75  | µg/sample |
| Barium, ICP     | 1.48   | 0.125 | µg/sample |
| Beryllium, ICP  | < DL   | 0.050 | µg/sample |
| Cadmium, ICP    | 0.292  | 0.100 | µg/sample |
| Chromium, ICP   | 2.31   | 0.200 | µg/sample |
| Cobalt, ICP     | < DL   | 0.125 | µg/sample |
| Copper, ICP     | 3.05   | 1.25  | µg/sample |
| Lead, ICP       | 1.44   | 1.25  | µg/sample |
| Manganese, ICP  | 104.   | 0.075 | µg/sample |
| Nickel, ICP     | 0.772  | 0.750 | µg/sample |
| Phosphorus, ICP | 13.8   | 5.00  | µg/sample |
| Selenium, ICP   | < DL   | 3.75  | µg/sample |
| Silver, ICP     | < DL   | 0.500 | µg/sample |
| Thallium, ICP   | < DL   | 2.50  | µg/sample |
| Vanadium, ICP   | < DL   | 0.250 | µg/sample |
| Zinc, ICP       | 11.9   | 0.750 | µg/sample |

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Lab ID: 20-S2364  
Client ID: R3 Cont. 4  
Source: BH-2  
Sample Date: 12/16/20

| Analyte         | Result | DL    | Units     |
|-----------------|--------|-------|-----------|
| Aluminum, ICP   | 39.9   | 1.50  | µg/sample |
| Antimony, ICP   | 0.742  | 0.500 | µg/sample |
| Arsenic, ICP    | < DL   | 0.700 | µg/sample |
| Barium, ICP     | 0.976  | 0.050 | µg/sample |
| Beryllium, ICP  | < DL   | 0.020 | µg/sample |
| Cadmium, ICP    | < DL   | 0.040 | µg/sample |
| Chromium, ICP   | 0.600  | 0.080 | µg/sample |
| Cobalt, ICP     | < DL   | 0.050 | µg/sample |
| Copper, ICP     | 3.26   | 0.500 | µg/sample |
| Lead, ICP       | 0.823  | 0.500 | µg/sample |
| Manganese, ICP  | 2.26   | 0.030 | µg/sample |
| Nickel, ICP     | 0.352  | 0.300 | µg/sample |
| Phosphorus, ICP | < DL   | 2.00  | µg/sample |
| Selenium, ICP   | < DL   | 1.50  | µg/sample |
| Silver, ICP     | < DL   | 0.200 | µg/sample |
| Thallium, ICP   | < DL   | 1.00  | µg/sample |
| Vanadium, ICP   | < DL   | 0.100 | µg/sample |
| Zinc, ICP       | 9.37   | 0.300 | µg/sample |

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Analysis performed by: **CHESTER LabNet**

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Lab ID: 20-S2354  
Client ID: SM Cont. 1 & 3  
Source: BH-1  
Sample Date: 12/17/20

| Analyte         | Result | DL    | Units     |
|-----------------|--------|-------|-----------|
| Aluminum, ICP   | 112.   | 3.75  | µg/sample |
| Antimony, ICP   | < DL   | 1.25  | µg/sample |
| Arsenic, ICP    | 6.04   | 1.75  | µg/sample |
| Barium, ICP     | 2.02   | 0.125 | µg/sample |
| Beryllium, ICP  | < DL   | 0.050 | µg/sample |
| Cadmium, ICP    | 0.152  | 0.100 | µg/sample |
| Chromium, ICP   | 18.7   | 0.200 | µg/sample |
| Cobalt, ICP     | < DL   | 0.125 | µg/sample |
| Copper, ICP     | 3.32   | 1.25  | µg/sample |
| Lead, ICP       | 3.73   | 1.25  | µg/sample |
| Manganese, ICP  | 69.9   | 0.075 | µg/sample |
| Nickel, ICP     | 6.96   | 0.750 | µg/sample |
| Phosphorus, ICP | 15.7   | 5.00  | µg/sample |
| Selenium, ICP   | < DL   | 3.75  | µg/sample |
| Silver, ICP     | < DL   | 0.500 | µg/sample |
| Thallium, ICP   | < DL   | 2.50  | µg/sample |
| Vanadium, ICP   | 0.259  | 0.250 | µg/sample |
| Zinc, ICP       | 7.77   | 0.750 | µg/sample |

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Lab ID: 20-S2355  
Client ID: SM Cont. 4  
Source: BH-1  
Sample Date: 12/17/20

| Analyte         | Result | DL    | Units     |
|-----------------|--------|-------|-----------|
| Aluminum, ICP   | 18.1   | 1.50  | µg/sample |
| Antimony, ICP   | < DL   | 0.500 | µg/sample |
| Arsenic, ICP    | < DL   | 0.700 | µg/sample |
| Barium, ICP     | 1.39   | 0.050 | µg/sample |
| Beryllium, ICP  | < DL   | 0.020 | µg/sample |
| Cadmium, ICP    | < DL   | 0.040 | µg/sample |
| Chromium, ICP   | 0.780  | 0.080 | µg/sample |
| Cobalt, ICP     | 0.265  | 0.050 | µg/sample |
| Copper, ICP     | 2.79   | 0.500 | µg/sample |
| Lead, ICP       | 0.961  | 0.500 | µg/sample |
| Manganese, ICP  | 6.32   | 0.030 | µg/sample |
| Nickel, ICP     | 0.651  | 0.300 | µg/sample |
| Phosphorus, ICP | 2.72   | 2.00  | µg/sample |
| Selenium, ICP   | < DL   | 1.50  | µg/sample |
| Silver, ICP     | < DL   | 0.200 | µg/sample |
| Thallium, ICP   | < DL   | 1.00  | µg/sample |
| Vanadium, ICP   | < DL   | 0.100 | µg/sample |
| Zinc, ICP       | 8.46   | 0.300 | µg/sample |

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Lab ID: 20-S2356  
Client ID: Cont 8a 0.1N HNO3 Blank

| Analyte         | Result | DL    | Units     |
|-----------------|--------|-------|-----------|
| Aluminum, ICP   | < DL   | 3.75  | µg/sample |
| Antimony, ICP   | < DL   | 1.25  | µg/sample |
| Arsenic, ICP    | < DL   | 1.75  | µg/sample |
| Barium, ICP     | 0.282  | 0.125 | µg/sample |
| Beryllium, ICP  | < DL   | 0.050 | µg/sample |
| Cadmium, ICP    | < DL   | 0.100 | µg/sample |
| Chromium, ICP   | < DL   | 0.200 | µg/sample |
| Cobalt, ICP     | < DL   | 0.125 | µg/sample |
| Copper, ICP     | < DL   | 1.25  | µg/sample |
| Lead, ICP       | 1.57   | 1.25  | µg/sample |
| Manganese, ICP  | 0.077  | 0.075 | µg/sample |
| Nickel, ICP     | < DL   | 0.750 | µg/sample |
| Phosphorus, ICP | < DL   | 5.00  | µg/sample |
| Selenium, ICP   | < DL   | 3.75  | µg/sample |
| Silver, ICP     | < DL   | 0.500 | µg/sample |
| Thallium, ICP   | < DL   | 2.50  | µg/sample |
| Vanadium, ICP   | < DL   | 0.250 | µg/sample |
| Zinc, ICP       | < DL   | 0.750 | µg/sample |

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Lab ID: 20-S2357  
Client ID: Cont 12 Filter Blank

| Analyte         | Result | DL    | Units     |
|-----------------|--------|-------|-----------|
| Aluminum, ICP   | 95.7   | 3.75  | µg/sample |
| Antimony, ICP   | < DL   | 1.25  | µg/sample |
| Arsenic, ICP    | 3.58   | 1.75  | µg/sample |
| Barium, ICP     | 0.917  | 0.125 | µg/sample |
| Beryllium, ICP  | < DL   | 0.050 | µg/sample |
| Cadmium, ICP    | 0.358  | 0.100 | µg/sample |
| Chromium, ICP   | 0.934  | 0.200 | µg/sample |
| Cobalt, ICP     | < DL   | 0.125 | µg/sample |
| Copper, ICP     | < DL   | 1.25  | µg/sample |
| Lead, ICP       | < DL   | 1.25  | µg/sample |
| Manganese, ICP  | 1.27   | 0.075 | µg/sample |
| Nickel, ICP     | < DL   | 0.750 | µg/sample |
| Phosphorus, ICP | 13.8   | 5.00  | µg/sample |
| Selenium, ICP   | < DL   | 3.75  | µg/sample |
| Silver, ICP     | < DL   | 0.500 | µg/sample |
| Thallium, ICP   | < DL   | 2.50  | µg/sample |
| Vanadium, ICP   | < DL   | 0.250 | µg/sample |
| Zinc, ICP       | 2.33   | 0.750 | µg/sample |

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Analysis performed by: **CHESTER LabNet**

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Client: B020 - Bison Engineering  
Report Number: 20-513

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Lab ID: 20-S2358  
Client ID: Cont 9 H2O2/HNO3 Blank

| Analyte         | Result | DL    | Units     |
|-----------------|--------|-------|-----------|
| Aluminum, ICP   | 6.36   | 1.50  | µg/sample |
| Antimony, ICP   | < DL   | 0.500 | µg/sample |
| Arsenic, ICP    | < DL   | 0.700 | µg/sample |
| Barium, ICP     | 0.586  | 0.050 | µg/sample |
| Beryllium, ICP  | < DL   | 0.020 | µg/sample |
| Cadmium, ICP    | < DL   | 0.040 | µg/sample |
| Chromium, ICP   | 0.377  | 0.080 | µg/sample |
| Cobalt, ICP     | < DL   | 0.050 | µg/sample |
| Copper, ICP     | 1.91   | 0.500 | µg/sample |
| Lead, ICP       | 0.814  | 0.500 | µg/sample |
| Manganese, ICP  | 0.256  | 0.030 | µg/sample |
| Nickel, ICP     | < DL   | 0.300 | µg/sample |
| Phosphorus, ICP | < DL   | 2.00  | µg/sample |
| Selenium, ICP   | < DL   | 1.50  | µg/sample |
| Silver, ICP     | < DL   | 0.200 | µg/sample |
| Thallium, ICP   | < DL   | 1.00  | µg/sample |
| Vanadium, ICP   | < DL   | 0.100 | µg/sample |
| Zinc, ICP       | 0.541  | 0.300 | µg/sample |

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Analysis performed by: **CHESTER LabNet**

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Client: B020 - Bison Engineering  
Report Number: 20-513

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Lab ID: 20-U423  
Client ID: Vent 1  
Source: Bldg 8  
Sample Date: 12/ 6/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter |       |
|---------|-----------|-------|
|         | Conc.     | DL    |
| ICP     |           |       |
| As      | < DL      | 1.75  |
| Cr      | 14.4      | 0.200 |
| Mn      | 849.      | 0.075 |
| Ni      | 6.02      | 0.750 |
| Pb      | 21.1      | 1.25  |

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Lab ID: 20-U424  
Client ID: Vent 7  
Source: Bldg 8  
Sample Date: 12/ 6/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter |       |
|---------|-----------|-------|
|         | Conc.     | DL    |
| ICP     |           |       |
| As      | < DL      | 1.75  |
| Cr      | 6.18      | 0.200 |
| Mn      | 474.      | 0.075 |
| Ni      | 3.41      | 0.750 |
| Pb      | 7.16      | 1.25  |

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Lab ID: 20-U430  
Client ID: Vent 9  
Source: Bldg 11  
Sample Date: 12/ 7/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter |       |
|---------|-----------|-------|
|         | Conc.     | DL    |
| ICP     |           |       |
| As      | < DL      | 1.75  |
| Cr      | 11.3      | 0.200 |
| Mn      | 792.      | 0.075 |
| Ni      | 20.6      | 0.750 |
| Pb      | 13.9      | 1.25  |

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Lab ID: 20-U429  
Client ID: Vent 8  
Source: Bldg 11  
Sample Date: 12/ 7/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter |       |
|---------|-----------|-------|
|         | Conc.     | DL    |
| ICP     |           |       |
| As      | < DL      | 1.75  |
| Cr      | 25.9      | 0.200 |
| Mn      | 614.      | 0.075 |
| Ni      | 34.6      | 0.750 |
| Pb      | 6.86      | 1.25  |

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Analysis performed by: **CHESTER LabNet**

12242 SW Garden Place ♦ Tigard, OR 97223 ♦ (503) 624-2183 ♦ [www.chesterlab.net](http://www.chesterlab.net)

Client: B020 - Bison Engineering  
Report Number: 20-513

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Lab ID: 20-U432  
Client ID: Vent 9  
Source: Bldg 11  
Sample Date: 12/ 8/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter |       |
|---------|-----------|-------|
|         | Conc.     | DL    |
| ICP     |           |       |
| As      | < DL      | 1.75  |
| Cr      | 0.850     | 0.200 |
| Mn      | 9.18      | 0.075 |
| Ni      | 2.30      | 0.750 |
| Pb      | < DL      | 1.25  |

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Lab ID: 20-U431  
Client ID: Vent 8  
Source: Bldg 11  
Sample Date: 12/ 8/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter |       |
|---------|-----------|-------|
|         | Conc.     | DL    |
| ICP     |           |       |
| As      | < DL      | 1.75  |
| Cr      | 28.9      | 0.200 |
| Mn      | 835.      | 0.075 |
| Ni      | 37.3      | 0.750 |
| Pb      | 11.2      | 1.25  |

---

Lab ID: 20-U427  
Client ID: Vent 5  
Source: Bldg 11  
Sample Date: 12/ 9/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter |       |
|---------|-----------|-------|
|         | Conc.     | DL    |
| ICP     |           |       |
| As      | < DL      | 1.75  |
| Cr      | 55.9      | 0.200 |
| Mn      | 2,910     | 0.075 |
| Ni      | 56.8      | 0.750 |
| Pb      | 26.0      | 1.25  |

---

Lab ID: 20-U428  
Client ID: Vent 7  
Source: Bldg 11  
Sample Date: 12/ 9/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter |       |
|---------|-----------|-------|
|         | Conc.     | DL    |
| ICP     |           |       |
| As      | < DL      | 1.75  |
| Cr      | 22.9      | 0.200 |
| Mn      | 1,120     | 0.075 |
| Ni      | 44.7      | 0.750 |
| Pb      | 11.1      | 1.25  |

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Client: B020 - Bison Engineering  
Report Number: 20-513

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Lab ID: 20-U434  
Client ID: Vent 4  
Source: Bldg 11  
Sample Date: 12/10/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter |       |
|---------|-----------|-------|
|         | Conc.     | DL    |
| ICP     |           |       |
| As      | < DL      | 1.75  |
| Cr      | 22.5      | 0.200 |
| Mn      | 1,750     | 0.075 |
| Ni      | 15.3      | 0.750 |
| Pb      | 11.7      | 1.25  |

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Lab ID: 20-U433  
Client ID: Vent 5  
Source: Bldg 11  
Sample Date: 12/10/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter |       |
|---------|-----------|-------|
|         | Conc.     | DL    |
| ICP     |           |       |
| As      | < DL      | 1.75  |
| Cr      | 55.9      | 0.200 |
| Mn      | 2,470     | 0.075 |
| Ni      | 47.2      | 0.750 |
| Pb      | 46.9      | 1.25  |

---

Lab ID: 20-U435  
Client ID: Vent 1  
Source: Bldg 8  
Sample Date: 12/13/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter |       |
|---------|-----------|-------|
|         | Conc.     | DL    |
| ICP     |           |       |
| As      | < DL      | 1.75  |
| Cr      | 31.8      | 0.200 |
| Mn      | 1,830     | 0.075 |
| Ni      | 5.58      | 0.750 |
| Pb      | 13.8      | 1.25  |

---

Lab ID: 20-U436  
Client ID: Vent 7  
Source: Bldg 8  
Sample Date: 12/13/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter |       |
|---------|-----------|-------|
|         | Conc.     | DL    |
| ICP     |           |       |
| As      | < DL      | 1.75  |
| Cr      | 7.89      | 0.200 |
| Mn      | 390.      | 0.075 |
| Ni      | 9.49      | 0.750 |
| Pb      | 3.03      | 1.25  |

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Analysis performed by: **CHESTER LabNet**

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Client: B020 - Bison Engineering  
Report Number: 20-513

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Lab ID: 20-U437  
Client ID: Vent 1  
Source: Bldg 11  
Sample Date: 12/14/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter |       |
|---------|-----------|-------|
|         | Conc.     | DL    |
| ICP     |           |       |
| As      | < DL      | 1.75  |
| Cr      | 32.9      | 0.200 |
| Mn      | 4,940     | 0.075 |
| Ni      | 8.56      | 0.750 |
| Pb      | 36.4      | 1.25  |

---

Lab ID: 20-U439  
Client ID: Vent 4  
Source: Bldg 11  
Sample Date: 12/14/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter |       |
|---------|-----------|-------|
|         | Conc.     | DL    |
| ICP     |           |       |
| As      | < DL      | 1.75  |
| Cr      | 14.2      | 0.200 |
| Mn      | 894.      | 0.075 |
| Ni      | 19.1      | 0.750 |
| Pb      | 6.65      | 1.25  |

---

Lab ID: 20-U438  
Client ID: Vent 7  
Source: Bldg 11  
Sample Date: 12/15/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter |       |
|---------|-----------|-------|
|         | Conc.     | DL    |
| ICP     |           |       |
| As      | < DL      | 1.75  |
| Cr      | 1.31      | 0.200 |
| Mn      | 49.0      | 0.075 |
| Ni      | 2.91      | 0.750 |
| Pb      | < DL      | 1.25  |

---

Lab ID: 20-U440  
Client ID: Vent 5  
Source: Bldg 11  
Sample Date: 12/15/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter |       |
|---------|-----------|-------|
|         | Conc.     | DL    |
| ICP     |           |       |
| As      | < DL      | 1.75  |
| Cr      | 47.7      | 0.200 |
| Mn      | 1,450     | 0.075 |
| Ni      | 23.0      | 0.750 |
| Pb      | 35.6      | 1.25  |

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Client: B020 - Bison Engineering  
Report Number: 20-513

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Lab ID: 20-U590  
Client ID: Vent 8  
Source: Bldg 11  
Sample Date: 12/16/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter |       |
|---------|-----------|-------|
|         | Conc.     | DL    |
| ICP     |           |       |
| As      | < DL      | 1.75  |
| Cr      | 192.      | 0.200 |
| Mn      | 1,440     | 0.075 |
| Ni      | 197.      | 0.750 |
| Pb      | 4.04      | 1.25  |

---

Lab ID: 20-U591  
Client ID: Vent 9  
Source: Bldg 11  
Sample Date: 12/16/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter |       |
|---------|-----------|-------|
|         | Conc.     | DL    |
| ICP     |           |       |
| As      | < DL      | 1.75  |
| Cr      | 1.13      | 0.200 |
| Mn      | 16.1      | 0.075 |
| Ni      | 3.57      | 0.750 |
| Pb      | < DL      | 1.25  |

---

Lab ID: 20-U592  
Client ID: Vent 5  
Source: Bldg 11  
Sample Date: 12/17/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter |       |
|---------|-----------|-------|
|         | Conc.     | DL    |
| ICP     |           |       |
| As      | < DL      | 1.75  |
| Cr      | 56.8      | 0.200 |
| Mn      | 1,740     | 0.075 |
| Ni      | 59.6      | 0.750 |
| Pb      | 23.9      | 1.25  |

---

Lab ID: 20-U593  
Client ID: Vent 8  
Source: Bldg 11  
Sample Date: 12/17/20  
Deposit Area: 13.9 cm<sup>2</sup>

| Analyte | µg/filter |       |
|---------|-----------|-------|
|         | Conc.     | DL    |
| ICP     |           |       |
| As      | < DL      | 1.75  |
| Cr      | 42.4      | 0.200 |
| Mn      | 2,510     | 0.075 |
| Ni      | 34.6      | 0.750 |
| Pb      | 4.32      | 1.25  |

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Analysis performed by: **CHESTER LabNet**

12242 SW Garden Place ♦ Tigard, OR 97223 ♦ (503) 624-2183 ♦ [www.chesterlab.net](http://www.chesterlab.net)

## QA/QC Report

Client Name: Bison Engineering  
 Project Number: B020  
 Analytical Technique: IC-PCR  
 Instrument: Dionex ICS-1100  
 Sample Description: 47mm Impregnated Cellulose  
 Report Number: 20-513  
 =====

### Blank Data

| Analyte | Sample ID | Measured Conc. µg/L | DL Conc. µg/L |
|---------|-----------|---------------------|---------------|
| Cr VI   | ICB       | < DL                | 0.020         |
| Cr VI   | Meth_Blk  | < DL                | 0.020         |
| Cr VI   | SM_Blk *  | < DL                | 0.200         |
| Cr VI   | CCB       | < DL                | 0.020         |
| Cr VI   | CCB       | < DL                | 0.020         |
| Cr VI   | CCB       | < DL                | 0.020         |
| Cr VI   | CCB       | < DL                | 0.020         |
| Cr VI   | CCB       | < DL                | 0.020         |

ICB: Initial Calibration Blank CCB: Continuing Calibration Blank

\*: Sample Media Blank (SM\_Blk) concentration in µg/filter

Method Blank is in control if Method Blank results are <10% of sample results

### Calibration QC

| Analyte | Sample ID | Standard Conc. µg/L | Measured Conc. µg/L | Percent Recovery |
|---------|-----------|---------------------|---------------------|------------------|
| Cr VI   | ICV       | 0.500               | 0.500               | 100.0            |
| Cr VI   | LL-LCS    | 0.050               | 0.051               | 102.0            |
| Cr VI   | CCV       | 0.500               | 0.491               | 98.2             |
| Cr VI   | CCV       | 0.500               | 0.490               | 98.0             |
| Cr VI   | CCV       | 0.500               | 0.492               | 98.4             |
| Cr VI   | CCV       | 0.500               | 0.498               | 99.6             |
| Cr VI   | CCV       | 0.500               | 0.494               | 98.8             |

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification

Calibration Verification Limits: 90% - 110% Recovery

LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery

LL-LCS Limits: 50% - 150% Recovery

LL-LCS results are not significant if sample results are >10x LL-LCS concentration

### Replicate Data

| Analyte | Sample ID | Sample Conc. µg/L | Replicate Conc. µg/L | RPD  |
|---------|-----------|-------------------|----------------------|------|
| Cr VI   | 20-C314   | 18.9              | 19.0                 | 0.26 |

$RPD = \frac{(sample - replicate)}{((sample + replicate) / 2)} \times 100$

N/C: RPD is not calculated when sample or replicate is below detection limit

Replicate Limit: 20% RPD

#: per EPA CIP protocol, control limits do not apply if sample and/or replicate concentration is less than 5x the detection limit

### Laboratory Control Sample/Matrix Post Spike Analysis

| Analyte | Sample ID | Sample Conc. µg/L | Spike Conc. µg/L | Spike Amount µg/L | Percent Recovery |
|---------|-----------|-------------------|------------------|-------------------|------------------|
| Cr VI   | LCS       | < 0.02            | 0.483            | 0.500             | 96.6             |
| Cr VI   | LCS-Int   | < 0.02            | 0.507            | 0.500             | 101.             |
| Cr VI   | 20-C315   | 35.9              | 86.8             | 50.0              | 102.             |

LCS Limit: 80% - 120% Recovery Spike Limit: 75% - 125% Recovery

#: per EPA CIP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

## QA/QC Report

Client Name: Bison Engineering  
Project Number: B020  
Analytical Technique: IC-PCR  
Instrument: Dionex ICS-1100  
Sample Description: 47mm Impregnated Cellulose  
Report Number: 20-513  
=====

### Interference Check LCS Data

| Analyte | Sample ID | Original Conc. µg/L | Replicate Conc. µg/L | RPD  |
|---------|-----------|---------------------|----------------------|------|
| Cr VI   | LCS-Int   | 0.483               | 0.507                | 4.85 |

Duplicate Limit: 20% RPD

$RPD = \frac{(\text{sample} - \text{duplicate})}{[(\text{sample} + \text{duplicate})/2]} \times 100$

This LCS was spiked with equal amounts Cr VI and Cr III and is indicative of interconversion between Cr III and Cr VI during extraction and/or analysis.

## QA/QC Report

Client Name: Bison Engineering  
Project Number: B020  
Analytical Technique: IC-PCR  
Sample Description: SW-846 0061  
Report Number: 20-513  
=====

### Blank Data

| Analyte | Sample ID | Measured Conc. µg/L | DL Conc. µg/L |
|---------|-----------|---------------------|---------------|
| Cr VI   | ICB       | < DL                | 0.010         |
| Cr VI   | CCB       | < DL                | 0.010         |
| Cr VI   | CCB       | < DL                | 0.010         |

\*: Sample Media Blank (SM\_Blk) concentration in µg/filter  
ICB: Initial Calibration Blank CCB: Continuing Calibration Blank  
Method Blank is in control if Method Blank results are <10% of sample results

### Calibration QC

| Analyte | Sample ID | Standard Conc. µg/L | Measured Conc. µg/L | Percent Recovery |
|---------|-----------|---------------------|---------------------|------------------|
| Cr VI   | ICV       | 0.500               | 0.491               | 98.2             |
| Cr VI   | LL-LCS    | 0.030               | 0.030               | 100.0            |
| Cr VI   | CCV       | 0.500               | 0.490               | 98.0             |
| Cr VI   | CCV       | 0.500               | 0.495               | 99.0             |

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification  
Calibration Verification Limits: 90% - 110% Recovery  
LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery  
LL-LCS Limits: 50% - 150% Recovery  
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

### Duplicate Data

| Analyte | Sample ID | Sample Conc. µg/L | Duplicate Conc. µg/L | RPD  |
|---------|-----------|-------------------|----------------------|------|
| Cr VI   | 20-S2311  | 1.06              | 1.09                 | 2.80 |

$RPD = \frac{(\text{sample} - \text{duplicate})}{((\text{sample} + \text{duplicate}) / 2)} \times 100$   
N/C: RPD is not calculated when sample or duplicate is below detection limit  
#: per EPA CLP protocol, control limits do not apply if sample and/or duplicate concentration is less than 5x the detection limit

### Laboratory Control Sample/Matrix Spike Analysis

| Analyte | Sample ID | Sample Conc. µg/L | Spike Conc. µg/L | Spike Amount µg/L | Percent Recovery |
|---------|-----------|-------------------|------------------|-------------------|------------------|
| Cr VI   | 20-S2312  | 1.81              | 4.27             | 2.50              | 98.4             |

\*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

**ION CHROMATOGRAPHY RAW DATA**

Available upon request

|                                                                |               |               |               |               |               |            |           |          |
|----------------------------------------------------------------|---------------|---------------|---------------|---------------|---------------|------------|-----------|----------|
| All masses in grams (g)                                        |               |               | M201A filter: | Bison 20-513  |               |            |           |          |
|                                                                |               |               |               |               |               |            |           |          |
| Sx ID                                                          | Tare          | Tare QC       | Tare - QC     | Gross         | Gross QC      | Gross - QC | Net Mass* | Net Mass |
| date/init:                                                     | 9/18/20 TP    | 9/25/20 TP    |               | 1/5/21 TMM    | 1/11/21 SM    |            |           | (mg)     |
| time:                                                          | 13:18         | 12:13         |               | 14:26         | 10:32         |            |           |          |
| Ambient                                                        |               |               |               |               |               |            |           |          |
| Rel. Humidity                                                  | 39.9%         | 36.8%         |               | 40.4%         | 38.3%         |            |           |          |
| Temp (C/F)                                                     | 22.5C / 72.5F | 22.7C / 72.9F |               | 21.3C / 70.3F | 20.8C / 69.4F |            |           |          |
| Desiccator                                                     |               |               |               |               |               |            |           |          |
| Rel. Humidity                                                  | 2.0%          | 2.0%          |               | 0.2%          | 0.2%          |            |           |          |
| Temp (C/F)                                                     | 22.4C / 72.3F | 22.3C / 72.1F |               | 20.9C / 69.6F | 20.4C / 68.7F |            |           |          |
| 0.10000g QC                                                    | 0.09999       | 0.09999       |               | 0.10000       | 0.10000       |            |           |          |
| 0.30000g QC                                                    | 0.30000       | 0.30004       |               | 0.30000       | 0.30000       |            |           |          |
| 0.50000g QC                                                    | 0.50003       | 0.49999       |               | 0.50001       | 0.50000       |            |           |          |
| 20-U442                                                        | 0.13432       | 0.13429       | 0.00003       | 0.13441       | 0.13410       | 0.00031    | 0.00009   | 0.09     |
| 20-U443                                                        | 0.14349       | 0.14343       | 0.00006       | 0.14371       | 0.14374       | -0.00003   | 0.00022   | 0.22     |
| 20-U444                                                        | 0.13420       | 0.13413       | 0.00007       | 0.13441       | 0.13435       | 0.00006    | 0.00021   | 0.21     |
| 20-U445                                                        | 0.13138       | 0.13130       | 0.00008       | 0.12944       | 0.12948       | -0.00004   | -0.00194  | -1.94    |
| 20-U446                                                        | 0.14697       | 0.14691       | 0.00006       | 0.14650       | 0.14631       | 0.00019    | -0.00047  | -0.47    |
| 20-U447                                                        | 0.14242       | 0.14234       | 0.00008       | 0.14250       | 0.14246       | 0.00004    | 0.00008   | 0.08     |
| *net mass = gross - tare (g)                                   |               |               |               |               |               |            |           |          |
| Quartz tissue filters                                          |               |               |               |               |               |            |           |          |
| Data collected electronically by proprietary BERT II software. |               |               |               |               |               |            |           |          |

|                                                                          |               |                             |           |               |               |            |                  |          |
|--------------------------------------------------------------------------|---------------|-----------------------------|-----------|---------------|---------------|------------|------------------|----------|
| All masses in grams (g)                                                  |               | M201A Acetone: BISON 20-513 |           |               |               |            |                  |          |
|                                                                          |               |                             |           |               |               |            |                  |          |
| Sx ID                                                                    | Tare          | Tare QC                     | Tare - QC | Gross         | Gross QC      | Gross - QC | *net (g)         | net (mg) |
| date/init:                                                               | 12/29/20 TMM  | 12/30/20 TMM                |           | 1/5/21 TMM    | 1/6/21 TMM    |            | (total mass liq) |          |
| time:                                                                    | 16:11         | 11:35                       |           | 16:27         | 10:53         |            |                  |          |
| Ambient                                                                  |               |                             |           |               |               |            |                  |          |
| Rel. Humidity                                                            | 39.8%         | 42.3%                       |           | 39.9%         | 41.4%         |            |                  |          |
| Temp (C/F)                                                               | 20.6C / 69.1F | 20.3C / 68.5F               |           | 21.0C / 69.8F | 20.9C / 69.6F |            |                  |          |
| Desiccator                                                               |               |                             |           |               |               |            |                  |          |
| Rel. Humidity                                                            | 4.0%          | 7.4%                        |           | 1.7%          | 1.7%          |            |                  |          |
| Temp (C/F)                                                               | 20.6C / 69.1F | 20.4C / 68.7F               |           | 20.8C / 69.4F | 20.3C / 68.5F |            |                  |          |
| 0.30000g QC                                                              | 0.30001       | 0.30002                     |           | 0.29997       | 0.30000       |            |                  |          |
| 5.00000g QC                                                              | 5.00000       | 5.00001                     |           | 5.00001       | 4.99999       |            |                  |          |
| 50.00000g QC                                                             | 50.00007      | 49.99999                    |           | 50.00007      | 50.00004      |            |                  |          |
| Lab Blank                                                                | 7.60768       | 7.60774                     | -0.00006  | 7.60764       | 7.60770       | -0.00006   | -0.00004         | -0.04    |
| Method Blank                                                             | 7.62571       | 7.62575                     | -0.00004  | 7.62570       | 7.62575       | -0.00005   | -0.00001         | -0.01    |
| 20S 2316                                                                 | 7.70901       | 7.70906                     | -0.00005  | 7.71113       | 7.71111       | 0.00002    | 0.00212          | 2.12     |
| 20S 2317                                                                 | 7.62628       | 7.62652                     | -0.00024  | 7.62716       | 7.62713       | 0.00003    | 0.00088          | 0.88     |
| 20S 2318                                                                 | 7.89311       | 7.89334                     | -0.00023  | 7.89372       | 7.89383       | -0.00011   | 0.00061          | 0.61     |
| 20S 2319                                                                 | 7.90585       | 7.90611                     | -0.00026  | 7.90654       | 7.90665       | -0.00011   | 0.00069          | 0.69     |
| 20S 2320                                                                 | 7.70745       | 7.70746                     | -0.00001  | 7.70769       | 7.70792       | -0.00023   | 0.00024          | 0.24     |
| 20S 2321                                                                 | 7.62834       | 7.62835                     | -0.00001  | 7.62899       | 7.62885       | 0.00014    | 0.00065          | 0.65     |
| 20S 2322                                                                 | 7.58749       | 7.58741                     | 0.00008   | 7.58889       | 7.58913       | -0.00024   | 0.00140          | 1.40     |
| 20S 2323                                                                 | 7.69640       | 7.69644                     | -0.00004  | 7.69661       | 7.69673       | -0.00012   | 0.00021          | 0.21     |
| 20S 2324                                                                 | 7.70278       | 7.70294                     | -0.00016  | 7.70332       | 7.70329       | 0.00003    | 0.00054          | 0.54     |
| 20S 2325                                                                 | 7.63414       | 7.63413                     | 0.00001   | 7.63409       | 7.63422       | -0.00013   | -0.00005         | -0.05    |
| 20S 2326                                                                 | 7.71263       | 7.71274                     | -0.00011  | 7.71274       | 7.71306       | -0.00032   | 0.00011          | 0.11     |
| 20S 2327                                                                 | 7.63510       | 7.63493                     | 0.00017   | 7.63531       | 7.63531       | 0.00000    | 0.00021          | 0.21     |
| *net mass = gross - tare (g)                                             |               |                             |           |               |               |            |                  |          |
| 100g weight: S/N 14091 certified value: 100.00004 (99.99994 - 100.00014) |               |                             |           |               |               |            |                  |          |
| Data collected electronically by proprietary BERT II software.           |               |                             |           |               |               |            |                  |          |

|                                                                |               |               |                         |               |               |            |           |          |
|----------------------------------------------------------------|---------------|---------------|-------------------------|---------------|---------------|------------|-----------|----------|
| All masses in grams (g)                                        |               |               | M5 filter: BISON 20-513 |               |               |            |           |          |
|                                                                |               |               |                         |               |               |            |           |          |
|                                                                |               |               |                         |               |               |            |           |          |
| Sx ID                                                          | Tare          | Tare QC       | Tare - QC               | Gross         | Gross QC      | Gross - QC | Net Mass* | Net Mass |
| date/init:                                                     | 3/19/20 TP    | 3/20/20 TP    |                         | 1/5/21 TMM    | 1/11/21 SM    |            |           | (mg)     |
| time:                                                          | 14:20         | 15:39         |                         | 14:49         | 10:00         |            |           |          |
| Ambient                                                        |               |               |                         |               |               |            |           |          |
| Rel. Humidity                                                  | 39.3%         | 39.9%         |                         | 40.9%         | 40.3%         |            |           |          |
| Temp (C/F)                                                     | 21.8C / 71.2F | 21.9C / 71.4F |                         | 21.2C / 70.2F | 20.6C / 69.1F |            |           |          |
| Desiccator                                                     |               |               |                         |               |               |            |           |          |
| Rel. Humidity                                                  | 0.5%          | 0.6%          |                         | 0.2%          | 0.2%          |            |           |          |
| Temp (C/F)                                                     | 21.4C / 70.5F | 21.8C / 71.2F |                         | 20.9C / 69.6F | 20.4C / 68.7F |            |           |          |
| 0.30000g QC                                                    | 0.30000       | 0.30002       |                         | 0.30001       | 0.30003       |            |           |          |
| 0.50000g QC                                                    | 0.50000       | 0.50001       |                         | 0.50001       | 0.49998       |            |           |          |
| 3.00000g QC                                                    | 3.00003       | 3.00003       |                         | 2.99997       | 2.99996       |            |           |          |
| 20-U205                                                        | 0.47102       | 0.47094       | 0.00008                 | 0.47101       | 0.47087       | 0.00014    | -0.00001  | -0.01    |
| 20-U206                                                        | 0.47718       | 0.47711       | 0.00007                 | 0.47614       | 0.47609       | 0.00005    | -0.00104  | -1.04    |
| 20-U207                                                        | 0.47562       | 0.47557       | 0.00005                 | 0.47454       | 0.47447       | 0.00007    | -0.00108  | -1.08    |
| 20-U209                                                        | 0.47707       | 0.47703       | 0.00004                 | 0.47635       | 0.47631       | 0.00004    | -0.00072  | -0.72    |
| 20-U210                                                        | 0.47734       | 0.47727       | 0.00007                 | 0.47659       | 0.47663       | -0.00004   | -0.00075  | -0.75    |
| 20-U211                                                        | 0.47046       | 0.47038       | 0.00008                 | 0.46972       | 0.46973       | -0.00001   | -0.00074  | -0.74    |
|                                                                |               |               |                         |               |               |            |           |          |
| *net mass = gross - tare (g)                                   |               |               |                         |               |               |            |           |          |
| Quartz tissue filters                                          |               |               |                         |               |               |            |           |          |
|                                                                |               |               |                         |               |               |            |           |          |
| Data collected electronically by proprietary BERT II software. |               |               |                         |               |               |            |           |          |

