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APPENDIX K/ST
OEPA Stack Test Review Summary Form

28

COMPANY NAME Butler Asphalt Plant #3
COUNTY Gauche DATE SENT _____
PREMISE/ SOURCE NO. 08297 00404 P001 SCC CODE _____
SOURCE DESCRIPTION BATCH ASPHALT PLANT

CONTROL EQUIPMENT Baghouse

MONITORING EQUIPMENT (CEM) _____

TEST FIRM Hayden / Bowser Mower DATE(S) OF TEST 7/14/94

FINAL TEST REPORT RECEIVED ON 10/6/94

POLLUTANT(S) TESTED PM

AUDIT SAMPLE SUBMITTED (please circle): YES or NO (if yes) PASSED or FAILED

EMISSION RATES*:

OPERATING RATES*: 120 T/HR CAP

ACTUAL** 0.0425 gr/dscf

MAXIMUM** 101.5 T/HR

ALLOWABLE** 0.04 gr/dscf

DURING TEST PERIOD** 93.8 T/HR

TEST RESULTS: PASSED or FAILED or RETEST

WERE ALL THE RUNS WITNESSED BY THE OEPA/ LOCAL INSPECTOR(S) YES or NO
IF NO, THEN EXPLAIN UNDER COMMENTS:

COMMENTS: THIS NSPS SOURCE PASSED AT 0.04 gr/dscf
by guidance from USEPA dated 6/6/1990 for Performance
Test Calculation Guidelines. It is important to note that
THE SOURCE OPERATED AT 78% OF RATED CAPACITY.

I HEREBY VERIFY THAT THE INFORMATION CONTAINED WITHIN THE STACK TEST REPORT HAS
BEEN REVIEWED AND IT HAS BEEN DETERMINED THAT THE TEST PROCEDURES, ANALYSES, AND
CALCULATIONS ARE:

☒ AN ACCEPTABLE DEMONSTRATION OF CONFORMANCE WITH THE APPROVED TESTING
METHODOLOGY

☐ AN UNACCEPTABLE DEMONSTRATION OF CONFORMANCE WITH THE APPROVED TESTING
METHODOLOGY

10/12/94
Date of Review

W. W. Adams
Reviewed by

- * Based on three run averages
- ** Specify applicable units

7/22/93

Contact Report

Facility: Butler Asphalt Plant #3
5326 Medway Rd.
Fairborn, Ohio 45324

Premises No#: 0829700404 P001

Contact: Ryan Griffith
Junior Roberts

RAPCA Rep: Sharon Kunselman *Sharon Kunselman* ; *Jeff Adams*

Date: July 14, 1994

Subject: Stack Test

This plant was installed in 1987 and is required to meet NSPS of 0.04 grain of particulate per dry standard cubic feet of exhaust gases with a visible emissions limit of 20% opacity. The opacity limit in the permit is incorrect and will be changed to reflect 20%.

This plant uses a baghouse for control of particulate. There is a magnehelic read-out in the control room for monitoring pressure drop across the bags. The kiln uses #2 diesel fuel only. No rap is used in the feed. During the test, grounds and mix feed were wet from rain. There were no fugitive emissions from material handling, storage piles, roadways or parking areas. I had been present during dry weather, and saw fugitive emissions escaping the weigh hopper. The leak has since been mended.

Butler was having baghouse problems one month ago. Visible emissions were high, but since then bags have been replaced and opacity was back down to zero.

The maximum capacity rate for this plant is 120 tons/hr. The normal, average rate of operation is 90 to 100 tons/hr. Hours of operation are 7 a.m. - 3:30 p.m. five days per week and every Saturday from 7:00 a.m. - 1:00 p.m.

Opacity during the entire test remained at zero. Method 5 was the test method used at the stack outlet. Rates and times for test performance were as follows;

	Time:	Begin	End	Begin	End	Average Process Rate
Run #1		9:13	10:17	X	X	112 t/hr
Run #2		11:53	12:09	12:26	1:20	109 t/hr

