



## EUDRYER Emissions Test Report

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AIR QUALITY DIVISION

*Prepared for:*

**Towns Brothers Construction Co.**

Ludington, Michigan

Towns Brothers Construction Co.  
679 S. Pere Marquette Hwy  
P.O. Box 608  
Ludington, Michigan

Project No. 14-4641.00  
December 15, 2014

BT Environmental Consulting, Inc.  
4949 Fernlee Avenue  
Royal Oak, Michigan 48071  
(248) 548-8070

EXECUTIVE SUMMARY

AIR QUALITY DIV.

BT Environmental Consulting, Inc. (BTEC) was retained by Towns Brothers Construction Company (Towns Brothers) to conduct compliance emissions testing at the Towns Brothers facility in Ludington, Michigan. The test program consisted of sampling for filterable particulate matter (PM) and visual opacity emissions from the EUDRYER exhaust stack.

Testing of the source consisted of triplicate 120-minute test runs for PM and 60-minute opacity readings at the EUDRYER exhaust stack. Sampling was performed utilizing United States Environmental Protection Agency (USEPA) reference test methods. Testing occurred on December 4, 2014. The results of the emissions test program will be used to demonstrate compliance with MDEQ Permit No. 158-94C and are summarized by Table I.

**Table I**  
**EUDRYER Emission Summary**  
**Test Date: October 14<sup>th</sup>, 2014**

| Source  | Pollutant               | Average Test Result              | Emission Limit                 |
|---------|-------------------------|----------------------------------|--------------------------------|
| EUDRYER | Particulate Matter (PM) | 0.001 lb/ 1000 lb of exhaust gas | 0.01lb/ 1000 lb of exhaust gas |
|         | VE                      | 0                                | 10%                            |

**1. Introduction**

BT Environmental Consulting, Inc. (BTEC) was retained by Towns Brothers Construction Company (Towns Brothers) to conduct compliance emissions testing at the Towns Brothers facility in Ludington, Michigan. The test program consisted of sampling for filterable particulate matter (PM) and visual opacity emissions from the EUDRYER exhaust stack. The emissions test program was conducted on December 4, 2014. The purpose of this report is to document the results of the test program.

AQD has published a guidance document entitled “Format for Submittal of Source Emission Test Plans and Reports” (December 2013). The following is a summary of the emissions test program and results in the format suggested by the aforementioned document.

**1.a Identification, Location, and Dates of Test**

Sampling and analysis for the emission test program was conducted on December 4, 2014 at the Towns Brothers facility located in Ludington, Michigan. The test program included evaluation of PM and opacity from EUDRYER.

**1.b Purpose of Testing**

AQD issued Permit to Install 158-94C to Towns Brothers on October 11, 2012. This permit limits emissions as summarized by Table 1.

**Table 1  
Emission Limitations**

| Source  | Pollutant               | Emission Limit                 |
|---------|-------------------------|--------------------------------|
| EUDRYER | Particulate Matter (PM) | 0.01lb/ 1000 lb of exhaust gas |
|         | VE                      | 10%                            |

**1.c Source Description**

The EUDRYER, 30.00 MMBtu/hr natural gas-fired rotary drum dryer for drying chrome ore or sand and is controlled by a dry fabric filter dust collector.



### 1.d Test Program Contacts

Names, addresses, and telephone numbers of the contacts for information regarding the test and the test report, and names and affiliations of all personnel involved in conducting the testing.

The contact for the source and test report is:

Mr. Bob Towns  
General Manager  
Towns Brothers Construction Co.  
679 S. Pere Marquette Hwy  
P.O. Box 608  
Ludington, Michigan 49431

Mr. Barry P. Boulianne  
Senior Project Manager  
BT Environmental Consulting, Inc.  
4949 Fernlee Avenue  
Royal Oak, MI 48073  
313-449-2361

Names and affiliations for personnel who were present during the testing program are summarized by Table 2.