|                                                                          |               |                          |           |               |               |            |                  |          |
|--------------------------------------------------------------------------|---------------|--------------------------|-----------|---------------|---------------|------------|------------------|----------|
| All masses in grams (g)                                                  |               | M5 Acetone: BISON 20-513 |           |               |               |            |                  |          |
|                                                                          |               |                          |           |               |               |            |                  |          |
|                                                                          |               |                          |           |               |               |            |                  |          |
| Sx ID                                                                    | Tare          | Tare QC                  | Tare - QC | Gross         | Gross QC      | Gross - QC | *net (g)         | net (mg) |
| date/init:                                                               | 12/28/20 TMM  | 12/29/20 TMM             |           | 1/6/21 TMM    | 1/12/21 TMM   |            | (total mass liq) |          |
| time:                                                                    | 12:35         | 11:40                    |           | 14:11         | 12:34         |            |                  |          |
| Ambient                                                                  |               |                          |           |               |               |            |                  |          |
| Rel. Humidity                                                            | 38.8%         | 37.7%                    |           | 41.9%         | 43.9%         |            |                  |          |
| Temp (C/F)                                                               | 20.4C / 68.7F | 20.4C / 68.7F            |           | 21.0C / 69.8F | 20.6C / 69.1F |            |                  |          |
| Desiccator                                                               |               |                          |           |               |               |            |                  |          |
| Rel. Humidity                                                            | 2.0%          | 2.0%                     |           | 2.0%          | 2.0%          |            |                  |          |
| Temp (C/F)                                                               | 20.4C / 68.7F | 20.7C / 69.3F            |           | 21.5C / 70.7F | 21.4C / 70.5F |            |                  |          |
| 0.30000g QC                                                              | 0.30000       | 0.30001                  |           | 0.29999       | 0.30002       |            |                  |          |
| 3.00000g QC                                                              | 2.99996       | 2.99997                  |           | 2.99998       | 2.99997       |            |                  |          |
| 100.00000g QC                                                            | 99.99997      | 100.00011                |           | 100.00000     | 100.00009     |            |                  |          |
| Lab Blank                                                                | 102.95081     | 102.95092                | -0.00011  | 102.95079     | 102.95100     | -0.00021   | -0.00002         | -0.02    |
| Method Blank                                                             | 102.96566     | 102.96564                | 0.00002   | 102.96537     | 102.96568     | -0.00031   | -0.00029         | -0.29    |
| 20-S2328                                                                 | 103.18963     | 103.18942                | 0.00021   | 103.18961     | 103.18975     | -0.00014   | -0.00002         | -0.02    |
| 20-S2330                                                                 | 103.45050     | 103.45039                | 0.00011   | 103.45108     | 103.45105     | 0.00003    | 0.00058          | 0.58     |
| 20-S2331                                                                 | 98.66506      | 98.66498                 | 0.00008   | 98.66625      | 98.66665      | -0.00040   | 0.00119          | 1.19     |
| 20-S2333                                                                 | 117.00381     | 117.00379                | 0.00002   | 117.00429     | 117.00441     | -0.00012   | 0.00048          | 0.48     |
| 20-S2334                                                                 | 100.18576     | 100.18557                | 0.00019   | 100.18650     | 100.18661     | -0.00011   | 0.00074          | 0.74     |
| 20-S2336                                                                 | 99.26531      | 99.26521                 | 0.00010   | 99.26721      | 99.26744      | -0.00023   | 0.00190          | 1.90     |
| 20-S2337                                                                 | 102.30054     | 102.30078                | -0.00024  | 102.30099     | 102.30126     | -0.00027   | 0.00045          | 0.45     |
| 20-S2339                                                                 | 100.90700     | 100.90745                | -0.00045  | 100.90846     | 100.90850     | -0.00004   | 0.00146          | 1.46     |
| 20-S2341                                                                 | 100.70289     | 100.70315                | -0.00026  | 100.70427     | 100.70399     | 0.00028    | 0.00138          | 1.38     |
| 20-S2342                                                                 | 101.39209     | 101.39196                | 0.00013   | 101.39291     | 101.39322     | -0.00031   | 0.00082          | 0.82     |
| 20-S2344                                                                 | 100.81418     | 100.81422                | -0.00004  | 100.81529     | 100.81508     | 0.00021    | 0.00111          | 1.11     |
| 20-S2345                                                                 | 100.38576     | 100.38554                | 0.00022   | 100.38605     | 100.38617     | -0.00012   | 0.00029          | 0.29     |
| 20-S2347                                                                 | 100.66699     | 100.66667                | 0.00032   | 100.66775     | 100.66800     | -0.00025   | 0.00076          | 0.76     |
| *net mass = gross - tare (g)                                             |               |                          |           |               |               |            |                  |          |
| 100g weight: S/N 14091 certified value: 100.00004 (99.99994 - 100.00014) |               |                          |           |               |               |            |                  |          |
| Data collected electronically by proprietary BERT II software.           |               |                          |           |               |               |            |                  |          |

|                                                                          |               |                     |           |               |               |            |                  |           |
|--------------------------------------------------------------------------|---------------|---------------------|-----------|---------------|---------------|------------|------------------|-----------|
| All masses in grams (g)                                                  |               | ODEQ5: BISON 20-513 |           |               |               |            |                  |           |
| Organic Phase                                                            |               |                     |           |               |               |            |                  |           |
| Sx ID                                                                    | Tare          | Tare QC             | Tare - QC | Gross         | Gross QC      | Gross - QC | *net (g)         | net (mg)* |
| date/init:                                                               | 12/29/20 TMM  | 12/30/20 TMM        |           | 1/12/21 TMM   | 1/13/21 TMM   |            | (total mass liq) |           |
| time:                                                                    | 14:24         | 13:46               |           | 15:24         | 14:20         |            |                  |           |
| Ambient                                                                  |               |                     |           |               |               |            |                  |           |
| Rel. Humidity                                                            | 40.3%         | 41.9%               |           | 46.5%         | 39.4%         |            |                  |           |
| Temp (C/F)                                                               | 20.3C / 68.5F | 21.2C / 70.2F       |           | 21.2C / 70.2F | 21.3C / 70.3F |            |                  |           |
| Desiccator                                                               |               |                     |           |               |               |            |                  |           |
| Rel. Humidity                                                            | 2.6%          | 4.9%                |           | 0.8%          | 0.2%          |            |                  |           |
| Temp (C/F)                                                               | 21.8C / 71.2F | 21.6C / 70.9F       |           | 22.2C / 72.0F | 21.9C / 71.4F |            |                  |           |
| 0.30000g QC                                                              | 0.29998       | 0.29999             |           | 0.29999       | 0.30002       |            |                  |           |
| 3.00000g QC                                                              | 2.99998       | 2.99996             |           | 2.99998       | 2.99997       |            |                  |           |
| 100.00000g QC                                                            | 100.00002     | 100.00010           |           | 100.00010     | 100.00008     |            |                  |           |
| Lab Blank                                                                | 100.88848     | 100.88860           | -0.00012  | 100.88857     | 100.88822     | 0.00035    | 0.00009          | 0.09      |
| Method Blank                                                             | 101.38136     | 101.38127           | 0.00009   | 101.38149     | 101.38140     | 0.00009    | 0.00013          | 0.13      |
| 20-S2329                                                                 | 109.17124     | 109.17131           | -0.00007  | 109.17154     | 109.17175     | -0.00021   | 0.00030          | 0.30      |
| 20-S2332                                                                 | 119.90593     | 119.90598           | -0.00005  | 119.90620     | 119.90610     | 0.00010    | 0.00027          | 0.27      |
| 20-S2335                                                                 | 120.68345     | 120.68383           | -0.00038  | 120.68409     | 120.68415     | -0.00006   | 0.00064          | 0.64      |
| 20-S2340                                                                 | 118.01218     | 118.01219           | -0.00001  | 118.01261     | 118.01231     | 0.00030    | 0.00043          | 0.43      |
| 20-S2343                                                                 | 101.65152     | 101.65158           | -0.00006  | 101.65239     | 101.65279     | -0.00040   | 0.00087          | 0.87      |
| 20-S2346                                                                 | 102.32790     | 102.32794           | -0.00004  | 102.32834     | 102.32855     | -0.00021   | 0.00044          | 0.44      |
| *net mass = gross - tare (g)                                             |               |                     |           |               |               |            |                  |           |
| 100g weight: S/N 14091 certified value: 100.00004 (99.99994 - 100.00014) |               |                     |           |               |               |            |                  |           |
| Data collected electronically by proprietary BERT II software.           |               |                     |           |               |               |            |                  |           |

|                                                                          |               |                                                                |                     |               |               |            |                  |          |
|--------------------------------------------------------------------------|---------------|----------------------------------------------------------------|---------------------|---------------|---------------|------------|------------------|----------|
| All masses in grams (g)                                                  |               |                                                                | ODEQ5: BISON 20-513 |               |               |            |                  |          |
| Aqueous Phase                                                            |               |                                                                |                     |               |               |            |                  |          |
| Sx ID                                                                    | Tare          | Tare QC                                                        | Tare - QC           | Gross         | Gross QC      | Gross - QC | *net (g)         | net (mg) |
| date/init:                                                               | 12/28/20 TMM  | 12/29/20 TMM                                                   |                     | 1/13/21 TMM   | 1/14/21 TMM   |            | (total mass liq) |          |
| time:                                                                    | 16:32         | 13:17                                                          |                     | 18:15         | 11:41         |            |                  |          |
| Ambient                                                                  |               |                                                                |                     |               |               |            |                  |          |
| Rel. Humidity                                                            | 37.7%         | 38.8%                                                          |                     | 40.9%         | 37.2%         |            |                  |          |
| Temp (C/F)                                                               | 20.4C / 68.7F | 20.8C / 69.4F                                                  |                     | 21.3C / 70.3F | 20.5C / 68.9F |            |                  |          |
| Desiccator                                                               |               |                                                                |                     |               |               |            |                  |          |
| Rel. Humidity                                                            | 1.4%          | 2.6%                                                           |                     | 0.2%          | 0.8%          |            |                  |          |
| Temp (C/F)                                                               | 21.6C / 70.9F | 21.8C / 71.2F                                                  |                     | 21.9C / 71.4F | 21.3C / 70.3F |            |                  |          |
| 0.30000g QC                                                              | 0.29999       | 0.30002                                                        |                     | 0.29999       | 0.29998       |            |                  |          |
| 3.00000g QC                                                              | 2.99997       | 2.99998                                                        |                     | 2.99996       | 2.99996       |            |                  |          |
| 100.00000g QC                                                            | 100.00007     | 100.00007                                                      |                     | 100.00005     | 100.00007     |            |                  |          |
| Lab Blank                                                                | 103.54207     | 103.54209                                                      | -0.00002            | 103.54191     | 103.54210     | -0.00019   | -0.00016         | -0.16    |
| Method Blank                                                             | 97.65943      | 97.65937                                                       | 0.00006             | 97.66013      | 97.66045      | -0.00032   | 0.00070          | 0.70     |
| 20-S2329                                                                 | 121.80215     | 121.80219                                                      | -0.00004            | 121.80420     | 121.80404     | 0.00016    | 0.00205          | 2.05     |
| 20-S2332                                                                 | 115.63632     | 115.63635                                                      | -0.00003            | 115.64106     | 115.64142     | -0.00036   | 0.00474          | 4.74     |
| 20-S2335                                                                 | 102.45032     | 102.45017                                                      | 0.00015             | 102.45400     | 102.45373     | 0.00027    | 0.00368          | 3.68     |
| 20-S2338                                                                 | 99.57033      | 99.57011                                                       | 0.00022             | 99.57059      | 99.57027      | 0.00032    | 0.00026          | 0.26     |
| 20-S2340                                                                 | 102.50948     | 102.50966                                                      | -0.00018            | 102.51449     | 102.51469     | -0.00020   | 0.00501          | 5.01     |
| 20-S2343                                                                 | 101.61642     | 101.61677                                                      | -0.00035            | 101.62022     | 101.61995     | 0.00027    | 0.00380          | 3.80     |
| 20-S2346                                                                 | 102.17471     | 102.17454                                                      | 0.00017             | 102.18001     | 102.17993     | 0.00008    | 0.00530          | 5.30     |
| 100g weight: S/N 14091 certified value: 100.00004 (99.99994 - 100.00014) |               |                                                                |                     |               |               |            |                  |          |
| *net mass = gross - tare (g)                                             |               | Data collected electronically by proprietary BERT II software. |                     |               |               |            |                  |          |

## QA/QC Report

Client Name: Bison Engineering  
 Project Number: B020  
 Analytical Technique: ICP - Optima 8300  
 Sample Description: EPA Method 29 Cont. 1&3  
 Report Number: 20-513

### Blank Data

| Analyte | Sample ID | Measured Conc. µg/L | DL Conc. µg/L |
|---------|-----------|---------------------|---------------|
| Ag      | ICB       | < DL                | 2.00          |
| Ag      | Meth_Blkc | < DL                | 2.00          |
| Ag      | CCB       | < DL                | 2.00          |
| Ag      | CCB       | < DL                | 2.00          |
| Al      | ICB       | < DL                | 15.0          |
| Al      | Meth_Blkc | < DL                | 15.0          |
| Al      | CCB       | < DL                | 15.0          |
| Al      | CCB       | < DL                | 15.0          |
| As      | ICB       | < DL                | 7.00          |
| As      | Meth_Blkc | < DL                | 7.00          |
| As      | CCB       | < DL                | 7.00          |
| As      | CCB       | < DL                | 7.00          |
| Ba      | ICB       | < DL                | 0.500         |
| Ba      | Meth_Blkc | < DL                | 0.500         |
| Ba      | CCB       | < DL                | 0.500         |
| Ba      | CCB       | < DL                | 0.500         |
| Be      | ICB       | < DL                | 0.200         |
| Be      | Meth_Blkc | < DL                | 0.200         |
| Be      | CCB       | < DL                | 0.200         |
| Be      | CCB       | < DL                | 0.200         |
| Cd      | ICB       | < DL                | 0.400         |
| Cd      | Meth_Blkc | < DL                | 0.400         |
| Cd      | CCB       | < DL                | 0.400         |
| Cd      | CCB       | < DL                | 0.400         |
| Co      | ICB       | < DL                | 0.500         |
| Co      | Meth_Blkc | < DL                | 0.500         |
| Co      | CCB       | < DL                | 0.500         |
| Co      | CCB       | < DL                | 0.500         |
| Cr      | ICB       | < DL                | 0.800         |
| Cr      | Meth_Blkc | < DL                | 0.800         |
| Cr      | CCB       | < DL                | 0.800         |
| Cr      | CCB       | < DL                | 0.800         |
| Cu      | ICB       | < DL                | 5.00          |
| Cu      | Meth_Blkc | < DL                | 5.00          |
| Cu      | CCB       | < DL                | 5.00          |
| Cu      | CCB       | < DL                | 5.00          |
| Mn      | ICB       | < DL                | 0.300         |
| Mn      | Meth_Blkc | < DL                | 0.300         |
| Mn      | CCB       | < DL                | 0.300         |
| Mn      | CCB       | < DL                | 0.300         |
| Ni      | ICB       | < DL                | 3.00          |
| Ni      | Meth_Blkc | < DL                | 3.00          |
| Ni      | CCB       | < DL                | 3.00          |
| Ni      | CCB       | < DL                | 3.00          |
| P       | ICB       | < DL                | 20.0          |
| P       | Meth_Blkc | < DL                | 20.0          |
| P       | CCB       | < DL                | 20.0          |
| P       | CCB       | < DL                | 20.0          |
| Pb      | ICB       | < DL                | 5.00          |
| Pb      | Meth_Blkc | < DL                | 5.00          |
| Pb      | CCB       | < DL                | 5.00          |
| Pb      | CCB       | < DL                | 5.00          |
| Sb      | ICB       | < DL                | 5.00          |
| Sb      | Meth_Blkc | < DL                | 5.00          |
| Sb      | CCB       | < DL                | 5.00          |
| Sb      | CCB       | < DL                | 5.00          |
| Se      | ICB       | < DL                | 15.0          |
| Se      | Meth_Blkc | < DL                | 15.0          |

\*: Sample Media Blank (SM\_Blkc) concentration in µg/filter

ICB: Initial Calibration Blank CCB: Continuing Calibration Blank

Method Blank is in control if Method Blank results are <10% of sample results

## QA/QC Report

Client Name: Bison Engineering  
 Project Number: B020  
 Analytical Technique: ICP - Optima 8300  
 Sample Description: EPA Method 29 Cont. 1&3  
 Report Number: 20-513  
 =====

### Blank Data

| Analyte | Sample ID | Measured Conc. µg/L | DL Conc. µg/L |
|---------|-----------|---------------------|---------------|
| Se      | CCB       | < DL                | 15.0          |
| Se      | CCB       | < DL                | 15.0          |
| Tl      | ICB       | < DL                | 10.0          |
| Tl      | Meth_Blkc | < DL                | 10.0          |
| Tl      | CCB       | < DL                | 10.0          |
| Tl      | CCB       | < DL                | 10.0          |
| V       | ICB       | < DL                | 1.00          |
| V       | Meth_Blkc | < DL                | 1.00          |
| V       | CCB       | < DL                | 1.00          |
| V       | CCB       | < DL                | 1.00          |
| Zn      | ICB       | < DL                | 3.00          |
| Zn      | Meth_Blkc | < DL                | 3.00          |
| Zn      | CCB       | < DL                | 3.00          |
| Zn      | CCB       | < DL                | 3.00          |

\*: Sample Media Blank (SM\_Blkc) concentration in µg/filter

ICB: Initial Calibration Blank CCB: Continuing Calibration Blank

Method Blank is in control if Method Blank results are <10% of sample results

### Calibration QC

| Analyte | Sample ID | Standard Conc. µg/L | Measured Conc. µg/L | Percent Recovery |
|---------|-----------|---------------------|---------------------|------------------|
| Ag      | ICV       | 2500                | 2400                | 96.1             |
| Ag      | LL-CCV    | 10.0                | 9.43                | 94.3             |
| Ag      | LL-LCS    | 9.00                | 9.58                | 106.4            |
| Ag      | CCV       | 2500                | 2390                | 95.5             |
| Ag      | CCV       | 2500                | 2390                | 95.6             |
| Al      | ICV       | 2500                | 2580                | 103.2            |
| Al      | LL-CCV    | 150.                | 147.                | 98.3             |
| Al      | LL-LCS    | 30.0                | 32.7                | 109.1            |
| Al      | CCV       | 2500                | 2600                | 103.9            |
| Al      | CCV       | 2500                | 2620                | 104.8            |
| As      | ICV       | 2500                | 2540                | 101.6            |
| As      | LL-CCV    | 35.0                | 25.6                | 73.1             |
| As      | LL-LCS    | 20.0                | 27.1                | 135.3            |
| As      | CCV       | 2500                | 2560                | 102.3            |
| As      | CCV       | 2500                | 2570                | 102.7            |
| Ba      | ICV       | 2500                | 2500                | 100.0            |
| Ba      | LL-CCV    | 2.50                | 2.89                | 115.6            |
| Ba      | LL-LCS    | 1.50                | 1.94                | 129.5            |
| Ba      | CCV       | 2500                | 2470                | 98.7             |
| Ba      | CCV       | 2500                | 2430                | 97.1             |
| Be      | ICV       | 2500                | 2500                | 100.1            |
| Be      | LL-CCV    | 1.00                | 1.04                | 103.9            |
| Be      | LL-LCS    | 0.500               | 0.614               | 122.8            |
| Be      | CCV       | 2500                | 2440                | 97.8             |
| Be      | CCV       | 2500                | 2440                | 97.6             |
| Cd      | ICV       | 2500                | 2560                | 102.4            |
| Cd      | LL-CCV    | 2.00                | 2.02                | 100.8            |
| Cd      | LL-LCS    | 1.50                | 1.92                | 127.7            |
| Cd      | CCV       | 2500                | 2610                | 104.4            |
| Cd      | CCV       | 2500                | 2550                | 102.1            |
| Co      | ICV       | 2500                | 2560                | 102.3            |

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification

Calibration Verification Limits: 90% - 110% Recovery

LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery

LL-LCS Limits: 50% - 150% Recovery

LL-LCS results are not significant if sample results are >10x LL-LCS concentration

## QA/QC Report

Client Name: Bison Engineering  
 Project Number: B020  
 Analytical Technique: ICP - Optima 8300  
 Sample Description: EPA Method 29 Cont. 1&3  
 Report Number: 20-513  
 =====

### Calibration QC

| Analyte | Sample ID | Standard Conc. µg/L | Measured Conc. µg/L | Percent Recovery |
|---------|-----------|---------------------|---------------------|------------------|
| Co      | LL-CCV    | 2.50                | 2.92                | 116.7            |
| Co      | LL-LCS    | 1.50                | 1.70                | 113.5            |
| Co      | CCV       | 2500                | 2370                | 94.8             |
| Co      | CCV       | 2500                | 2320                | 92.7             |
| Cr      | ICV       | 2500                | 2540                | 101.8            |
| Cr      | LL-CCV    | 4.00                | 4.36                | 109.1            |
| Cr      | LL-LCS    | 2.00                | 1.94                | 96.8             |
| Cr      | CCV       | 2500                | 2560                | 102.5            |
| Cr      | CCV       | 2500                | 2540                | 101.8            |
| Cu      | ICV       | 2500                | 2380                | 95.4             |
| Cu      | LL-CCV    | 25.0                | 27.6                | 110.3            |
| Cu      | LL-LCS    | 15.0                | 16.1                | 107.1            |
| Cu      | CCV       | 2500                | 2430                | 97.3             |
| Cu      | CCV       | 2500                | 2430                | 97.3             |
| Mn      | ICV       | 2500                | 2480                | 99.0             |
| Mn      | LL-CCV    | 1.50                | 1.64                | 109.1            |
| Mn      | LL-LCS    | 1.00                | 1.01                | 100.8            |
| Mn      | CCV       | 2500                | 2490                | 99.5             |
| Mn      | CCV       | 2500                | 2470                | 98.8             |
| Ni      | ICV       | 2500                | 2390                | 95.6             |
| Ni      | LL-CCV    | 15.0                | 15.2                | 101.5            |
| Ni      | LL-LCS    | 6.00                | 6.87                | 114.6            |
| Ni      | CCV       | 2500                | 2410                | 96.4             |
| Ni      | CCV       | 2500                | 2400                | 95.8             |
| P       | ICV       | 2500                | 2510                | 100.6            |
| P       | LL-CCV    | 100.                | 92.7                | 92.7             |
| P       | LL-LCS    | 75.0                | 82.4                | 109.9            |
| P       | CCV       | 2500                | 2500                | 100.2            |
| P       | CCV       | 2500                | 2450                | 98.0             |
| Pb      | ICV       | 2500                | 2520                | 100.9            |
| Pb      | LL-CCV    | 25.0                | 30.2                | 120.6            |
| Pb      | LL-LCS    | 15.0                | 15.1                | 100.4            |
| Pb      | CCV       | 2500                | 2500                | 100.1            |
| Pb      | CCV       | 2500                | 2480                | 99.3             |
| Sb      | ICV       | 2500                | 2300                | 92.1             |
| Sb      | LL-CCV    | 25.0                | 23.8                | 95.2             |
| Sb      | LL-LCS    | 15.0                | 12.5                | 83.1             |
| Sb      | CCV       | 2500                | 2310                | 92.5             |
| Sb      | CCV       | 2500                | 2330                | 93.1             |
| Se      | ICV       | 2500                | 2570                | 102.8            |
| Se      | LL-CCV    | 75.0                | 54.7                | 72.9             |
| Se      | LL-LCS    | 30.0                | 28.6                | 95.3             |
| Se      | CCV       | 2500                | 2640                | 105.6            |
| Se      | CCV       | 2500                | 2560                | 102.4            |
| Tl      | ICV       | 2500                | 2520                | 101.0            |
| Tl      | LL-CCV    | 50.0                | 58.3                | 116.5            |
| Tl      | LL-LCS    | 30.0                | 38.7                | 129.1            |
| Tl      | CCV       | 2500                | 2530                | 101.2            |
| Tl      | CCV       | 2500                | 2510                | 100.4            |
| V       | ICV       | 2500                | 2540                | 101.7            |
| V       | LL-CCV    | 5.00                | 5.32                | 106.5            |
| V       | LL-LCS    | 3.00                | 3.16                | 105.3            |
| V       | CCV       | 2500                | 2580                | 103.2            |
| V       | CCV       | 2500                | 2570                | 102.6            |
| Zn      | ICV       | 2500                | 2510                | 100.5            |
| Zn      | LL-CCV    | 15.0                | 16.4                | 109.7            |

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification  
 Calibration Verification Limits: 90% - 110% Recovery  
 LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery  
 LL-LCS Limits: 50% - 150% Recovery  
 LL-LCS results are not significant if sample results are >10x LL-LCS concentration

## QA/QC Report

Client Name: Bison Engineering  
 Project Number: B020  
 Analytical Technique: ICP - Optima 8300  
 Sample Description: EPA Method 29 Cont. 1&3  
 Report Number: 20-513  
 =====

### Calibration QC

| Analyte | Sample ID | Standard Conc. µg/L | Measured Conc. µg/L | Percent Recovery |
|---------|-----------|---------------------|---------------------|------------------|
| Zn      | LL-LCS    | 6.00                | 5.75                | 95.8             |
| Zn      | CCV       | 2500                | 2530                | 101.2            |
| Zn      | CCV       | 2500                | 2520                | 100.6            |

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification  
 Calibration Verification Limits: 90% - 110% Recovery  
 LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery  
 LL-LCS Limits: 50% - 150% Recovery  
 LL-LCS results are not significant if sample results are >10x LL-LCS concentration

### Replicate Data

| Analyte | Sample ID | Sample Conc. µg/L | Replicate Conc. µg/L | RPD    |
|---------|-----------|-------------------|----------------------|--------|
| Ag      | 20-S2348  | < 2               | < 2                  | N/C #  |
| Al      | 20-S2348  | 454.6             | 456.7                | 0.46   |
| As      | 20-S2348  | 17.05             | 13.57                | 22.7 # |
| Ba      | 20-S2348  | 9.271             | 10.20                | 9.54   |
| Be      | 20-S2348  | < 0.2             | < 0.2                | N/C #  |
| Cd      | 20-S2348  | 1.034             | 1.023                | 1.07 # |
| Co      | 20-S2348  | < 0.5             | < 0.5                | N/C #  |
| Cr      | 20-S2348  | 94.55             | 92.91                | 1.75   |
| Cu      | 20-S2348  | 19.98             | 19.04                | 4.82 # |
| Mn      | 20-S2348  | 740.1             | 743.1                | 0.40   |
| Ni      | 20-S2348  | 19.08             | 17.40                | 9.21   |
| P       | 20-S2348  | 56.53             | 77.66                | 31.5 # |
| Pb      | 20-S2348  | 7.572             | 7.309                | 3.53 # |
| Sb      | 20-S2348  | < 5               | < 5                  | N/C #  |
| Se      | 20-S2348  | < 15              | < 15                 | N/C #  |
| Tl      | 20-S2348  | < 10              | < 10                 | N/C #  |
| V       | 20-S2348  | 2.358             | 2.065                | 13.2 # |
| Zn      | 20-S2348  | 61.90             | 60.74                | 1.89   |

N/C: RPD is not calculated when sample or replicate is below detection limit  
 Replicate Limit: 20% RPD  
 #: per EPA CLP protocol, control limits do not apply if sample and/or replicate concentration is less than 5x the detection limit

### Laboratory Control Sample/Post Digestion Spike Analysis

| Analyte | Sample ID | Sample Conc. µg/L | Spike Conc. µg/L | Spike Amount µg/L | Percent Recovery |
|---------|-----------|-------------------|------------------|-------------------|------------------|
| Ag      | LCS       | < 2               | 561.7            | 2500.             | 22.5             |
| Ag      | LCS       | < 2               | 2494.            | 2500.             | 99.8             |
| Ag      | 20-S2350  | < 2               | 2407.            | 2500.             | 96.3             |
| Al      | LCS       | < 15              | 2829.            | 2500.             | 113.             |
| Al      | LCS       | < 15              | 2887.            | 2500.             | 115.             |
| Al      | 20-S2350  | 421.2             | 3200.            | 2500.             | 111.             |
| As      | LCS       | < 7               | 2763.            | 2500.             | 111.             |
| As      | LCS       | < 7               | 2754.            | 2500.             | 110.             |
| As      | 20-S2350  | 21.14             | 2578.            | 2500.             | 102.             |
| Ba      | LCS       | < 0.5             | 2620.            | 2500.             | 105.             |
| Ba      | LCS       | < 0.5             | 2621.            | 2500.             | 105.             |
| Ba      | 20-S2350  | 6.268             | 2388.            | 2500.             | 95.3             |

LCS Limit: 80% - 120% Recovery Spike Limit: 75% - 125% Recovery  
 \*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

## QA/QC Report

Client Name: Bison Engineering  
 Project Number: B020  
 Analytical Technique: ICP - Optima 8300  
 Sample Description: EPA Method 29 Cont. 1&3  
 Report Number: 20-513  
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### Laboratory Control Sample/Post Digestion Spike Analysis

| Analyte | Sample ID | Sample Conc. µg/L | Spike Conc. µg/L | Spike Amount µg/L | Percent Recovery |
|---------|-----------|-------------------|------------------|-------------------|------------------|
| Be      | LCS       | < 0.2             | 2635.            | 2500.             | 105.             |
| Be      | LCS       | < 0.2             | 2629.            | 2500.             | 105.             |
| Be      | 20-S2350  | < 0.2             | 2463.            | 2500.             | 98.5             |
| Cd      | LCS       | < 0.4             | 2937.            | 2500.             | 117.             |
| Cd      | LCS       | < 0.4             | 2956.            | 2500.             | 118.             |
| Cd      | 20-S2350  | 0.440             | 2587.            | 2500.             | 103.             |
| Co      | LCS       | < 0.5             | 2552.            | 2500.             | 102.             |
| Co      | LCS       | < 0.5             | 2583.            | 2500.             | 103.             |
| Co      | 20-S2350  | < 0.5             | 2279.            | 2500.             | 91.2             |
| Cr      | LCS       | < 0.8             | 2629.            | 2500.             | 105.             |
| Cr      | LCS       | < 0.8             | 2623.            | 2500.             | 105.             |
| Cr      | 20-S2350  | 27.46             | 2538.            | 2500.             | 100.             |
| Cu      | LCS       | < 5               | 2542.            | 2500.             | 102.             |
| Cu      | LCS       | < 5               | 2530.            | 2500.             | 101.             |
| Cu      | 20-S2350  | 12.80             | 2523.            | 2500.             | 100.             |
| Mn      | LCS       | < 0.3             | 2566.            | 2500.             | 103.             |
| Mn      | LCS       | < 0.3             | 2557.            | 2500.             | 102.             |
| Mn      | 20-S2350  | 208.9             | 2615.            | 2500.             | 96.2             |
| Ni      | LCS       | < 3               | 2538.            | 2500.             | 102.             |
| Ni      | LCS       | < 3               | 2539.            | 2500.             | 102.             |
| Ni      | 20-S2350  | 6.515             | 2282.            | 2500.             | 91.0             |
| P       | LCS       | < 20              | 2802.            | 2500.             | 112.             |
| P       | LCS       | < 20              | 2728.            | 2500.             | 109.             |
| P       | 20-S2350  | 37.11             | 2549.            | 2500.             | 100.             |
| Pb      | LCS       | < 5               | 2727.            | 2500.             | 109.             |
| Pb      | LCS       | < 5               | 2732.            | 2500.             | 109.             |
| Pb      | 20-S2350  | 5.911             | 2215.            | 2500.             | 88.4             |
| Sb      | LCS       | < 5               | 2486.            | 2500.             | 99.4             |
| Sb      | LCS       | < 5               | 2476.            | 2500.             | 99.0             |
| Sb      | 20-S2350  | < 5               | 2311.            | 2500.             | 92.4             |
| Se      | LCS       | < 15              | 2984.            | 2500.             | 119.             |
| Se      | LCS       | < 15              | 2995.            | 2500.             | 120.             |
| Se      | 20-S2350  | < 15              | 2612.            | 2500.             | 104.             |
| Tl      | LCS       | < 10              | 2770.            | 2500.             | 111.             |
| Tl      | LCS       | < 10              | 2744.            | 2500.             | 110.             |
| Tl      | 20-S2350  | < 10              | 2329.            | 2500.             | 93.2             |
| V       | LCS       | < 1               | 2630.            | 2500.             | 105.             |
| V       | LCS       | < 1               | 2611.            | 2500.             | 104.             |
| V       | 20-S2350  | < 1               | 2490.            | 2500.             | 99.6             |
| Zn      | LCS       | < 3               | 2735.            | 2500.             | 109.             |
| Zn      | LCS       | < 3               | 2756.            | 2500.             | 110.             |
| Zn      | 20-S2350  | 26.26             | 2576.            | 2500.             | 102.             |

LCS Limit: 80% - 120% Recovery Spike Limit: 75% - 125% Recovery

\*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

### Laboratory Control Sample Duplicate Data

| Analyte | Sample ID | Spike Conc. µg/L | Duplicate Conc. µg/L | RPD  |
|---------|-----------|------------------|----------------------|------|
| Ag      | LCS-DUP   | 562.             | 2490                 | 126. |
| Al      | LCS-DUP   | 2830             | 2890                 | 2.03 |
| As      | LCS-DUP   | 2760             | 2750                 | 0.33 |
| Ba      | LCS-DUP   | 2620             | 2620                 | 0.04 |
| Be      | LCS-DUP   | 2640             | 2630                 | 0.23 |
| Cd      | LCS-DUP   | 2940             | 2960                 | 0.64 |

Duplicate Limit: 20% RPD

## QA/QC Report

Client Name: Bison Engineering  
Project Number: B020  
Analytical Technique: ICP - Optima 8300  
Sample Description: EPA Method 29 Cont. 1&3  
Report Number: 20-513  
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### Laboratory Control Sample Duplicate Data

| Analyte | Sample ID | Spike Conc. µg/L | Duplicate Conc. µg/L | RPD  |
|---------|-----------|------------------|----------------------|------|
| Co      | LCS-DUP   | 2550             | 2580                 | 1.21 |
| Cr      | LCS-DUP   | 2630             | 2620                 | 0.23 |
| Cu      | LCS-DUP   | 2540             | 2530                 | 0.47 |
| Mn      | LCS-DUP   | 2570             | 2560                 | 0.35 |
| Ni      | LCS-DUP   | 2540             | 2540                 | 0.04 |
| P       | LCS-DUP   | 2800             | 2730                 | 2.68 |
| Pb      | LCS-DUP   | 2730             | 2730                 | 0.18 |
| Sb      | LCS-DUP   | 2490             | 2480                 | 0.40 |
| Se      | LCS-DUP   | 2980             | 3000                 | 0.37 |
| Tl      | LCS-DUP   | 2770             | 2740                 | 0.94 |
| V       | LCS-DUP   | 2630             | 2610                 | 0.73 |
| Zn      | LCS-DUP   | 2740             | 2760                 | 0.76 |

Duplicate Limit: 20% RPD

# QA/QC Report

Client Name: Bison Engineering  
 Project Number: B020  
 Analytical Technique: ICP - Optima 8300  
 Sample Description: EPA Method 29 Cont. 4  
 Report Number: 20-513