Visible Emission Observation Form

SOURCE NAME <i>Butler Asphalt Plant #3</i>		OBSERVATION DATE <i>7-14-94</i>		START TIME <i>105 pm</i>		STOP TIME <i>1:22</i>	
ADDRESS <i>5326 midway Rd.</i>		SEC MIN 0 15 30 45		SEC MIN 0 15 30 45			
CITY <i>Fairborn</i>	STATE <i>OH.</i>	ZIP <i>45324</i>	1 <i>0 0 0 0</i>		31 <i>0 0 0 0</i>		
PHONE <i>879-5578</i>	SOURCE ID NUMBER <i>0829700404 P001</i>		2 <i>0 0 0 0</i>		32 <i>0 0 0 0</i>		
PROCESS EQUIPMENT <i>Aggregate Dryer</i>	OPERATING MODE <i>109 T/H</i>		3 <i>0 0 0 0</i>		33 <i>0 0 0 0</i>		
CONTROL EQUIPMENT <i>Baghouse</i>	OPERATING MODE <i>in operation</i>		4 <i>0 0 0 0</i>		34 <i>0 0 0 0</i>		
DESCRIBE EMISSION POINT <i>Square metal Stack Same</i>			5 <i>0 0 0 0</i>		35 <i>0 0 0 0</i>		
HEIGHT ABOVE GROUND LEVEL <i>START 40'5" STOP 40'5"</i>		HEIGHT RELATIVE TO OBSERVER <i>START 35' STOP 35'</i>		6 <i>0 0 0 0</i>		36 <i>0 0 0 0</i>	
DISTANCE FROM OBSERVER <i>START 38 yds STOP 38 yds</i>		DIRECTION FROM OBSERVER <i>START NW 3/5 STOP NW 3/5</i>		7 <i>0 0 0 0</i>		37 <i>0 0 0 0</i>	
DESCRIBE EMISSIONS <i>START N/A STOP N/A</i>			8 <i>0 0 0 0</i>		38 <i>0 0 0 0</i>		
EMISSION COLOR <i>START N/A STOP</i>			9 <i>0 0 0 0</i>		39 <i>0 0 0 0</i>		
WATER DROPLETS PRESENT: <i>NO YES</i>			10 <i>0 0 0 0</i>		40 <i>0 0 0 0</i>		
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED <i>START At stack exit STOP at stack exit</i>			11 <i>0 0 0 0</i>		41 <i>0 0 0 0</i>		
DESCRIBE BACKGROUND <i>START Sky STOP Sky</i>			12 <i>0 0 0 0</i>		42 <i>0 0 0 0</i>		
BACKGROUND COLOR <i>START Blue/white STOP white</i>			13 <i>0 0 0 0</i>		43 <i>0 0 0 0</i>		
WIND SPEED <i>START 3-5 mph STOP 3-5 mph</i>			14 <i>0 0 0 0</i>		44 <i>0 0 0 0</i>		
WIND DIRECTION <i>START NNN STOP NNN</i>			15 <i>0 0 0 0</i>		45 <i>0 0 0 0</i>		
AMBIENT TEMP. <i>START 80° STOP 80°</i>			16 <i>0 0 0 0</i>		46 <i>0 0 0 0</i>		
WET BULB TEMP. <i>76°</i>			17 <i>0 0 0 0</i>		47 <i>0 0 0 0</i>		
RH. percent <i>90</i>			18 <i>0 0 0 0</i>		48 <i>0 0 0 0</i>		
Source Layout Sketch Draw North Arrow			19 <i>0 0 0 0</i>		49 <i>0 0 0 0</i>		
			20 <i>0 0 0 0</i>		50 <i>0 0 0 0</i>		
			21 <i>0 0 0 0</i>		51 <i>0 0 0 0</i>		
			22 <i>0 0 0 0</i>		52 <i>0 0 0 0</i>		
			23 <i>0 0 0 0</i>		53 <i>0 0 0 0</i>		
			24 <i>0 0 0 0</i>		54 <i>0 0 0 0</i>		
			25 <i>0 0 0 0</i>		55 <i>0 0 0 0</i>		
			26 <i>0 0 0 0</i>		56 <i>0 0 0 0</i>		
			27 <i>0 0 0 0</i>		57 <i>0 0 0 0</i>		
			28 <i>0 0 0 0</i>		58 <i>0 0 0 0</i>		
			29 <i>0 0 0 0</i>		59 <i>0 0 0 0</i>		
			30 <i>0 0 0 0</i>		60 <i>0 0 0 0</i>		
AVERAGE OPACITY FOR HIGHEST PERIOD <i>0</i>			NUMBER OF READINGS ABOVE 20 % WERE <i>0</i>				
RANGE OF OPACITY READINGS MINIMUM <i>0</i> MAXIMUM <i>0</i>							
OBSERVER'S NAME (PRINT) <i>SHARON G. KUNSELMAN</i>							
OBSERVER'S SIGNATURE <i>Sharon G. Kunselman</i>			DATE <i>7-14-94</i>				
ORGANIZATION <i>R.A.P.C.A.</i>							
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE			CERTIFIED BY <i>ETA</i>				
TITLE			DATE <i>3-3-94</i>				
DATE			VERIFIED BY <i>JOE SPINNEY</i>				
			DATE <i>3-3-94</i>				