**Table 2**  
**Test Personnel**

| <b>Name and Title</b>                             | <b>Affiliation</b>  | <b>Telephone</b> |
|---|---|------------------|
| Mr. Bob Towns<br>General Manager                  | Towns Brothers Construction Co.<br>679 S. Pere Marquette Hwy<br>P.O. Box 608<br>Ludington, Michigan 49431 | (586)-336-5086   |
| Mr. Barry Boulianne<br>Senior Project Manager     | BTEC<br>4949 Fernlee<br>Royal Oak, MI 48073   | (313) 449-2361   |
| Mr. Ken Lievens<br>Project Manager                | BTEC<br>4949 Fernlee<br>Royal Oak, MI 48073   | (248) 548-8070   |
| Mr. Brandon Chase<br>Staff Environmental Engineer | BTEC<br>4949 Fernlee<br>Royal Oak, MI 48073   | (248) 548-8070   |
| Mr. Rob Dickman                                   | MDEQ<br>Air Quality Division  | (231) 876-4412   |



## **2. Summary of Results**

Sections 2.a through 2.d summarize the results of the emissions compliance test program.

### **2.a Operating Data**

Process data monitored during the emissions test program includes baghouse pressure drop and sand production and is available in Appendix E.

### **2.b Applicable Permit**

The applicable permit for this emissions test program is Permit to Install 158-94C.

### **2.c Results**

The overall results of the emission test program are summarized by Table 3 (see Section 5.a).

## **3. Source Description**

Sections 3.a through 3.e provide a detailed description of the process.

### **3.a Process Description**

A 30.0 MMBtu/hr natural gas-fired rotary drum dryer for drying chrome ore or sand and is controlled by a dry fabric filter dust collector.

### **3.b Process Flow Diagram**

Due to the simplicity of the sand dryer, a process flow diagram is not necessary.

### **3.c Raw and Finished Materials**

The raw material used by the process is natural gas and sand.

### **3.d Process Capacity**

Permittee shall not process more than 3,600 tons of sand per day nor 1,314,000 tons of sand product per 12-month rolling time period, as determined at the end of each calendar month, through EUDRYER.

Permittee shall not process more than 20 tons of chrome ore per hour nor 129,000 tons of chrome ore per 12-month rolling time period, as determined at the end of each calendar month through EDRYER.



Permittee shall burn only natural gas in EUDRYER.

Permittee shall not process any asbestos tailing or asbestos containing waste materials in EUDRYER pursuant to the National Emission Standards for Hazardous Air Pollutants, 40 CFR Part 61 Subpart M.

### **3.e Process Instrumentation**

Process data monitored during the emissions test program includes baghouse pressure drop and sand production and is available in Appendix E.

## **4. Sampling and Analytical Procedures**

Sections 4.a through 4.d provide a summary of the sampling and analytical procedures used.

### **4.a Sampling Train and Field Procedures**

The emissions test program utilized the following test methods codified at Title 40, Part 60, Appendix A of the Code of Federal Regulations (40 CFR 60, Appendix A):

- Method 1 - "Sample and Velocity Traverses for Stationary Sources"
- Method 2 - "Determination of Stack Gas Velocity and Volumetric Flowrate"
- Method 3A - "Determination of Molecular Weight of Dry Stack Gas"(Analyzer)
- Method 4 - "Determination of Moisture Content in Stack Gases"
- Method 5 - "Determination of Particulate Matter Emissions from stationary sources"
- Method 9 - "Determination of Visual Opacity from Stationary Sources"

Stack gas velocity traverses were conducted in accordance with the procedures outlined in Method 1 and Method 2. S-type pitot tubes with thermocouple assemblies, calibrated in accordance with Method 2, Section 4.1.1, were used to measure exhaust gas velocity pressures (using a manometer) and temperatures during testing. The S-type pitot tube dimensions outlined in Sections 2-6 through 2-8 are within specified limits, therefore, a baseline pitot tube coefficient of 0.84 (dimensionless) is assigned. A diagram of the sample points is provided in Figure 1.

Cyclonic flow checks were performed at each sampling location. The existence of cyclonic flow is determined by measuring the flow angle at each sample point. The flow angle is the angle between the direction of flow and the axis of the stack. If the average of the absolute values of the flow angles is greater than 20 degrees, cyclonic flow exists.