## Blank Data

| Analyte | Sample ID | Measured Conc. µg/L | DL Conc. µg/L |
|---------|-----------|---------------------|---------------|
| Ag      | ICB       | < DL                | 2.00          |
| Ag      | Meth_Blkc | < DL                | 2.00          |
| Ag      | CCB       | < DL                | 2.00          |
| Ag      | CCB       | < DL                | 2.00          |
| Al      | ICB       | < DL                | 15.0          |
| Al      | Meth_Blkc | 34.8                | 15.0          |
| Al      | CCB       | < DL                | 15.0          |
| Al      | CCB       | < DL                | 15.0          |
| As      | ICB       | < DL                | 7.00          |
| As      | Meth_Blkc | < DL                | 7.00          |
| As      | CCB       | < DL                | 7.00          |
| As      | CCB       | < DL                | 7.00          |
| Ba      | ICB       | < DL                | 0.500         |
| Ba      | Meth_Blkc | < DL                | 0.500         |
| Ba      | CCB       | < DL                | 0.500         |
| Ba      | CCB       | < DL                | 0.500         |
| Be      | ICB       | < DL                | 0.200         |
| Be      | Meth_Blkc | < DL                | 0.200         |
| Be      | CCB       | < DL                | 0.200         |
| Be      | CCB       | < DL                | 0.200         |
| Cd      | ICB       | < DL                | 0.400         |
| Cd      | Meth_Blkc | < DL                | 0.400         |
| Cd      | CCB       | < DL                | 0.400         |
| Cd      | CCB       | < DL                | 0.400         |
| Co      | ICB       | < DL                | 0.500         |
| Co      | Meth_Blkc | < DL                | 0.500         |
| Co      | CCB       | < DL                | 0.500         |
| Co      | CCB       | < DL                | 0.500         |
| Cr      | ICB       | < DL                | 0.800         |
| Cr      | Meth_Blkc | < DL                | 0.800         |
| Cr      | CCB       | < DL                | 0.800         |
| Cr      | CCB       | < DL                | 0.800         |
| Cu      | ICB       | < DL                | 5.00          |
| Cu      | Meth_Blkc | < DL                | 5.00          |
| Cu      | CCB       | < DL                | 5.00          |
| Cu      | CCB       | < DL                | 5.00          |
| Mn      | ICB       | < DL                | 0.300         |
| Mn      | Meth_Blkc | < DL                | 0.300         |
| Mn      | CCB       | < DL                | 0.300         |
| Mn      | CCB       | < DL                | 0.300         |
| Ni      | ICB       | < DL                | 3.00          |
| Ni      | Meth_Blkc | < DL                | 3.00          |
| Ni      | CCB       | < DL                | 3.00          |
| Ni      | CCB       | < DL                | 3.00          |
| P       | ICB       | < DL                | 20.0          |
| P       | Meth_Blkc | < DL                | 20.0          |
| P       | CCB       | < DL                | 20.0          |
| P       | CCB       | < DL                | 20.0          |
| Pb      | ICB       | < DL                | 5.00          |
| Pb      | Meth_Blkc | < DL                | 5.00          |
| Pb      | CCB       | < DL                | 5.00          |
| Pb      | CCB       | < DL                | 5.00          |
| Sb      | ICB       | < DL                | 5.00          |
| Sb      | Meth_Blkc | 9.57                | 5.00          |
| Sb      | CCB       | < DL                | 5.00          |
| Sb      | CCB       | < DL                | 5.00          |
| Se      | ICB       | < DL                | 15.0          |
| Se      | Meth_Blkc | < DL                | 15.0          |

\*: Sample Media Blank (SM\_Blkc) concentration in µg/filter

ICB: Initial Calibration Blank CCB: Continuing Calibration Blank

Method Blank is in control if Method Blank results are <10% of sample results

## QA/QC Report

Client Name: Bison Engineering  
 Project Number: B020  
 Analytical Technique: ICP - Optima 8300  
 Sample Description: EPA Method 29 Cont. 4  
 Report Number: 20-513  
 =====

### Blank Data

| Analyte | Sample ID | Measured Conc. µg/L | DL Conc. µg/L |
|---------|-----------|---------------------|---------------|
| Se      | CCB       | < DL                | 15.0          |
| Se      | CCB       | < DL                | 15.0          |
| Tl      | ICB       | < DL                | 10.0          |
| Tl      | Meth_Blkc | < DL                | 10.0          |
| Tl      | CCB       | < DL                | 10.0          |
| Tl      | CCB       | < DL                | 10.0          |
| V       | ICB       | < DL                | 1.00          |
| V       | Meth_Blkc | < DL                | 1.00          |
| V       | CCB       | < DL                | 1.00          |
| V       | CCB       | < DL                | 1.00          |
| Zn      | ICB       | < DL                | 3.00          |
| Zn      | Meth_Blkc | < DL                | 3.00          |
| Zn      | CCB       | < DL                | 3.00          |
| Zn      | CCB       | < DL                | 3.00          |

\*: Sample Media Blank (SM\_Blkc) concentration in µg/filter

ICB: Initial Calibration Blank CCB: Continuing Calibration Blank

Method Blank is in control if Method Blank results are <10% of sample results

### Calibration QC

| Analyte | Sample ID | Standard Conc. µg/L | Measured Conc. µg/L | Percent Recovery |
|---------|-----------|---------------------|---------------------|------------------|
| Ag      | ICV       | 2500                | 2460                | 98.5             |
| Ag      | LL-CCV    | 10.0                | 10.9                | 108.9            |
| Ag      | LL-LCS    | 9.00                | 10.1                | 112.2            |
| Ag      | CCV       | 2500                | 2440                | 97.6             |
| Ag      | CCV       | 2500                | 2450                | 98.0             |
| Al      | ICV       | 2500                | 2520                | 100.9            |
| Al      | LL-CCV    | 75.0                | 76.8                | 102.3            |
| Al      | LL-LCS    | 30.0                | 158.                | 526.0            |
| Al      | CCV       | 2500                | 2490                | 99.6             |
| Al      | CCV       | 2500                | 2500                | 100.1            |
| As      | ICV       | 2500                | 2440                | 97.5             |
| As      | LL-CCV    | 35.0                | 35.4                | 101.1            |
| As      | LL-LCS    | 20.0                | 16.0                | 79.9             |
| As      | CCV       | 2500                | 2470                | 98.8             |
| As      | CCV       | 2500                | 2420                | 97.0             |
| Ba      | ICV       | 2500                | 2560                | 102.6            |
| Ba      | LL-CCV    | 2.50                | 3.05                | 122.2            |
| Ba      | LL-LCS    | 1.50                | 2.24                | 149.2            |
| Ba      | CCV       | 2500                | 2570                | 103.0            |
| Ba      | CCV       | 2500                | 2570                | 102.7            |
| Be      | ICV       | 2500                | 2520                | 100.6            |
| Be      | LL-CCV    | 1.00                | 0.827               | 82.7             |
| Be      | LL-LCS    | 0.500               | < 0.2               | Empty            |
| Be      | CCV       | 2500                | 2510                | 100.5            |
| Be      | CCV       | 2500                | 2510                | 100.5            |
| Cd      | ICV       | 2500                | 2430                | 97.1             |
| Cd      | LL-CCV    | 2.00                | 2.29                | 114.6            |
| Cd      | LL-LCS    | 1.50                | 1.19                | 79.1             |
| Cd      | CCV       | 2500                | 2460                | 98.2             |
| Cd      | CCV       | 2500                | 2380                | 95.2             |
| Co      | ICV       | 2500                | 2380                | 95.2             |

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification

Calibration Verification Limits: 90% - 110% Recovery

LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery

LL-LCS Limits: 50% - 150% Recovery

LL-LCS results are not significant if sample results are >10x LL-LCS concentration

# QA/QC Report

Client Name: Bison Engineering  
 Project Number: B020  
 Analytical Technique: ICP - Optima 8300  
 Sample Description: EPA Method 29 Cont. 4  
 Report Number: 20-513  
 =====

## Calibration QC

| Analyte | Sample ID | Standard Conc. µg/L | Measured Conc. µg/L | Percent Recovery |
|---------|-----------|---------------------|---------------------|------------------|
| Co      | LL-CCV    | 2.50                | 2.70                | 108.2            |
| Co      | LL-LCS    | 1.50                | 1.22                | 81.3             |
| Co      | CCV       | 2500                | 2420                | 96.6             |
| Co      | CCV       | 2500                | 2340                | 93.8             |
| Cr      | ICV       | 2500                | 2590                | 103.8            |
| Cr      | LL-CCV    | 4.00                | 4.32                | 108.1            |
| Cr      | LL-LCS    | 2.00                | 1.91                | 95.4             |
| Cr      | CCV       | 2500                | 2560                | 102.4            |
| Cr      | CCV       | 2500                | 2600                | 103.8            |
| Cu      | ICV       | 2500                | 2310                | 92.2             |
| Cu      | LL-CCV    | 25.0                | 25.1                | 100.3            |
| Cu      | LL-LCS    | 15.0                | 15.2                | 101.2            |
| Cu      | CCV       | 2500                | 2400                | 96.1             |
| Cu      | CCV       | 2500                | 2270                | 90.7             |
| Mn      | ICV       | 2500                | 2520                | 100.7            |
| Mn      | LL-CCV    | 1.50                | 1.54                | 102.5            |
| Mn      | LL-LCS    | 1.00                | 1.05                | 105.3            |
| Mn      | CCV       | 2500                | 2520                | 100.6            |
| Mn      | CCV       | 2500                | 2520                | 100.9            |
| Ni      | ICV       | 2500                | 2420                | 96.8             |
| Ni      | LL-CCV    | 15.0                | 15.0                | 99.8             |
| Ni      | LL-LCS    | 6.00                | 6.10                | 101.7            |
| Ni      | CCV       | 2500                | 2390                | 95.4             |
| Ni      | CCV       | 2500                | 2420                | 96.7             |
| P       | ICV       | 2500                | 2390                | 95.7             |
| P       | LL-CCV    | 100.                | 64.5                | 64.5             |
| P       | LL-LCS    | 75.0                | 45.9                | 61.2             |
| P       | CCV       | 2500                | 2440                | 97.6             |
| P       | CCV       | 2500                | 2310                | 92.6             |
| Pb      | ICV       | 2500                | 2420                | 96.7             |
| Pb      | LL-CCV    | 25.0                | 25.7                | 102.6            |
| Pb      | LL-LCS    | 15.0                | 19.2                | 128.3            |
| Pb      | CCV       | 2500                | 2450                | 98.0             |
| Pb      | CCV       | 2500                | 2440                | 97.5             |
| Sb      | ICV       | 2500                | 2420                | 96.7             |
| Sb      | LL-CCV    | 25.0                | 24.0                | 95.8             |
| Sb      | LL-LCS    | 15.0                | 12.4                | 82.7             |
| Sb      | CCV       | 2500                | 2540                | 101.7            |
| Sb      | CCV       | 2500                | 2520                | 101.0            |
| Se      | ICV       | 2500                | 2350                | 94.0             |
| Se      | LL-CCV    | 75.0                | 70.2                | 93.6             |
| Se      | LL-LCS    | 30.0                | 30.2                | 100.5            |
| Se      | CCV       | 2500                | 2450                | 98.0             |
| Se      | CCV       | 2500                | 2300                | 91.9             |
| Tl      | ICV       | 2500                | 2520                | 100.9            |
| Tl      | LL-CCV    | 50.0                | 49.1                | 98.1             |
| Tl      | LL-LCS    | 30.0                | 24.6                | 82.0             |
| Tl      | CCV       | 2500                | 2540                | 101.6            |
| Tl      | CCV       | 2500                | 2520                | 100.9            |
| V       | ICV       | 2500                | 2470                | 98.6             |
| V       | LL-CCV    | 5.00                | 5.32                | 106.3            |
| V       | LL-LCS    | 3.00                | 3.19                | 106.2            |
| V       | CCV       | 2500                | 2520                | 100.8            |
| V       | CCV       | 2500                | 2460                | 98.4             |
| Zn      | ICV       | 2500                | 2460                | 98.5             |
| Zn      | LL-CCV    | 15.0                | 16.5                | 110.1            |

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification  
 Calibration Verification Limits: 90% - 110% Recovery  
 LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery  
 LL-LCS Limits: 50% - 150% Recovery  
 LL-LCS results are not significant if sample results are >10x LL-LCS concentration

## QA/QC Report

Client Name: Bison Engineering  
 Project Number: B020  
 Analytical Technique: ICP - Optima 8300  
 Sample Description: EPA Method 29 Cont. 4  
 Report Number: 20-513  
 =====

### Calibration QC

| Analyte | Sample ID | Standard Conc. µg/L | Measured Conc. µg/L | Percent Recovery |
|---------|-----------|---------------------|---------------------|------------------|
| Zn      | LL-LCS    | 6.00                | 8.99                | 149.9            |
| Zn      | CCV       | 2500                | 2490                | 99.6             |
| Zn      | CCV       | 2500                | 2420                | 96.9             |

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification  
 Calibration Verification Limits: 90% - 110% Recovery  
 LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery  
 LL-LCS Limits: 50% - 150% Recovery  
 LL-LCS results are not significant if sample results are >10x LL-LCS concentration

### Replicate Data

| Analyte | Sample ID | Sample Conc. µg/L | Replicate Conc. µg/L | RPD    |
|---------|-----------|-------------------|----------------------|--------|
| Ag      | 20-S2349  | < 2               | < 2                  | N/C #  |
| Al      | 20-S2349  | 195.9             | 198.4                | 1.27   |
| As      | 20-S2349  | < 7               | < 7                  | N/C #  |
| Ba      | 20-S2349  | 48.30             | 48.45                | 0.31   |
| Be      | 20-S2349  | < 0.2             | < 0.2                | N/C #  |
| Cd      | 20-S2349  | < 0.4             | < 0.4                | N/C #  |
| Co      | 20-S2349  | < 0.5             | < 0.5                | N/C #  |
| Cr      | 20-S2349  | 7.001             | 6.904                | 1.40   |
| Cu      | 20-S2349  | 36.73             | 34.56                | 6.09   |
| Mn      | 20-S2349  | 32.38             | 32.10                | 0.87   |
| Ni      | 20-S2349  | 5.028             | 3.927                | 24.6 # |
| P       | 20-S2349  | 44.27             | 33.22                | 28.5 # |
| Pb      | 20-S2349  | 7.243             | 6.497                | 10.9 # |
| Sb      | 20-S2353  | < 5               | < 5                  | N/C #  |
| Se      | 20-S2349  | < 15              | < 15                 | N/C #  |
| Tl      | 20-S2349  | < 10              | < 10                 | N/C #  |
| V       | 20-S2349  | < 1               | < 1                  | N/C #  |
| Zn      | 20-S2349  | 35.13             | 34.53                | 1.72   |

N/C: RPD is not calculated when sample or replicate is below detection limit

Replicate Limit: 20% RPD

#: per EPA CLP protocol, control limits do not apply if sample and/or replicate concentration is less than 5x the detection limit

### Laboratory Control Sample/Post Digestion Spike Analysis

| Analyte | Sample ID | Sample Conc. µg/L | Spike Conc. µg/L | Spike Amount µg/L | Percent Recovery |
|---------|-----------|-------------------|------------------|-------------------|------------------|
| Ag      | LCS       | < 2               | 2348.            | 2500.             | 93.9             |
| Ag      | LCS       | < 2               | 323.9            | 2500.             | 13.0             |
| Ag      | 20-S2351  | < 2               | 2062.            | 2500.             | 82.5             |
| Al      | LCS       | 34.76             | 2663.            | 2500.             | 105.             |
| Al      | LCS       | 34.76             | 2451.            | 2500.             | 96.6             |
| Al      | 20-S2351  | 105.0             | 2369.            | 2500.             | 90.6             |
| As      | LCS       | < 7               | 2415.            | 2500.             | 96.6             |
| As      | LCS       | < 7               | 2439.            | 2500.             | 97.6             |
| As      | 20-S2351  | < 7               | 2363.            | 2500.             | 94.5             |
| Ba      | LCS       | < 0.5             | 2485.            | 2500.             | 99.4             |
| Ba      | LCS       | < 0.5             | 2457.            | 2500.             | 98.3             |
| Ba      | 20-S2351  | 9.607             | 2306.            | 2500.             | 91.9             |

LCS Limit: 80% - 120% Recovery Spike Limit: 75% - 125% Recovery

\*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

## QA/QC Report

Client Name: Bison Engineering  
 Project Number: B020  
 Analytical Technique: ICP - Optima 8300  
 Sample Description: EPA Method 29 Cont. 4  
 Report Number: 20-513  
 =====

### Laboratory Control Sample/Post Digestion Spike Analysis

| Analyte | Sample ID | Sample Conc. µg/L | Spike Conc. µg/L | Spike Amount µg/L | Percent Recovery |
|---------|-----------|-------------------|------------------|-------------------|------------------|
| Be      | LCS       | < 0.2             | 2408.            | 2500.             | 96.3             |
| Be      | LCS       | < 0.2             | 2392.            | 2500.             | 95.7             |
| Be      | 20-S2351  | < 0.2             | 2263.            | 2500.             | 90.5             |
| Cd      | LCS       | < 0.4             | 2434.            | 2500.             | 97.4             |
| Cd      | LCS       | < 0.4             | 2440.            | 2500.             | 97.6             |
| Cd      | 20-S2351  | < 0.4             | 2330.            | 2500.             | 93.2             |
| Co      | LCS       | < 0.5             | 2434.            | 2500.             | 97.4             |
| Co      | LCS       | < 0.5             | 2450.            | 2500.             | 98.0             |
| Co      | 20-S2351  | < 0.5             | 2350.            | 2500.             | 94.0             |
| Cr      | LCS       | < 0.8             | 2574.            | 2500.             | 103.             |
| Cr      | LCS       | < 0.8             | 2558.            | 2500.             | 102.             |
| Cr      | 20-S2351  | 5.919             | 2451.            | 2500.             | 97.8             |
| Cu      | LCS       | < 5               | 2402.            | 2500.             | 96.1             |
| Cu      | LCS       | < 5               | 2414.            | 2500.             | 96.6             |
| Cu      | 20-S2351  | 41.89             | 2469.            | 2500.             | 97.1             |
| Mn      | LCS       | < 0.3             | 2481.            | 2500.             | 99.2             |
| Mn      | LCS       | < 0.3             | 2473.            | 2500.             | 98.9             |
| Mn      | 20-S2351  | 31.00             | 2378.            | 2500.             | 93.9             |
| Ni      | LCS       | < 3               | 2347.            | 2500.             | 93.9             |
| Ni      | LCS       | < 3               | 2332.            | 2500.             | 93.3             |
| Ni      | 20-S2351  | 4.843             | 2212.            | 2500.             | 88.3             |
| P       | LCS       | < 20              | 2381.            | 2500.             | 95.2             |
| P       | LCS       | < 20              | 2317.            | 2500.             | 92.7             |
| P       | 20-S2351  | < 20              | 2230.            | 2500.             | 89.2             |
| Pb      | LCS       | < 5               | 2369.            | 2500.             | 94.8             |
| Pb      | LCS       | < 5               | 2363.            | 2500.             | 94.5             |
| Pb      | 20-S2351  | 10.68             | 2296.            | 2500.             | 91.4             |
| Sb      | LCS       | 9.567             | 2418.            | 2500.             | 96.3             |
| Sb      | LCS       | 9.567             | 2406.            | 2500.             | 95.9             |
| Sb      | 20-S2355  | < 5               | 2309.            | 2500.             | 92.4             |
| Se      | LCS       | < 15              | 2300.            | 2500.             | 92.0             |
| Se      | LCS       | < 15              | 2277.            | 2500.             | 91.1             |
| Se      | 20-S2351  | < 15              | 2119.            | 2500.             | 84.8             |
| Tl      | LCS       | < 10              | 2414.            | 2500.             | 96.6             |
| Tl      | LCS       | < 10              | 2379.            | 2500.             | 95.2             |
| Tl      | 20-S2351  | < 10              | 2243.            | 2500.             | 89.7             |
| V       | LCS       | < 1               | 2571.            | 2500.             | 103.             |
| V       | LCS       | < 1               | 2597.            | 2500.             | 104.             |
| V       | 20-S2351  | < 1               | 2518.            | 2500.             | 101.             |
| Zn      | LCS       | < 3               | 2436.            | 2500.             | 97.4             |
| Zn      | LCS       | < 3               | 2439.            | 2500.             | 97.6             |
| Zn      | 20-S2351  | 133.8             | 2471.            | 2500.             | 93.5             |

LCS Limit: 80% - 120% Recovery Spike Limit: 75% - 125% Recovery

\*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

### Laboratory Control Sample Duplicate Data

| Analyte | Sample ID | Spike Conc. µg/L | Duplicate Conc. µg/L | RPD  |
|---------|-----------|------------------|----------------------|------|
| Ag      | LCS-DUP   | 2350             | 324.                 | 152. |
| Al      | LCS-DUP   | 2660             | 2450                 | 8.29 |
| As      | LCS-DUP   | 2420             | 2440                 | 0.99 |
| Ba      | LCS-DUP   | 2480             | 2460                 | 1.13 |
| Be      | LCS-DUP   | 2410             | 2390                 | 0.67 |
| Cd      | LCS-DUP   | 2430             | 2440                 | 0.25 |

Duplicate Limit: 20% RPD

## QA/QC Report

Client Name: Bison Engineering  
Project Number: B020  
Analytical Technique: ICP - Optima 8300  
Sample Description: EPA Method 29 Cont. 4  
Report Number: 20-513  
=====

### Laboratory Control Sample Duplicate Data

| Analyte | Sample ID | Spike Conc. µg/L | Duplicate Conc. µg/L | RPD  |
|---------|-----------|------------------|----------------------|------|
| Co      | LCS-DUP   | 2430             | 2450                 | 0.66 |
| Cr      | LCS-DUP   | 2570             | 2560                 | 0.62 |
| Cu      | LCS-DUP   | 2400             | 2410                 | 0.50 |
| Mn      | LCS-DUP   | 2480             | 2470                 | 0.32 |
| Ni      | LCS-DUP   | 2350             | 2330                 | 0.64 |
| P       | LCS-DUP   | 2380             | 2320                 | 2.72 |
| Pb      | LCS-DUP   | 2370             | 2360                 | 0.25 |
| Sb      | LCS-DUP   | 2420             | 2410                 | 0.50 |
| Se      | LCS-DUP   | 2300             | 2280                 | 1.01 |
| Tl      | LCS-DUP   | 2410             | 2380                 | 1.46 |
| V       | LCS-DUP   | 2570             | 2600                 | 1.01 |
| Zn      | LCS-DUP   | 2440             | 2440                 | 0.12 |

Duplicate Limit: 20% RPD

## QA/QC Report

Client Name: Bison Engineering  
 Project Number: B020  
 Analytical Technique: ICP - Optima 8300  
 Sample Description: 47mm Quartz  
 Report Number: 20-513  
 =====

### Blank Data

| Analyte | Sample ID | Measured Conc. µg/L | DL Conc. µg/L |
|---------|-----------|---------------------|---------------|
| As      | ICB       | < DL                | 7.00          |
| As      | Meth_Blkc | < DL                | 7.00          |
| As      | SM_Blkc*  | < DL                | 1.75          |
| As      | CCB       | < DL                | 7.00          |
| As      | CCB       | < DL                | 7.00          |
| As      | CCB       | < DL                | 7.00          |
| As      | CCB       | < DL                | 7.00          |
| As      | CCB       | < DL                | 7.00          |
| Cr      | ICB       | < DL                | 0.800         |
| Cr      | Meth_Blkc | < DL                | 0.800         |
| Cr      | SM_Blkc*  | 0.448               | 0.200         |
| Cr      | CCB       | < DL                | 0.800         |
| Cr      | CCB       | < DL                | 0.800         |
| Cr      | CCB       | < DL                | 0.800         |
| Mn      | ICB       | < DL                | 0.300         |
| Mn      | Meth_Blkc | < DL                | 0.300         |
| Mn      | SM_Blkc*  | 0.232               | 0.075         |
| Mn      | CCB       | < DL                | 0.300         |
| Mn      | CCB       | < DL                | 0.300         |
| Mn      | CCB       | < DL                | 0.300         |
| Mn      | CCB       | < DL                | 0.300         |
| Ni      | ICB       | < DL                | 3.00          |
| Ni      | Meth_Blkc | < DL                | 3.00          |
| Ni      | SM_Blkc*  | 1.85                | 0.750         |
| Ni      | CCB       | < DL                | 3.00          |
| Ni      | CCB       | < DL                | 3.00          |
| Ni      | CCB       | < DL                | 3.00          |
| Pb      | ICB       | < DL                | 5.00          |
| Pb      | Meth_Blkc | < DL                | 5.00          |
| Pb      | SM_Blkc*  | < DL                | 1.25          |
| Pb      | CCB       | < DL                | 5.00          |
| Pb      | CCB       | < DL                | 5.00          |
| Pb      | CCB       | < DL                | 5.00          |

\*: Sample Media Blank (SM\_Blkc) concentration in µg/filter

ICB: Initial Calibration Blank CCB: Continuing Calibration Blank

Method Blank is in control if Method Blank results are <10% of sample results

### Calibration QC

| Analyte | Sample ID | Standard Conc. µg/L | Measured Conc. µg/L | Percent Recovery |
|---------|-----------|---------------------|---------------------|------------------|
| As      | ICV       | 2500                | 2550                | 102.0            |
| As      | LL-CCV    | 35.0                | 33.1                | 94.5             |
| As      | LL-LCS    | 20.0                | 24.8                | 124.0            |
| As      | CCV       | 2500                | 2370                | 94.8             |
| As      | CCV       | 2500                | 2350                | 94.0             |
| As      | CCV       | 2500                | 2390                | 95.8             |
| As      | CCV       | 2500                | 2280                | 91.0             |
| As      | CCV       | 2500                | 2350                | 94.1             |
| Cr      | ICV       | 2500                | 2670                | 107.0            |
| Cr      | LL-CCV    | 4.00                | 3.91                | 97.8             |
| Cr      | LL-LCS    | 2.00                | 2.01                | 100.6            |
| Cr      | CCV       | 2500                | 2680                | 107.0            |

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification

Calibration Verification Limits: 90% - 110% Recovery

LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery

LL-LCS Limits: 50% - 150% Recovery

LL-LCS results are not significant if sample results are >10x LL-LCS concentration

## QA/QC Report

Client Name: Bison Engineering  
 Project Number: B020  
 Analytical Technique: ICP - Optima 8300  
 Sample Description: 47mm Quartz  
 Report Number: 20-513  
 =====

### Calibration QC

| Analyte | Sample ID | Standard Conc. µg/L | Measured Conc. µg/L | Percent Recovery |
|---------|-----------|---------------------|---------------------|------------------|
| Cr      | CCV       | 2500                | 2700                | 108.0            |
| Cr      | CCV       | 2500                | 2700                | 107.9            |
| Mn      | ICV       | 2500                | 2460                | 98.4             |
| Mn      | LL-CCV    | 1.50                | 1.27                | 84.5             |
| Mn      | LL-LCS    | 1.00                | 0.728               | 72.8             |
| Mn      | CCV       | 2500                | 2340                | 93.6             |
| Mn      | CCV       | 2500                | 2330                | 93.1             |
| Mn      | CCV       | 2500                | 2310                | 92.2             |
| Mn      | CCV       | 2500                | 2270                | 90.8             |
| Ni      | ICV       | 2500                | 2480                | 99.4             |
| Ni      | LL-CCV    | 15.0                | 14.9                | 99.3             |
| Ni      | LL-LCS    | 6.00                | 6.44                | 107.4            |
| Ni      | CCV       | 2500                | 2480                | 99.3             |
| Ni      | CCV       | 2500                | 2500                | 100.1            |
| Ni      | CCV       | 2500                | 2510                | 100.4            |
| Pb      | ICV       | 2500                | 2340                | 93.5             |
| Pb      | LL-CCV    | 25.0                | 17.6                | 70.3             |
| Pb      | LL-LCS    | 15.0                | 14.5                | 96.5             |
| Pb      | CCV       | 2500                | 2390                | 95.6             |
| Pb      | CCV       | 2500                | 2310                | 92.5             |
| Pb      | CCV       | 2500                | 2380                | 95.0             |

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification  
 Calibration Verification Limits: 90% - 110% Recovery  
 LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery  
 LL-LCS Limits: 50% - 150% Recovery  
 LL-LCS results are not significant if sample results are >10x LL-LCS concentration

### Replicate Data

| Analyte | Sample ID | Sample Conc. µg/L | Replicate Conc. µg/L | RPD   |
|---------|-----------|-------------------|----------------------|-------|
| As      | 20-U423   | < 7               | < 7                  | N/C # |
| Cr      | 20-U423   | 57.79             | 57.60                | 0.33  |
| Mn      | 20-U423   | 3397.             | 3331.                | 1.96  |
| Ni      | 20-U423   | 24.10             | 23.06                | 4.41  |
| Pb      | 20-U423   | 84.36             | 90.68                | 7.22  |

N/C: RPD is not calculated when sample or replicate is below detection limit  
 Replicate Limit: 20% RPD  
 #: per EPA CLP protocol, control limits do not apply if sample and/or replicate concentration is less than 5x the detection limit

### Laboratory Control Sample/Post Digestion Spike Analysis

| Analyte | Sample ID | Sample Conc. µg/L | Spike Conc. µg/L | Spike Amount µg/L | Percent Recovery |
|---------|-----------|-------------------|------------------|-------------------|------------------|
| As      | LCS       | < 7               | 2705.            | 2500.             | 108.             |
| As      | LCS       | < 7               | 2631.            | 2500.             | 105.             |
| As      | 20-U424   | < 7               | 2522.            | 2500.             | 101.             |
| Cr      | LCS       | 1.791             | 2492.            | 2500.             | 99.6             |
| Cr      | LCS       | 1.791             | 2544.            | 2500.             | 102.             |
| Cr      | 20-U424   | 24.72             | 2468.            | 2500.             | 97.7             |
| Mn      | LCS       | 0.927             | 2596.            | 2500.             | 104.             |

LCS Limit: 80% - 120% Recovery Spike Limit: 75% - 125% Recovery  
 \*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

## QA/QC Report

Client Name: Bison Engineering  
Project Number: B020  
Analytical Technique: ICP - Optima 8300  
Sample Description: 47mm Quartz  
Report Number: 20-513  
=====

### Laboratory Control Sample/Post Digestion Spike Analysis

| Analyte | Sample ID | Sample Conc. µg/L | Spike Conc. µg/L | Spike Amount µg/L | Percent Recovery |
|---------|-----------|-------------------|------------------|-------------------|------------------|
| Mn      | LCS       | 0.927             | 2558.            | 2500.             | 102.             |
| Mn      | 20-U424   | 1896.             | 4185.            | 2500.             | 91.6             |
| Ni      | LCS       | 7.387             | 2351.            | 2500.             | 93.7             |
| Ni      | LCS       | 7.387             | 2408.            | 2500.             | 96.0             |
| Ni      | 20-U424   | 13.65             | 2319.            | 2500.             | 92.2             |
| Pb      | LCS       | < 5               | 2435.            | 2500.             | 97.4             |
| Pb      | LCS       | < 5               | 2506.            | 2500.             | 100.             |
| Pb      | 20-U424   | 28.65             | 2459.            | 2500.             | 97.2             |

LCS Limit: 80% - 120% Recovery Spike Limit: 75% - 125% Recovery

\*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

### Laboratory Control Sample Duplicate Data

| Analyte | Sample ID | Spike Conc. µg/L | Duplicate Conc. µg/L | RPD  |
|---------|-----------|------------------|----------------------|------|
| As      | LCS-DUP   | 2700             | 2630                 | 2.77 |
| Cr      | LCS-DUP   | 2490             | 2540                 | 2.07 |
| Mn      | LCS-DUP   | 2600             | 2560                 | 1.47 |
| Ni      | LCS-DUP   | 2350             | 2410                 | 2.40 |
| Pb      | LCS-DUP   | 2440             | 2510                 | 2.87 |

Duplicate Limit: 20% RPD

**ICP RAW DATA**

Available upon request

**CHESTER LABNET**  
**SOURCE SAMPLE RECEIPT CHECKLIST**

Client Bison Engineering Date 12/18/20

# Runs Mini-Vol - 18 20  
M29 - 7  
Cr - 18 18, 00605 - 6  
0061-5, 2014 - 6 Report # 20-513

Custody Seals Inspected, If Present None

Chain-of-Custody Form Inspected

|                                                              |                                     |                                 |
|--------------------------------------------------------------|-------------------------------------|---------------------------------|
| CoC present with samples?                                    | <input checked="" type="checkbox"/> |                                 |
| CoC indicate analytical methodology to be used? (eg M29 etc) | <input checked="" type="checkbox"/> | *                               |
| CoC indicate if compliance testing? (esp. M26)               | <input checked="" type="checkbox"/> | ODEQ 5, M20, 201A, 0061, TSM !! |
| M26 samples have Thiosulfate added in field?                 | <input checked="" type="checkbox"/> | Not stated !!                   |
| M29 indicate FH/BH separate or combined?                     | <input checked="" type="checkbox"/> | NA !!                           |
| Has Form Been Signed?                                        | <input checked="" type="checkbox"/> | per quote separate !!           |
| Have Date and Time Custody Released Been Noted on Form?      | <input checked="" type="checkbox"/> |                                 |

All Sample Containers Inspected

|                                                                   |                                     |      |
|-------------------------------------------------------------------|-------------------------------------|------|
| Does Number of Samples Match Number on CoC Form?                  | <input checked="" type="checkbox"/> | !!   |
| Do All Sample ID Numbers Match Those on the CoC Form?             | <input checked="" type="checkbox"/> | !!   |
| Did client mark sample volumes prior to shipment?                 | <input checked="" type="checkbox"/> | *    |
| If required by method, did client vent samples prior to shipment? | <input checked="" type="checkbox"/> | NA   |
| Are the Sample Containers Intact?                                 | <input checked="" type="checkbox"/> | !!   |
| Are signs of leakage present?                                     | <input checked="" type="checkbox"/> | NO * |

Chain-of-Custody Form Signed and Dated by CLN ☒

Corrective Actions

|                                                       |                                     |
|-------------------------------------------------------|-------------------------------------|
| Client Contacted Due to Mismatching Sample ID Numbers | <input checked="" type="checkbox"/> |
| Client Contacted Due to Broken Sample Container(s)    | <input checked="" type="checkbox"/> |
| Client Contacted Due to Leaking Sample Container(s)   | <input checked="" type="checkbox"/> |
| Client contacted for verification of methodology?     | <input checked="" type="checkbox"/> |
| Corrective Actions Documented?                        | <input checked="" type="checkbox"/> |
| Corrective Actions Accomplished?                      | <input checked="" type="checkbox"/> |

Items marked !! shall be addressed prior to any analytical work being started.

Items marked \* shall be noted in case narrative upon reporting of results to client.