Visible Emission Observation Form

SOURCE NAME		OBSERVATION DATE		START TIME		STOP TIME	
Bultha Asphalt plant #3		7-14-94		940		9:57	
ADDRESS		SEC	MIN	0	15	30	45
5326 Medway Rd.		0	15	30	45	MIN	0 15 30 45
CITY		1	2	3	4	5	6
Fairborn		0	0	0	0	31	
STATE		0	0	0	0	32	
OH		0	0	0	0	33	
ZIP		0	0	0	0	34	
45324		0	0	0	0	35	
PHONE		0	0	0	0	36	
879-5578		0	0	0	0	37	
SOURCE ID NUMBER		0	0	0	0	38	
0829700704 Pool		0	0	0	0	39	
PROCESS EQUIPMENT		0	0	0	0	40	
Aggregate Dryer		0	0	0	0	41	
OPERATING MODE		0	0	0	0	42	
109 T/H.		0	0	0	0	43	
CONTROL EQUIPMENT		0	0	0	0	44	
BAGHOUSE		0	0	0	0	45	
OPERATING MODE		0	0	0	0	46	
IN OPERATION		0	0	0	0	47	
DESCRIBE EMISSION POINT		0	0	0	0	48	
STACK		0	0	0	0	49	
START Square metal STOP SAME		0	0	0	0	50	
HEIGHT ABOVE GROUND LEVEL		0	0	0	0	51	
START 40'5" STOP 40'5"		0	0	0	0	52	
HEIGHT RELATIVE TO OBSERVER		0	0	0	0	53	
START 35' STOP 35'		0	0	0	0	54	
DISTANCE FROM OBSERVER		0	0	0	0	55	
START 40yds STOP 40yds		0	0	0	0	56	
DIRECTION FROM OBSERVER		0	0	0	0	57	
START 255°W STOP 255°N		0	0	0	0	58	
DESCRIBE EMISSIONS		0	0	0	0	59	
START N/A STOP N/A		0	0	0	0	60	
EMISSION COLOR		AVERAGE OPACITY FOR HIGHEST PERIOD 0					
START N/A STOP N/A		NUMBER OF READINGS ABOVE 20 % WERE 0					
PLUME TYPE CONTINUOUS ☐		RANGE OF OPACITY READINGS 0 MINIMUM 0 MAXIMUM					
FUGITIVE ☐ INTERMITTENT ☐		OBSERVER'S NAME (PRINT) SHARON G. KUNSELMAN 7-14-94					
WATER DROPLETS PRESENT: NO ☒ YES ☐		OBSERVER'S SIGNATURE Sharon G. Kunselman DATE 7-14-94					
IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐		ORGANIZATION R.A.P.C.A.					
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED		CERTIFIED BY E.T.A. DATE 3.3.94					
START At stack exit STOP Same		VERIFIED BY Joe Spry DATE 3.3.94					
DESCRIBE BACKGROUND		I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE					
START Sky STOP Sky		TITLE					
BACKGROUND COLOR		DATE					
START Grey/white STOP SAME							
SKY CONDITIONS							
START OVERCAST STOP SAME							
WIND SPEED							
START 3-5mph STOP 3-5mph							
WIND DIRECTION 280° 280°							
START NWW STOP NWW							
AMBIENT TEMP.							
START 73° STOP 73°							
WET BULB TEMP.							
RH. percent 90%							

Source Layout Sketch Draw North Arrow

COMMENTS all clear.

PARTICULATE EMISSION TEST DATA

FACILITY : BUTLER ASPHALT UNIT #3
PROCESS/RUN NUMBER :
SOURCE/RUN : 2
TEST DATE : 7/14/94

TEST



VOLUME METERED AT STD. CONDITIONS	= 28.5767123564413 DSCF
VOLUME WATER COLLECTED AT STP.	= 7.615926000000001 SCF
PERCENT MOISTURE BY VOLUME	= 21.04274887338954 %
MOLECULAR WEIGHT OF STACK GAS	= 26.89058647685634 LB/LB-MOL
PERCENT EXCESS AIR	= 521.4541120381405 %
AVERAGE STACK GAS VELOCITY	= 78.05757996281515 FT/SEC
ABSOLUTE STACK PRESSURE	= 29.23382352941177 IN. HG
STACK FLOW RATE AT ACTUAL COND.	= 36494.83798610669 ACFM
STACK FLOW RATE AT STD. COND.	= 20937.88724293574 DSCFM
STACK EMISSIONS	= 4.952494123002205E-002 GR/DSCF
	= 7.077114101770151E-006 LB/DSCF
STACK EMISSION RATE	= 8.890789024095234 LB/HR
ISOKINETIC VARIATION	= 108.5914673211719 %

4.95
7.07
8.89
108.64%

TIME OF TEST	= 60 MIN
VOLUME METERED	= 30.295 CU.FT
DRY GAS METER CALB. FACT.	= 1.0058
TEST BAR. PRESSURE	= 29.25 IN HG
AVERAGE DELTA H	= .819
AVG. METER TEMP.	= 91.3 DEG. F
VOL. H2O (IMPINGERS)	= 148.9 ML
WEIGHT GAIN OF SILICA GEL	= 12.9 GM
%CO2	= 3.5 %
%CO	= 0 %
%O2	= 17.5 %
%N2	= 79 %
STATIC P OF STACK	= -.22 IN. H2O
STACK TEMP.	= 249.7 DEG. F
PITOT COEFFICIENT	= .84
AVG. ROOT DELTA P	= 1.144
STACK DIAMETER	= 0 IN.
MASS PARTICULATE	= 91.90000000000001 MG
NOZZLE DIAMETER	= .173 IN