The Molecular Weight of the gas stream was evaluated according to procedures outlined in Title 40, Part 60, Appendix A, Method 3A. The O<sub>2</sub>/CO<sub>2</sub> content of the gas stream was drawn from the exhaust of the dry gas meter and measured using an O<sub>2</sub>/CO<sub>2</sub> gas analyzer.

Exhaust gas was extracted as part of the Method 5 sampling train. Exhaust gas moisture content was determined gravimetrically.

40 CFR 60, Appendix A, Method 5, "*Determination of Particulate Emissions from Stationary Sources*" was used to measure PM concentrations and calculate PM emission rates (see Figure 2 for a schematic of the sampling train).

BTEC's Nutech<sup>®</sup> Model 2010 modular isokinetic stack sampling system consists of (1) a steel nozzle, (2) a glass probe, (3) a Teflon connecting line to the impingers, (4) a set of four Greenburg-Smith (GS) impingers with the first two with 100 ml of deionized water (ii) an empty impinger, (iii) and an impinger filled with approximately 300 grams of silica gel. (5) a length of sample line, and (6) a Nutech<sup>®</sup> control case equipped with a pump, dry gas meter, and calibrated orifice.

A sampling train leak test was conducted before and after each test run. After completion of the final leak test for each test run, the filter was recovered, and the nozzle and the front half of the filter holder assembly were brushed and triple rinsed with acetone. The acetone rinses will were collected in a pre-cleaned sample container.

#### **4.b Recovery and Analytical Procedures**

See section 4.a.

#### **4.c Sampling Ports**

A diagram of the stack showing sampling ports in relation to upstream and downstream disturbances is included as Figure 1.

#### **4.d Traverse Points**

A diagram of the stack indicating traverse point locations and stack dimensions is included as Figure 1.

### **5. Test Results and Discussion**

Sections 5.a through 5.k provide a summary of the test results.

#### **5.a Results Tabulation**

The overall results of the emissions test program are summarized by Table 3. Detailed results for the emissions test program are summarized by Table 4.

**Table 3**  
**EUDRYER Overall Emission Summary**  
**Test Date: October 14<sup>th</sup>, 2014**

| Source  | Pollutant               | Average Test Result              | Emission Limit                 |
|---------|-------------------------|----------------------------------|--------------------------------|
| EUDRYER | Particulate Matter (PM) | 0.001 lb/ 1000 lb of exhaust gas | 0.01lb/ 1000 lb of exhaust gas |
|         | VE                      | 0                                | 10%                            |

### **5.b Discussion of Results**

PM emissions from the EUDRYER are below the corresponding emission limit of 0.01 lb/ 1000 lb of exhaust gas. Visible emissions are below the limit of 10%.

### **5.c Sampling Procedure Variations**

There were no sampling variations used during the emission compliance test program.

### **5.d Process or Control Device Upsets**

No upset conditions occurred during testing.

### **5.e Control Device Maintenance**

There was no control equipment maintenance performed during the emissions test program.

### **5.f Re-Test**

EUDRYER was previously tested on October 14, 2014 with non-passing results (BTEC Project No. 14-4603).

### **5.g Audit Sample Analyses**

No audit samples were collected as part of the test program.

### **5.h Calibration Sheets**

Relevant equipment calibration documents are provided in Appendix B.



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Stack gas velocity traverses were conducted in accordance with the procedures outlined in Method 1 and Method 2. S-type pitot tubes with thermocouple assemblies, calibrated in accordance with Method 2, Section 4.1.1, were used to measure exhaust gas velocity pressures (using a manometer) and temperatures during testing. The S-type pitot tube dimensions outlined in Sections 2-6 through 2-8 are within specified limits, therefore, a baseline pitot tube coefficient of 0.84 (dimensionless) is assigned. A diagram of the sample points is provided in Figure 1.

Cyclonic flow checks were performed at each sampling location. The existence of cyclonic flow is determined by measuring the flow angle at each sample point. The flow angle is the angle between the direction of flow and the axis of the stack. If the average of the absolute values of the flow angles is greater than 20 degrees, cyclonic flow exists.