Signed Lisa Bell

Notes Metals for M29 confirmed verbally as well  
as via email.

|                                           |                             |     |
|-------------------------------------------|-----------------------------|-----|
| Company Name<br><i>Blum Engineering</i>   |                             |     |
| Contact<br><i>Blum</i>                    | Phone                       |     |
| E-Mail Address<br><i>blum@blumeng.com</i> | Fax                         |     |
| Report Address                            |                             |     |
| City                                      | State                       | Zip |
| Billing Address                           |                             |     |
| City                                      | State                       | Zip |
| PO #                                      | Project<br><i>SLR220430</i> |     |

**CHESTER LabNet**

12242 SW Garden Place  
Tigard, OR 97223  
(503) 624-2183  
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**CHAIN-OF-CUSTODY RECORD**Page 1 of 2

| LabNet ID | Field Sample ID | Site | Sample Date | Volume (m <sup>3</sup> ) | Particle Size | Analysis Requested |  |  |  |  |  |  |  |  |  | Turn Around Time<br><input type="checkbox"/> Standard<br><input type="checkbox"/> Rush _____<br>Specify | Remarks |
|-----------|-----------------|------|-------------|--------------------------|---------------|--------------------|--|--|--|--|--|--|--|--|--|---------------------------------------------------------------------------------------------------------|---------|
|           |                 |      |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052316   | 121 12/18/20    | CHI  | 12/18/20    |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052317   | 122 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052318   | 123 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052319   | 124 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052320   | 125 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052321   | 126 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052322   | 127 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052323   | 128 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052324   | 129 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052325   | 130 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052326   | 131 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052327   | 132 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052328   | 133 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052329   | 134 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052330   | 135 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052331   | 136 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052332   | 137 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052333   | 138 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052334   | 139 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052335   | 140 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052336   | 141 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052337   | 142 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052338   | 143 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052339   | 144 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052340   | 145 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052341   | 146 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052342   | 147 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052343   | 148 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052344   | 149 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052345   | 150 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052346   | 151 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052347   | 152 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052348   | 153 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052349   | 154 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052350   | 155 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052351   | 156 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052352   | 157 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052353   | 158 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052354   | 159 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052355   | 160 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052356   | 161 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052357   | 162 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052358   | 163 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052359   | 164 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052360   | 165 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052361   | 166 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052362   | 167 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052363   | 168 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052364   | 169 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052365   | 170 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052366   | 171 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052367   | 172 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052368   | 173 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052369   | 174 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052370   | 175 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052371   | 176 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052372   | 177 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052373   | 178 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052374   | 179 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052375   | 180 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052376   | 181 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052377   | 182 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052378   | 183 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052379   | 184 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052380   | 185 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052381   | 186 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052382   | 187 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052383   | 188 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052384   | 189 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052385   | 190 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052386   | 191 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052387   | 192 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052388   | 193 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052389   | 194 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052390   | 195 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052391   | 196 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052392   | 197 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052393   | 198 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052394   | 199 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052395   | 200 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052396   | 201 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052397   | 202 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052398   | 203 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052399   | 204 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |
| 2052400   | 205 12/18/20    | CHI  |             |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                         |         |

Relinquished By: (Signature) Date/Time  
*[Signature]* 12/18/20 12:30

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*[Signature]* 12/18/20 12:30

Received By: (Signature) Date/Time  
*[Signature]* 12/18/20 12:30

Received By: (Signature) Date/Time

Notes:

|                                         |                             |     |
|-----------------------------------------|-----------------------------|-----|
| Company Name<br><i>Clin Engineering</i> |                             |     |
| Contact                                 | Phone                       |     |
| E-Mail Address                          | Fax                         |     |
| Report Address                          |                             |     |
| City                                    | State                       | Zip |
| Billing Address                         |                             |     |
| City                                    | State                       | Zip |
| PO #                                    | Project<br><i>SLR220430</i> |     |

## CHESTER LabNet

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# CHAIN-OF-CUSTODY RECORD

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| LabNet ID                                                                  | Field Sample ID | Site | Sample Date                                                            | Volume (m³) | Particle Size | Analysis Requested |          |      |         |  |  |  |  |  |  | Remarks |  |
|----------------------------------------------------------------------------|-----------------|------|------------------------------------------------------------------------|-------------|---------------|--------------------|----------|------|---------|--|--|--|--|--|--|---------|--|
|                                                                            |                 |      |                                                                        |             |               | Turn Around Time   | Standard | Rush | Specify |  |  |  |  |  |  |         |  |
| 2052337                                                                    | Acetone B       | BH2  | 12/18/20                                                               |             |               |                    |          |      |         |  |  |  |  |  |  |         |  |
| 2052338                                                                    | Water B         | BH2  | 12/18/20                                                               |             |               |                    |          |      |         |  |  |  |  |  |  |         |  |
| 2052322                                                                    | Acetone B       | BH2  | 12/18/20                                                               |             |               |                    |          |      |         |  |  |  |  |  |  |         |  |
| 52324                                                                      | Acetone B       | BH2  | 12/18/20                                                               |             |               |                    |          |      |         |  |  |  |  |  |  |         |  |
| 52326                                                                      | Acetone B       | BH2  | 12/18/20                                                               |             |               |                    |          |      |         |  |  |  |  |  |  |         |  |
| 52323                                                                      | Acetone B       | BH2  | 12/18/20                                                               |             |               |                    |          |      |         |  |  |  |  |  |  |         |  |
| 52325                                                                      | Acetone B       | BH2  | 12/18/20                                                               |             |               |                    |          |      |         |  |  |  |  |  |  |         |  |
| 52327                                                                      | Acetone B       | BH2  | 12/18/20                                                               |             |               |                    |          |      |         |  |  |  |  |  |  |         |  |
|                                                                            |                 |      |                                                                        |             |               |                    |          |      |         |  |  |  |  |  |  |         |  |
|                                                                            |                 |      |                                                                        |             |               |                    |          |      |         |  |  |  |  |  |  |         |  |
|                                                                            |                 |      |                                                                        |             |               |                    |          |      |         |  |  |  |  |  |  |         |  |
|                                                                            |                 |      |                                                                        |             |               |                    |          |      |         |  |  |  |  |  |  |         |  |
|                                                                            |                 |      |                                                                        |             |               |                    |          |      |         |  |  |  |  |  |  |         |  |
| Relinquished By: (Signature) Date/Time<br><i>[Signature]</i> 12/18/20 1230 |                 |      | Received By: (Signature) Date/Time<br><i>[Signature]</i> 12/18/20 1230 |             |               | Notes:             |          |      |         |  |  |  |  |  |  |         |  |
| Relinquished By: (Signature) Date/Time<br><i>[Signature]</i> 12/18/20 1230 |                 |      | Received By: (Signature) Date/Time<br><i>[Signature]</i> 12/18/20 1230 |             |               |                    |          |      |         |  |  |  |  |  |  |         |  |

|                                                                 |                              |                     |
|-----------------------------------------------------------------|------------------------------|---------------------|
| Company Name<br><i>Colum Engineering</i>                        |                              |                     |
| Contact<br><i>Robert Borden</i>                                 | Phone                        |                     |
| E-Mail Address<br><i>rborden@cheesterlab.net</i>                | Fax                          |                     |
| Report Address<br><i>2020 Columbia Steel Casting Co., Inc.</i>  |                              |                     |
| City<br><i>Tigard</i>                                           | State<br><i>OR</i>           | Zip<br><i>97223</i> |
| Billing Address<br><i>2020 Columbia Steel Casting Co., Inc.</i> |                              |                     |
| City<br><i>Tigard</i>                                           | State<br><i>OR</i>           | Zip<br><i>97223</i> |
| PO #                                                            | Project<br><i>SLR 220430</i> |                     |

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## CHAIN-OF-CUSTODY RECORD

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| LabNet ID                                                                    | Field Sample ID | Site | Sample Date                                                            | Volume (m³) | Particle Size | Analysis Requested |  |  |  |  |  |  |  |  |  | Turn Around Time<br><input checked="" type="checkbox"/> Standard<br><input type="checkbox"/> Rush _____<br>Specify | Remarks |
|------------------------------------------------------------------------------|-----------------|------|------------------------------------------------------------------------|-------------|---------------|--------------------|--|--|--|--|--|--|--|--|--|--------------------------------------------------------------------------------------------------------------------|---------|
|                                                                              |                 |      |                                                                        |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |
| 20-1205                                                                      | MS Run 1        | Bur2 | 12/16/20                                                               |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |
| 20-1206                                                                      | MS Run 2        | Bur2 |                                                                        |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |
| 20-1207                                                                      | MS Run 3        | Bur2 |                                                                        |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |
| 2052326                                                                      | Cont. 1         |      |                                                                        |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |
| 52331                                                                        | Cont. 2         |      |                                                                        |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |
| 52334                                                                        | Cont. 3         |      |                                                                        |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |
| 52329                                                                        | Cont. 4         |      |                                                                        |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |
| 52332                                                                        | Cont. 5         |      |                                                                        |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |
| 52335                                                                        | Cont. 6         |      |                                                                        |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |
| 52330                                                                        | Cont. 7         |      |                                                                        |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |
| 52333                                                                        | Cont. 8         |      |                                                                        |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |
| 52334                                                                        | Cont. 9         |      |                                                                        |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |
| Relinquished By: (Signature) Date/Time<br><i>Robert Borden 12/18/20 1230</i> |                 |      | Received By: (Signature) Date/Time<br><i>Robert Ball 12/18/20 1230</i> |             |               | Notes:             |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |
| Relinquished By: (Signature) Date/Time<br><i>12/18/20 1230</i>               |                 |      | Received By: (Signature) Date/Time                                     |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |

|                                                |                             |     |
|------------------------------------------------|-----------------------------|-----|
| Company Name<br><i>Bison Engineering</i>       |                             |     |
| Contact<br><i>Helen Bunker</i>                 | Phone                       |     |
| E-Mail Address<br><i>h.bunker@bisoneng.com</i> | Fax                         |     |
| Report Address                                 |                             |     |
| City                                           | State                       | Zip |
| Billing Address                                |                             |     |
| City                                           | State                       | Zip |
| PO #                                           | Project<br><i>SLR220430</i> |     |

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| LabNet ID                                                                   | Field Sample ID | Site | Sample Date                                                             | Volume (m³) | Particle Size | Analysis Requested |  |  |  |  |  |  |  |  |  | Turn Around Time<br><input checked="" type="checkbox"/> Standard<br><input type="checkbox"/> Rush _____<br>Specify | Remarks |  |
|-----------------------------------------------------------------------------|-----------------|------|-------------------------------------------------------------------------|-------------|---------------|--------------------|--|--|--|--|--|--|--|--|--|--------------------------------------------------------------------------------------------------------------------|---------|--|
|                                                                             |                 |      |                                                                         |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |  |
| 2052348                                                                     | Cent. 1         | BH1  | 12/14/20                                                                |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |  |
| 2052350                                                                     | Cent. 1         | BH1  | 12/14/20                                                                |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |  |
| 2052352                                                                     | Cent. 1         | BH1  | 12/14/20                                                                |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |  |
| 2052359                                                                     | Cent. 1         | BH2  | 12/14/20                                                                |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |  |
| 2052361                                                                     | Cent. 1         | BH2  | 12/14/20                                                                |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |  |
| 2052363                                                                     | Cent. 1         | BH2  | 12/14/20                                                                |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |  |
|                                                                             |                 |      |                                                                         |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |  |
|                                                                             |                 |      |                                                                         |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |  |
|                                                                             |                 |      |                                                                         |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |  |
|                                                                             |                 |      |                                                                         |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |  |
|                                                                             |                 |      |                                                                         |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |  |
|                                                                             |                 |      |                                                                         |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |  |
|                                                                             |                 |      |                                                                         |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |  |
|                                                                             |                 |      |                                                                         |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |  |
|                                                                             |                 |      |                                                                         |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |  |
| Relinquished By: (Signature) Date/Time<br><i>[Signature]</i> 12/18/20 12:30 |                 |      | Received By: (Signature) Date/Time<br><i>[Signature]</i> 12/18/20 12:30 |             |               | Notes:             |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |  |
| Relinquished By: (Signature) Date/Time<br><i>[Signature]</i> 12/18/20 12:30 |                 |      | Received By: (Signature) Date/Time                                      |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |  |

|                                            |                             |     |
|--------------------------------------------|-----------------------------|-----|
| Company Name<br><i>Bison Engineering</i>   |                             |     |
| Contact<br><i>Adam Bunker</i>              | Phone                       |     |
| E-Mail Address<br><i>adam@bisoneng.com</i> | Fax                         |     |
| Report Address                             |                             |     |
| City                                       | State                       | Zip |
| Billing Address                            |                             |     |
| City                                       | State                       | Zip |
| PO #                                       | Project<br><i>SLR220430</i> |     |

## CHESTER LabNet

12242 SW Garden Place  
Tigard, OR 97223  
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Fax (503) 624-2653  
cln@chesterlab.net

# CHAIN-OF-CUSTODY RECORD

5 10  
Page ~~1~~ of ~~1~~

| LabNet ID | Field Sample ID | Site | Sample Date | Volume (m³) | Particle Size | Analysis Requested |  |  |  |  |  |  |  |  |  | Turn Around Time<br><input checked="" type="checkbox"/> Standard<br><input type="checkbox"/> Rush _____<br>Specify | Remarks |                         |
|-----------|-----------------|------|-------------|-------------|---------------|--------------------|--|--|--|--|--|--|--|--|--|--------------------------------------------------------------------------------------------------------------------|---------|-------------------------|
|           |                 |      |             |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |                         |
| 52048     | Cont. 2         | BH1  | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |                         |
| 52050     | Cont. 3         | BH1  |             |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |                         |
| 52052     | Cont. 3         | BH1  |             |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |                         |
| 2052349   | Cont. 4         | BH1  |             |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         | Impinger cabinet filter |
| 52351     | Cont. 4         | BH1  |             |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |                         |
| 52353     | Cont. 4         | BH1  |             |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |                         |
| 2052350   | Cont. 6         | BH2  |             |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         | Protein filter          |
| 2351362   | Cont. 6         | BH2  |             |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |                         |
| 52363     | Cont. 6         | BH2  |             |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |                         |
| 2052360   | Cont. 4         | BH2  |             |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         | Impinger cabinet filter |
| 2362      | Cont. 4         | BH2  |             |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |                         |
| 2364      | Cont. 4         | BH2  |             |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |         |                         |

|                                                                             |                                                                         |        |
|-----------------------------------------------------------------------------|-------------------------------------------------------------------------|--------|
| Relinquished By: (Signature) Date/Time<br><i>[Signature]</i> 12/10/20 12:30 | Received By: (Signature) Date/Time<br><i>[Signature]</i> 12/10/20 12:30 | Notes: |
| Relinquished By: (Signature) Date/Time<br><i>[Signature]</i> 12/10/20 12:30 | Received By: (Signature) Date/Time                                      |        |

|                                                   |                              |                     |
|---------------------------------------------------|------------------------------|---------------------|
| Company Name<br><i>Siron Engineering</i>          |                              |                     |
| Contact<br><i>Adam Conder</i>                     | Phone                        |                     |
| E-Mail Address<br><i>adam@ironengineering.com</i> | Fax                          |                     |
| Report Address<br><i>3143 E. Lyndale</i>          |                              |                     |
| City<br><i>Bellevue</i>                           | State<br><i>WA</i>           | Zip<br><i>98001</i> |
| Billing Address<br><i>3143 E. Lyndale</i>         |                              |                     |
| City<br><i>Bellevue</i>                           | State<br><i>WA</i>           | Zip<br><i>98001</i> |
| PO #                                              | Project<br><i>2020-04-20</i> |                     |

## CHESTER LabNet

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## CHAIN-OF-CUSTODY RECORD

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| LabNet ID | Field Sample ID | Site   | Sample Date | Volume (m³) | Particle Size | Analysis Requested |  |  |  |  |  |  |  |  |  | Turn Around Time |  | Remarks |
|-----------|-----------------|--------|-------------|-------------|---------------|--------------------|--|--|--|--|--|--|--|--|--|------------------|--|---------|
|           |                 |        |             |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0009   | 20-0009         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0010   | 20-0010         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0011   | 20-0011         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0012   | 20-0012         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0013   | 20-0013         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0014   | 20-0014         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0015   | 20-0015         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0016   | 20-0016         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0017   | 20-0017         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0018   | 20-0018         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0019   | 20-0019         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0020   | 20-0020         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0021   | 20-0021         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0022   | 20-0022         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0023   | 20-0023         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0024   | 20-0024         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0025   | 20-0025         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0026   | 20-0026         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0027   | 20-0027         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0028   | 20-0028         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0029   | 20-0029         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0030   | 20-0030         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0031   | 20-0031         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0032   | 20-0032         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0033   | 20-0033         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0034   | 20-0034         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0035   | 20-0035         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0036   | 20-0036         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0037   | 20-0037         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0038   | 20-0038         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0039   | 20-0039         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0040   | 20-0040         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0041   | 20-0041         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0042   | 20-0042         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0043   | 20-0043         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0044   | 20-0044         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0045   | 20-0045         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0046   | 20-0046         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0047   | 20-0047         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0048   | 20-0048         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0049   | 20-0049         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0050   | 20-0050         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0051   | 20-0051         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0052   | 20-0052         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0053   | 20-0053         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0054   | 20-0054         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0055   | 20-0055         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0056   | 20-0056         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0057   | 20-0057         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0058   | 20-0058         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0059   | 20-0059         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0060   | 20-0060         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0061   | 20-0061         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0062   | 20-0062         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0063   | 20-0063         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0064   | 20-0064         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0065   | 20-0065         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0066   | 20-0066         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0067   | 20-0067         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0068   | 20-0068         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0069   | 20-0069         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0070   | 20-0070         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0071   | 20-0071         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0072   | 20-0072         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0073   | 20-0073         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0074   | 20-0074         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0075   | 20-0075         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0076   | 20-0076         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0077   | 20-0077         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0078   | 20-0078         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0079   | 20-0079         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0080   | 20-0080         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0081   | 20-0081         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0082   | 20-0082         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0083   | 20-0083         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0084   | 20-0084         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0085   | 20-0085         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0086   | 20-0086         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0087   | 20-0087         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0088   | 20-0088         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0089   | 20-0089         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0090   | 20-0090         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0091   | 20-0091         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0092   | 20-0092         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0093   | 20-0093         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0094   | 20-0094         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0095   | 20-0095         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0096   | 20-0096         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0097   | 20-0097         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0098   | 20-0098         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0099   | 20-0099         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |
| 20-0100   | 20-0100         | Site 1 | 12/10/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                  |  |         |

Relinquished By: (Signature) Date/Time  
*[Signature]* 12/18/20 12:30

Received By: (Signature) Date/Time  
*[Signature]* 12/18/20 12:30

Notes:

|                                                         |                          |     |
|---------------------------------------------------------|--------------------------|-----|
| Company Name<br><i>Columbia Steel Casting Co., Inc.</i> |                          |     |
| Contact<br><i>John Barker</i>                           | Phone                    |     |
| E-Mail Address                                          | Fax                      |     |
| Report Address                                          |                          |     |
| City                                                    | State                    | Zip |
| Billing Address                                         |                          |     |
| City                                                    | State                    | Zip |
| PO #                                                    | Project<br><i>205754</i> |     |

## CHESTER LabNet

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cln@chesterlab.net

## CHAIN-OF-CUSTODY RECORD

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| LabNet ID     | Field Sample ID | Site         | Sample Date     | Volume (m <sup>3</sup> ) | Particle Size | Analysis Requested |  |  |  |  |  |  |  |  |  | Turn Around Time<br><input checked="" type="checkbox"/> Standard<br><input type="checkbox"/> Rush _____ Specify | Remarks |
|---------------|-----------------|--------------|-----------------|--------------------------|---------------|--------------------|--|--|--|--|--|--|--|--|--|-----------------------------------------------------------------------------------------------------------------|---------|
|               |                 |              |                 |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                 |         |
| <i>205754</i> | <i>1001</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1001</i>                                                                                              |         |
| <i>205754</i> | <i>1002</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1002</i>                                                                                              |         |
| <i>205754</i> | <i>1003</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1003</i>                                                                                              |         |
| <i>205754</i> | <i>1004</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1004</i>                                                                                              |         |
| <i>205754</i> | <i>1005</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1005</i>                                                                                              |         |
| <i>205754</i> | <i>1006</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1006</i>                                                                                              |         |
| <i>205754</i> | <i>1007</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1007</i>                                                                                              |         |
| <i>205754</i> | <i>1008</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1008</i>                                                                                              |         |
| <i>205754</i> | <i>1009</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1009</i>                                                                                              |         |
| <i>205754</i> | <i>1010</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1010</i>                                                                                              |         |
| <i>205754</i> | <i>1011</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1011</i>                                                                                              |         |
| <i>205754</i> | <i>1012</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1012</i>                                                                                              |         |
| <i>205754</i> | <i>1013</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1013</i>                                                                                              |         |
| <i>205754</i> | <i>1014</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1014</i>                                                                                              |         |
| <i>205754</i> | <i>1015</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1015</i>                                                                                              |         |
| <i>205754</i> | <i>1016</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1016</i>                                                                                              |         |
| <i>205754</i> | <i>1017</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1017</i>                                                                                              |         |
| <i>205754</i> | <i>1018</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1018</i>                                                                                              |         |
| <i>205754</i> | <i>1019</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1019</i>                                                                                              |         |
| <i>205754</i> | <i>1020</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1020</i>                                                                                              |         |
| <i>205754</i> | <i>1021</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1021</i>                                                                                              |         |
| <i>205754</i> | <i>1022</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1022</i>                                                                                              |         |
| <i>205754</i> | <i>1023</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1023</i>                                                                                              |         |
| <i>205754</i> | <i>1024</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1024</i>                                                                                              |         |
| <i>205754</i> | <i>1025</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1025</i>                                                                                              |         |
| <i>205754</i> | <i>1026</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1026</i>                                                                                              |         |
| <i>205754</i> | <i>1027</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1027</i>                                                                                              |         |
| <i>205754</i> | <i>1028</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1028</i>                                                                                              |         |
| <i>205754</i> | <i>1029</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1029</i>                                                                                              |         |
| <i>205754</i> | <i>1030</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1030</i>                                                                                              |         |
| <i>205754</i> | <i>1031</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1031</i>                                                                                              |         |
| <i>205754</i> | <i>1032</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1032</i>                                                                                              |         |
| <i>205754</i> | <i>1033</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1033</i>                                                                                              |         |
| <i>205754</i> | <i>1034</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1034</i>                                                                                              |         |
| <i>205754</i> | <i>1035</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1035</i>                                                                                              |         |
| <i>205754</i> | <i>1036</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1036</i>                                                                                              |         |
| <i>205754</i> | <i>1037</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1037</i>                                                                                              |         |
| <i>205754</i> | <i>1038</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1038</i>                                                                                              |         |
| <i>205754</i> | <i>1039</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1039</i>                                                                                              |         |
| <i>205754</i> | <i>1040</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1040</i>                                                                                              |         |
| <i>205754</i> | <i>1041</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1041</i>                                                                                              |         |
| <i>205754</i> | <i>1042</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1042</i>                                                                                              |         |
| <i>205754</i> | <i>1043</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1043</i>                                                                                              |         |
| <i>205754</i> | <i>1044</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1044</i>                                                                                              |         |
| <i>205754</i> | <i>1045</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1045</i>                                                                                              |         |
| <i>205754</i> | <i>1046</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1046</i>                                                                                              |         |
| <i>205754</i> | <i>1047</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1047</i>                                                                                              |         |
| <i>205754</i> | <i>1048</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1048</i>                                                                                              |         |
| <i>205754</i> | <i>1049</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1049</i>                                                                                              |         |
| <i>205754</i> | <i>1050</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1050</i>                                                                                              |         |
| <i>205754</i> | <i>1051</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1051</i>                                                                                              |         |
| <i>205754</i> | <i>1052</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1052</i>                                                                                              |         |
| <i>205754</i> | <i>1053</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1053</i>                                                                                              |         |
| <i>205754</i> | <i>1054</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1054</i>                                                                                              |         |
| <i>205754</i> | <i>1055</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1055</i>                                                                                              |         |
| <i>205754</i> | <i>1056</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1056</i>                                                                                              |         |
| <i>205754</i> | <i>1057</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1057</i>                                                                                              |         |
| <i>205754</i> | <i>1058</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1058</i>                                                                                              |         |
| <i>205754</i> | <i>1059</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1059</i>                                                                                              |         |
| <i>205754</i> | <i>1060</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1060</i>                                                                                              |         |
| <i>205754</i> | <i>1061</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1061</i>                                                                                              |         |
| <i>205754</i> | <i>1062</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1062</i>                                                                                              |         |
| <i>205754</i> | <i>1063</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1063</i>                                                                                              |         |
| <i>205754</i> | <i>1064</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1064</i>                                                                                              |         |
| <i>205754</i> | <i>1065</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1065</i>                                                                                              |         |
| <i>205754</i> | <i>1066</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1066</i>                                                                                              |         |
| <i>205754</i> | <i>1067</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1067</i>                                                                                              |         |
| <i>205754</i> | <i>1068</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1068</i>                                                                                              |         |
| <i>205754</i> | <i>1069</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1069</i>                                                                                              |         |
| <i>205754</i> | <i>1070</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1070</i>                                                                                              |         |
| <i>205754</i> | <i>1071</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1071</i>                                                                                              |         |
| <i>205754</i> | <i>1072</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1072</i>                                                                                              |         |
| <i>205754</i> | <i>1073</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1073</i>                                                                                              |         |
| <i>205754</i> | <i>1074</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1074</i>                                                                                              |         |
| <i>205754</i> | <i>1075</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1075</i>                                                                                              |         |
| <i>205754</i> | <i>1076</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1076</i>                                                                                              |         |
| <i>205754</i> | <i>1077</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1077</i>                                                                                              |         |
| <i>205754</i> | <i>1078</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1078</i>                                                                                              |         |
| <i>205754</i> | <i>1079</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1079</i>                                                                                              |         |
| <i>205754</i> | <i>1080</i>     | <i>Sub 1</i> | <i>12/14/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>205754 1080</i>                                                                                              |         |
| <i>205754</i> | <i>1081</i>     | <i>Sub 1</i> | <i>1</i>        |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                 |         |

Company Name  
 Contact  
 E-Mail Address  
 Report Address  
 City State Zip  
 Billing Address  
 City State Zip  
 PO # Project

# CHESTER LabNet

12242 SW Garden Place  
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 (503) 624-2183  
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## CHAIN-OF-CUSTODY RECORD

8 10  
 Page 2 of 4

| LabNet ID | Field Sample ID | Site    | Sample Date | Volume (m³) | Particle Size | Analysis Requested |  |  |  |  |  |  |  |  |  | Turn Around Time<br><input checked="" type="checkbox"/> Standard<br><input type="checkbox"/> Rush _____<br>Specify | Remarks      |
|-----------|-----------------|---------|-------------|-------------|---------------|--------------------|--|--|--|--|--|--|--|--|--|--------------------------------------------------------------------------------------------------------------------|--------------|
|           |                 |         |             |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |              |
| 20-00430  | Vent #1         | Bldg 8  | 12/18/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |              |
| 20-00431  | Vent #2         | Bldg 8  | 12/18/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    |              |
| 20-00432  | Vent #3         | Bldg 11 | 12/18/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    | SN 8701      |
| 20-00433  | Vent #4         | Bldg 11 | 12/18/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    | SN 4114      |
| 20-00434  | Vent #5         | Bldg 11 | 12/18/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    | #432 SN 8701 |
| 20-00435  | Vent #6         | Bldg 11 | 12/18/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    | #431 SN 4114 |
| 20-00436  | Vent #7         | Bldg 11 | 12/18/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    | #437 SN 8701 |
| 20-00437  | Vent #8         | Bldg 11 | 12/18/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    | #438 SN 4114 |
| 20-00438  | Vent #9         | Bldg 11 | 12/18/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    | #439 SN 4114 |
| 20-00439  | Vent #10        | Bldg 11 | 12/18/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    | #435 SN 8701 |
| 20-00440  | Vent #11        | Bldg 8  | 12/18/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    | #436 SN 4114 |
| 20-00441  | Vent #12        | Bldg 8  | 12/18/20    |             |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                                    | #434 SN 8701 |

Relinquished By: (Signature) Date/Time  
 Received By: (Signature) Date/Time  
 Relinquished By: (Signature) Date/Time  
 Received By: (Signature) Date/Time

Notes:  
 Select metals: Arsenic, Chromium, Lead, Manganese, Nickel

20-53

|                                       |                            |     |
|---------------------------------------|----------------------------|-----|
| Company Name<br><i>Chester LabNet</i> |                            |     |
| Contact<br><i>John Carter</i>         | Phone                      |     |
| E-Mail Address                        | Fax                        |     |
| Report Address                        |                            |     |
| City                                  | State                      | Zip |
| Billing Address                       |                            |     |
| City                                  | State                      | Zip |
| PO #                                  | Project<br><i>2020-001</i> |     |

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**CHAIN-OF-CUSTODY RECORD**

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| Analysis Requested                                                                |                 |               |                                                                             |                          |               |                         |  |  |  |  |  | Turn Around Time<br><input type="checkbox"/> Standard<br><input type="checkbox"/> Rush _____ Specify |  |         |
|-----------------------------------------------------------------------------------|-----------------|---------------|-----------------------------------------------------------------------------|--------------------------|---------------|-------------------------|--|--|--|--|--|------------------------------------------------------------------------------------------------------|--|---------|
| LabNet ID                                                                         | Field Sample ID | Site          | Sample Date                                                                 | Volume (m <sup>3</sup> ) | Particle Size |                         |  |  |  |  |  |                                                                                                      |  | Remarks |
| <i>205231</i>                                                                     | <i>205231</i>   | <i>205231</i> | <i>12/18/20</i>                                                             |                          |               |                         |  |  |  |  |  |                                                                                                      |  |         |
| <i>52312</i>                                                                      | <i>52312</i>    | <i>52312</i>  | <i>12/18/20</i>                                                             |                          |               |                         |  |  |  |  |  |                                                                                                      |  |         |
| <i>52313</i>                                                                      | <i>52313</i>    | <i>52313</i>  | <i>12/18/20</i>                                                             |                          |               |                         |  |  |  |  |  |                                                                                                      |  |         |
| <i>52314</i>                                                                      | <i>52314</i>    | <i>52314</i>  | <i>12/18/20</i>                                                             |                          |               |                         |  |  |  |  |  |                                                                                                      |  |         |
| <i>52315</i>                                                                      | <i>52315</i>    | <i>52315</i>  | <i>12/18/20</i>                                                             |                          |               |                         |  |  |  |  |  |                                                                                                      |  |         |
|                                                                                   |                 |               |                                                                             |                          |               |                         |  |  |  |  |  |                                                                                                      |  |         |
|                                                                                   |                 |               |                                                                             |                          |               |                         |  |  |  |  |  |                                                                                                      |  |         |
|                                                                                   |                 |               |                                                                             |                          |               |                         |  |  |  |  |  |                                                                                                      |  |         |
| Relinquished By: (Signature) Date/Time<br><i>John Carter</i> <i>12/18/20 1230</i> |                 |               | Received By: (Signature) Date/Time<br><i>John Bell</i> <i>12/18/20 1230</i> |                          |               | Notes: <i>@ - 0.9°C</i> |  |  |  |  |  |                                                                                                      |  |         |
| Relinquished By: (Signature) Date/Time<br><i>12/18/20 1230</i>                    |                 |               | Received By: (Signature) Date/Time                                          |                          |               |                         |  |  |  |  |  |                                                                                                      |  |         |

|                                            |                               |     |
|--------------------------------------------|-------------------------------|-----|
| Company Name<br><i>Chester Engineering</i> |                               |     |
| Contact<br><i>John Bender</i>              | Phone                         |     |
| E-Mail Address                             | Fax                           |     |
| Report Address                             |                               |     |
| City                                       | State                         | Zip |
| Billing Address                            |                               |     |
| City                                       | State                         | Zip |
| PO #                                       | Project<br><i>218220-1230</i> |     |

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## CHAIN-OF-CUSTODY RECORD

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| LabNet ID   | Field Sample ID | Site          | Sample Date     | Volume (m <sup>3</sup> ) | Particle Size | Analysis Requested |  |  |  |  |  |  |  |  |  | Turn Around Time<br><input type="checkbox"/> Standard<br><input type="checkbox"/> Rush _____ Specify | Remarks |
|-------------|-----------------|---------------|-----------------|--------------------------|---------------|--------------------|--|--|--|--|--|--|--|--|--|------------------------------------------------------------------------------------------------------|---------|
|             |                 |               |                 |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                      |         |
| <i>2204</i> | <i>Cont 1</i>   | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2204 Cont 1</i>                                                                                   |         |
| <i>2205</i> | <i>Cont 2</i>   | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2205 Cont 2</i>                                                                                   |         |
| <i>2206</i> | <i>Cont 3</i>   | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2206 Cont 3</i>                                                                                   |         |
| <i>2207</i> | <i>Cont 4</i>   | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2207 Cont 4</i>                                                                                   |         |
| <i>2208</i> | <i>Cont 5</i>   | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2208 Cont 5</i>                                                                                   |         |
| <i>2209</i> | <i>Cont 6</i>   | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2209 Cont 6</i>                                                                                   |         |
| <i>2210</i> | <i>Cont 7</i>   | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2210 Cont 7</i>                                                                                   |         |
| <i>2211</i> | <i>Cont 8</i>   | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2211 Cont 8</i>                                                                                   |         |
| <i>2212</i> | <i>Cont 9</i>   | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2212 Cont 9</i>                                                                                   |         |
| <i>2213</i> | <i>Cont 10</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2213 Cont 10</i>                                                                                  |         |
| <i>2214</i> | <i>Cont 11</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2214 Cont 11</i>                                                                                  |         |
| <i>2215</i> | <i>Cont 12</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2215 Cont 12</i>                                                                                  |         |
| <i>2216</i> | <i>Cont 13</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2216 Cont 13</i>                                                                                  |         |
| <i>2217</i> | <i>Cont 14</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2217 Cont 14</i>                                                                                  |         |
| <i>2218</i> | <i>Cont 15</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2218 Cont 15</i>                                                                                  |         |
| <i>2219</i> | <i>Cont 16</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2219 Cont 16</i>                                                                                  |         |
| <i>2220</i> | <i>Cont 17</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2220 Cont 17</i>                                                                                  |         |
| <i>2221</i> | <i>Cont 18</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2221 Cont 18</i>                                                                                  |         |
| <i>2222</i> | <i>Cont 19</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2222 Cont 19</i>                                                                                  |         |
| <i>2223</i> | <i>Cont 20</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2223 Cont 20</i>                                                                                  |         |
| <i>2224</i> | <i>Cont 21</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2224 Cont 21</i>                                                                                  |         |
| <i>2225</i> | <i>Cont 22</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2225 Cont 22</i>                                                                                  |         |
| <i>2226</i> | <i>Cont 23</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2226 Cont 23</i>                                                                                  |         |
| <i>2227</i> | <i>Cont 24</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2227 Cont 24</i>                                                                                  |         |
| <i>2228</i> | <i>Cont 25</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2228 Cont 25</i>                                                                                  |         |
| <i>2229</i> | <i>Cont 26</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2229 Cont 26</i>                                                                                  |         |
| <i>2230</i> | <i>Cont 27</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2230 Cont 27</i>                                                                                  |         |
| <i>2231</i> | <i>Cont 28</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2231 Cont 28</i>                                                                                  |         |
| <i>2232</i> | <i>Cont 29</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2232 Cont 29</i>                                                                                  |         |
| <i>2233</i> | <i>Cont 30</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2233 Cont 30</i>                                                                                  |         |
| <i>2234</i> | <i>Cont 31</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2234 Cont 31</i>                                                                                  |         |
| <i>2235</i> | <i>Cont 32</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2235 Cont 32</i>                                                                                  |         |
| <i>2236</i> | <i>Cont 33</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2236 Cont 33</i>                                                                                  |         |
| <i>2237</i> | <i>Cont 34</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2237 Cont 34</i>                                                                                  |         |
| <i>2238</i> | <i>Cont 35</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2238 Cont 35</i>                                                                                  |         |
| <i>2239</i> | <i>Cont 36</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2239 Cont 36</i>                                                                                  |         |
| <i>2240</i> | <i>Cont 37</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2240 Cont 37</i>                                                                                  |         |
| <i>2241</i> | <i>Cont 38</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2241 Cont 38</i>                                                                                  |         |
| <i>2242</i> | <i>Cont 39</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2242 Cont 39</i>                                                                                  |         |
| <i>2243</i> | <i>Cont 40</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2243 Cont 40</i>                                                                                  |         |
| <i>2244</i> | <i>Cont 41</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2244 Cont 41</i>                                                                                  |         |
| <i>2245</i> | <i>Cont 42</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2245 Cont 42</i>                                                                                  |         |
| <i>2246</i> | <i>Cont 43</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2246 Cont 43</i>                                                                                  |         |
| <i>2247</i> | <i>Cont 44</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2247 Cont 44</i>                                                                                  |         |
| <i>2248</i> | <i>Cont 45</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2248 Cont 45</i>                                                                                  |         |
| <i>2249</i> | <i>Cont 46</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2249 Cont 46</i>                                                                                  |         |
| <i>2250</i> | <i>Cont 47</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2250 Cont 47</i>                                                                                  |         |
| <i>2251</i> | <i>Cont 48</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2251 Cont 48</i>                                                                                  |         |
| <i>2252</i> | <i>Cont 49</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2252 Cont 49</i>                                                                                  |         |
| <i>2253</i> | <i>Cont 50</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2253 Cont 50</i>                                                                                  |         |
| <i>2254</i> | <i>Cont 51</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2254 Cont 51</i>                                                                                  |         |
| <i>2255</i> | <i>Cont 52</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2255 Cont 52</i>                                                                                  |         |
| <i>2256</i> | <i>Cont 53</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2256 Cont 53</i>                                                                                  |         |
| <i>2257</i> | <i>Cont 54</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2257 Cont 54</i>                                                                                  |         |
| <i>2258</i> | <i>Cont 55</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2258 Cont 55</i>                                                                                  |         |
| <i>2259</i> | <i>Cont 56</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2259 Cont 56</i>                                                                                  |         |
| <i>2260</i> | <i>Cont 57</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2260 Cont 57</i>                                                                                  |         |
| <i>2261</i> | <i>Cont 58</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2261 Cont 58</i>                                                                                  |         |
| <i>2262</i> | <i>Cont 59</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2262 Cont 59</i>                                                                                  |         |
| <i>2263</i> | <i>Cont 60</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2263 Cont 60</i>                                                                                  |         |
| <i>2264</i> | <i>Cont 61</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2264 Cont 61</i>                                                                                  |         |
| <i>2265</i> | <i>Cont 62</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2265 Cont 62</i>                                                                                  |         |
| <i>2266</i> | <i>Cont 63</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2266 Cont 63</i>                                                                                  |         |
| <i>2267</i> | <i>Cont 64</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2267 Cont 64</i>                                                                                  |         |
| <i>2268</i> | <i>Cont 65</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2268 Cont 65</i>                                                                                  |         |
| <i>2269</i> | <i>Cont 66</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2269 Cont 66</i>                                                                                  |         |
| <i>2270</i> | <i>Cont 67</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2270 Cont 67</i>                                                                                  |         |
| <i>2271</i> | <i>Cont 68</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2271 Cont 68</i>                                                                                  |         |
| <i>2272</i> | <i>Cont 69</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2272 Cont 69</i>                                                                                  |         |
| <i>2273</i> | <i>Cont 70</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2273 Cont 70</i>                                                                                  |         |
| <i>2274</i> | <i>Cont 71</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2274 Cont 71</i>                                                                                  |         |
| <i>2275</i> | <i>Cont 72</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2275 Cont 72</i>                                                                                  |         |
| <i>2276</i> | <i>Cont 73</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2276 Cont 73</i>                                                                                  |         |
| <i>2277</i> | <i>Cont 74</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2277 Cont 74</i>                                                                                  |         |
| <i>2278</i> | <i>Cont 75</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2278 Cont 75</i>                                                                                  |         |
| <i>2279</i> | <i>Cont 76</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2279 Cont 76</i>                                                                                  |         |
| <i>2280</i> | <i>Cont 77</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2280 Cont 77</i>                                                                                  |         |
| <i>2281</i> | <i>Cont 78</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2281 Cont 78</i>                                                                                  |         |
| <i>2282</i> | <i>Cont 79</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2282 Cont 79</i>                                                                                  |         |
| <i>2283</i> | <i>Cont 80</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2283 Cont 80</i>                                                                                  |         |
| <i>2284</i> | <i>Cont 81</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2284 Cont 81</i>                                                                                  |         |
| <i>2285</i> | <i>Cont 82</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2285 Cont 82</i>                                                                                  |         |
| <i>2286</i> | <i>Cont 83</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2286 Cont 83</i>                                                                                  |         |
| <i>2287</i> | <i>Cont 84</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2287 Cont 84</i>                                                                                  |         |
| <i>2288</i> | <i>Cont 85</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2288 Cont 85</i>                                                                                  |         |
| <i>2289</i> | <i>Cont 86</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2289 Cont 86</i>                                                                                  |         |
| <i>2290</i> | <i>Cont 87</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2290 Cont 87</i>                                                                                  |         |
| <i>2291</i> | <i>Cont 88</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2291 Cont 88</i>                                                                                  |         |
| <i>2292</i> | <i>Cont 89</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2292 Cont 89</i>                                                                                  |         |
| <i>2293</i> | <i>Cont 90</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2293 Cont 90</i>                                                                                  |         |
| <i>2294</i> | <i>Cont 91</i>  | <i>218220</i> | <i>12/18/20</i> |                          |               |                    |  |  |  |  |  |  |  |  |  | <i>2294 Cont 91</i>                                                                                  |         |
| <i>2295</i> |                 |               |                 |                          |               |                    |  |  |  |  |  |  |  |  |  |                                                                                                      |         |

Below is the sampling analysis summary for the different metals sampling performed at SLR 220430, please use this as a reference if you have any questions regarding sample analysis.