=====

PARTICULATE EMISSION TEST DATA

FACILITY : BUTLER ASPHALT UNIT #3
PROCESS/RUN NUMBER :
SOURCE/RUN : 3
TEST DATE : 7/14/94

VOLUME METERED AT STD. CONDITIONS	= 51.89662756065985 DSCF
VOLUME WATER COLLECTED AT STP.	= 12.694779 SCF
PERCENT MOISTURE BY VOLUME	= 19.65397515856529 %
MOLECULAR WEIGHT OF STACK GAS	= 27.04696239714555 LB/LB-MOL
PERCENT EXCESS AIR	= 521.4541120381405 %
AVERAGE STACK GAS VELOCITY	= 78.51709741114614 FT/SEC
ABSOLUTE STACK PRESSURE	= 29.23161764705882 IN. HG
STACK FLOW RATE AT ACTUAL COND.	= 36709.679579154 ACFM
STACK FLOW RATE AT STD. COND.	= 21839.24680343698 DSCFM
STACK EMISSIONS	= 3.925919844441805E-002 GR/DSCF = 5.61013945770734E-006 LB/DSCF
STACK EMISSION RATE	= 7.351273213114243 LB/HR
ISOKINETIC VARIATION	= 94.27062421603227 %

3.92
5.61
7.359
94.22

TIME OF TEST	= 60 MIN
VOLUME METERED	= 55.454 CU.FT
DRY GAS METER CALB. FACT.	= 1.0058
TEST BAR. PRESSURE	= 29.25 IN HG
AVERAGE DELTA H	= 2.987
AVG. METER TEMP.	= 98.7 DEG. F
VOL. H2O (IMPINGERS)	= 249.6 ML
WEIGHT GAIN OF SILICA GEL	= 20.1 GM
%CO2	= 3.5 %
%CO	= 0 %
%O2	= 17.5 %
%N2	= 79 %
STATIC P OF STACK	= -.25 IN. H2O
STACK TEMP.	= 236.4 DEG. F
PITOT COEFFICIENT	= .84
AVG. ROOT DELTA P	= 1.165
STACK DIAMETER	= 0 IN.
MASS PARTICULATE	= 132.3 MG
NOZZLE DIAMETER	= .245 IN

=====

PARTICULATE EMISSION TEST DATA

FACILITY : BUTLER ASPHALT UNIT #3
PROCESS/RUN NUMBER :
SOURCE/RUN : 4
TEST DATE : 7/14/94

VOLUME METERED AT STD. CONDITIONS = 53.34892206901038 DSCF
VOLUME WATER COLLECTED AT STP. = 14.116293 SCF
PERCENT MOISTURE BY VOLUME = 20.92380938170937 %
MOLECULAR WEIGHT OF STACK GAS = 26.91346820649372 LB/LB-MOL
PERCENT EXCESS AIR = 597.9575382961568 %
AVERAGE STACK GAS VELOCITY = 81.3649731358387 FT/SEC
ABSOLUTE STACK PRESSURE = 29.23529411764706 IN. HG
STACK FLOW RATE AT ACTUAL COND. = 38041.16799099987 ACFM
STACK FLOW RATE AT STD. COND. = 22042.27254807073 DSCFM
STACK EMISSIONS = 3.894099298412566E-002 GR/DSCF
= 5.564667897431558E-006 LB/DSCF
STACK EMISSION RATE = 7.359475586081166 LB/HR
ISOKINETIC VARIATION = 96.01641589864043 %

✓
3.89
5.56
7.359
96.07

TIME OF TEST = 60 MIN
VOLUME METERED = 57.74 CU.FT
DRY GAS METER CALB. FACT. = 1.0058
TEST BAR. PRESSURE = 29.25 IN HG
AVERAGE DELTA H = 3.132
AVG. METER TEMP. = 106.1 DEG. F
VOL. H2O (IMPINGERS) = 271.9 ML
WEIGHT GAIN OF SILICA GEL = 28 GM
%CO2 = 3.5 %
%CO = 0 %
%O2 = 17.8 %
%N2 = 78.7 %
STATIC P OF STACK = -.2 IN. H2O
STACK TEMP. = 243.8 DEG. F
PITOT COEFFICIENT = .84
AVG. ROOT DELTA P = 1.198
STACK DIAMETER = 0 IN.
MASS PARTICULATE = 134.9 MG
NOZZLE DIAMETER = .245 IN

RW #1 scrubbed

PARTICULATE EMISSION TEST REVIEW SHEET

1. Facility Name: Cutler Asphalt #13
2. Run Number: 2 2 2
3. Test Date: July 14, 1994
4. Time of Test: 60 60 60 (min)
5. Volume Metered: 30.295 55.454 57.24 (ft³)
6. Dry Gas Meter Calb. Factor: 1.0058
7. Test Barometric Pressure: 29.25 (in. Hg)
8. Avg. Delta H: 0.819 2.978 3.132 (in. H₂O)
9. Avg. Meter Temp: 71.3 98.7 106.1 (Deg. F)
10. Volume H₂O (Impingers): 148.9 249.10 271.9 (ML)
11. Weight Gain of Silica Gel: 12.9 20.1 28.0 (GM)
12. % CO₂: 3.5 3.5 3.5
13. % CO: 0 0 0
14. % O₂: 17.5 17.5 12.8
15. % N₂: 79 79 28.7
16. Static Pressure of Stack: 0.22 -0.25 -0.2 (in. H₂O)
17. Stack Temp: 249.7 236.4 243.8 (Deg. F)
18. Pitot Coefficient: .84 .84
19. Avg. Root Delta P: 1.144 1.165 1.198
20. Stack Diameter: 33 x 34" (in.)
21. Mass Particulate: 91.9 132.3 134.9 (mg)
22. Nozzle Diameter: .173 .245 .245 (in.)