**5.i Sample Calculations**

Sample calculations are provided in Appendix C.

**5.j Field Data Sheets**

Field documents relevant to the emissions test program are presented in Appendix A.

**5.k Laboratory Data**

Laboratory analytical results are presented in Appendix E.

**Table 3**  
**EUDRYER Particulate Matter Emission Rates**

| Company<br>Source Designation<br>Test Date  | Towns Bros<br>Dryer Exhaust |           |           | Average  |
|---|-----------------------------|-----------|-----------|----------|
|   | 12/4/2014                   | 12/4/2014 | 12/4/2014 |          |
| <b>Meter/Nozzle Information</b>             |                             |           |           |          |
|   | P-1                         | P-2       | P-3       |          |
| Meter Temperature Tm (F)                    | 48.5                        | 63.8      | 71.1      | 61.1     |
| Meter Pressure - Pm (in. Hg)                | 30.0                        | 30.0      | 30.0      | 30.0     |
| Measured Sample Volume (Vm)                 | 75.2                        | 69.1      | 75.0      | 73.1     |
| Sample Volume (Vm-Std ft3)                  | 79.3                        | 70.7      | 75.7      | 75.2     |
| Sample Volume (Vm-Std m3)                   | 2.25                        | 2.00      | 2.14      | 2.13     |
| Condensate Volume (Vw-std)                  | 25.494                      | 25.518    | 28.766    | 26.593   |
| Gas Density (Ps(std) lbs/ft3) (wet)         | 0.0685                      | 0.0680    | 0.0676    | 0.0680   |
| Gas Density (Ps(std) lbs/ft3) (dry)         | 0.0756                      | 0.0757    | 0.0756    | 0.0756   |
| Total weight of sampled gas (m g lbs) (wet) | 7.18                        | 6.54      | 7.06      | 6.93     |
| Total weight of sampled gas (m g lbs) (dry) | 5.99                        | 5.35      | 5.72      | 5.69     |
| Nozzle Size - An (sq. ft.)                  | 0.000873                    | 0.000873  | 0.000873  | 0.000873 |
| Isokinetic Variation - I                    | 104.4                       | 98.3      | 103.7     | 102.1    |
| <b>Stack Data</b>                           |                             |           |           |          |
| Average Stack Temperature - Ts (F)          | 259.5                       | 257.1     | 254.3     | 257.0    |
| Molecular Weight Stack Gas- dry (Md)        | 29.2                        | 29.3      | 29.3      | 29.3     |
| Molecular Weight Stack Gas-wet (Ms)         | 26.5                        | 26.3      | 26.2      | 26.3     |
| Stack Gas Specific Gravity (Gs)             | 0.915                       | 0.908     | 0.903     | 0.909    |
| Percent Moisture (Bws)                      | 24.33                       | 26.53     | 27.54     | 26.13    |
| Water Vapor Volume (fraction)               | 0.2433                      | 0.2653    | 0.2754    | 0.2613   |
| Pressure - Ps ("Hg)                         | 29.9                        | 29.9      | 29.9      | 29.9     |
| Average Stack Velocity - Vs (ft/sec)        | 21.8                        | 21.2      | 21.7      | 21.6     |
| Area of Stack (ft2)                         | 5.1                         | 5.1       | 5.1       | 5.1      |
| <b>Exhaust Gas Flowrate</b>                 |                             |           |           |          |
| Flowrate ft <sup>3</sup> (Actual)           | 6,623                       | 6,430     | 6,594     | 6,549    |
| Flowrate ft <sup>3</sup> (Standard Wet)     | 4,854                       | 4,729     | 4,868     | 4,817    |
| Flowrate ft <sup>3</sup> (Standard Dry)     | 3,673                       | 3,474     | 3,527     | 3,558    |
| Flowrate m <sup>3</sup> (standard dry)      | 104                         | 98        | 100       | 101      |
| <b>Total Particulate Weights (mg)</b>       |                             |           |           |          |
| Nozzle/Probe/Filter                         | 5.5                         | 2.5       | 1.6       | 3.2      |
| <b>Total Particulate Concentration</b>      |                             |           |           |          |
| lb/1000 lb (wet)                            | 0.002                       | 0.001     | 0.000     | 0.001    |
| lb/1000 lb (dry)                            | 0.002                       | 0.001     | 0.001     | 0.001    |
| mg/dscm (dry)                               | 2.4                         | 1.2       | 0.7       | 1.5      |
| gr/dscf                                     | 0.0011                      | 0.0005    | 0.0003    | 0.0006   |
| <b>Total Particulate Emission Rate</b>      |                             |           |           |          |
| lb/ hr                                      | 0.03                        | 0.02      | 0.01      | 0.02     |