Baghouse 15 – SM (arsenic, lead, chromium, nickel and manganese).

Baghouse 1 and 2 – TSM (full list of Method 29 metals plus aluminum and vanadium) no mercury.

Minivol samples – SM (arsenic, lead, chromium, nickel and manganese).

Testing will be conducted to determine emission rates for hexavalent chromium (Cr(VI)), selected metals (SM) to include arsenic, lead, chromium, nickel and manganese, and total select metals (TSM) to include the full list of Method 29 metals plus aluminum and vanadium and excluding mercury from baghouse exhaust stacks and building roof fan vents, as well as gaseous pollutants and particulate matter from the electric arc furnace (EAF) baghouses.

**Table 1: Emission Sampling Summary**

| COLUMBIA STEEL CASTING CO, INC.<br>PORTLAND, OREGON |                                     |                                        |                                                                                     |
|-----------------------------------------------------|-------------------------------------|----------------------------------------|-------------------------------------------------------------------------------------|
| Source                                              | Pollutant                           | Units                                  | Purpose                                                                             |
| BH #15                                              | Cr(VI)                              | lb/hr and lb/ton of castings processed | Establish Emission Factor                                                           |
| BH #26                                              | SM                                  |                                        |                                                                                     |
| BH #1<br><br>BH #2                                  | *PM <sub>2.5</sub>                  | lb/hr and lb/ton of steel melted       | Emission factor verification. Current emission factors = 0.0152 lb/ton steel melted |
|                                                     | *PM <sub>10</sub>                   |                                        |                                                                                     |
|                                                     | *Total PM                           |                                        |                                                                                     |
|                                                     | Cr(VI)                              | lb/hr and lb/ton of steel melted       | Establish Emission Factor                                                           |
| TSM                                                 |                                     |                                        |                                                                                     |
| NO <sub>x</sub>                                     | ppm, lb/hr, and lb/ton metal melted |                                        |                                                                                     |
| CO                                                  |                                     |                                        |                                                                                     |
| Roof Fan Vents on Building #8 and Building #11      | Cr(VI)                              | µg/m <sup>3</sup> and lb/hr            | Establish Emission Factor                                                           |
|                                                     | SM                                  |                                        |                                                                                     |

\*All particulate matter measurements include filterable and condensable particulate matter (CPM).

Emission limits as determined by Draft ACDP #26-1869 Section 13.0.

PM – particulate matter

PM<sub>10</sub> – particulate matter less than 10 microns in size

PM<sub>2.5</sub> – particulate matter less than 2.5 microns in size

lb/hr – pounds per hour

lb/ton steel melted – pounds per ton of steel melted during production process

NO<sub>x</sub> – nitrogen oxides

CO – carbon monoxide

µg/m<sup>3</sup> – micrograms per meter cubed

Thanks Lisa,

**Bo Wilkins**

Source Team Coordinator

Bison Engineering

3143 E. Lyndale Ave, Helena, MT 59601

Office: 406-442-5768

Cell: 406-461-7946



**Lisa Ball**

---

**From:** Bo Wilkins <bwilkins@bison-eng.com>  
**Sent:** Monday, December 21, 2020 10:29 AM  
**To:** Lisa Ball  
**Cc:** Adam Bender; Jennifer Kessler; 'Paul Duda'  
**Subject:** RE: SLR220430

Lisa,

Thank you for your diligence in seeking clarification.

Baghouse 1 Stainless Melt should be analyzed for the full list (plus V, Al).

Thank you,

Bo

**From:** Lisa Ball <lball@chesterlab.net>  
**Sent:** Monday, December 21, 2020 11:23 AM  
**To:** Bo Wilkins <bwilkins@bison-eng.com>  
**Cc:** Adam Bender <abender@bison-eng.com>; Jennifer Kessler <jkessler@bison-eng.com>; 'Paul Duda' <pduda@chesterlab.net>  
**Subject:** RE: SLR220430

Bo,

I have one run for M29 that is called Stainless Melt, but source says BH1. Can you confirm that is for the full list (plus V, Al). It is confusing because the ID is "SM" which is the same as what you refer the select metals list to "SM". Just want to be sure we have this correct.

Lisa Ball  
**CHESTER LabNet**  
12242 SW Garden Place  
Tigard, OR 97223  
[lball@chesterlab.net](mailto:lball@chesterlab.net)  
<http://www.chesterlab.net>  
(503)624-2183  
fax (503)624-2653

**From:** Bo Wilkins [<mailto:bwilkins@bison-eng.com>]  
**Sent:** Monday, December 21, 2020 10:07 AM  
**To:** [lball@chesterlab.net](mailto:lball@chesterlab.net)  
**Cc:** Adam Bender <[abender@bison-eng.com](mailto:abender@bison-eng.com)>; Jennifer Kessler <[jkessler@bison-eng.com](mailto:jkessler@bison-eng.com)>  
**Subject:** SLR220430

Hi Lisa,



**RAW DATA**

Available upon request

## **APPENDIX H: PLANT OPERATING RECORDS AND FAN SPECIFICATIONS**

| Data Needs                     | BH15                  | Run 1<br>12/7/2020 |       | Run 2<br>12/8/2020 |       | Run 3<br>12/9/2020 |       | Notes                                         |
|--------------------------------|-----------------------|--------------------|-------|--------------------|-------|--------------------|-------|-----------------------------------------------|
|                                |                       | Start              | Stop  | Start              | Stop  | Start              | Stop  |                                               |
| Burn-Arc (total metal weights) | Cr VI                 | 7:20               | 19:25 | 8:00               | 20:04 | 7:43               | 20:45 | Delayed by one hour due to impinger blow out. |
|                                | Metals                | 7:20               | 19:25 | 8:00               | 20:04 | 7:45               | 19:48 |                                               |
|                                | Melt Weight (lb)      | 85,990             |       | 9,788              |       | 23,724             |       |                                               |
|                                | Melt Weight (tons/hr) | 4.70               |       | 0.86               |       | 2.08               |       |                                               |
|                                | Hours of operation    | 9.15               |       | 5.70               |       | 5.70               |       |                                               |

|                                                  | BH1                   | Run 1<br>12/10/2020  |      | Run 2<br>12/14/2020  |      | Run 3<br>12/15/2020  |      | Notes                            |
|--------------------------------------------------|-----------------------|----------------------|------|----------------------|------|----------------------|------|----------------------------------|
|                                                  |                       | Start                | Stop | Start                | Stop | Start                | Stop |                                  |
| Arc Furnace total melt weights (South 10TT, 6MT) | Cr VI                 | 21:25                | 6:00 | 22:15                | 3:55 | 21:20                | 3:11 | End times are the following day. |
|                                                  | Metals                | 21:25                | 6:00 | 22:15                | 3:55 | 21:20                | 3:11 |                                  |
|                                                  | Melt Weight (lb)      | 29,000               |      | 21,050               |      | 22,000               |      |                                  |
|                                                  | Melt Weight (tons/hr) | 1.77                 |      | 2.03                 |      | 2.12                 |      |                                  |
|                                                  | Hours of operation    | 8.20                 |      | 5.18                 |      | 5.18                 |      |                                  |
|                                                  | Heat Times            | Heat 1 - 21:20-23:10 |      | Heat 1 - 22:15-00:10 |      | Heat 1 - 21:20-23:05 |      |                                  |
|                                                  |                       | Heat 2 - 23:25-01:50 |      | Heat 2 - 00:29-02:15 |      | Heat 2 - 23:30-01:10 |      |                                  |
|                                                  |                       | Heat 3 - 02:15-04:10 |      | Heat 3 - 02:25-03:55 |      | Heat 3 - 01:29-03:15 |      |                                  |
|                                                  |                       | Heat 4 - 04:23-06:25 |      |                      |      |                      |      |                                  |

|                                             | BH2                   | Run 1<br>12/10/2020  |      | Run 2<br>12/14/2020  |      | Run 3<br>12/15/2020  |      | Notes                            |
|---------------------------------------------|-----------------------|----------------------|------|----------------------|------|----------------------|------|----------------------------------|
|                                             |                       | Start                | Stop | Start                | Stop | Start                | Stop |                                  |
| Arc Furnace total melt weights (North 10TT) | Cr VI                 | 22:23                | 5:10 | 22:18                | 2:55 | 22:02                | 4:13 | End times are the following day. |
|                                             | Metals                | 22:20                | 5:10 | 22:18                | 2:55 | 22:02                | 4:13 |                                  |
|                                             | Melt Weight (lb)      | 61,500               |      | 36,000               |      | 66,500               |      |                                  |
|                                             | Melt Weight (tons/hr) | 4.96                 |      | 4.30                 |      | 6.21                 |      |                                  |
|                                             | Hours of operation    | 6.20                 |      | 4.18                 |      | 5.35                 |      |                                  |
|                                             | Heat Times            | Heat 1 - 22:20-23:55 |      | Heat 1 - 22:20-00:35 |      | Heat 1 - 22:00-23:45 |      |                                  |
|                                             |                       | Heat 2 - 00:15-02:20 |      | Heat 2 - 00:50-02:46 |      | Heat 2 - 00:10-02:00 |      |                                  |
|                                             |                       | Heat 3 - 02:33-05:05 |      |                      |      | Heat 3 - 02:25-04:10 |      |                                  |

|                                                  | BH1                   | Run 1<br>12/16/2020  |       | Run 2<br>12/16/2020  |      | Run 3<br>12/17/2020  |      | Notes                                    |
|--------------------------------------------------|-----------------------|----------------------|-------|----------------------|------|----------------------|------|------------------------------------------|
|                                                  |                       | Start                | Stop  | Start                | Stop | Start                | Stop |                                          |
| Arc Furnace total melt weights (South 10TT, 6MT) | ODEQ M5               | 21:13                | 23:09 | 23:47                | 1:40 | 2:10                 | 3:55 | NOx and CO were performed simultaneously |
|                                                  | 201A                  | 21:13                | 23:07 | 23:47                | 1:39 | 2:10                 | 3:53 |                                          |
|                                                  | Melt Weight (lb)      | 7,000                |       | 6,500                |      | 6,500                |      |                                          |
|                                                  | melt weight (tons/hr) | 1.83                 |       | 1.95                 |      | 1.77                 |      |                                          |
|                                                  | hours of operation    | 1.92                 |       | 1.67                 |      | 1.83                 |      |                                          |
|                                                  | Heat Times            | Heat 1 - 21:10-23:05 |       | Heat 2 - 23:55-01:35 |      | Heat 3 - 02:10-04:00 |      |                                          |
|                                                  |                       |                      |       |                      |      |                      |      |                                          |

|                                             | BH2                   | Run 1<br>12/16/2020  |       | Run 2<br>12/16/2020  |      | Run 3<br>12/17/2020  |      | Notes                                    |
|---------------------------------------------|-----------------------|----------------------|-------|----------------------|------|----------------------|------|------------------------------------------|
|                                             |                       | Start                | Stop  | Start                | Stop | Start                | Stop |                                          |
| Arc Furnace total melt weights (North 10TT) | ODEQ M5               | 22:37                | 23:46 | 0:18                 | 1:28 | 1:56                 | 3:06 | NOx and CO were performed simultaneously |
|                                             | 201A                  | 22:37                | 23:46 | 0:18                 | 1:24 | 1:56                 | 3:04 |                                          |
|                                             | Melt Weight (lb)      | 16,000               |       | 16,000               |      | 16,000               |      |                                          |
|                                             | melt weight (tons/hr) | 3.56                 |       | 3.56                 |      | 6.86                 |      |                                          |
|                                             | hours of operation    | 2.25                 |       | 2.25                 |      | 1.17                 |      |                                          |
|                                             | Heat Times            | Heat 1 - 22:40-00:55 |       | Heat 1 - 22:40-00:55 |      | Heat 2 - 01:55-03:05 |      |                                          |
|                                             |                       |                      |       |                      |      |                      |      |                                          |

#### High Chromium Melt

|                                                  | BH1                   | Run 1<br>12/17/2020  |      |
|--------------------------------------------------|-----------------------|----------------------|------|
|                                                  |                       | Start                | Stop |
| Arc Furnace total melt weights (South 10TT, 6MT) | Cr VI                 | 21:06                | 2:07 |
|                                                  | Metals                | 21:06                | 2:08 |
|                                                  | Melt Weight (lb)      | 19,500               |      |
|                                                  | melt weight (tons/hr) | 2.19                 |      |
|                                                  | hours of operation    | 4.45                 |      |
|                                                  | Heat Times            | Heat 1 - 21:05-22:40 |      |
|                                                  |                       | Heat 2 - 22:53-00:20 |      |
|                                                  |                       | Heat 3 - 00:40-02:05 |      |

MiniVol Production Data Summary

|                                                                         | Sample Location |      |                  |                  | Induction -<br>Total Metal<br>(lb) | Arc Furnaces -<br>Total Metal<br>(lb) | Total<br>Metal<br>(lb) | Total<br>Metal<br>(tons) | MiniVol<br>Sample<br>Time ( hrs) | tons/hr<br>samle time<br>basis |
|-------------------------------------------------------------------------|-----------------|------|------------------|------------------|------------------------------------|---------------------------------------|------------------------|--------------------------|----------------------------------|--------------------------------|
|                                                                         | Building        | Vent |                  |                  |                                    |                                       |                        |                          |                                  |                                |
| <b>Data Needs</b><br>Bldg 8 Induction Furnace -<br>total metal weight   | 8               | 1    | 12/6/2020 21:00  | 12/7/2020 21:00  | 9,060                              | --                                    | 9,060                  | 4.53                     | 24                               | 0.189                          |
|                                                                         | 8               | 1    | 12/13/2020 20:00 | 12/14/2020 18:00 | 10,700                             | --                                    | 10,700                 | 5.35                     | 22                               | 0.243                          |
|                                                                         | 8               | 7    | 12/6/2020 21:00  | 12/7/2020 21:00  | 9,060                              | --                                    | 9,060                  | 4.53                     | 24                               | 0.189                          |
|                                                                         | 8               | 7    | 12/13/2020 20:00 | 12/14/2020 18:00 | 10,700                             | --                                    | 10,700                 | 5.35                     | 22                               | 0.243                          |
| Arc Furnace (all), Group 6<br>Induction Furnace - total<br>metal weight | 11              | 1    | 12/14/2020 20:00 | 12/15/2020 18:00 | 4,950                              | 57,050                                | 62,000                 | 31.00                    | 22                               | 1.409                          |
|                                                                         | 11              | 4    | 12/10/2020 20:00 | 12/11/2020 18:00 | 3,800                              | 90,500                                | 94,300                 | 47.15                    | 22                               | 2.143                          |
|                                                                         | 11              | 4    | 12/14/2020 20:00 | 12/15/2020 18:00 | 4,950                              | 57,050                                | 62,000                 | 31.00                    | 22                               | 1.409                          |
|                                                                         | 11              | 5    | 12/9/2020 20:00  | 12/10/2020 18:00 | --                                 | 63,500                                | 63,500                 | 31.75                    | 22                               | 1.443                          |
|                                                                         | 11              | 5    | 12/10/2020 20:00 | 12/11/2020 18:00 | 3,800                              | 90,500                                | 94,300                 | 47.15                    | 22                               | 2.143                          |
|                                                                         | 11              | 5    | 12/15/2020 20:00 | 12/16/2020 18:00 | 2,100                              | 88,500                                | 90,600                 | 45.30                    | 22                               | 2.059                          |
|                                                                         | 11              | 5    | 12/17/2020 20:00 | 12/18/2020 18:00 | --                                 | 51,500                                | 51,500                 | 25.75                    | 22                               | 1.170                          |
|                                                                         | 11              | 7    | 12/9/2020 20:00  | 12/10/2020 18:00 | --                                 | 63,500                                | 63,500                 | 31.75                    | 22                               | 1.443                          |
|                                                                         | 11              | 7    | 12/15/2020 20:00 | 12/16/2020 18:00 | 2,100                              | 88,500                                | 90,600                 | 45.30                    | 22                               | 2.059                          |
|                                                                         | 11              | 8    | 12/7/2020 23:00  | 12/8/2020 17:00  | 3,750                              | 78,000                                | 81,750                 | 40.88                    | 18                               | 2.271                          |
|                                                                         | 11              | 8    | 12/8/2020 20:00  | 12/9/2020 20:00  | --                                 | 96,000                                | 96,000                 | 48.00                    | 22                               | 2.182                          |
|                                                                         | 11              | 8    | 12/16/2020 20:00 | 12/17/2020 18:00 | 3,610                              | 52,000                                | 55,610                 | 27.81                    | 22                               | 1.264                          |
|                                                                         | 11              | 8    | 12/17/2020 20:00 | 12/18/2020 18:00 | --                                 | 51,500                                | 51,500                 | 25.75                    | 22                               | 1.170                          |
|                                                                         | 11              | 9    | 12/7/2020 23:00  | 12/8/2020 17:00  | 3,750                              | 78,000                                | 81,750                 | 40.88                    | 18                               | 2.271                          |
|                                                                         | 11              | 9    | 12/8/2020 20:00  | 12/9/2020 20:00  | --                                 | 96,000                                | 96,000                 | 48.00                    | 22                               | 2.182                          |
|                                                                         | 11              | 9    | 12/16/2020 20:00 | 12/17/2020 18:00 | 3,610                              | 52,000                                | 55,610                 | 27.81                    | 22                               | 1.264                          |

CAO BURN-ARC DATA 12/2020

| DATE           | SHIFT                                  | START    | STOP     | TOTAL TIME    | WEIGHT LBS.         | ALLOY          |
|----------------|----------------------------------------|----------|----------|---------------|---------------------|----------------|
| 12/6-12/7/2020 | 10:00 PM 12/6/2020 - 6:30 AM 12/7/2020 | 10:30 PM | 11:55 PM | 1 HR. 25 MIN. | Same Part<br>6,250  | L98 MANGANESE  |
| 12/6-12/7/2020 | 10:00 PM 12/6/2020 - 6:30 AM 12/7/2020 | 12:00 AM | 12:45 AM | 45 MIN.       |                     | L98 MANGANESE  |
| 12/6-12/7/2020 | 10:00 PM 12/6/2020 - 6:30 AM 12/7/2020 | 1:00 AM  | 2:00 AM  | 1 HOUR        |                     | L98 MANGANESE  |
| 12/6-12/7/2020 | 10:00 PM 12/6/2020 - 6:30 AM 12/7/2020 | 2:00 AM  | 2:55 AM  | 55 MIN.       | Same Part<br>21,000 | L78 MANGANESE  |
| 12/6-12/7/2020 | 10:00 PM 12/6/2020 - 6:30 AM 12/7/2020 | 3:33 AM  | 4:56 AM  | 1 HR. 23 MIN. |                     | L78 MANGANESE  |
| 12/6-12/7/2020 | 10:00 PM 12/6/2020 - 6:30 AM 12/7/2020 | 5:12 AM  | 6:02 AM  | 50 MIN.       |                     | L78 MANGANESE  |
|                |                                        |          |          |               |                     |                |
| 12/7/2020      | 6:00 AM - 2:30 PM                      | 6:30 AM  | 7:10 AM  | 40 MIN.       | Same Part<br>28,000 | R-57 MANGANESE |
| 12/7/2020      | 6:00 AM - 2:30 PM                      | 7:15 AM  | 7:45 AM  | 30 MIN.       |                     | R-57 MANGANESE |
| 12/7/2020      | 6:00 AM - 2:30 PM                      | 7:50 AM  | 8:45 AM  | 55 MIN.       |                     | R-57 MANGANESE |
| 12/7/2020      | 6:00 AM - 2:30 PM                      | 9:00 AM  | 9:40 AM  | 40 MIN.       |                     | R-57 MANGANESE |
| 12/7/2020      | 6:00 AM - 2:30 PM                      | 9:52 AM  | 10:25 AM | 33 MIN.       |                     | R-57 MANGANESE |
| 12/7/2020      | 6:00 AM - 2:30 PM                      | 10:30 AM | 10:55 AM | 25 MIN.       | Same Part<br>28,000 | R-57 MANGANESE |
| 12/7/2020      | 6:00 AM - 2:30 PM                      | 11:35 AM | 12:15 PM | 40 MIN.       |                     | R-57 MANGANESE |
| 12/7/2020      | 6:00 AM - 2:30 PM                      | 12:22 PM | 12:55 PM | 33 MIN.       |                     | R-57 MANGANESE |
| 12/7/2020      | 6:00 AM - 2:30 PM                      | 1:10 PM  | 1:56 PM  | 46 MIN.       |                     | R-57 MANGANESE |
|                |                                        |          |          |               |                     |                |
| 12/7/2020      | 2:00 PM-10:30 PM                       | 2:39 PM  | 3:10 PM  | 31 MIN.       | 28,000              | R-57 MANGANESE |
| 12/7/2020      | 2:00 PM-10:30 PM                       | 3:34 PM  | 4:14 PM  | 40 MIN.       | 1,880               | L68 MANGANESE  |
| 12/7/2020      | 2:00 PM-10:30 PM                       | 4:35 PM  | 4:47 PM  | 21 MIN.       | 50                  | L98 MANGANESE  |
| 12/7/2020      | 2:00 PM-10:30 PM                       | 5:00 PM  | 6:55 PM  | 1 HR 55 MIN.  | 60                  | L98 MANGANESE  |
| 12/7/2020      | 2:00 PM-10:30 PM                       | 7:33 PM  | 8:55 PM  | 1HR. 22 MIN.  | 23                  | L98 MANGANESE  |
| 12/7/2020      | 2:00 PM-10:30 PM                       | 9:13 PM  | 9:30 PM  | 17 MIN.       | 215                 | L98 MANGANESE  |
|                |                                        |          |          |               |                     |                |
|                |                                        |          |          |               |                     |                |
| 12/7-12/8/2020 | 10:00 PM 12/7/2020 - 6:30 AM 12/8/2020 | 10:40 PM | 11:10 PM | 30 MIN.       | 144                 | L98 MANGANESE  |
| 12/7-12/8/2020 | 10:00 PM 12/7/2020 - 6:30 AM 12/8/2020 | 11:30 PM | 12:46 AM | 1 HR. 16 MIN. | 18,000              | R-57 MANGANESE |
| 12/7-12/8/2020 | 10:00 PM 12/7/2020 - 6:30 AM 12/8/2020 | 1:02 AM  | 2:35 AM  | 1 HR. 33 MIN. | Same Part           | R-57 MANGANESE |
| 12/7-12/8/2020 | 10:00 PM 12/7/2020 - 6:30 AM 12/8/2020 | 2:45 AM  | 2:56 AM  | 11 MIN.       | 3,000<br>Same Part  | R-57 MANGANESE |
| 12/7-12/8/2020 | 10:00 PM 12/7/2020 - 6:30 AM 12/8/2020 | 3:32 AM  | 4:10 AM  | 38 MIN.       |                     | R-57 MANGANESE |
| 12/7-12/8/2020 | 10:00 PM 12/7/2020 - 6:30 AM 12/8/2020 | 4:25 AM  | 4:56 AM  | 31 MIN.       |                     | R-57 MANGANESE |
| 12/7-12/8/2020 | 10:00 PM 12/7/2020 - 6:30 AM 12/8/2020 | 5:12 AM  | 5:35 AM  | 23 MIN.       |                     | R-57 MANGANESE |
|                |                                        |          |          |               |                     |                |
|                |                                        |          |          |               |                     |                |

CAO BURN-ARC DATA 12/2020

| DATE           | SHIFT                             | START    | STOP     | TOTAL TIME    | WEIGHT LBS.      | ALLOY          |
|----------------|-----------------------------------|----------|----------|---------------|------------------|----------------|
| 12/8/2020      | 6:00 AM - 2:30 PM                 | 6:30 AM  | 8:00 AM  | 1 HR. 30 MIN. | 2,200            | L98 MANGANESE  |
| 12/8/2020      | 6:00 AM - 2:30 PM                 | 8:30 AM  | 8:45 AM  | 15 MIN.       | Same Part<br>570 | G59 MANGANESE  |
| 12/8/2020      | 6:00 AM - 2:30 PM                 | 9:10 AM  | 10:00 AM | 50 MIN.       |                  | G59 MANGANESE  |
| 12/8/2020      | 6:00 AM - 2:30 PM                 | 10:15 AM | 10:35 AM | 20 MIN.       |                  | G59 MANGANESE  |
| 12/8/2020      | 6:00 AM - 2:30 PM                 | 11:40 AM | 12:20 PM | 40 MIN.       | 4,100            | L68 MANGANESE  |
| 12/8/2020      | 6:00 AM - 2:30 PM                 | 12:30 PM | 12:55 PM | 25 MIN.       | 110              | L98 MANGANESE  |
| 12/8/2020      | 6:00 AM - 2:30 PM                 | 1:10 PM  | 1:25 PM  | 15 MIN.       | 240              | L98 MANGANESE  |
| 12/8/2020      | 6:00 AM - 2:30 PM                 | 1:40 PM  | 1:52 PM  | 12 MIN        | 788              | L98 MANGANESE  |
|                |                                   |          |          |               |                  |                |
|                |                                   |          |          |               |                  |                |
| 12/8/2020      | 2:00 PM-10:30 PM                  | 2:30 PM  | 3:12 PM  | 42 MIN.       | 630              | H39 LOW CHROME |
| 12/8/2020      | 2:00 PM-10:30 PM                  | 3:33 PM  | 4:15 AM  | 42 MIN.       | 630              | H39 LOW CHROME |
| 12/8/2020      | 2:00 PM-10:30 PM                  | 4:30 PM  | 4:49 PM  | 29 MIN.       | 630              | H39 LOW CHROME |
| 12/8/2020      | 2:00 PM-10:30 PM                  | 6:05 PM  | 6:43 PM  | 38 MIN.       | 630              | H39 LOW CHROME |
| 12/8/2020      | 2:00 PM-10:30 PM                  | 7:47 PM  | 8:01 PM  | 14 MIN.       | 1,460            | H55 LOW CHROME |
| 12/8/2020      | 2:00 PM-10:30 PM                  | 8:33 PM  | 8:55 PM  | 22 MIN.       | 2,200            | H39 LOW CHROME |
| 12/8/2020      | 2:00 PM-10:30 PM                  | 9:13 PM  | 9:30 PM  | 17 MIN.       | 1460             | H39 LOW CHROME |
| 12/8/2020      | 2:00 PM-10:30 PM                  | 9:39 PM  | 10:00 PM | 21 MIN.       | 545              | H39 LOW CHROME |
|                |                                   |          |          |               |                  |                |
|                |                                   |          |          |               |                  |                |
| 12/8-12/9/2020 | 10:00 PM 12/8 - 6:30 AM 12/9/2020 | 10:30 PM | 12:46 AM | 2HR. 16 MIN.  | 1,820            | R-57 MANGANESE |
| 12/8-12/9/2020 | 10:00 PM 12/8 - 6:30 AM 12/9/2020 | 1:04 AM  | 1:55 AM  | 51 MIN        | Same Part        | R-57 MANGANESE |
| 12/8-12/9/2020 | 10:00 PM 12/8 - 6:30 AM 12/9/2020 | 2:00 AM  | 2:42 AM  | 42 MIN.       | 2,700            | L98 MANGANESE  |
| 12/8-12/9/2020 | 10:00 PM 12/8 - 6:30 AM 12/9/2020 | 3:36 AM  | 4:16 AM  | 45 MIN.       | 2,000            | L98 MANGANESE  |
| 12/8-12/9/2020 | 10:00 PM 12/8 - 6:30 AM 12/9/2020 | 4:20 AM  | 4:53 AM  | 33 MIN.       | 1,820            | L68 MANGANESE  |
| 12/8-12/9/2020 | 10:00 PM 12/8 - 6:30 AM 12/9/2020 | 5:10 AM  | 5:50AM   | 40 MIN        | 1,820            | L68 MANGANESE  |
|                |                                   |          |          |               |                  |                |
| 12/9/2020      | 6:00 AM - 2:30 PM                 | 6:30 AM  | 6:40 AM  | 10 MIN        | 1,820            | L68 MANGANESE  |
| 12/9/2020      | 6:00 AM - 2:30 PM                 | 6:50 AM  | 7:05 AM  | 15 MIN        | Same Part        | L68 MANGANESE  |
| 12/9/2020      | 6:00 AM - 2:30 PM                 | 7:15 AM  | 7:25 AM  | 10 MIN.       | 1,820            | L68 MANGANESE  |
| 12/9/2020      | 6:00 AM - 2:30 PM                 | 7:30 AM  | 7:44 AM  | 14 MIN.       | Same Part        | L68 MANGANESE  |
| 12/9/2020      | 6:00 AM - 2:30 PM                 | 7:52 AM  | 8:02 AM  | 10 MIN.       | 1,820            | L68 MANGANESE  |
| 12/9/2020      | 6:00 AM - 2:30 PM                 | 8:07 AM  | 8:25 AM  | 18 MIN.       | Same Part        | L68 MANGANESE  |

CAO BURN-ARC DATA 12/2020

|                 |                                    |              |             |                   |                    |                |
|-----------------|------------------------------------|--------------|-------------|-------------------|--------------------|----------------|
| 12/9/2020       | 6:00 AM - 2:30 PM                  | 8:30 AM      | 8:45 AM     | 15 MIN.           | Same Part          | L68 MANGANESE  |
| 12/9/2020       | 6:00 AM - 2:30 PM                  | 9:02 AM      | 9:19 AM     | 19 MIN.           | 2,050              | L68 MANGANESE  |
| <b>DATE</b>     | <b>SHIFT</b>                       | <b>START</b> | <b>STOP</b> | <b>TOTAL TIME</b> | <b>WEIGHT LBS.</b> | <b>ALLOY</b>   |
| 12/9/2020       | 6:00 AM - 2:30 PM                  | 9:30 AM      | 9:45 AM     | 15 MIN.           | 650                | L68 MANGANESE  |
| 12/9/2020       | 6:00 AM - 2:30 PM                  | 9:58 AM      | 10:15 AM    | 17 MIN.           | 1,170              | L68 MANGANESE  |
| 12/9/2020       | 6:00 AM - 2:30 PM                  | 10:18 AM     | 10:55 AM    | 22 MIN.           | 5,800              | L98 MANGANESE  |
| 12/9/2020       | 6:00 AM - 2:30 PM                  | 11:45 AM     | 12:25 AM    | 40 MIN.           | Same Part          | L98 MANGANESE  |
| 12/9/2020       | 6:00 AM - 2:30 PM                  | 12:40 AM     | 12:55 AM    | 15 MIN.           | 1,530              | L98 MANGANESE  |
| 12/9/2020       | 6:00 AM - 2:30 PM                  | 1:12 PM      | 1:24 PM     | 12 MIN.           | Same Part          | L98 MANGANESE  |
|                 |                                    |              |             |                   |                    |                |
| 12/9/2020       | 2:00 PM-10:30 PM                   | 2:25 PM      | 3:07 PM     | 42 MIN.           | 1,090              | H39 LOW CHROME |
| 12/9/2020       | 2:00 PM-10:30 PM                   | 3:29 PM      | 4:43 PM     | 44 MIN.           | 1,090              | H39 LOW CHROME |
| 12/9/2020       | 2:00 PM-10:30 PM                   | 5:03 PM      | 5:41 PM     | 38 MIN.           | 2,920              | H39 LOW CHROME |
| 12/9/2020       | 2:00 PM-10:30 PM                   | No time doc  | No time doc | 21 MIN.           | 3,784              | H39 LOW CHROME |
|                 |                                    |              |             |                   |                    |                |
| 12/9-12/10/2020 | 10:00 PM 12/9 - 6:30 AM 12/10/2020 |              |             | 1 HR.             | 7,450              | R-57 MANGANESE |
| 12/9-12/10/2020 | 10:00 PM 12/9 - 6:30 AM 12/10/2020 |              |             | 1 HR.             | 8,400              | L68 MANGANESE  |
| 12/9-12/10/2020 | 10:00 PM 12/9 - 6:30 AM 12/10/2020 |              |             | 2HRS.             | 3,239              | H39 LOW CHROME |
| 12/9-12/10/2020 | 10:00 PM 12/9 - 6:30 AM 12/10/2020 |              |             | 1HR. 15 MIN.      | 3,239              | H39 LOW CHROME |
| 12/9-12/10/2020 | 10:00 PM 12/9 - 6:30 AM 12/10/2020 |              |             | 1 HR.             | 3,239              | H39 LOW CHROME |
|                 |                                    |              |             |                   |                    |                |
|                 |                                    |              |             |                   |                    |                |
| 12/10/2020      | 6:00 AM - 2:30 PM                  |              |             | 10 MIN.           | 1,180              | H39 LOW CHROME |
| 12/10/2020      | 6:00 AM - 2:30 PM                  |              |             | 1 HR. 5 MIN.      | 1,590              | H39 LOW CHROME |
| 12/10/2020      | 6:00 AM - 2:30 PM                  |              |             | 1 HR. 5 MIN.      | 1,615              | H39 LOW CHROME |
| 12/10/2020      | 6:00 AM - 2:30 PM                  |              |             | 1 HR. 5 MIN.      | 3,800              | H55 LOW CHROME |
| 12/10/2020      | 6:00 AM - 2:30 PM                  |              |             | 25 MIN.           | 1,960              | H55 LOW CHROME |
| 12/10/2020      | 6:00 AM - 2:30 PM                  |              |             | 27 MIN.           | 1,750              | H55 LOW CHROME |
| 12/10/2020      | 6:00 AM - 2:30 PM                  |              |             | 24 MIN.           | 1,835              | H55 LOW CHROME |
| 12/10/2020      | 6:00 AM - 2:30 PM                  |              |             | 15 MIN.           | 925                | H55 LOW CHROME |
| 12/10/2020      | 6:00 AM - 2:30 PM                  |              |             | 40 MIN.           | 5,180              | H55 LOW CHROME |
| 12/10/2020      | 2:00 PM-10:30 PM                   |              |             | 2HRS. 57 MIN.     | 5,180              | H39 LOW CHROME |
| 12/10/2020      | 2:00 PM-10:30 PM                   |              |             | 31 MIN.           | 630                | H39 LOW CHROME |
| 12/10/2020      | 2:00 PM-10:30 PM                   |              |             | 31 MIN.           | 630                | H39 LOW CHROME |
| 12/10/2020      | 2:00 PM-10:30 PM                   |              |             | 29 MIN.           | 630                | H39 LOW CHROME |