Coal Data

1. % Hydrogen: _____
2. % Carbon: _____
3. % Sulfur: _____
4. % Nitrogen: _____
5. % Oxygen: _____
6. F Factor: _____
7. Gross Calorific Value: _____

RECEIVED

OCT 06 1994

REGIONAL AIR POLLUTION
CONTROL AGENCY

**COMPLIANCE TEST REPORT
DETERMINATION OF
PARTICULATE EMISSION RATES
FROM THE ASPHALT PLANT
BUTLER ASPHALT
FAIRBORN, OHIO**

prepared for

Bowser Morner, Inc.
4518 Taylorsville Road
P.O. Box 51
Dayton, Ohio 45401-0051

prepared by:

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Written By:
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Project Manager
Emissions Measurements Division



Reviewed By:
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Environmental Engineer
Emissions Measurement Division

P.N. 850.002
August 3, 1994

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Executive Summary

Hayden Environmental Group, Inc. was retained by Bowser Morner, Inc. to determine the filterable particulate emission rate from the baghouse outlet at Butler Asphalt's Fairborn, Ohio plant. The evaluation was performed to demonstrate compliance with Ohio Environmental Protection Agency regulations restricting emissions from stationary sources. Emission samples were collected and analyzed using USEPA Reference Methods for stationary source sampling. The tests were conducted on July 14, 1994. The results of the tests are summarized below:

Summary of Particulate Emissions

Run No.	Emission Rate (lb/hr) ^a
2	8.89
3	7.36
4	7.36
Average	7.87

^a pounds per hour

1.0 Introduction

Hayden Environmental Group, Inc. (Hayden) was retained by Bowser Morner, Inc. (Bowser) to perform a filterable particulate emissions rate evaluation on the baghouse exhaust from Butler Asphalt's Fairborn, Ohio facility. Triplicate tests were run using USEPA Reference Methods 1, 2, 3, 4, and 5. Mr. Henry Butcher of Bowser coordinated the test schedules with plant operations. Mr. Jeff Adams and Ms. Sharon Kunselman of the Regional Air Pollution Control Agency (RAPCA) were on-site to verify process conditions and witness test procedures. The emission tests were performed by the Hayden test team of Mr. Bruce Sarven and Mr. Bert Forsyth. The emission samples were analyzed by Hayden Laboratories located in Miamisburg, Ohio.

2.0 Process Description

Butler operates a batch asphalt process at their Fairborn, Ohio plant. In this process raw aggregate is first screened and then fed into a #2 diesel fuel fired rotary kiln. In the kiln the aggregate is heated to approximately 325°F, mixed, and dried. The finished product is carried by a drag conveyor and loaded into either a 23 ton capacity hopper or a 100 ton capacity storage silo. The plant can produce a maximum of 120 tons per hour. Exhaust emissions from the kiln are ducted through a fabric filter baghouse. The exhaust gases from the baghouse are vented to the atmosphere.

The plant produced an average of 93.9 tons of asphalt per hour during the compliance test. The production rates for each test run are shown in Appendix A.

3.0 Sample Site Description

Emissions from the baghouse are vented through a vertical 33 inch by 34 inch rectangular stack. The sampling ports are located 60 inches or 1.79 equivalent diameters (Dia) from the closest downstream disturbance and 48 inches or 1.4 Dia from the closest upstream disturbance. A drawing of the sampling site is provided in Figure 3.1.