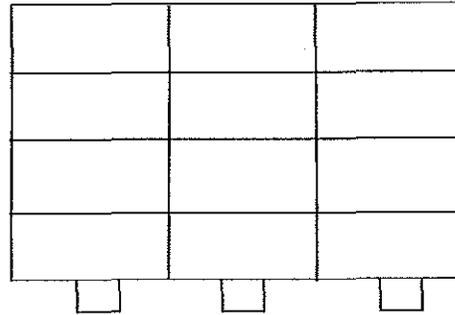
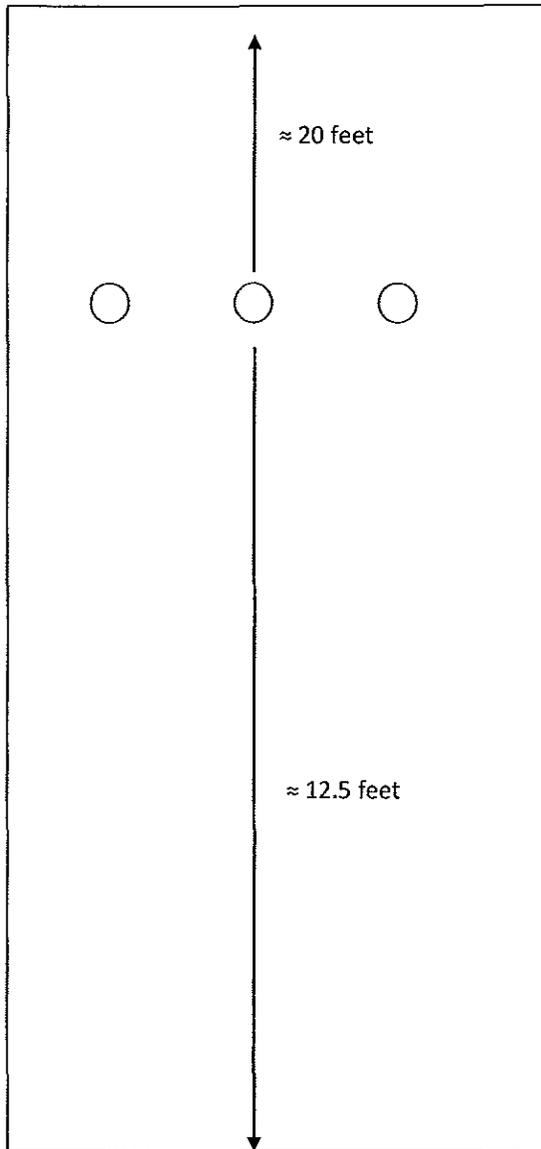
# Figures



Stack Dimensions:

Depth: 27 inches

Width: 27 inches



Not to Scale

| Points | Distance " |
|--------|------------|
| 1      | 3.4        |
| 2      | 10.1       |
| 3      | 16.9       |
| 4      | 23.6       |

Figure No. 1

Site: EUDRYER Exhaust  
Town's Brothers Construction Company  
Ludington, Michigan

Sampling Date:  
December 4, 2014

BT Environmental Consulting, Inc.  
4949 Fernlee Avenue  
Royal Oak, Michigan 48073