CAO BURN-ARC DATA 12/2020

| DATE             | SHIFT                               | START | STOP | TOTAL TIME    | WEIGHT LBS. | ALLOY          |
|------------------|-------------------------------------|-------|------|---------------|-------------|----------------|
| 12/10/2020       | 2:00 PM-10:30 PM                    |       |      | 31 MIN.       | 545         | H39 LOW CHROME |
| 12/10/2020       | 2:00 PM-10:30 PM                    |       |      | 29 MIN.       | 630         | H39 LOW CHROME |
| 12/10/2020       | 2:00 PM-10:30 PM                    |       |      | 27 MIN.       | 630         | H39 LOW CHROME |
|                  |                                     |       |      |               |             |                |
| 12/10-12/11/2020 | 10:00 PM 12/10 - 6:30 AM 12/11/2020 |       |      | 20 MIN.       | 545         | H39 LOW CHROME |
| 12/10-12/11/2020 | 10:00 PM 12/10 - 6:30 AM 12/11/2020 |       |      | 15 MIN.       | 1,960       | H55 LOW CHROME |
| 12/10-12/11/2020 | 10:00 PM 12/10 - 6:30 AM 12/11/2020 |       |      | 20 MIN.       | 1,750       | H55 LOW CHROME |
| 12/10-12/11/2020 | 10:00 PM 12/10 - 6:30 AM 12/11/2020 |       |      | 30 MIN.       | 1,835       | H55 LOW CHROME |
| 12/10-12/11/2020 | 10:00 PM 12/10 - 6:30 AM 12/11/2020 |       |      | 1 HR.         | 1,180       | H39 LOW CHROME |
| 12/10-12/11/2020 | 10:00 PM 12/10 - 6:30 AM 12/11/2020 |       |      | 1 HR.         | 1615        | H39 LOW CHROME |
| 12/10-12/11/2020 | 10:00 PM 12/10 - 6:30 AM 12/11/2020 |       |      | 1 HR.         | 1,180       | H39 LOW CHROME |
| 12/10-12/11/2020 | 10:00 PM 12/10 - 6:30 AM 12/11/2020 |       |      | 15 MIN.       | 630         | H39 LOW CHROME |
| 12/10-12/11/2020 | 10:00 PM 12/10 - 6:30 AM 12/11/2020 |       |      | 30 MIN.       | 3,239       | H39 LOW CHROME |
| 12/10-12/11/2020 | 10:00 PM 12/10 - 6:30 AM 12/11/2020 |       |      | 45 MIN.       | 3,239       | H39 LOW CHROME |
| 12/10-12/11/2020 | 10:00 PM 12/10 - 6:30 AM 12/11/2020 |       |      | 15 MIN.       | 1,460       | H39 LOW CHROME |
|                  |                                     |       |      |               |             |                |
| 12/11/2020       | 6:00 AM - 2:30 PM                   |       |      | 28 MIN.       | 3,800       | H55 LOW CHROME |
| 12/11/2020       | 6:00 AM - 2:30 PM                   |       |      | 14 MIN.       | 925         | H55 LOW CHROME |
| 12/11/2020       | 6:00 AM - 2:30 PM                   |       |      | 1 HR.         | 5,180       | H39 LOW CHROME |
| 12/11/2020       | 6:00 AM - 2:30 PM                   |       |      | 16 MIN.       | 1,615       | H39 LOW CHROME |
| 12/11/2020       | 6:00 AM - 2:30 PM                   |       |      | 2 HRS. 30MIN. | 5,720       | H39 LOW CHROME |
| 12/11/2020       | 6:00 AM - 2:30 PM                   |       |      | 28 MIN.       | 1,460       | H39 LOW CHROME |
| 12/11/2020       | 6:00 AM - 2:30 PM                   |       |      | 26 MIN.       | 1,460       | H39 LOW CHROME |
|                  |                                     |       |      |               |             |                |
| 12/11/2020       | 2:00 PM-10:30 PM                    |       |      | 40 MIN.       | 1,460       | H39 LOW CHROME |
| 12/11/2020       | 2:00 PM-10:30 PM                    |       |      | 41 MIN.       | 1,460       | H39 LOW CHROME |
| 12/11/2020       | 2:00 PM-10:30 PM                    |       |      | 41 MIN.       | 1,460       | H39 LOW CHROME |
| 12/11/2020       | 2:00 PM-10:30 PM                    |       |      | 41 MIN.       | 1,460       | H39 LOW CHROME |
| 12/11/2020       | 2:00 PM-10:30 PM                    |       |      | 41 MIN.       | 1,460       | H39 LOW CHROME |
| 12/11/2020       | 2:00 PM-10:30 PM                    |       |      | 41 MIN.       | 1,460       | H39 LOW CHROME |
| 12/11/2020       | 2:00 PM-10:30 PM                    |       |      | 59 MIN.       | 925         | H55 LOW CHROME |

**CAO TESTING 12/2020 ARC MELT INFORMATION**

| DATE             | BH | FURNACE    | START TIME | END TIME | WEIGHT | ALLOY                |        | Min Total | Additional from Grp 6 | Total |
|------------------|----|------------|------------|----------|--------|----------------------|--------|-----------|-----------------------|-------|
| 12/6-12/7/2020   | 1  | SOUTH 10TT | 12:25 AM   | 2:45 AM  | 18,500 | R5 MANGANESE         |        |           |                       |       |
| 12/6-12/7/2020   | 2  | NORTH 10TT | 12:38 AM   | 2:00 AM  | 16,000 | L68 MANGANESE        |        |           |                       |       |
| 12/6-12/7/2020   | 2  | NORTH 10TT | 2:25 AM    | 4:30 AM  | 22,000 | R57 MANGANESE        |        |           |                       |       |
| 12/6-12/7/2020   | 1  | SOUTH 10TT | 3:15 AM    | 4:55 AM  | 22,000 | R5 MANGANESE         |        |           |                       |       |
| 12/6-12/7/2020   | 2  | NORTH 10TT | 4:55 AM    | 6:15 AM  | 18,000 | R57 MANGANESE        |        |           |                       |       |
|                  |    |            |            |          |        |                      | 6-Dec  | 350       | 90                    | 440   |
| 12/7-12/8/2020   | 2  | NORTH 10TT | 10:05 PM   | 11:40 PM | 20,500 | R57 MANGANESE        |        |           |                       |       |
| 12/7-12/8/2020   | 1  | 6MT        | 10:50 PM   | 1:05AM   | 7,000  | H7 LOW CHROME        |        |           |                       |       |
| 12/7-12/8/2020   | 2  | NORTH 10TT | 12:12 AM   | 1:40 AM  | 19,500 | L98 MANGANESE        |        |           |                       |       |
| 12/7-12/8/2020   | 1  | 6MT        | 1:15 AM    | 2:55 AM  | 7,000  | H7 LOW CHROME        |        |           |                       |       |
| 12/7-12/8/2020   | 2  | NORTH 10TT | 2:05 AM    | 3:30 AM  | 17,500 | L98 MANGANESE        |        |           |                       |       |
| 12/7-12/8/2020   | 1  | 6MT        | 3:25 AM    | 5:06 AM  | 6,500  | H3 LOW CHROME        | 7-Dec  | 421       | 0                     | 421   |
|                  |    |            |            |          |        |                      |        |           |                       |       |
| 12/8-12/9/2020   | 2  | NORTH 10TT | 11:03 PM   | 12:35 AM | 17,000 | L88 MANGANESE        |        |           |                       |       |
| 12/8-12/9/2020   | 1  | SOUTH 10TT | 11:05 PM   | 1:45 AM  | 18,500 | H5 LOW CHROME        |        |           |                       |       |
| 12/8-12/9/2020   | 2  | NORTH 10TT | 12:55 AM   | 2:44 AM  | 22,000 | R5 MANGANESE         |        |           |                       |       |
| 12/8-12/9/2020   | 2  | NORTH 10TT | 3:00 AM    | 4:20 AM  | 20,000 | R57 MANGANESE        |        |           |                       |       |
| 12/8-12/9/2020   | 1  | SOUTH 10TT | 2:15 AM    | 5:05 AM  | 18,500 | H5 LOW CHROME        | 8-Dec  | 362       | 0                     | 362   |
|                  |    |            |            |          |        |                      |        |           |                       |       |
| 12/9-12/10/2020  | 1  | 6MT        | 9:35 PM    | 11:50 PM | 7,000  | H79 LOW CHROME       | 135    |           |                       |       |
| 12/9-12/10/2020  | 1  | 6MT        | 12:15 AM   | 2:20 AM  | 7,500  | H3 LOW CHROME        |        |           |                       |       |
| 12/9-12/10/2020  | 2  | NORTH 10TT | 12:55 AM   | 3:00 AM  | 18,000 | L98 MANGANESE        |        |           |                       |       |
| 12/9-12/10/2020  | 1  | 6MT        | 2:50 AM    | 4:15 AM  | 6,500  | H7 LOW CHROME        |        |           |                       |       |
| 12/9-12/10/2020  | 2  | NORTH 10TT | 3:30 AM    | 5:15 AM  | 18,000 | L98 MANGANESE        |        |           |                       |       |
| 12/9-12/10/2020  | 1  | 6MT        | 4:45 AM    | 6:15 AM  | 6,500  | H7 LOW CHROME        |        |           |                       |       |
|                  |    |            |            |          |        |                      | 9-Dec  | 495       | 0                     | 495   |
| 12/10-12/11/2020 | 1  | 6MT        | 9:20 PM    | 11:10 PM | 7,500  | H3 LOW CHROME        |        |           |                       |       |
| 12/10-12/11/2020 | 2  | NORTH 10TT | 10:20 PM   | 11:55 PM | 19,500 | L98 MANGANESE        |        |           |                       |       |
| 12/10-12/11/2020 | 1  | 6MT        | 11:25 PM   | 1:50 PM  | 7,500  | K7 LOW/MEDIUM CHROME |        |           |                       |       |
| 12/10-12/11/2020 | 2  | NORTH 10TT | 12:15 AM   | 2:20 AM  | 22,000 | R57 MANGANESE        |        |           |                       |       |
| 12/10-12/11/2020 | 1  | 6MT        | 2:15 AM    | 4:10 AM  | 6,500  | H5 LOW CHROME        |        |           |                       |       |
| 12/10-12/11/2020 | 2  | NORTH 10TT | 2:33 AM    | 5:05 AM  | 20,000 | R57 MANGANESE        |        |           |                       |       |
| 12/10-12/11/2020 | 1  | 6MT        | 4:23 AM    | 6:25 AM  | 7,500  | H5 LOW CHROME        |        |           |                       |       |
|                  |    |            |            |          |        |                      | 10-Dec | 545       | 0                     | 545   |
| DATE             | BH | FURNACE    | START TIME | END TIME | WEIGHT | ALLOY                |        |           |                       |       |
| 12/13-12/14/2020 | 1  | 6MT        | 1:15 AM    | 3:10 AM  | 7,000  | H39 LOW CHROME       |        |           |                       |       |
| 12/13-12/14/2020 | 2  | NORTH 10TT | 12:40 AM   | 4:20 AM  | 19,000 | L9 MANGANESE         |        |           |                       |       |
| 12/13-12/14/2020 | 1  | 6MT        | 3:26 AM    | 5:10 AM  | 6,500  | H55 LOW CHROME       |        |           |                       |       |
| 12/13-12/14/2020 | 1  | 6MT        | 5:23 AM    | 6:45 AM  | 6,000  | H39 LOW CHROME       |        |           |                       |       |
|                  |    |            |            |          |        |                      | 13-Dec | 365       | 0                     | 365   |

**CAO TESTING 12/2020 ARC MELT INFORMATION**

|                  |   |            |          |          |        |                           |        |     |     |     |
|------------------|---|------------|----------|----------|--------|---------------------------|--------|-----|-----|-----|
| 12/14-12/15/2020 | 1 | 6MT        | 10:15 PM | 12:10 AM | 7,550  | H79 LOW CHROME            |        |     |     |     |
| 12/14-12/15/2020 | 2 | NORTH 10TT | 10:20 AM | 12:35 AM | 18,000 | R5 MANGANESE              |        |     |     |     |
| 12/14-12/15/2020 | 1 | 6MT        | 12:29 AM | 2:15 AM  | 7,000  | H39 LOW CHROME            |        |     |     |     |
| 12/14-12/15/2020 | 2 | NORTH 10TT | 12:50 AM | 2:46 AM  | 18,000 | R5 MANGANESE              |        |     |     |     |
| 12/14-12/15/2020 | 1 | 6MT        | 2:25 AM  | 3:55 AM  | 6,500  | H55 LOW CHROME            | 14-Dec | 340 | 105 | 445 |
|                  |   |            |          |          |        |                           |        |     |     |     |
| 12/15-12/16/2020 | 1 | 6MT        | 9:20 PM  | 11:05 PM | 7,000  | H39 LOW CHROME            |        |     |     |     |
| 12/15-12/16/2020 | 2 | NORTH 10TT | 10:00 PM | 11:45 PM | 23,000 | R5 MANGANESE              |        |     |     |     |
| 12/15-12/16/2020 | 1 | 6MT        | 11:30 PM | 1:10 AM  | 7,000  | H55 LOW CHROME            |        |     |     |     |
| 12/15-12/16/2020 | 2 | NORTH 10TT | 12:10 PM | 2:00 AM  | 23,000 | L7 MANGANESE              |        |     |     |     |
| 12/15-12/16/2020 | 1 | 6MT        | 1:29 AM  | 3:15 AM  | 8,000  | H39 LOW CHROME            |        |     |     |     |
| 12/15-12/16/2020 | 2 | NORTH 10TT | 2:25 AM  | 4:10 AM  | 20,500 | L6 MANGANESE              |        |     |     |     |
|                  |   |            |          |          |        |                           | 15-Dec | 410 | 0   | 410 |
| 12/16-12/17/2020 | 1 | 6MT        | 9:10 PM  | 11:05 PM | 7,000  | H39 LOW CHROME            |        |     |     |     |
| 12/16-12/17/2020 | 2 | NORTH 10TT | 10:40 PM | 12:55 AM | 16,000 | L9 MANGANESE              |        |     |     |     |
| 12/16-12/17/2020 | 1 | 6MT        | 11:55 PM | 1:35 AM  | 6,500  | H55 LOW CHROME            |        |     |     |     |
| 12/16-12/17/2020 | 2 | NORTH 10TT | 1:55 AM  | 3:05 AM  | 16,000 | L9 MANGANESE              |        |     |     |     |
| 12/16-12/17/2020 | 1 | 6MT        | 2:10 AM  | 4:00 AM  | 6,500  | H79 LOW CHROME            |        |     |     |     |
|                  |   |            |          |          |        |                           | 16-Dec | 410 |     | 410 |
| 12/17-12/18/2020 | 1 | 6MT        | 9:05 PM  | 10:40 PM | 7,000  | S42 STAINLESS HIGH CHROME |        |     |     |     |
| 12/17-12/18/2020 | 1 | 6MT        | 10:53 PM | 12:20 AM | 6,500  | S72 STAINLESS HIGH CHROME | -13    |     |     |     |
| 12/17-12/18/2020 | 2 | NORTH 10TT | 11:02 PM | 12:50 PM | 16,000 | R5 MANGANESE              |        |     |     |     |
| 12/17-12/18/2020 | 1 | 6MT        | 12:40 AM | 2:05 AM  | 6,000  | S72 STAINLESS HIGH CHROME |        |     |     |     |
| 12/17-12/18/2020 | 2 | NORTH 10TT | 1:10 AM  | 2:40 AM  | 16,000 | R5 MANGANESE              |        |     |     |     |
|                  |   |            |          |          |        |                           | 17-Dec | 322 |     | 322 |

**CAO TESTING 12/2020 INDUCTION MELT INFORMATION BUILDING 8**

| DATE             | FURNACE    | START TIME | END TIME | WEIGHT | ALLOY          |  | Run time<br>(min) |              |     |
|------------------|------------|------------|----------|--------|----------------|--|-------------------|--------------|-----|
| 12/6-12/7/2020   | DUAL TRACK | 10:20 PM   | 12:03 AM | 1820   | H39 LOW CHROME |  | 103               |              |     |
| 12/6-12/7/2020   | DUAL TRACK | 12:03 AM   | 1:33 AM  | 1800   | H39 LOW CHROME |  | 90                |              |     |
| 12/6-12/7/2020   | DUAL TRACK | 1:33 AM    | 2:54 AM  | 1770   | H39 LOW CHROME |  | 81                |              |     |
| 12/6-12/7/2020   | DUAL TRACK | 2:54 AM    | 4:17 AM  | 1830   | H39 LOW CHROME |  | 83                |              |     |
| 12/6-12/7/2020   | DUAL TRACK | 4:17 AM    | 6:00 AM  | 1840   | H39 LOW CHROME |  | 103               |              |     |
|                  |            |            |          |        |                |  | <b>460</b>        | <b>Total</b> |     |
| 12/13-12/14/2020 | DUAL TRACK | 10:25 PM   | 12:11 AM | 2140   | H55 LOW CHROME |  | 106               |              |     |
| 12/13-12/14/2020 | DUAL TRACK | 12:11 AM   | 1:54 AM  | 2140   | H55 LOW CHROME |  | 103               |              | 103 |
| 12/13-12/14/2020 | DUAL TRACK | 1:54 AM    | 3:21 AM  | 2140   | H55 LOW CHROME |  | 87                |              | 87  |
| 12/13-12/14/2020 | DUAL TRACK | 3:21 AM    | 4:45 AM  | 2140   | H55 LOW CHROME |  | 84                |              |     |
| 12/13-12/14/2020 | DUAL TRACK | 4:45 AM    | 6:13 AM  | 2140   | H55 LOW CHROME |  | 88                |              |     |
|                  |            |            |          |        |                |  | <b>468</b>        | <b>Total</b> |     |

**CAO TESTING 12/2020 INDUCTION MELT INFORMATION GROUP 6**

| DATE             | FURNACE         | START TIME | END TIME | WEIGHT | ALLOY         |
|------------------|-----------------|------------|----------|--------|---------------|
| 12/6-12/7/2020   | PILLAR/INDUCTO  | 10:50 PM   | 11:55 PM | 950    | H3 LOW CHROME |
| 12/6-12/7/2020   | PILLAR/INDUCTO  | 12:00 AM   | 1:05 AM  | 950    | H3 LOW CHROME |
| 12/6-12/7/2020   | PILLAR/INDUCTO  | 1:00 AM    | 2:00AM   | 950    | H3 LOW CHROME |
| 12/6-12/7/2020   | PILLAR/INDUCTO  | 2:35 AM    | 3:40 AM  | 950    | H3 LOW CHROME |
| 12/6-12/7/2020   | PILLAR/INDUCTO  | 3:35 AM    | 4:40 AM  | 950    | H3 LOW CHROME |
| 12/6-12/7/2020   | PILLAR/INDUCTO  | 4:45 AM    | 5:45 AM  | 950    | H3 LOW CHROME |
|                  |                 |            |          |        |               |
| 12/7-12/8/2020   | PILLAR/INDUCTO  | 11:10 PM   | 12:15 AM | 950    | H3 LOW CHROME |
| 12/7-12/8/2020   | PILLAR/INDUCTO  | 12:20 AM   | 1:20 AM  | 950    | H3 LOW CHROME |
| 12/7-12/8/2020   | PILLAR/INDUCTO  | 1:25 AM    | 2:20 AM  | 950    | H3 LOW CHROME |
| 12/7-12/8/2020   | PILLAR/INDUCTO  | 3:00 AM    | 4:00 AM  | 900    | L6 MANGANESE  |
|                  |                 |            |          |        |               |
| 12/8-12/9/2020   | NO HEATS MELTED |            |          |        |               |
|                  |                 |            |          |        |               |
| 12/9-12/10/2020  | NO HEATS MELTED |            |          |        |               |
|                  |                 |            |          |        |               |
| 12/10-12/11/2020 | PILLAR/INDUCTO  | 10:10 PM   | 11:15 PM | 950    | H3 LOW CHROME |
| 12/10-12/11/2020 | PILLAR/INDUCTO  | 11:45 PM   | 12:50 AM | 950    | H3 LOW CHROME |
| 12/10-12/11/2020 | PILLAR/INDUCTO  | 12:45 AM   | 1:50 AM  | 950    | H7 LOW CHROME |
| 12/10-12/11/2020 | PILLAR/INDUCTO  | 2:45 AM    | 3:50 AM  | 950    | H7 LOW CHROME |
|                  |                 |            |          |        |               |
| 12/14-12/15/2020 | PILLAR/INDUCTO  | 11:20 PM   | 12:25 AM | 1050   | H7 LOW CHROME |
| 12/14-12/15/2020 | PILLAR/INDUCTO  | 12:30 AM   | 1:35 AM  | 1050   | H7 LOW CHROME |
| 12/14-12/15/2020 | PILLAR/INDUCTO  | 2:30 AM    | 3:40 AM  | 1050   | H7 LOW CHROME |
| 12/14-12/15/2020 | PILLAR/INDUCTO  | 3:45 AM    | 4:35 AM  | 900    | L6 MANGANESE  |
| 12/14-12/15/2020 | PILLAR/INDUCTO  | 4:40 AM    | 5:40 AM  | 900    | L6 MANGANESE  |
|                  |                 |            |          |        |               |
| 12/15-12/16/2020 | PILLAR/INDUCTO  | 1:05 AM    | 2:05 AM  | 1050   | H5 LOW CHROME |
| 12/15-12/16/2020 | PILLAR/INDUCTO  | 2:30 AM    | 3:35 AM  | 1050   | H5 LOW CHROME |
|                  |                 |            |          |        |               |
| 12/16-12/17/2020 | PILLAR/INDUCTO  | 10:30 PM   | 11:35 AM | 1050   | H5 LOW CHROME |
| 12/16-12/17/2020 | PILLAR/INDUCTO  | 11:50 AM   | 12:55 AM | 900    | L6 MANGANESE  |
| 12/16-12/17/2020 | PILLAR/INDUCTO  | 1:00 AM    | 1:50 AM  | 900    | L6 MANGANESE  |
| 12/16-12/17/2020 | PILLAR/INDUCTO  | 2:40 AM    | 3:40 AM  | 760    | L9 MANGANESE  |

## OXYGEN USAGE HEAT BOIL

[illegible]

## PANGBORN CT-264 BH-1 MONOMETER READINGS

[illegible]

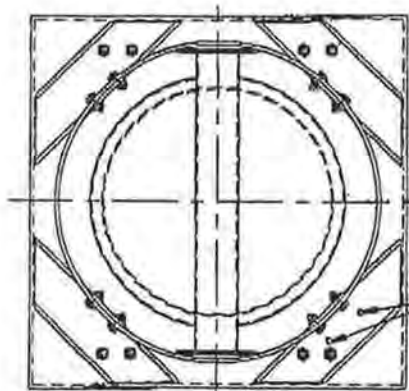
## READINGS

[illegible]

WHEELABRATOR BH15  
MONOMETER READINGS

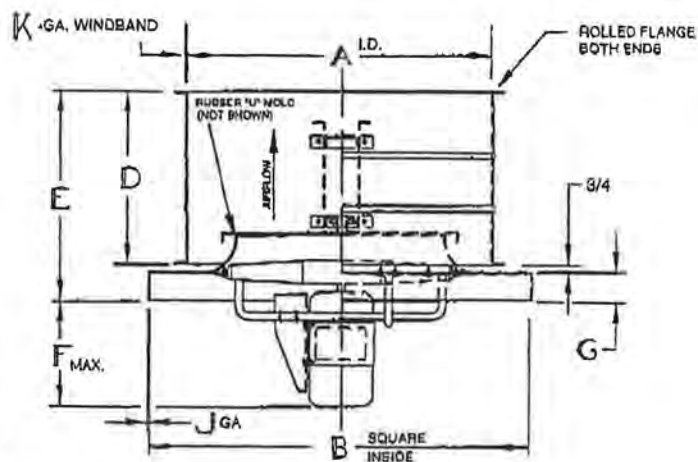
[illegible]

# Dimensions



EXTERNAL LUBE TUBES (OPTIONAL)

## Series 61

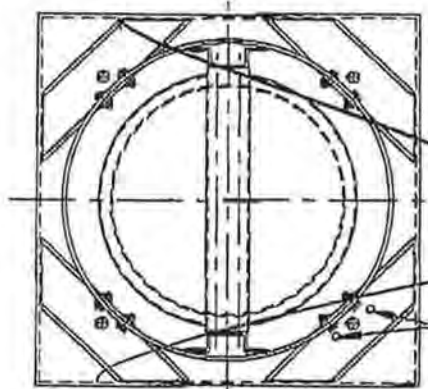


Principal Dimensions - Series 61 and 63 (Inches)

|          |     |     |     |     | F max    |          |          |          |    |      |       |      | Max Motor Frame Size |      |      |      | Weight (less motor and options) |          |          |          |          |
|----------|-----|-----|-----|-----|----------|----------|----------|----------|----|------|-------|------|----------------------|------|------|------|---------------------------------|----------|----------|----------|----------|
|          |     |     |     |     | 61       |          | 63       |          |    |      |       |      | 61                   |      | 63   |      | 61                              |          | 63       |          |          |
|          |     |     |     |     | "G" Duty | "H" Duty | "G" Duty | "H" Duty |    |      |       |      | G                    | J    |      | K    |                                 | "G" Duty | "H" Duty | "G" Duty | "H" Duty |
| Fan Size | A   | B   | D   | E   |          |          |          |          | G  | Galv | Alum  | Galv | Alum                 |      |      |      |                                 | Galv     | Alum     | Galv     | Alum     |
| 12       | 18  | 22  | 12  | 14% | --       | 12       | --       | --       | 2  | 14   | 0.125 | 20   | 0.064                | --   | 56   | --   | --                              | 44       | 33       | --       | --       |
| 14       | 20  | 24  | 12  | 14% | --       | 12       | --       | --       | 2  | 14   | 0.125 | 20   | 0.064                | --   | 56   | --   | --                              | 50       | 37       | --       | --       |
| 16       | 22  | 26  | 12  | 14% | --       | 12       | --       | --       | 2  | 14   | 0.125 | 20   | 0.064                | --   | 56   | --   | --                              | 51       | 38       | --       | --       |
| 18       | 24  | 28  | 20  | 22% | 10%      | 12       | --       | --       | 2  | 14   | 0.125 | 20   | 0.064                | 56   | 56   | --   | --                              | 77       | 57       | --       | --       |
| 20       | 26  | 30  | 20  | 22% | 10%      | 12       | --       | --       | 2  | 14   | 0.125 | 20   | 0.064                | 143T | 145  | --   | --                              | 85       | 63       | --       | --       |
| 24       | 30  | 36  | 20  | 23% | 10%      | 11%      | 12%      | 15%      | 2% | 14   | 0.125 | 20   | 0.064                | 145T | 184T | 56   | 145T                            | 124      | 93       | 117      | 88       |
| 28       | 34  | 42  | 20  | 23% | 12%      | 11       | 12%      | 16%      | 2% | 14   | 0.125 | 20   | 0.064                | 145T | 184T | 56   | 145T                            | 135      | 101      | 124      | 93       |
| 32       | 38  | 42  | 26  | 29% | 12%      | 11       | 12%      | 18%      | 2% | 14   | 0.125 | 20   | 0.064                | 184T | 184T | 145T | 184T                            | 169      | 126      | 210      | 157      |
| 36       | 44  | 48  | 26  | 29% | 15%      | 14%      | 15%      | 17%      | 2% | 14   | 0.125 | 20   | 0.064                | 213T | 215T | 145T | 184T                            | 175      | 126      | 191      | 143      |
| 40       | 48  | 50  | 26  | 29% | 15%      | 19%      | 15%      | 18%      | 2% | 14   | 0.125 | 20   | 0.064                | 215T | 256T | 182T | 184T                            | 227      | 170      | 241      | 181      |
| 44       | 52  | 54  | 38  | 41% | 18       | 19%      | 14%      | 22%      | 2% | 14   | 0.125 | 16   | 0.100                | 254T | 256T | 184T | 215T                            | 275      | 165      | 217      | 163      |
| 48       | 56  | 58% | 38  | 42% | 18       | 18%      | 14%      | 21%      | 3% | 14   | 0.125 | 16   | 0.100                | 254T | 256T | 184T | 215T                            | 409      | 263      | 291      | 218      |
| 54       | 62  | 64% | 38  | 42% | --       | 21%      | --       | 21%      | 3% | 14   | 0.125 | 16   | 0.100                | --   | 286T | --   | 256T                            | 628      | 432      | 586      | 440      |
| 60       | 68  | 70% | 38  | 42% | --       | 21%      | --       | 21%      | 3% | 14   | 0.125 | 14   | 0.100                | --   | 286T | --   | 256T                            | 640      | 437      | 486      | 364      |
| 66       | 76% | 79% | 36% | 40% | --       | 28       | --       | 44       | 4  | 1/2  | 0.375 | 10   | 0.190                | --   | 326T | --   | 256T                            | 484      | 363      | 532      | 399      |
| 72       | 82% | 85% | 36% | 40% | --       | 29%      | --       | 44       | 4  | 1/2  | 0.375 | 10   | 0.190                | --   | 365T | --   | 286T                            | 1150     | 862.5    | 966      | 724.5    |
| 84       | 95  | 98% | 42% | 46% | --       | --       | --       | 49       | 4  | 1/2  | 0.375 | 10   | 0.190                | --   | --   | --   | 324T                            | --       | --       | 1447.7   | 1085.78  |

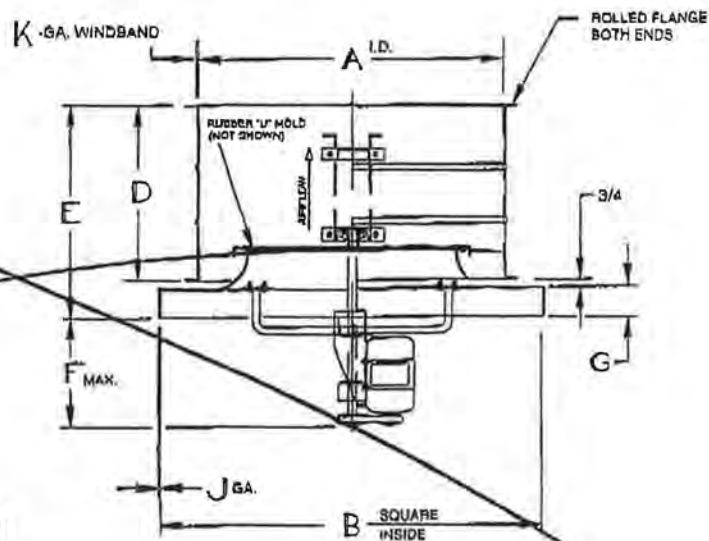
NOTE: Dimensions and specifications are subject to change. Certified prints are available.

Maximum installation weight less motor and any optional equipment.



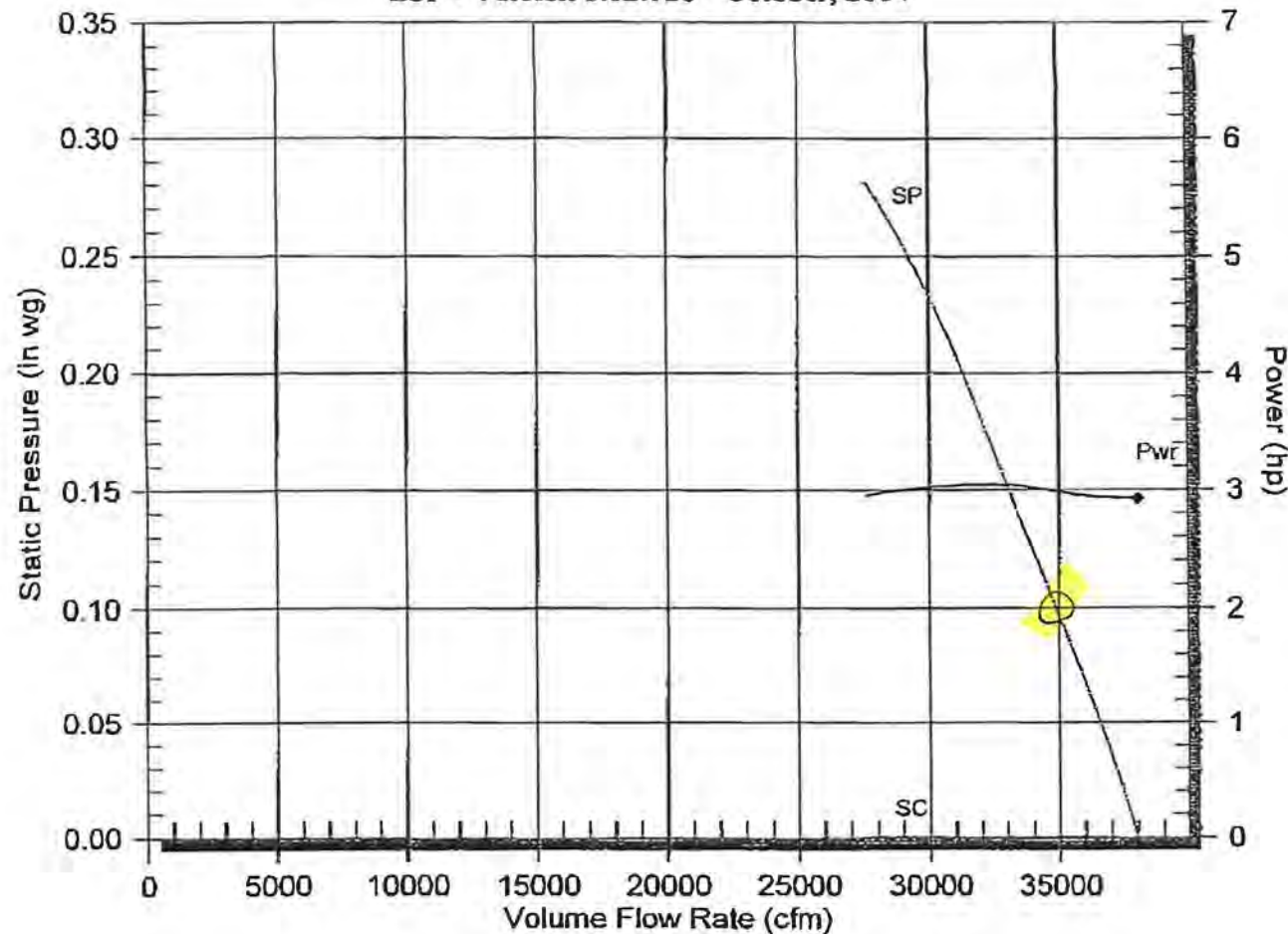
EXTERNAL LUBE TUBES (OPTIONAL)

## Series 63



**Hartzell Fan, Inc.®**

ESP - Version 1.12.128 - October, 2004



Date: 11/17/2005  
 Job Ref:  
 Tag #:  
 Proposal #:  
 Rep. Name: David P. Wilson Co., Inc.  
 Phone #: 1-503-528-9730  
 Fax #: 1-503-528-9731

**Fan Selected:****A61-H-602NC---STFCK5**

61 - Direct Drive Upblast Roof Ventilator  
 Vol Flow Rate 38023.  
 Static Pressure 0.  
 Density .075  
 Operating Temp 70 F  
 Fan RPM 870  
 Max Safe RPM 1270  
 Operating Power 2.932  
 Standard Power 2.932  
 Static Efficiency 0.  
 Outlet Velocity 1889

**Discharge Sound Power Levels**  
 referred to 10<sup>-12</sup> watts

| 1   | 2   | 3  | 4  | 5  | 6  | 7  | 8  |
|-----|-----|----|----|----|----|----|----|
| 101 | 100 | 97 | 97 | 95 | 92 | 88 | 86 |

Air performance ratings are based on tests performed in accordance with AMCA Standard 210.

Performance shown is for Installation Type B: Free Inlet, Ducted Outlet.

Performance Ratings do not include the effects of appurtenances in the airstream.

Sound ratings are based on sound power level data obtained in accordance with AMCA Standard 300.

The sound power level ratings shown are in decibels, referred to 10<sup>-12</sup> watts, calculated per AMCA Standard 301.

Fan Outlet Sound Testing. Values shown are for outlet LwA sound power levels for: Installation Type B: free inlet, ducted outlet.

Ratings include the effects of duct end correction.

See page 2 for sound information,  
 including dBA and LwA.

# Hartzell • FAN, INC.

BUILDING 8

P.O. BOX 919 • PIQUA, OHIO, U.S.A. 45356  
PHONE 513-773-7411  
FAX 513-773-8994*Manufacturers of Fans and Blowers*DUNS NO.  
05-655-1039

6/28/99

CUSTOMER ORDER NO.

60405

OUR ORDER NO.

9904139

001

COLUMBIA STEEL CASTINGS  
PO BOX 83095COLUMBIA STEEL CASTINGS  
10425 N BLOSS AVE

PORTLAND

OR 97283

PORTLAND

OR 97283

C/F

SALESMAN ORDER NO.