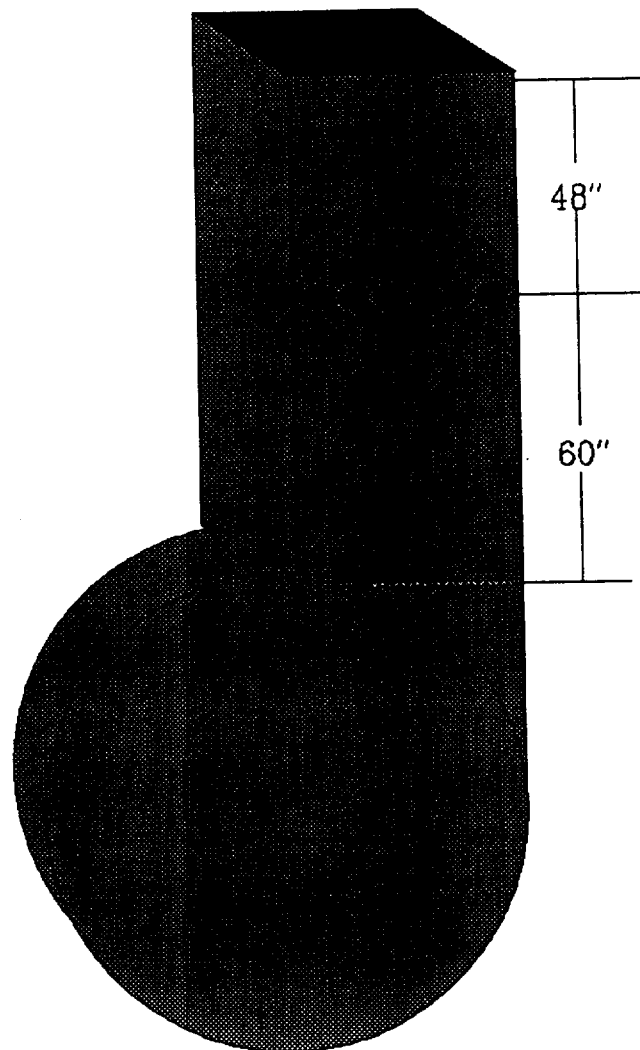
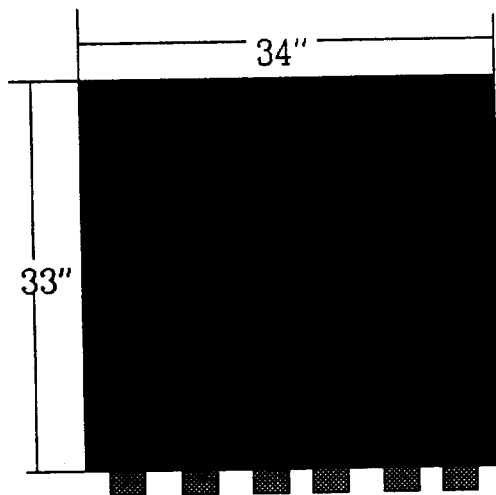


Figure 3.1 Baghouse Exhaust Sampling Site Detail

4.0 Sampling and Analytical Procedures

The sampling and analytical procedures conformed to the most recent revisions of USEPA Reference Methods for stationary sources. Specifically, USEPA Reference Methods 1, 2, 3, 4, and 5 were used. A brief description of each procedure is included below:

4.1 Measurement Sites (USEPA Method 1)

The location of measurement sites and the number of traverse points were determined using USEPA Reference Method 1, "Sample and Velocity Traverses for Stationary Sources."

4.2 Velocities and Volumetric Flow Rates (USEPA Method 2)

The stack gas velocity and volumetric flow rate were determined using USEPA Reference Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate." Stack gas velocities were measured on a 10" Dwyer oil manometer using a calibrated S-Type pitot tube. Stack gas temperatures were measured with a calibrated type "K" thermocouple and Omega digital temperature readout.

4.3 Dry Molecular Weight (USEPA Method 3)

The stack gas dry molecular weight was determined using USEPA Reference Method 3, "Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight." Several grab samples of the stack gas were collected and analyzed during each test with Fyrite combustion gas analyzers which directly measure concentrations of O₂ and CO₂.

4.4 Moisture (USEPA Method 4)

The stack gas moisture content was determined using USEPA Reference Method 4, "Determination of Moisture Content in Stack Gases." The samples were collected in a series of chilled impingers. The moisture collected within the impingers was analyzed by gravimetric analysis.

4.5 Particulate Matter (USEPA Method 5)

The particulate emissions were determined using USEPA Reference Method 5, "Determination of Particulate Emissions from Stationary Sources." The stack gas samples were collected isokinetically through a heated glass or stainless steel lined probe, a heated (248°±25°) tared glass fiber filter, and a series of cooled impingers (to condense the moisture). The acetone from each probe rinse was transferred to a tared beaker before being evaporated at a temperature below its boiling point. The filter and the residue from the probe rinse were analyzed by gravimetric analysis. A drawing of the sample train is included in Figure 4.1.

The Hayden Environmental Group Inc. Air Sampling Quality Assurance Program includes procedures for equipment calibration as per USEPA and manufacturers guidelines, use of and strict adherence to standard published procedures, and traceability protocols for the recording and calculation of data.