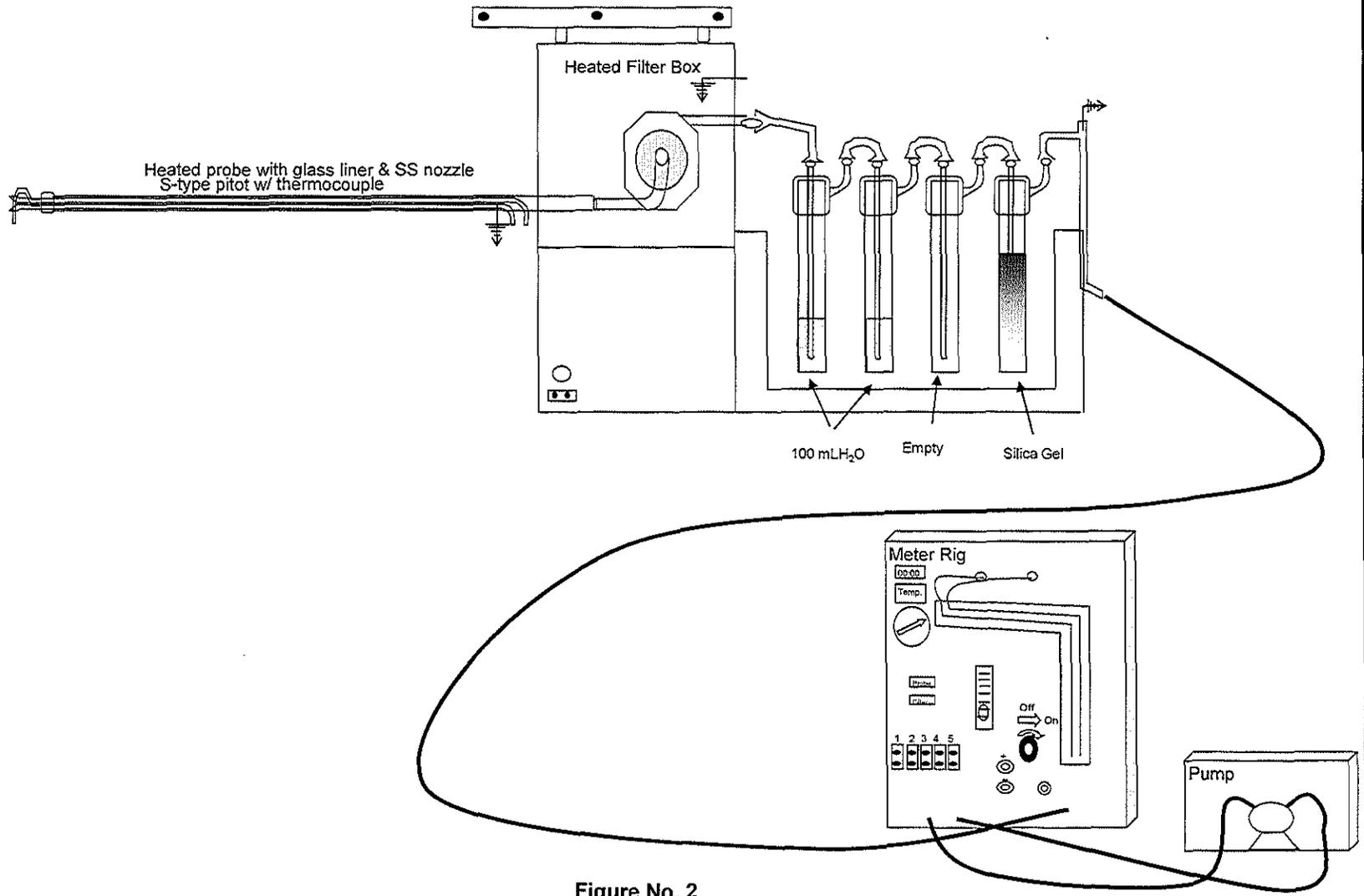


Figure No. 2

Site:  
USEPA Method 5  
Towns Brothers Construction Company  
Ludington, Michigan

Sampling Date:  
December 4, 2014

BT Environmental Consulting, Inc.  
4949 Fernlee Avenue  
Royal Oak, Michigan 48073