99/06/21

89DW

FPD CC

99/07/16

\*\*\*WARNING: DO NOT SCALE COPIES OF DRAWING TO OBTAIN DIMENSIONS NOT SHOWN  
ON THE DRAWING. CONSULT FACTORY IF ADDITIONAL DRAWING  
DIMENSIONS ARE REQUIRED.

\*\*\*\*\*

AGENT ORDER NO 72-99H

7 PB69904139001

69H-24-SI3

24" SMOKE VENTILATOR HI-TEMP

MOTOR: 1-1/2 HP 1750 RPM 1 SP OEDP EE

480/60/3

FAN: 1425 RPM 7,845 CFM @ 0" SP

WITH: HI-TEMP COATING

STD FLOW VERT EXHAUST

VP DRIVES

COMB MTR COVER/BELT GUARD

NEMA 3R DISCONNECT SWITCH

MTR &amp; WIRED @ 460 VOLT

STACK CAP

CURB PANEL

NUMBER OF DRAWINGS 2

DRAWING TYPE

RECORD

The safe application and use of equipment supplied by Hartzell Fan, Inc. is the responsibility of the installer, user, owner, and employer. To evaluate the safe application of this equipment, the following should be considered: the location of the installation, accessibility of employees and other persons to the equipment, any adjacent equipment, applicable building and safety codes, and requirements of OSHA. Since the application and use of its equipment can vary greatly, Hartzell Fan, Inc. offers various product types, optional safety accessories, and sound performance data per laboratory tests.

An industry publication: "Recommended Safety Practices for Users and Installers of Industrial and Commercial Fans" is available from Hartzell upon request.

455

## ACCESSORIES

- 1) CONSTRUCTION ☐ STAINLESS STEEL  
 2) BIRD SCREEN ☐ GALV.  
 3) GUARD ☐ PAINTED STEEL  
 4) ROOF CURB ADAPTER BASE  
     ☐ 12' MIN. HEIGHT ☐ OTHER \_\_\_\_\_  
     ☐ FLAT ☐ SLOPED ☐ PEAKED: \_\_\_\_\_ SLOPE PER FT.  
 5) PREFABRICATED ROOF CURB ☐ 8' HIGH ☐ 12' HIGH  
     ☐ FLAT ☐ SLOPED ☐ PEAKED: \_\_\_\_\_ SLOPE PER FT.  
 6) SPECIAL COATINGS ☐ TARSET ☐ EPOXY ☐ OTHER \_\_\_\_\_

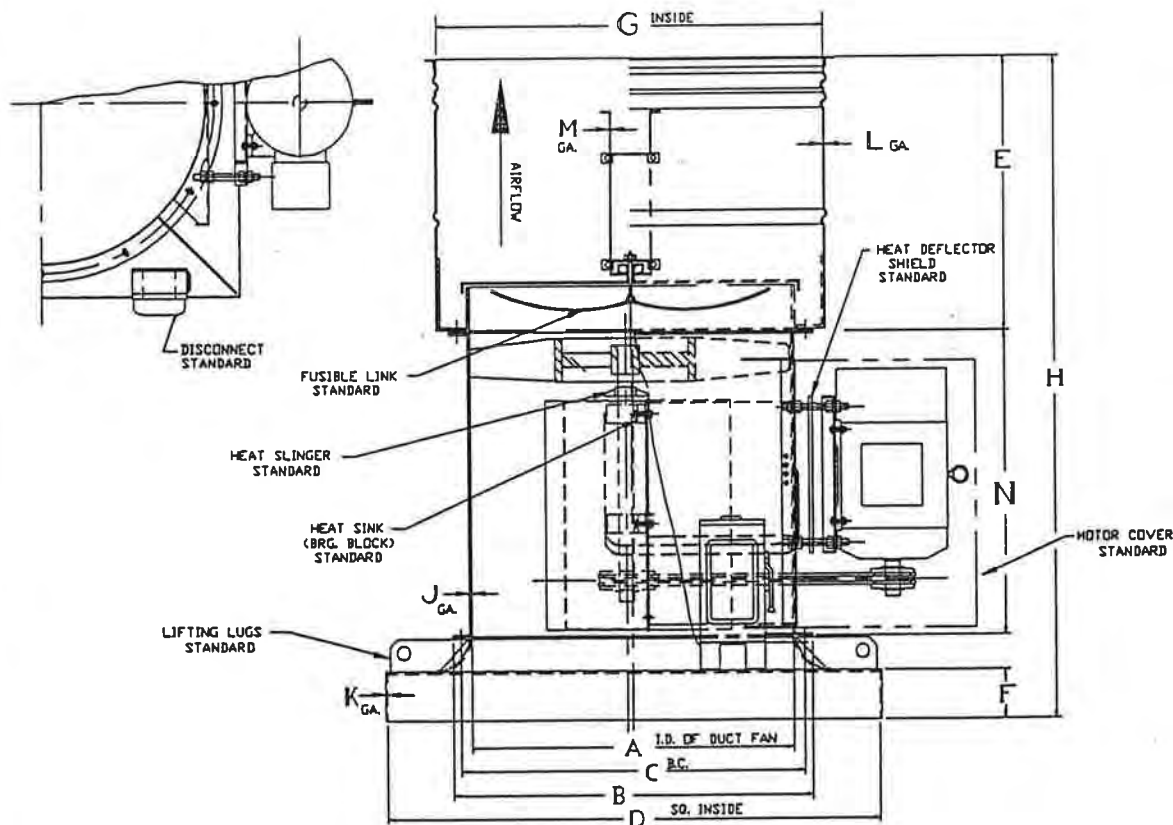
REF: UNIT IS DESIGNED TO OPERATE  
 AT 500° F. FOR 4 HRS. MIN.

## GENERAL NOTES

- CAUTION: WHEN THE PERIPHERY OF THE BLADES OF A FAN IS LESS THAN SEVEN (7) FEET ABOVE THE FLOOR OR WORKING LEVEL THE BLADES MUST BE GUARDED TO COMPLY WITH OSHA REQUIREMENTS.
- CUSTOMER TO ASSURE THAT UNIT IS INSTALLED AND SOLIDLY ATTACHED TO ROOF'S STRUCTURE.
- UNLESS OTHERWISE SPECIFIED: STD. CONSTR. IS PAINTED STEEL-HI TEMP. GRAY. APPROXIMATELY 2-MILLS THICK.
- WHEN SMOKE VENT. TEMPERATURES EXCEEDS 165° F. THE FUSIBLE LINK ALLOWS THE SPRING-OPERATED LID OPENER TO LOCK THE STACK CAP LIDS IN UPRIGHT POSITION.
- STANDARD MOTOR IS TO BE OEDP.
- UNITS ARE DESIGNED TO MEET OR EXCEED THE STANDARDS ESTABLISHED BY IRI.
- UNITS ARE LICENSED TO BEAR THE AMCA CERTIFIED RATING SEAL FOR AIR PERFORMANCE.

## INTELLECTUAL PROPERTY DRAWING NOTE

ITEMS SHOWN ON THIS DRAWING ARE THE INTELLECTUAL PROPERTY OF HARTZELL FAN, INCORPORATED AND ARE PROVIDED FOR INTERFACE DIMENSIONS ONLY. DRAWINGS AND PERFORMANCE DATA SHALL NOT BE COPIED OR RELEASED WITHOUT THE WRITTEN CONSENT OF HARTZELL FAN, INCORPORATED AND SHALL BE RETURNED ON REQUEST.



| FAN SIZE | A      | B      | C      | D      | E       | F     | G  | H        | J     | K     | L     | M     | N  | MOTOR FRAMES MAX |
|----------|--------|--------|--------|--------|---------|-------|----|----------|-------|-------|-------|-------|----|------------------|
| 18       | 18 7/8 | 21 5/8 | 20 5/8 | 28     | 22 1/16 | 2     | 24 | 41 5/16  | 12 GA | 12 GA | 20 GA | 26 GA | 25 | 213T             |
| 24       | 24 7/8 | 29 1/8 | 26 7/8 | 36     | 22 9/16 | 2 3/4 | 30 | 59 13/16 | 10 GA | 12 GA | 20 GA | 26 GA | 31 | 215T             |
| 30       | 30 7/8 | 35 1/8 | 33     | 42     | 22 9/16 | 2 3/4 | 36 | 63 13/16 | 10 GA | 12 GA | 20 GA | 26 GA | 34 | 215T             |
| 36       | 37     | 41 3/8 | 39     | 48     | 28 9/16 | 2 3/4 | 44 | 69 13/16 | 10 GA | 12 GA | 20 GA | 26 GA | 34 | 215T             |
| 42       | 42 7/8 | 47 1/4 | 45     | 54     | 28 9/16 | 2 3/4 | 50 | 78 7/16  | 10 GA | 12 GA | 20 GA | 26 GA | 42 | 215T             |
| 48       | 49 1/8 | 53 1/2 | 51 5/8 | 58 1/4 | 41 1/8  | 3 3/4 | 56 | 88 1/8   | 10 GA | 12 GA | 16 GA | 20 GA | 42 | 215T             |
| 54       | 55 3/8 | 60 5/8 | 57 5/8 | 64 1/4 | 41 1/8  | 3 3/4 | 62 | 92 3/8   | 10 GA | 12 GA | 16 GA | 20 GA | 42 | 254T             |
| 60       | 61 3/8 | 66 5/8 | 63 5/8 | 70 1/4 | 41 1/8  | 3 3/4 | 68 | 93 3/32  | 10 GA | 12 GA | 14 GA | 20 GA | 42 | 254T             |

DRAWING NO.

69H-20019-1

SHEET 1 OF 1 REV --

DATE: 7-8-99

Hartzell  
 FAN, INC.  
 Piquette, OHIO

DATE 8/1/97

DATE 3/6/98

DATE 3/6/98

GE

CHECKED RB

APPR. 1/10

TITLE:  
 BELT DRIVE UPBLAST  
 SMOKE VENTILATOR  
 (SERIES 69H)

DATE 3/6/98

MODEL NO. 9904139

ORDER NO. 9904139

DATE 1/30/98

ECN

## **APPENDIX I: CALIBRATIONS AND CERTIFICATIONS**



American Association for Laboratory Accreditation

## Accredited Air Emission Testing Body

A2LA has accredited

**BISON ENGINEERING, INC.**

In recognition of the successful completion of the joint A2LA and Stack Testing Accreditation Council (STAC) evaluation process, this laboratory is accredited to perform testing activities in compliance with ASTM D7036:2004 - Standard Practice for Competence of Air Emission Testing Bodies.

Presented this 15<sup>th</sup> day of January 2020.



A blue ink signature of a person, likely the Vice President of Accreditation Services, is written over a horizontal line.

Vice President, Accreditation Services  
For the Accreditation Council  
Certificate Number 4675.01  
Valid to November 30, 2021

*This accreditation program is not included under the A2LA ILAC Mutual Recognition Arrangement.*

## APEX INSTRUMENTS

### METERBOX CALIBRATION USING REFERENCE DGM

| Meter Console Information |          |
|---------------------------|----------|
| Console Model Number      | BOX 9    |
| Console Serial Number     |          |
| DGM Model Number          |          |
| DGM Serial Number         | A2003246 |

| Calibration Conditions  |      |           |       |
|-------------------------|------|-----------|-------|
| Date                    | Time | 25-Nov-20 | 0:00  |
| Barometric Pressure     |      | 26.78     | in Hg |
| Calibration Technician  |      | KAD       |       |
| Calibration Meter Gamma |      | 1.0000    |       |

| Standardized Factors/Conversions |        |         |
|----------------------------------|--------|---------|
| Temperature                      | 528    | R       |
| Pressure                         | 29.92  | in Hg   |
| K <sub>1</sub>                   | 17.647 | R/in Hg |

&lt;&lt;&lt;&lt;&lt;&lt;&lt;Your reference meter here

| Calibration Data |                                       |                               |                               |                              |                        |                       |                               |                               |                              |                        |                       |  |
|------------------|---------------------------------------|-------------------------------|-------------------------------|------------------------------|------------------------|-----------------------|-------------------------------|-------------------------------|------------------------------|------------------------|-----------------------|--|
| Run Time         | Metering Console                      |                               |                               |                              |                        |                       | Reference Meter               |                               |                              |                        |                       |  |
| Elapsed          | Manometer<br>ΔH                       | Volume<br>Initial             | Volume<br>Final               | Sample<br>Volume             | Outlet Temp<br>Initial | Outlet Temp<br>Final  | Volume<br>Initial             | Volume<br>Final               | Sample<br>Volume             | Outlet Temp<br>Initial | Outlet Temp<br>Final  |  |
| Θ<br>minutes     | P <sub>m</sub><br>in H <sub>2</sub> O | V <sub>mi</sub><br>cubic feet | V <sub>mf</sub><br>cubic feet | V <sub>m</sub><br>cubic feet | t <sub>oi</sub><br>°F  | t <sub>of</sub><br>°F | V <sub>wi</sub><br>cubic feet | V <sub>wf</sub><br>cubic feet | V <sub>w</sub><br>cubic feet | t <sub>wi</sub><br>°F  | t <sub>wf</sub><br>°F |  |
| 10.00            | 6.00                                  | 750.800                       | 765.474                       | 14.674                       | 63                     | 65                    | 0.000                         | 14.548                        | 14.397                       | 62                     | 62                    |  |
| 10.00            | 3.00                                  | 765.500                       | 775.921                       | 10.421                       | 65                     | 66                    | 0.000                         | 10.327                        | 10.204                       | 62                     | 63                    |  |
| 10.00            | 2.00                                  | 776.000                       | 784.522                       | 8.522                        | 66                     | 67                    | 0.000                         | 8.411                         | 8.281                        | 63                     | 64                    |  |
| 10.00            | 1.00                                  | 784.600                       | 790.743                       | 6.143                        | 67                     | 68                    | 0.000                         | 5.897                         | 5.897                        | 65                     | 65                    |  |
| 10.00            | 0.50                                  | 790.800                       | 795.188                       | 4.388                        | 68                     | 68                    | 0.000                         | 4.183                         | 4.183                        | 66                     | 67                    |  |

| Results                           |                                             |                                   |                                             |                    |           |                                                   |                                        |                         |
|-----------------------------------|---------------------------------------------|-----------------------------------|---------------------------------------------|--------------------|-----------|---------------------------------------------------|----------------------------------------|-------------------------|
| Standardized Data                 |                                             |                                   |                                             | Dry Gas Meter      |           |                                                   |                                        |                         |
| Dry Gas Meter                     |                                             | Calibration Meter                 |                                             | Calibration Factor |           | Flowrate                                          | ΔH <sub>@</sub>                        |                         |
| V <sub>m(std)</sub><br>cubic feet | Q <sub>m(std)</sub><br>ft <sup>3</sup> /min | V <sub>w(std)</sub><br>cubic feet | Q <sub>w(std)</sub><br>ft <sup>3</sup> /min | Value              | Variation | Std & Corr                                        | 0.75 SCFM                              | Variation               |
|                                   |                                             |                                   |                                             | Y                  | ΔY        | Q <sub>m(std)(corr)</sub><br>ft <sup>3</sup> /min | ΔH <sub>@</sub><br>in H <sub>2</sub> O | ΔΔH <sub>@</sub>        |
| 13.452                            | 1.345                                       | 13.171                            | 1.317                                       | 0.9791             | 0.005     | 1.317                                             | 1.793                                  | 0.001                   |
| 9.449                             | 0.945                                       | 9.341                             | 0.934                                       | 0.9885             | 0.014     | 0.934                                             | 1.783                                  | -0.009                  |
| 7.691                             | 0.769                                       | 7.593                             | 0.759                                       | 0.9872             | 0.013     | 0.759                                             | 1.808                                  | 0.016                   |
| 5.519                             | 0.552                                       | 5.308                             | 0.531                                       | 0.9619             | -0.012    | 0.531                                             | 1.790                                  | -0.002                  |
| 3.933                             | 0.393                                       | 3.755                             | 0.375                                       | 0.9547             | -0.020    | 0.375                                             | 1.787                                  | -0.005                  |
| Pre-test Y                        | 0.980                                       | % Deviation                       | PASS                                        | 0.9743             | Y Average |                                                   | 1.792                                  | ΔH <sub>@</sub> Average |

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +0.02.

Note: For ΔH<sub>@</sub>, orifice pressure differential that equates to 0.75cfm (0.0212m<sup>3</sup>/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is +0.2inches (5.1mm) H<sub>2</sub>O.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR 40 Part 60, using the Precision Wet Test Meter # 11AE6, which in turn was calibrated using the American Bell Prover # 157, certified 05/26/2006 using Pi Tape S/N 20700139, which is traceable to the National Bureau of Standards (NIST).

Signature \_\_\_\_\_  
KADDate \_\_\_\_\_  
25-Nov-20

## APEX INSTRUMENTS

### METERBOX CALIBRATION USING REFERENCE DGM

| Meter Console Information |          |
|---------------------------|----------|
| Console Model Number      | BOX 9    |
| Console Serial Number     |          |
| DGM Model Number          |          |
| DGM Serial Number         | A2003246 |

| Calibration Conditions  |      |           |       |
|-------------------------|------|-----------|-------|
| Date                    | Time | 21-Dec-20 | 16:29 |
| Barometric Pressure     |      | 25.91     | in Hg |
| Calibration Technician  |      | JCR       |       |
| Calibration Meter Gamma |      | 1.0000    |       |

| Standardized Factors/Conversions |        |         |
|----------------------------------|--------|---------|
| Temperature                      | 528    | R       |
| Pressure                         | 29.92  | in Hg   |
| K <sub>1</sub>                   | 17.647 | R/in Hg |

&lt;&lt;&lt;&lt;&lt;&lt;&lt;Your reference meter here

| Calibration Data |                                       |                               |                               |                              |                        |                       |                               |                               |                              |                        |                       |  |
|------------------|---------------------------------------|-------------------------------|-------------------------------|------------------------------|------------------------|-----------------------|-------------------------------|-------------------------------|------------------------------|------------------------|-----------------------|--|
| Run Time         | Metering Console                      |                               |                               |                              |                        |                       | Reference Meter               |                               |                              |                        |                       |  |
| Elapsed          | Manometer<br>ΔH                       | Volume<br>Initial             | Volume<br>Final               | Sample<br>Volume             | Outlet Temp<br>Initial | Outlet Temp<br>Final  | Volume<br>Initial             | Volume<br>Final               | Sample<br>Volume             | Outlet Temp<br>Initial | Outlet Temp<br>Final  |  |
| Θ<br>minutes     | P <sub>m</sub><br>in H <sub>2</sub> O | V <sub>mi</sub><br>cubic feet | V <sub>mf</sub><br>cubic feet | V <sub>m</sub><br>cubic feet | t <sub>oi</sub><br>°F  | t <sub>of</sub><br>°F | V <sub>wi</sub><br>cubic feet | V <sub>wf</sub><br>cubic feet | V <sub>w</sub><br>cubic feet | t <sub>wi</sub><br>°F  | t <sub>wf</sub><br>°F |  |
| 10.00            | 6.00                                  | 354.092                       | 368.807                       | 14.715                       | 64                     | 69                    | 0.000                         | 14.536                        | 14.536                       | 72                     | 71                    |  |
| 10.25            | 3.00                                  | 369.143                       | 379.950                       | 10.807                       | 69                     | 71                    | 0.000                         | 10.478                        | 10.478                       | 71                     | 72                    |  |
| 10.00            | 2.00                                  | 380.184                       | 388.881                       | 8.697                        | 71                     | 72                    | 0.000                         | 8.415                         | 8.415                        | 72                     | 73                    |  |
| 10.00            | 1.00                                  | 389.428                       | 395.615                       | 6.187                        | 72                     | 72                    | 0.000                         | 5.963                         | 5.963                        | 73                     | 73                    |  |
| 10.00            | 0.50                                  | 395.805                       | 400.210                       | 4.405                        | 72                     | 72                    | 0.000                         | 4.224                         | 4.224                        | 73                     | 73                    |  |

| Results                           |                                             |                                   |                                             |                    |           |                                                   |                                        |                         |
|-----------------------------------|---------------------------------------------|-----------------------------------|---------------------------------------------|--------------------|-----------|---------------------------------------------------|----------------------------------------|-------------------------|
| Standardized Data                 |                                             |                                   |                                             | Dry Gas Meter      |           |                                                   |                                        |                         |
| Dry Gas Meter                     |                                             | Calibration Meter                 |                                             | Calibration Factor |           | Flowrate                                          | ΔH <sub>g</sub>                        |                         |
| V <sub>m(std)</sub><br>cubic feet | Q <sub>m(std)</sub><br>ft <sup>3</sup> /min | V <sub>w(std)</sub><br>cubic feet | Q <sub>w(std)</sub><br>ft <sup>3</sup> /min | Value              | Variation | Std & Corr                                        | 0.75 SCFM                              | Variation               |
|                                   |                                             |                                   |                                             | Y                  | ΔY        | Q <sub>m(std)(corr)</sub><br>ft <sup>3</sup> /min | ΔH <sub>g</sub><br>in H <sub>2</sub> O | ΔΔH <sub>g</sub>        |
| 12.997                            | 1.300                                       | 12.505                            | 1.250                                       | 0.9621             | 0.003     | 1.250                                             | 1.876                                  | 0.015                   |
| 9.403                             | 0.917                                       | 9.014                             | 0.879                                       | 0.9587             | -0.001    | 0.879                                             | 1.884                                  | 0.022                   |
| 7.524                             | 0.752                                       | 7.225                             | 0.723                                       | 0.9603             | 0.001     | 0.723                                             | 1.855                                  | -0.006                  |
| 5.333                             | 0.533                                       | 5.116                             | 0.512                                       | 0.9593             | 0.000     | 0.512                                             | 1.849                                  | -0.013                  |
| 3.791                             | 0.379                                       | 3.623                             | 0.362                                       | 0.9556             | -0.004    | 0.362                                             | 1.843                                  | -0.018                  |
| Pre-test Y                        | 0.974                                       | % Deviation                       | PASS                                        | 0.9592             | Y Average |                                                   | 1.861                                  | ΔH <sub>g</sub> Average |

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +0.02.

Note: For ΔH<sub>g</sub>, orifice pressure differential that equates to 0.75cfm (0.0212m<sup>3</sup>/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is +0.2inches (5.1mm) H<sub>2</sub>O.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR 40 Part 60, using the Precision Wet Test Meter # 11AE6, which in turn was calibrated using the American Bell Prover # 157, certified 05/26/2006 using Pi Tape S/N 20700139, which is traceable to the National Bureau of Standards (NIST).

Signature \_\_\_\_\_  
JCRDate \_\_\_\_\_  
21-Dec-20

## APEX INSTRUMENTS

### METERBOX CALIBRATION USING REFERENCE DGM

| Meter Console Information |          |
|---------------------------|----------|
| Console Model Number      | 11       |
| Console Serial Number     | 2029     |
| DGM Model Number          |          |
| DGM Serial Number         | 13966757 |

| Calibration Conditions  |      |          |       |
|-------------------------|------|----------|-------|
| Date                    | Time | 3-Dec-20 | 13:18 |
| Barometric Pressure     |      | 26.32    | in Hg |
| Calibration Technician  |      | JCR      |       |
| Calibration Meter Gamma |      | 1.0000   |       |

| Standardized Factors/Conversions |        |         |
|----------------------------------|--------|---------|
| Temperature                      | 528    | R       |
| Pressure                         | 29.92  | in Hg   |
| K <sub>1</sub>                   | 17.647 | R/in Hg |

&lt;&lt;&lt;&lt;&lt;&lt;&lt;Your reference meter here

| Calibration Data |                                       |                               |                               |                              |                        |                       |                               |                               |                              |                        |                       |  |
|------------------|---------------------------------------|-------------------------------|-------------------------------|------------------------------|------------------------|-----------------------|-------------------------------|-------------------------------|------------------------------|------------------------|-----------------------|--|
| Run Time         | Metering Console                      |                               |                               |                              |                        |                       | Reference Meter               |                               |                              |                        |                       |  |
| Elapsed          | Manometer<br>ΔH                       | Volume<br>Initial             | Volume<br>Final               | Sample<br>Volume             | Outlet Temp<br>Initial | Outlet Temp<br>Final  | Volume<br>Initial             | Volume<br>Final               | Sample<br>Volume             | Outlet Temp<br>Initial | Outlet Temp<br>Final  |  |
| Θ<br>minutes     | P <sub>m</sub><br>in H <sub>2</sub> O | V <sub>mi</sub><br>cubic feet | V <sub>mf</sub><br>cubic feet | V <sub>m</sub><br>cubic feet | t <sub>oi</sub><br>°F  | t <sub>of</sub><br>°F | V <sub>wi</sub><br>cubic feet | V <sub>wf</sub><br>cubic feet | V <sub>w</sub><br>cubic feet | t <sub>wi</sub><br>°F  | t <sub>wf</sub><br>°F |  |
| 10.00            | 6.00                                  | 871.202                       | 885.852                       | 14.650                       | 68                     | 69                    | 0.000                         | 14.371                        | 14.371                       | 69                     | 69                    |  |
| 10.25            | 3.00                                  | 886.071                       | 896.600                       | 10.529                       | 69                     | 70                    | 0.000                         | 10.213                        | 10.213                       | 69                     | 69                    |  |
| 10.00            | 2.00                                  | 896.752                       | 905.326                       | 8.574                        | 70                     | 71                    | 0.000                         | 8.287                         | 8.287                        | 69                     | 69                    |  |
| 10.00            | 1.00                                  | 905.555                       | 911.634                       | 6.079                        | 69                     | 69                    | 0.000                         | 5.911                         | 5.911                        | 69                     | 69                    |  |
| 11.25            | 0.50                                  | 911.765                       | 916.635                       | 4.870                        | 69                     | 69                    | 0.000                         | 4.725                         | 4.725                        | 69                     | 70                    |  |

| Results                           |                                             |                                   |                                             |                    |           |                                                   |                                        |                         |
|-----------------------------------|---------------------------------------------|-----------------------------------|---------------------------------------------|--------------------|-----------|---------------------------------------------------|----------------------------------------|-------------------------|
| Standardized Data                 |                                             |                                   |                                             | Dry Gas Meter      |           |                                                   |                                        |                         |
| Dry Gas Meter                     |                                             | Calibration Meter                 |                                             | Calibration Factor |           | Flowrate                                          | ΔH <sub>g</sub>                        |                         |
| V <sub>m(std)</sub><br>cubic feet | Q <sub>m(std)</sub><br>ft <sup>3</sup> /min | V <sub>w(std)</sub><br>cubic feet | Q <sub>w(std)</sub><br>ft <sup>3</sup> /min | Value              | Variation | Std & Corr                                        | 0.75 SCFM                              | Variation               |
|                                   |                                             |                                   |                                             | Y                  | ΔY        | Q <sub>m(std)(corr)</sub><br>ft <sup>3</sup> /min | ΔH <sub>g</sub><br>in H <sub>2</sub> O | ΔΔH <sub>g</sub>        |
| 13.091                            | 1.309                                       | 12.618                            | 1.262                                       | 0.9639             | -0.002    | 1.262                                             | 1.864                                  | 0.001                   |
| 9.313                             | 0.909                                       | 8.967                             | 0.875                                       | 0.9628             | -0.003    | 0.875                                             | 1.936                                  | 0.072                   |
| 7.549                             | 0.755                                       | 7.276                             | 0.728                                       | 0.9639             | -0.002    | 0.728                                             | 1.862                                  | -0.002                  |
| 5.352                             | 0.535                                       | 5.190                             | 0.519                                       | 0.9696             | 0.004     | 0.519                                             | 1.835                                  | -0.029                  |
| 4.282                             | 0.381                                       | 4.144                             | 0.368                                       | 0.9679             | 0.002     | 0.368                                             | 1.821                                  | -0.042                  |
| Pre-test Y                        | 0.966                                       | % Deviation                       | PASS                                        | 0.9656             | Y Average |                                                   | 1.864                                  | ΔH <sub>g</sub> Average |

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +0.02.

Note: For ΔH<sub>g</sub>, orifice pressure differential that equates to 0.75cfm (0.0212m<sup>3</sup>/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is +0.2inches (5.1mm) H<sub>2</sub>O.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR 40 Part 60, using the Precision Wet Test Meter # 11AE6, which in turn was calibrated using the American Bell Prover # 157, certified 05/26/2006 using Pi Tape S/N 20700139, which is traceable to the National Bureau of Standards (NIST).

Signature \_\_\_\_\_  
JCRDate \_\_\_\_\_  
3-Dec-20

## APEX INSTRUMENTS

### METERBOX CALIBRATION USING REFERENCE DGM

| Meter Console Information |          |
|---------------------------|----------|
| Console Model Number      | 11       |
| Console Serial Number     | 2029     |
| DGM Model Number          |          |
| DGM Serial Number         | 13966757 |

| Calibration Conditions  |      |           |       |
|-------------------------|------|-----------|-------|
| Date                    | Time | 22-Dec-20 | 10:28 |
| Barometric Pressure     |      | 25.66     | in Hg |
| Calibration Technician  |      | JCR       |       |
| Calibration Meter Gamma |      | 1.0000    |       |

| Standardized Factors/Conversions |        |         |
|----------------------------------|--------|---------|
| Temperature                      | 528    | R       |
| Pressure                         | 29.92  | in Hg   |
| K <sub>1</sub>                   | 17.647 | R/in Hg |

&lt;&lt;&lt;&lt;&lt;&lt;&lt;Your reference meter here

| Calibration Data |                                       |                               |                               |                              |                        |                       |                               |                               |                              |                        |                       |  |
|------------------|---------------------------------------|-------------------------------|-------------------------------|------------------------------|------------------------|-----------------------|-------------------------------|-------------------------------|------------------------------|------------------------|-----------------------|--|
| Run Time         | Metering Console                      |                               |                               |                              |                        |                       | Reference Meter               |                               |                              |                        |                       |  |
| Elapsed          | Manometer<br>ΔH                       | Volume<br>Initial             | Volume<br>Final               | Sample<br>Volume             | Outlet Temp<br>Initial | Outlet Temp<br>Final  | Volume<br>Initial             | Volume<br>Final               | Sample<br>Volume             | Outlet Temp<br>Initial | Outlet Temp<br>Final  |  |
| Θ<br>minutes     | P <sub>m</sub><br>in H <sub>2</sub> O | V <sub>mi</sub><br>cubic feet | V <sub>mf</sub><br>cubic feet | V <sub>m</sub><br>cubic feet | t <sub>oi</sub><br>°F  | t <sub>of</sub><br>°F | V <sub>wi</sub><br>cubic feet | V <sub>wf</sub><br>cubic feet | V <sub>w</sub><br>cubic feet | t <sub>wi</sub><br>°F  | t <sub>wf</sub><br>°F |  |
| 10.00            | 6.00                                  | 554.478                       | 569.345                       | 14.867                       | 67                     | 68                    | 0.000                         | 14.699                        | 14.699                       | 71                     | 70                    |  |
| 10.00            | 3.00                                  | 569.496                       | 580.073                       | 10.577                       | 68                     | 70                    | 0.000                         | 10.320                        | 10.320                       | 70                     | 71                    |  |
| 10.00            | 2.00                                  | 580.184                       | 588.860                       | 8.676                        | 70                     | 72                    | 0.000                         | 8.448                         | 8.448                        | 71                     | 70                    |  |
| 10.00            | 1.00                                  | 589.274                       | 595.482                       | 6.208                        | 72                     | 73                    | 0.000                         | 6.023                         | 6.023                        | 71                     | 71                    |  |
| 10.00            | 0.50                                  | 595.579                       | 600.066                       | 4.487                        | 73                     | 74                    | 0.000                         | 4.342                         | 4.342                        | 71                     | 71                    |  |

| Results                           |                                             |                                   |                                             |                    |           |                                                   |                                        |                         |
|-----------------------------------|---------------------------------------------|-----------------------------------|---------------------------------------------|--------------------|-----------|---------------------------------------------------|----------------------------------------|-------------------------|
| Standardized Data                 |                                             |                                   |                                             | Dry Gas Meter      |           |                                                   |                                        |                         |
| Dry Gas Meter                     |                                             | Calibration Meter                 |                                             | Calibration Factor |           | Flowrate                                          | ΔH <sub>g</sub>                        |                         |
| V <sub>m(std)</sub><br>cubic feet | Q <sub>m(std)</sub><br>ft <sup>3</sup> /min | V <sub>w(std)</sub><br>cubic feet | Q <sub>w(std)</sub><br>ft <sup>3</sup> /min | Value              | Variation | Std & Corr                                        | 0.75 SCFM                              | Variation               |
|                                   |                                             |                                   |                                             | Y                  | ΔY        | Q <sub>m(std)(corr)</sub><br>ft <sup>3</sup> /min | ΔH <sub>g</sub><br>in H <sub>2</sub> O | ΔΔH <sub>g</sub>        |
| 12.982                            | 1.298                                       | 12.547                            | 1.255                                       | 0.9665             | -0.002    | 1.255                                             | 1.842                                  | 0.020                   |
| 9.132                             | 0.913                                       | 8.809                             | 0.881                                       | 0.9647             | -0.004    | 0.881                                             | 1.863                                  | 0.041                   |
| 7.441                             | 0.744                                       | 7.211                             | 0.721                                       | 0.9691             | 0.001     | 0.721                                             | 1.846                                  | 0.025                   |
| 5.294                             | 0.529                                       | 5.136                             | 0.514                                       | 0.9701             | 0.002     | 0.514                                             | 1.815                                  | -0.007                  |
| 3.814                             | 0.381                                       | 3.703                             | 0.370                                       | 0.9709             | 0.003     | 0.370                                             | 1.742                                  | -0.079                  |
| Pre-test Y                        | 0.966                                       | % Deviation                       | PASS                                        | 0.9683             | Y Average |                                                   | 1.822                                  | ΔH <sub>g</sub> Average |

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +0.02.

Note: For ΔH<sub>g</sub>, orifice pressure differential that equates to 0.75cfm (0.0212m<sup>3</sup>/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is +0.2inches (5.1mm) H<sub>2</sub>O.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR 40 Part 60, using the Precision Wet Test Meter # 11AE6, which in turn was calibrated using the American Bell Prover # 157, certified 05/26/2006 using Pi Tape S/N 20700139, which is traceable to the National Bureau of Standards (NIST).