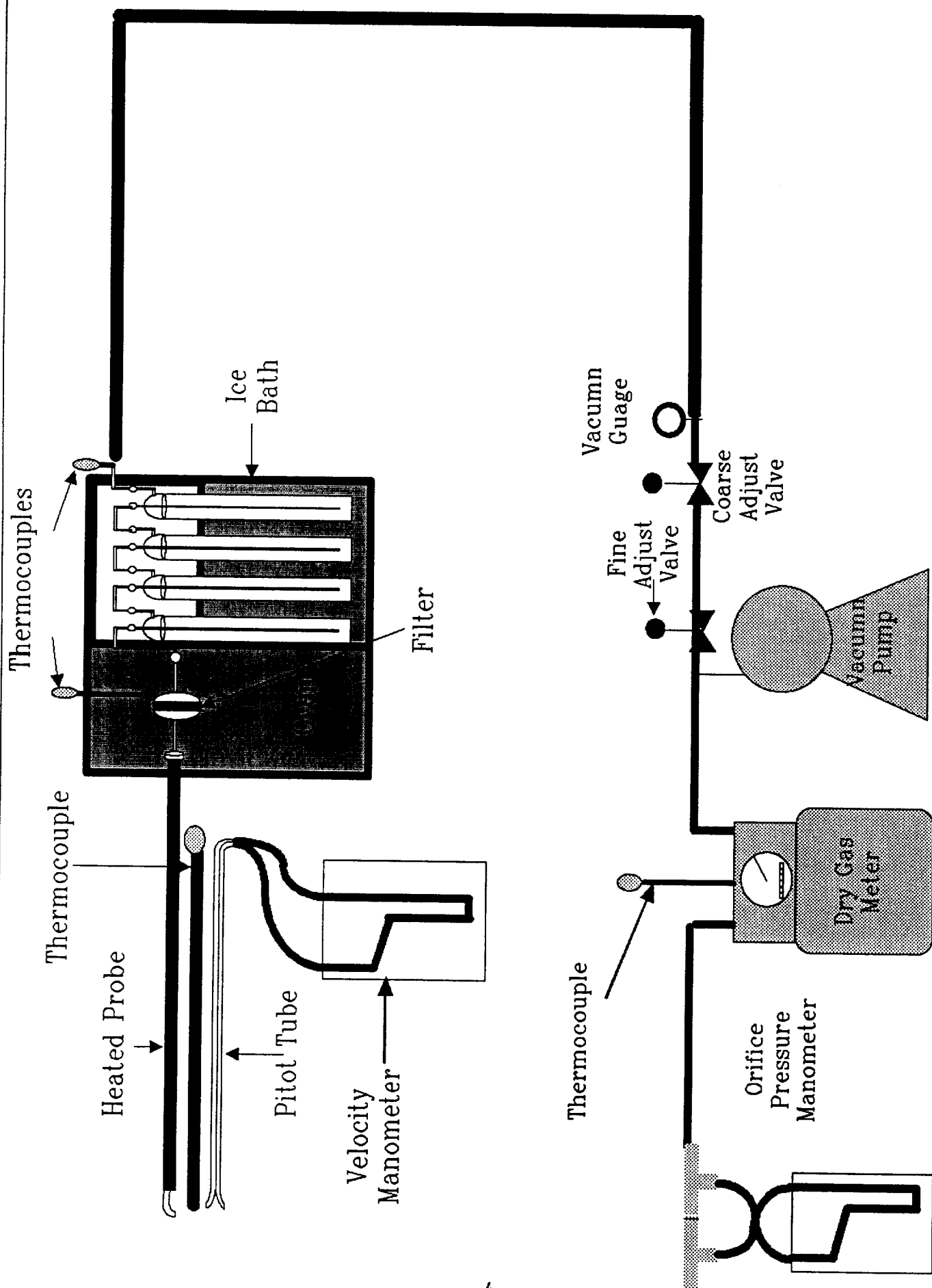


Figure 4.1 Particulate Sampling Train

5.0 Test Results

Table 5.1 summarizes the baghouse exhaust stack gas conditions. The stack gas velocity averaged 79.4 feet per second (fps). The volumetric flow rate averaged 37,086 actual cubic feet per minute (acfm) or 21,623 dry standard cubic feet per minute (dscfm) at 243°F and 20.5% moisture. The stack gas concentration of oxygen and carbon dioxide were 17.6% and 3.5%, respectively.

Table 4.3 summarizes the baghouse exhaust particulate emissions. The average stack gas particulate concentration was 4.25E-02 grains per dry standard cubic foot (gr/dscf) or 6.08E-06 pounds per dry standard cubic foot (lb/dscf). The particulate emission rate averaged 7.87 pounds per hour (lb/hr).

BUTLER ASPHALT

Table 5.1 Summary of the Baghouse Exhaust Stack Gas Conditions

Run No.	Time (7/14/94)	Velocity (fps) ^a	Flow Rate		Temp. (°F) ^d	Moisture (%)	Oxygen (%)	Carbon Dioxide (%)
			(acfm) ^b	(dscfm) ^c				
2	0911-1022	78.1	36,491	20,946	250	21.0	17.5	3.5
3	1153-1320	78.6	36,730	21,871	236	19.7	17.5	3.5
4	1507-1615	81.4	38,038	22,051	244	20.9	17.8	3.5
Averages		79.4	37,086	21,623	243	20.5	17.6	3.5

^a feet per second

^b actual cubic feet per minute

^c dry standard cubic feet per minute

^d degrees Fahrenheit

BUTLER ASPHALT

Table 5.2 Summary of the Baghouse Outlet Particulate Emissions

Run No.	Time (7/14/94)	Concentration		Emission Rate (lb/hr) ^c
		(gr/dscf) ^a	(lb/dscf) ^b	
2	0911-1022	4.95E-02	7.07E-06	8.89
3	1153-1320	3.92E-02	5.61E-06	7.36
4	1507-1615	3.89E-02	5.56E-06	7.36
Averages		4.25E-02	6.08E-06	7.87

^a grains per dry standard cubic foot

^b pounds per dry standard cubic foot

^c pounds per hour

6.0 Discussion and Interpretation

A pretest stack gas moisture test was performed which yielded results significantly lower than were obtained during the compliance test. As a result Test Run #1 did not meet the isokinetic sampling criteria specified in Method 1. Therefore the results from Test Run #1 were not reported and a fourth test run was performed.