Signature \_\_\_\_\_  
JCRDate \_\_\_\_\_  
22-Dec-20

## APEX INSTRUMENTS

### METERBOX CALIBRATION USING REFERENCE DGM

| Meter Console Information |                  |
|---------------------------|------------------|
| Console Model Number      | C-5000           |
| Console Serial Number     | 2199-D           |
| DGM Model Number          | DGM-SK25EXSR-QC8 |
| DGM Serial Number         | 1710021          |

| Calibration Conditions  |      |          |       |
|-------------------------|------|----------|-------|
| Date                    | Time | 3-Dec-20 | 11:51 |
| Barometric Pressure     |      | 26.32    | in Hg |
| Calibration Technician  |      | JCR      |       |
| Calibration Meter Gamma |      | 1.0000   |       |

| Standardized Factors/Conversions |        |         |
|----------------------------------|--------|---------|
| Temperature                      | 528    | R       |
| Pressure                         | 29.92  | in Hg   |
| K <sub>1</sub>                   | 17.647 | R/in Hg |

&lt;&lt;&lt;&lt;&lt;&lt;&lt;Your reference meter here

| Calibration Data |                                       |                               |                               |                              |                        |                       |                               |                               |                              |                        |                       |
|------------------|---------------------------------------|-------------------------------|-------------------------------|------------------------------|------------------------|-----------------------|-------------------------------|-------------------------------|------------------------------|------------------------|-----------------------|
| Run Time         | Metering Console                      |                               |                               |                              |                        |                       | Reference Meter               |                               |                              |                        |                       |
| Elapsed          | Manometer<br>ΔH                       | Volume<br>Initial             | Volume<br>Final               | Sample<br>Volume             | Outlet Temp<br>Initial | Outlet Temp<br>Final  | Volume<br>Initial             | Volume<br>Final               | Sample<br>Volume             | Outlet Temp<br>Initial | Outlet Temp<br>Final  |
| Θ<br>minutes     | P <sub>m</sub><br>in H <sub>2</sub> O | V <sub>mi</sub><br>cubic feet | V <sub>mf</sub><br>cubic feet | V <sub>m</sub><br>cubic feet | t <sub>oi</sub><br>°F  | t <sub>of</sub><br>°F | V <sub>wi</sub><br>cubic feet | V <sub>wf</sub><br>cubic feet | V <sub>w</sub><br>cubic feet | t <sub>wi</sub><br>°F  | t <sub>wf</sub><br>°F |
| 10.25            | 6.00                                  | 0.000                         | 14.028                        | 14.028                       | 66                     | 67                    | 0.000                         | 14.458                        | 14.458                       | 67                     | 68                    |
| 11.00            | 3.00                                  | 0.000                         | 10.902                        | 10.902                       | 67                     | 68                    | 0.000                         | 11.023                        | 11.023                       | 68                     | 69                    |
| 10.00            | 2.00                                  | 0.000                         | 7.843                         | 7.843                        | 68                     | 70                    | 0.000                         | 7.868                         | 7.868                        | 69                     | 69                    |
| 10.00            | 1.00                                  | 0.000                         | 5.873                         | 5.873                        | 70                     | 69                    | 0.000                         | 5.870                         | 5.870                        | 69                     | 69                    |
| 12.75            | 0.50                                  | 0.000                         | 5.318                         | 5.318                        | 69                     | 69                    | 0.000                         | 5.296                         | 5.296                        | 69                     | 69                    |

| Results                           |                                             |                                   |                                             |                    |           |                                                   |                                        |                         |
|-----------------------------------|---------------------------------------------|-----------------------------------|---------------------------------------------|--------------------|-----------|---------------------------------------------------|----------------------------------------|-------------------------|
| Standardized Data                 |                                             |                                   |                                             | Dry Gas Meter      |           |                                                   |                                        |                         |
| Dry Gas Meter                     |                                             | Calibration Meter                 |                                             | Calibration Factor |           | Flowrate                                          | ΔH <sub>g</sub>                        |                         |
| V <sub>m(std)</sub><br>cubic feet | Q <sub>m(std)</sub><br>ft <sup>3</sup> /min | V <sub>w(std)</sub><br>cubic feet | Q <sub>w(std)</sub><br>ft <sup>3</sup> /min | Value              | Variation | Std & Corr                                        | 0.75 SCFM                              | Variation               |
|                                   |                                             |                                   |                                             | Y                  | ΔY        | Q <sub>m(std)(corr)</sub><br>ft <sup>3</sup> /min | ΔH <sub>g</sub><br>in H <sub>2</sub> O | ΔΔH <sub>g</sub>        |
| 12.583                            | 1.228                                       | 12.731                            | 1.242                                       | 1.0118             | 0.011     | 1.242                                             | 1.932                                  | 0.004                   |
| 9.680                             | 0.880                                       | 9.688                             | 0.881                                       | 1.0008             | 0.000     | 0.881                                             | 1.917                                  | -0.010                  |
| 6.925                             | 0.692                                       | 6.908                             | 0.691                                       | 0.9976             | -0.003    | 0.691                                             | 2.071                                  | 0.144                   |
| 5.166                             | 0.517                                       | 5.154                             | 0.515                                       | 0.9977             | -0.003    | 0.515                                             | 1.859                                  | -0.069                  |
| 4.676                             | 0.367                                       | 4.650                             | 0.365                                       | 0.9945             | -0.006    | 0.365                                             | 1.858                                  | -0.069                  |
| Pre-test Y                        | 1.001                                       | % Deviation                       | PASS                                        | 1.0005             | Y Average |                                                   | 1.927                                  | ΔH <sub>g</sub> Average |

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +0.02.

Note: For ΔH<sub>g</sub>, orifice pressure differential that equates to 0.75cfm (0.0212m<sup>3</sup>/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is +0.2inches (5.1mm) H<sub>2</sub>O.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR 40 Part 60, using the Precision Wet Test Meter # 11AE6, which in turn was calibrated using the American Bell Prover # 157, certified 05/26/2006 using Pi Tape S/N 20700139, which is traceable to the National Bureau of Standards (NIST).

 Signature \_\_\_\_\_  
 JCR

 Date \_\_\_\_\_  
 3-Dec-20

## APEX INSTRUMENTS

### METERBOX CALIBRATION USING REFERENCE DGM

| Meter Console Information |                  |
|---------------------------|------------------|
| Console Model Number      | C-5000           |
| Console Serial Number     | 2199-D           |
| DGM Model Number          | DGM-SK25EXSR-QC8 |
| DGM Serial Number         | 1710021          |

| Calibration Conditions  |      |           |       |
|-------------------------|------|-----------|-------|
| Date                    | Time | 22-Dec-20 | 8:54  |
| Barometric Pressure     |      | 25.66     | in Hg |
| Calibration Technician  |      | JCR       |       |
| Calibration Meter Gamma |      | 1.0000    |       |

| Standardized Factors/Conversions |        |         |
|----------------------------------|--------|---------|
| Temperature                      | 528    | R       |
| Pressure                         | 29.92  | in Hg   |
| K <sub>1</sub>                   | 17.647 | R/in Hg |

&lt;&lt;&lt;&lt;&lt;&lt;&lt;Your reference meter here

| Calibration Data |                                       |                               |                               |                              |                        |                       |                               |                               |                              |                        |                       |  |
|------------------|---------------------------------------|-------------------------------|-------------------------------|------------------------------|------------------------|-----------------------|-------------------------------|-------------------------------|------------------------------|------------------------|-----------------------|--|
| Run Time         | Metering Console                      |                               |                               |                              |                        |                       | Reference Meter               |                               |                              |                        |                       |  |
| Elapsed          | Manometer<br>ΔH                       | Volume<br>Initial             | Volume<br>Final               | Sample<br>Volume             | Outlet Temp<br>Initial | Outlet Temp<br>Final  | Volume<br>Initial             | Volume<br>Final               | Sample<br>Volume             | Outlet Temp<br>Initial | Outlet Temp<br>Final  |  |
| Θ<br>minutes     | P <sub>m</sub><br>in H <sub>2</sub> O | V <sub>mi</sub><br>cubic feet | V <sub>mf</sub><br>cubic feet | V <sub>m</sub><br>cubic feet | t <sub>oi</sub><br>°F  | t <sub>of</sub><br>°F | V <sub>wi</sub><br>cubic feet | V <sub>wf</sub><br>cubic feet | V <sub>w</sub><br>cubic feet | t <sub>wi</sub><br>°F  | t <sub>wf</sub><br>°F |  |
| 10.00            | 6.00                                  | 0.000                         | 13.957                        | 13.957                       | 65                     | 66                    | 0.000                         | 14.393                        | 14.393                       | 65                     | 66                    |  |
| 10.00            | 3.00                                  | 0.000                         | 10.133                        | 10.133                       | 66                     | 67                    | 0.000                         | 10.256                        | 10.256                       | 66                     | 67                    |  |
| 10.00            | 2.00                                  | 0.000                         | 8.312                         | 8.312                        | 67                     | 69                    | 0.000                         | 8.350                         | 8.350                        | 67                     | 68                    |  |
| 10.00            | 1.00                                  | 0.000                         | 5.954                         | 5.954                        | 69                     | 71                    | 0.000                         | 5.942                         | 5.942                        | 68                     | 69                    |  |
| 10.00            | 0.50                                  | 0.000                         | 4.280                         | 4.280                        | 71                     | 72                    | 0.000                         | 4.249                         | 4.249                        | 70                     | 71                    |  |

| Results                           |                                             |                                   |                                             |                    |           |                                                   |                                        |                         |
|-----------------------------------|---------------------------------------------|-----------------------------------|---------------------------------------------|--------------------|-----------|---------------------------------------------------|----------------------------------------|-------------------------|
| Standardized Data                 |                                             |                                   |                                             | Dry Gas Meter      |           |                                                   |                                        |                         |
| Dry Gas Meter                     |                                             | Calibration Meter                 |                                             | Calibration Factor |           | Flowrate                                          | ΔH <sub>@</sub>                        |                         |
| V <sub>m(std)</sub><br>cubic feet | Q <sub>m(std)</sub><br>ft <sup>3</sup> /min | V <sub>w(std)</sub><br>cubic feet | Q <sub>w(std)</sub><br>ft <sup>3</sup> /min | Value              | Variation | Std & Corr                                        | 0.75 SCFM                              | Variation               |
|                                   |                                             |                                   |                                             | Y                  | ΔY        | Q <sub>m(std)(corr)</sub><br>ft <sup>3</sup> /min | ΔH <sub>@</sub><br>in H <sub>2</sub> O | ΔΔH <sub>@</sub>        |
| 12.234                            | 1.223                                       | 12.403                            | 1.240                                       | 1.0138             | 0.012     | 1.240                                             | 1.892                                  | 0.029                   |
| 8.790                             | 0.879                                       | 8.821                             | 0.882                                       | 1.0035             | 0.002     | 0.882                                             | 1.867                                  | 0.003                   |
| 7.169                             | 0.717                                       | 7.168                             | 0.717                                       | 0.9997             | -0.002    | 0.717                                             | 1.880                                  | 0.016                   |
| 5.102                             | 0.510                                       | 5.091                             | 0.509                                       | 0.9979             | -0.004    | 0.509                                             | 1.856                                  | -0.008                  |
| 3.652                             | 0.365                                       | 3.627                             | 0.363                                       | 0.9931             | -0.008    | 0.363                                             | 1.823                                  | -0.040                  |
| Pre-test Y                        | 1.001                                       | % Deviation                       | PASS                                        | 1.0016             | Y Average |                                                   | 1.863                                  | ΔH <sub>@</sub> Average |

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +0.02.

Note: For ΔH<sub>@</sub>, orifice pressure differential that equates to 0.75cfm (0.0212m<sup>3</sup>/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is +0.2inches (5.1mm) H<sub>2</sub>O.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR 40 Part 60, using the Precision Wet Test Meter # 11AE6, which in turn was calibrated using the American Bell Prover # 157, certified 05/26/2006 using Pi Tape S/N 20700139, which is traceable to the National Bureau of Standards (NIST).

Signature \_\_\_\_\_  
JCRDate \_\_\_\_\_  
22-Dec-20

## APEX INSTRUMENTS

### METERBOX CALIBRATION USING REFERENCE DGM

| Meter Console Information |        |
|---------------------------|--------|
| Console Model Number      | C-5000 |
| Console Serial Number     | 2200-D |
| DGM Model Number          | ltron  |
| DGM Serial Number         | 343    |

| Calibration Conditions  |      |          |       |
|-------------------------|------|----------|-------|
| Date                    | Time | 4-Dec-20 | 10:48 |
| Barometric Pressure     |      | 26.30    | in Hg |
| Calibration Technician  |      | JCR      |       |
| Calibration Meter Gamma |      | 1.0000   |       |

| Standardized Factors/Conversions |        |         |
|----------------------------------|--------|---------|
| Temperature                      | 528    | R       |
| Pressure                         | 29.92  | in Hg   |
| K <sub>1</sub>                   | 17.647 | R/in Hg |

&lt;&lt;&lt;&lt;&lt;&lt;&lt;Your reference meter here

| Calibration Data |                                       |                               |                               |                              |                        |                       |                               |                               |                              |                        |                       |  |
|------------------|---------------------------------------|-------------------------------|-------------------------------|------------------------------|------------------------|-----------------------|-------------------------------|-------------------------------|------------------------------|------------------------|-----------------------|--|
| Run Time         | Metering Console                      |                               |                               |                              |                        |                       | Reference Meter               |                               |                              |                        |                       |  |
| Elapsed          | Manometer<br>ΔH                       | Volume<br>Initial             | Volume<br>Final               | Sample<br>Volume             | Outlet Temp<br>Initial | Outlet Temp<br>Final  | Volume<br>Initial             | Volume<br>Final               | Sample<br>Volume             | Outlet Temp<br>Initial | Outlet Temp<br>Final  |  |
| Θ<br>minutes     | P <sub>m</sub><br>in H <sub>2</sub> O | V <sub>mi</sub><br>cubic feet | V <sub>mf</sub><br>cubic feet | V <sub>m</sub><br>cubic feet | t <sub>oi</sub><br>°F  | t <sub>of</sub><br>°F | V <sub>wi</sub><br>cubic feet | V <sub>wf</sub><br>cubic feet | V <sub>w</sub><br>cubic feet | t <sub>wi</sub><br>°F  | t <sub>wf</sub><br>°F |  |
| 10.75            | 6.00                                  | 0.000                         | 15.036                        | 15.036                       | 59                     | 63                    | 0.000                         | 15.314                        | 15.314                       | 59                     | 60                    |  |
| 10.00            | 3.00                                  | 0.000                         | 10.050                        | 10.050                       | 63                     | 65                    | 0.000                         | 10.027                        | 10.027                       | 60                     | 61                    |  |
| 10.00            | 2.00                                  | 0.000                         | 8.236                         | 8.236                        | 65                     | 66                    | 0.000                         | 8.168                         | 8.168                        | 61                     | 61                    |  |
| 10.25            | 1.00                                  | 0.000                         | 6.020                         | 6.020                        | 66                     | 66                    | 0.000                         | 5.937                         | 5.937                        | 61                     | 62                    |  |
| 10.00            | 0.50                                  | 0.000                         | 4.212                         | 4.212                        | 66                     | 67                    | 0.000                         | 4.142                         | 4.142                        | 62                     | 62                    |  |

| Results                           |                                             |                                   |                                             |                    |           |                                                   |                                        |                         |
|-----------------------------------|---------------------------------------------|-----------------------------------|---------------------------------------------|--------------------|-----------|---------------------------------------------------|----------------------------------------|-------------------------|
| Standardized Data                 |                                             |                                   |                                             | Dry Gas Meter      |           |                                                   |                                        |                         |
| Dry Gas Meter                     |                                             | Calibration Meter                 |                                             | Calibration Factor |           | Flowrate                                          | ΔH <sub>g</sub>                        |                         |
| V <sub>m(std)</sub><br>cubic feet | Q <sub>m(std)</sub><br>ft <sup>3</sup> /min | V <sub>w(std)</sub><br>cubic feet | Q <sub>w(std)</sub><br>ft <sup>3</sup> /min | Value              | Variation | Std & Corr                                        | 0.75 SCFM                              | Variation               |
|                                   |                                             |                                   |                                             | Y                  | ΔY        | Q <sub>m(std)(corr)</sub><br>ft <sup>3</sup> /min | ΔH <sub>g</sub><br>in H <sub>2</sub> O | ΔΔH <sub>g</sub>        |
| 13.619                            | 1.267                                       | 13.682                            | 1.273                                       | 1.0046             | 0.009     | 1.273                                             | 1.858                                  | -0.004                  |
| 8.976                             | 0.898                                       | 8.941                             | 0.894                                       | 0.9961             | 0.001     | 0.894                                             | 1.871                                  | 0.010                   |
| 7.315                             | 0.731                                       | 7.276                             | 0.728                                       | 0.9947             | -0.001    | 0.728                                             | 1.878                                  | 0.017                   |
| 5.327                             | 0.520                                       | 5.284                             | 0.515                                       | 0.9919             | -0.004    | 0.515                                             | 1.869                                  | 0.008                   |
| 3.718                             | 0.372                                       | 3.683                             | 0.368                                       | 0.9905             | -0.005    | 0.368                                             | 1.829                                  | -0.032                  |
| Pre-test Y                        | 0.996                                       | % Deviation                       | PASS                                        | 0.9956             | Y Average |                                                   | 1.861                                  | ΔH <sub>g</sub> Average |

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +0.02.

Note: For ΔH<sub>g</sub>, orifice pressure differential that equates to 0.75cfm (0.0212m<sup>3</sup>/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is +0.2inches (5.1mm) H<sub>2</sub>O.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR 40 Part 60, using the Precision Wet Test Meter # 11AE6, which in turn was calibrated using the American Bell Prover # 157, certified 05/26/2006 using Pi Tape S/N 20700139, which is traceable to the National Bureau of Standards (NIST).

Signature \_\_\_\_\_  
JCRDate \_\_\_\_\_  
4-Dec-20

## APEX INSTRUMENTS

### METERBOX CALIBRATION USING REFERENCE DGM

| Meter Console Information |        |
|---------------------------|--------|
| Console Model Number      | C-5000 |
| Console Serial Number     | 2200-D |
| DGM Model Number          | ltron  |
| DGM Serial Number         | 343    |

| Calibration Conditions  |      |           |       |
|-------------------------|------|-----------|-------|
| Date                    | Time | 21-Dec-20 | 14:50 |
| Barometric Pressure     |      | 25.91     | in Hg |
| Calibration Technician  |      | JCR       |       |
| Calibration Meter Gamma |      | 1.0000    |       |

| Standardized Factors/Conversions |        |         |
|----------------------------------|--------|---------|
| Temperature                      | 528    | R       |
| Pressure                         | 29.92  | in Hg   |
| K <sub>1</sub>                   | 17.647 | R/in Hg |

&lt;&lt;&lt;&lt;&lt;&lt;&lt;Your reference meter here

| Calibration Data |                                       |                               |                               |                              |                        |                       |                               |                               |                              |                        |                       |  |
|------------------|---------------------------------------|-------------------------------|-------------------------------|------------------------------|------------------------|-----------------------|-------------------------------|-------------------------------|------------------------------|------------------------|-----------------------|--|
| Run Time         | Metering Console                      |                               |                               |                              |                        |                       | Reference Meter               |                               |                              |                        |                       |  |
| Elapsed          | Manometer<br>ΔH                       | Volume<br>Initial             | Volume<br>Final               | Sample<br>Volume             | Outlet Temp<br>Initial | Outlet Temp<br>Final  | Volume<br>Initial             | Volume<br>Final               | Sample<br>Volume             | Outlet Temp<br>Initial | Outlet Temp<br>Final  |  |
| Θ<br>minutes     | P <sub>m</sub><br>in H <sub>2</sub> O | V <sub>mi</sub><br>cubic feet | V <sub>mf</sub><br>cubic feet | V <sub>m</sub><br>cubic feet | t <sub>oi</sub><br>°F  | t <sub>of</sub><br>°F | V <sub>wi</sub><br>cubic feet | V <sub>wf</sub><br>cubic feet | V <sub>w</sub><br>cubic feet | t <sub>wi</sub><br>°F  | t <sub>wf</sub><br>°F |  |
| 10.00            | 6.00                                  | 0.000                         | 14.105                        | 14.105                       | 68                     | 68                    | 0.000                         | 14.263                        | 14.263                       | 62                     | 63                    |  |
| 10.25            | 3.00                                  | 0.000                         | 10.378                        | 10.378                       | 68                     | 69                    | 0.000                         | 10.330                        | 10.330                       | 63                     | 64                    |  |
| 10.00            | 2.00                                  | 0.000                         | 8.354                         | 8.354                        | 69                     | 70                    | 0.000                         | 8.286                         | 8.286                        | 64                     | 66                    |  |
| 10.50            | 1.00                                  | 0.000                         | 6.258                         | 6.258                        | 70                     | 71                    | 0.000                         | 6.193                         | 6.193                        | 67                     | 68                    |  |
| 10.00            | 0.50                                  | 0.000                         | 4.269                         | 4.269                        | 71                     | 71                    | 0.000                         | 4.210                         | 4.210                        | 68                     | 68                    |  |

| Results                           |                                             |                                   |                                             |                    |           |                                                   |                                        |                         |
|-----------------------------------|---------------------------------------------|-----------------------------------|---------------------------------------------|--------------------|-----------|---------------------------------------------------|----------------------------------------|-------------------------|
| Standardized Data                 |                                             |                                   |                                             | Dry Gas Meter      |           |                                                   |                                        |                         |
| Dry Gas Meter                     |                                             | Calibration Meter                 |                                             | Calibration Factor |           | Flowrate                                          | ΔH <sub>g</sub>                        |                         |
| V <sub>m(std)</sub><br>cubic feet | Q <sub>m(std)</sub><br>ft <sup>3</sup> /min | V <sub>w(std)</sub><br>cubic feet | Q <sub>w(std)</sub><br>ft <sup>3</sup> /min | Value              | Variation | Std & Corr                                        | 0.75 SCFM                              | Variation               |
|                                   |                                             |                                   |                                             | Y                  | ΔY        | Q <sub>m(std)(corr)</sub><br>ft <sup>3</sup> /min | ΔH <sub>g</sub><br>in H <sub>2</sub> O | ΔΔH <sub>g</sub>        |
| 12.423                            | 1.242                                       | 12.481                            | 1.248                                       | 1.0047             | 0.009     | 1.248                                             | 1.878                                  | 0.016                   |
| 9.055                             | 0.883                                       | 9.023                             | 0.880                                       | 0.9964             | 0.001     | 0.880                                             | 1.886                                  | 0.024                   |
| 7.255                             | 0.725                                       | 7.217                             | 0.722                                       | 0.9948             | -0.001    | 0.722                                             | 1.867                                  | 0.005                   |
| 5.409                             | 0.515                                       | 5.368                             | 0.511                                       | 0.9925             | -0.003    | 0.511                                             | 1.856                                  | -0.006                  |
| 3.681                             | 0.368                                       | 3.646                             | 0.365                                       | 0.9904             | -0.005    | 0.365                                             | 1.823                                  | -0.038                  |
| Pre-test Y                        | 0.996                                       | % Deviation                       | PASS                                        | 0.9957             | Y Average |                                                   | 1.862                                  | ΔH <sub>g</sub> Average |

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +0.02.

Note: For ΔH<sub>g</sub>, orifice pressure differential that equates to 0.75cfm (0.0212m<sup>3</sup>/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is +0.2inches (5.1mm) H<sub>2</sub>O.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR 40 Part 60, using the Precision Wet Test Meter # 11AE6, which in turn was calibrated using the American Bell Prover # 157, certified 05/26/2006 using Pi Tape S/N 20700139, which is traceable to the National Bureau of Standards (NIST).

Signature \_\_\_\_\_  
JCRDate \_\_\_\_\_  
21-Dec-20

# CERTIFICATE OF ANALYSIS

## Grade of Product: EPA Protocol

Part Number: E03NI99E15A2038 Reference Number: 153-124603220-1  
Cylinder Number: CC232663 Cylinder Volume: 144.3 CF  
Laboratory: 124 - Tooele - UT Cylinder Pressure: 2015 PSIG  
PGVP Number: B72017 Valve Outlet: 660  
Gas Code: CO,NO,NOX,BALN Certification Date: Feb 23, 2017

**Expiration Date: Feb 23, 2025**

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

| ANALYTICAL RESULTS |                         |                      |                 |                            |                        |
|--------------------|-------------------------|----------------------|-----------------|----------------------------|------------------------|
| Component          | Requested Concentration | Actual Concentration | Protocol Method | Total Relative Uncertainty | Assay Dates            |
| NOX                | 100.0 PPM               | 101.1 PPM            | G1              | +/- 1.1% NIST Traceable    | 02/16/2017, 02/23/2017 |
| CARBON MONOXIDE    | 100.0 PPM               | 101.4 PPM            | G1              | +/- 1.0% NIST Traceable    | 02/16/2017             |
| NITRIC OXIDE       | 100.0 PPM               | 100.8 PPM            | G1              | +/- 1.0% NIST Traceable    | 02/16/2017, 02/23/2017 |
| NITROGEN           | Balance                 |                      |                 |                            |                        |

| CALIBRATION STANDARDS |            |             |                                     |             |                 |
|-----------------------|------------|-------------|-------------------------------------|-------------|-----------------|
| Type                  | Lot ID     | Cylinder No | Concentration                       | Uncertainty | Expiration Date |
| NTRM                  | 12060405   | CC353866    | 49.49 PPM CARBON MONOXIDE/NITROGEN  | 0.6         | Dec 20, 2017    |
| PRM                   | 12367      | APEX1099237 | 10.00 PPM NITROGEN DIOXIDE/NITROGEN | 1.6%        | May 29, 2016    |
| NTRM                  | 13010423   | KAL004029   | 97.6 PPM NITRIC OXIDE/NITROGEN      | 0.8         | May 09, 2019    |
| GMIS                  | 0315201603 | CC502257    | 4.875 PPM NITROGEN DIOXIDE/NITROGEN | 1.6         | Mar 15, 2019    |

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

| ANALYTICAL EQUIPMENT                 |                      |                             |
|--------------------------------------|----------------------|-----------------------------|
| Instrument/Make/Model                | Analytical Principle | Last Multipoint Calibration |
| Nicolet 6700 AHR0801550 CO MCO       | FTIR                 | Feb 15, 2017                |
| Nicolet 6700 AHR0801550 NO LNO       | FTIR                 | Feb 10, 2017                |
| Nicolet 6700 AHR0801550 NO2 impurity | FTIR NO2 impurity    | Feb 08, 2017                |

Triad Data Available Upon Request



*[Signature]*

Approved for Release

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# CERTIFICATE OF ANALYSIS

## Grade of Product: EPA Protocol

|                  |                         |                     |                 |
|------------------|-------------------------|---------------------|-----------------|
| Part Number:     | E03NI80E15A0138         | Reference Number:   | 153-401824756-1 |
| Cylinder Number: | CC347477                | Cylinder Volume:    | 150.9 CF        |
| Laboratory:      | 124 - Tooele (SAP) - UT | Cylinder Pressure:  | 2015 PSIG       |
| PGVP Number:     | B72020                  | Valve Outlet:       | 590             |
| Gas Code:        | CO2,O2,BALN             | Certification Date: | Jun 01, 2020    |

**Expiration Date: Jun 01, 2028**

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

| ANALYTICAL RESULTS |                         |                        |                 |                            |             |
|--------------------|-------------------------|------------------------|-----------------|----------------------------|-------------|
| Component          | Requested Concentration | Actual – Concentration | Protocol Method | Total Relative Uncertainty | Assay Dates |
| CARBON DIOXIDE     | 10.00 %                 | 10.01 %                | G1              | +/- 1.8% NIST Traceable    | 06/01/2020  |
| OXYGEN             | 10.00 %                 | 10.02 %                | G1              | +/- 0.7% NIST Traceable    | 06/01/2020  |
| NITROGEN           | Balance                 |                        |                 |                            |             |

| CALIBRATION STANDARDS |          |              |                                  |             |                 |
|-----------------------|----------|--------------|----------------------------------|-------------|-----------------|
| Type                  | Lot ID   | Cylinder No  | Concentration                    | Uncertainty | Expiration Date |
| NTRM                  | 13060628 | CC413727     | 13.359 % CARBON DIOXIDE/NITROGEN | 0.6%        | May 14, 2025    |
| NTRM                  | 98051017 | SG9142416BAL | 12.05 % OXYGEN/NITROGEN          | 0.7%        | Dec 14, 2023    |

| ANALYTICAL EQUIPMENT        |                         |                             |
|-----------------------------|-------------------------|-----------------------------|
| Instrument/Make/Model       | Analytical Principle    | Last Multipoint Calibration |
| Horiba VIA-510 SV4MEUTJ CO2 | CO2 NDIR (Dixon)        | May 14, 2020                |
| Horiba MPA-510 W603MM58 O2  | O2 Paramagnetic (Mason) | May 21, 2020                |

Triad Data Available Upon Request



# CERTIFICATE OF ANALYSIS

## Grade of Product: EPA Protocol

|                  |                          |                     |                |
|------------------|--------------------------|---------------------|----------------|
| Part Number:     | E02AI99E15A1704          | Reference Number:   | 54-401223063-1 |
| Cylinder Number: | CC507020                 | Cylinder Volume:    | 146.2 CF       |
| Laboratory:      | 124 - Chicago (SAP) - IL | Cylinder Pressure:  | 2015 PSIG      |
| PGVP Number:     | B12018                   | Valve Outlet:       | 660            |
| Gas Code:        | NO2,BALA                 | Certification Date: | Jun 19, 2018   |

Expiration Date: Jun 19, 2021

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

| ANALYTICAL RESULTS      |                         |                      |                 |                            |                        |
|-------------------------|-------------------------|----------------------|-----------------|----------------------------|------------------------|
| Component               | Requested Concentration | Actual Concentration | Protocol Method | Total Relative Uncertainty | Assay Dates            |
| NITROGEN DIOXIDE<br>AIR | 50.00 PPM<br>Balance    | 52.28 PPM            | G1              | +/- 2% NIST Traceable      | 06/12/2018, 06/19/2018 |

| CALIBRATION STANDARDS |            |             |                                     |             |                 |
|-----------------------|------------|-------------|-------------------------------------|-------------|-----------------|
| Type                  | Lot ID     | Cylinder No | Concentration                       | Uncertainty | Expiration Date |
| NTRM                  | 7272017102 | CC503946    | 100.9 PPM NITROGEN DIOXIDE/NITROGEN | +/- 1.1%    | Jun 21, 2020    |
| PRM                   | MS7323     | MS7323      | 100.1 PPM NITROGEN DIOXIDE/NITROGEN | +/- 1.0%    | May 19, 2016    |

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

| ANALYTICAL EQUIPMENT  |                      |                             |
|-----------------------|----------------------|-----------------------------|
| Instrument/Make/Model | Analytical Principle | Last Multipoint Calibration |
| MKS Multigas 17707558 | FTIR                 | May 21, 2018                |

Triad Data Available Upon Request



*Debari Hussain*

Approved for Release

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# CERTIFICATE OF ANALYSIS

## Grade of Product: EPA Protocol

|                  |                         |                     |                 |
|------------------|-------------------------|---------------------|-----------------|
| Part Number:     | E03NI56E15A1055         | Reference Number:   | 153-401757272-1 |
| Cylinder Number: | EB0075051               | Cylinder Volume:    | 161.7 CF        |
| Laboratory:      | 124 - Tooele (SAP) - UT | Cylinder Pressure:  | 2015 PSIG       |
| PGVP Number:     | B72020                  | Valve Outlet:       | 590             |
| Gas Code:        | CO2,O2,BALN             | Certification Date: | Mar 10, 2020    |

**Expiration Date: Mar 10, 2028**

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

| ANALYTICAL RESULTS |                         |                      |                 |                            |             |
|--------------------|-------------------------|----------------------|-----------------|----------------------------|-------------|
| Component          | Requested Concentration | Actual Concentration | Protocol Method | Total Relative Uncertainty | Assay Dates |
| CARBON DIOXIDE     | 22.00 %                 | 21.64 %              | G1              | +/- 0.6% NIST Traceable    | 03/10/2020  |
| OXYGEN             | 22.00 %                 | 22.03 %              | G1              | +/- 0.5% NIST Traceable    | 03/10/2020  |
| NITROGEN           | Balance                 |                      |                 |                            |             |

| CALIBRATION STANDARDS |          |             |                                 |             |                 |
|-----------------------|----------|-------------|---------------------------------|-------------|-----------------|
| Type                  | Lot ID   | Cylinder No | Concentration                   | Uncertainty | Expiration Date |
| NTRM                  | 06011806 | K012669     | 23.04 % CARBON DIOXIDE/NITROGEN | 0.5%        | Jun 27, 2022    |
| NTRM                  | 12062019 | CC367606    | 22.883 % OXYGEN/NITROGEN        | 0.050%      | May 14, 2024    |

| ANALYTICAL EQUIPMENT        |                         |                             |
|-----------------------------|-------------------------|-----------------------------|
| Instrument/Make/Model       | Analytical Principle    | Last Multipoint Calibration |
| Horiba VIA-510 SV4MEUTJ CO2 | CO2 NDIR (Dixon)        | Feb 20, 2020                |
| Horiba MPA-510 W603MM58 O2  | O2 Paramagnetic (Mason) | Feb 26, 2020                |

Triad Data Available Upon Request



SERIES 4040

System S/N 3880

**ENVIRONICS FLOW CONTROLLER CALIBRATION SHEET**

MFC # 1

Size: 10000 SCCM

MFC Serial Number: 3463700001

This flow controller was calibrated using a NIST-traceable Flow Standard. This calibration was performed with Nitrogen at a standard reference temperature and pressure of 32°F and 29.92 in. Hg. The Flow Calibration Data is not performance data. This data is used by the system operating mode to improve the flow accuracy. The Flow Verification Data is performance data.

**Flow Calibration Data**

|      | Set Flow | True Flow |
|------|----------|-----------|
| 5%   | 500      | 495.537   |
| 10%  | 1000     | 1018.425  |
| 20%  | 2000     | 2050.558  |
| 30%  | 3000     | 3079.502  |
| 40%  | 4000     | 4102.668  |
| 50%  | 5000     | 5121.474  |
| 60%  | 6000     | 6164.93   |
| 70%  | 7000     | 7192.218  |
| 80%  | 8000     | 8164.703  |
| 90%  | 9000     | 9184.672  |
| 100% | 10000    | 10206.343 |

All values in SCCM

**Flow Verification Data**

|     | Set Flow | True Flow |
|-----|----------|-----------|
| 99% | 9900     | 9921.62   |
| 85% | 8500     | 8498.859  |
| 55% | 5500     | 5526.296  |
| 25% | 2500     | 2504.338  |
| 10% | 1000     | 1002.403  |

All values in SCCM

Verified by:



Date:

2-5-20

*Computerized Gas Mixing / Dilution / Calibration Systems*

Environics Inc. • 69 Industrial Park Road East • Tolland, CT 06084 • (860) 872-1111 • Fax: (860) 870-9333

World Wide Web: <http://www.environics.com>E-mail: [info@environics.com](mailto:info@environics.com)

SERIES 4040

System S/N 3880

**ENVIRONICS FLOW CONTROLLER CALIBRATION SHEET**

MFC # 2

Size: 10000 SCCM

MFC Serial Number: 3463700002

This flow controller was calibrated using a NIST-traceable Flow Standard. This calibration was performed with Nitrogen at a standard reference temperature and pressure of 32°F and 29.92 in. Hg. The Flow Calibration Data is not performance data. This data is used by the system operating mode to improve the flow accuracy. The Flow Verification Data is performance data.

**Flow Calibration Data**

|      | Set Flow | True Flow |
|------|----------|-----------|
| 5%   | 500      | 492.77    |
| 10%  | 1000     | 1020.641  |
| 20%  | 2000     | 2058.834  |
| 30%  | 3000     | 3094.522  |
| 40%  | 4000     | 4113.414  |
| 50%  | 5000     | 5121.796  |
| 60%  | 6000     | 6123.949  |
| 70%  | 7000     | 7133.166  |
| 80%  | 8000     | 8089.188  |
| 90%  | 9000     | 9115.346  |
| 100% | 10000    | 10180.279 |

All values in SCCM

**Flow Verification Data**

|     | Set Flow | True Flow |
|-----|----------|-----------|
| 99% | 9900     | 9907.258  |
| 85% | 8500     | 8515.805  |
| 55% | 5500     | 5517.98   |
| 25% | 2500     | 2498.294  |
| 10% | 1000     | 999.317   |

All values in SCCM

Verified by:

*Jenae Lundmark*

Date:

*2-5-20**Computerized Gas Mixing / Dilution / Calibration Systems*

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SERIES 4040

System S/N 3880

## ENVIRONICS FLOW CONTROLLER CALIBRATION SHEET

MFC # 3

Size: 1000 SCCM

MFC Serial Number: 3474100001

This flow controller was calibrated using a NIST-traceable Flow Standard. This calibration was performed with Nitrogen at a standard reference temperature and pressure of 32°F and 29.92 in. Hg. The Flow Calibration Data is not performance data. This data is used by the system operating mode to improve the flow accuracy. The Flow Verification Data is performance data.

### Flow Calibration Data

|      | Set Flow | True Flow |
|------|----------|-----------|
| 5%   | 50       | 47.214    |
| 10%  | 100      | 98.186    |
| 20%  | 200      | 201.108   |
| 30%  | 300      | 304.888   |
| 40%  | 400      | 406.088   |
| 50%  | 500      | 509.032   |
| 60%  | 600      | 611.156   |
| 70%  | 700      | 713.653   |
| 80%  | 800      | 815.267   |
| 90%  | 900      | 922.889   |
| 100% | 1000     | 1027.701  |

All values in SCCM

### Flow Verification Data

|     | Set Flow | True Flow |
|-----|----------|-----------|
| 99% | 990      | 989.409   |
| 85% | 850      | 848.844   |
| 55% | 550      | 549.669   |
| 25% | 250      | 249.264   |
| 10% | 100      | 100.374   |

All values in SCCM

Verified by:

*Terrie Lundmark*

Date:

*2-5-20*

Computerized Gas Mixing / Dilution / Calibration Systems

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This is to acknowledge that

Zach Harding

HEL200826-10985

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successfully participated in Visible Emissions Evaluation field training and certification and pursuant to US EPA 40 CFR 60 Appendix A, Reference Method 9, as amended, is certified to evaluate Visible Emissions for a period of six (6) months from the date of this certification.



Anthony Ferro - Field Manager

Helena, MT

Location

08/26/2020

Date

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Jacob Rankin

HEL200826-19468

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successfully participated in Visible Emissions Evaluation field training and certification and pursuant to US EPA 40 CFR 60 Appendix A, Reference Method 9, as amended, is certified to evaluate Visible Emissions for a period of six (6) months from the date of this certification.



Anthony Ferro - Field Manager

Helena, MT

Location

08/26/2020

Date

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Adam R Bender

HEL200826-5998

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successfully participated in Visible Emissions Evaluation field training and certification and pursuant to US EPA 40 CFR 60 Appendix A, Reference Method 9, as amended, is certified to evaluate Visible Emissions for a period of six (6) months from the date of this certification.



Anthony Ferro - Field Manager

Helena, MT

Location

08/26/2020

Date

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