BUTLER ASPHALT

Table A.1 Production Data

Run No.	Time (7/14/94)	Production (tons)	Production Time (minutes)	Production Rate (tons/hour)
2	0911-1022	102.5	71	86.6
3	1153-1320	109	70	93.4
4	1507-1615	115	68	101.5
Average				93.8

METHOD 1 TRAVERSE POINT LOCATION FOR RECTANGULAR DUCTS

Client: Rouse + morner/OUTlet PN: 850.002 Date: 6/22/94
 Source: BAGhouse Site: OUTlet Run: ALL
 Calculated By: B. Jorgensen

INSIDE DUCT DIMENSIONS: 33" X 34"

NIPPLE DEPTH: N/A

EQUIVALENT STACK DIAMETER: 33.49

NEAREST UPSTREAM DISTURBANCE: 4' = 48" (1.4 DIA)

NEAREST DOWNSTREAM DISTURBANCE: 5' = 60" (1.79 DIA)

NUMBER OF TRAVERSE POINTS: 24 Required - Using 30

MATRIX: 6 X 5

TRAVERSE POINT NUMBER	INSIDE OF NEAR WALL TO TRAVERSE PT.	NIPPLE DEPTH	TRAVERSE POINT LOCATION	PORT LOCATION	DISTANCE FROM EDGE OF STACK
1	3.3	N/A	3 5/16"	1	2.8
2	9.9		9 7/8"	2	8.4
3	16.5		16 1/2"	3	14.0
4	23.1		23 1/8"	4	19.6
5	29.7		29 11/16"	5	25.2
				6	30.8

EMISSION TESTING FIELD DATA

Client: Bowen Marine
 PN: 850.002
 Date: 7/14/94
 Source: BAGHOUSE
 Site: OUTLET
 Sample Type: M-S
 Run: 1
 Operators: BS, DF
 Barometric Pressure (Pb): 29.25
 Static Pressure (Pg): -0.19

Meter Box #: N-3
 Sample Box #: 1
 Filter #: 0420
 Probe Length/Type: 4' 60"
 Stack Thermocouple #: 4A
 Oven Thermocouple #: 0-1
 Impinger Thermocouple #: 2-3
 Pitot Tube #: 4A
 Stack I.D.: 33 x 34
 Record Data Every 2.0 Minutes

Meter ΔH@: 1.849
 Meter Y Factor: 10.34
 C Factor: 0.975
 Reference ΔP: 2.0
 Nozzle I.D.: — — — Avg. 0.178
 Pre-Test Leak Rate: 0.025 cfm @ 10 "Hg
 Post-Test Leak Rate: 0.025 cfm @ 2 "Hg
 Pitot Tube Leak Check: Pre: ✓ Post: —
 Orsat Train Leak Check: Pre: — Post: —
 Page 1 of 2

Traverse Point Number	Sampling Time (min)	Clock Time (hr)	Meter Reading (cu ft.)	Velocity Pressure ΔP ("H ₂ O)	Orifice Pressure ΔH@ ("H ₂ O)		Train Vacuum ("Hg)	Temperatures (°F)				
					Desired	Actual		Stack	Filter	Probe	IMP	Meter
A 1	0	0743	030.179	1.4	1.25	1.25	1.0	191	240	N/A	65	80 79
2	2		031.300	1.9	1.70	1.70	1.0	198	238		63	79 79
3	4		032.770	D.2	1.95	1.95	1.0	201	240		63	79 79
4	6		034.260	2.0	1.85	1.85	1.0	201	244		67	79 79
5	8		035.710	1.4	1.25	1.25	1.0	201	244		63	82 79
	10		036.958									
B 1	12		038.050	1.2	1.05	1.05	1.0	203	235		64	81 79
2	14		039.165	1.2	1.05	1.05	1.0	208	236		63	82 80
3	16		040.650	1.9	1.70	1.70	1.0	216	240		64	82 79
4	18		041.900	1.8	1.60	1.60	1.0	221	247		63	85 80
5	20		043.112	1.4	1.25	1.25	1.0	221	242		63	85 80
6												

EMISSION TESTING FIELD DATA

Client: LOWE'S Run #: 1Date: 7/14/97 Page 2 of 2

Traverse Point Number	Sampling Time (min)	Clock Time (hr)	Meter Reading (cu ft.)	Velocity Pressure ΔP ("H ₂ O)	Orifice Pressure $\Delta H @$ ("H ₂ O)		Train Vacuum ("Hg)	Temperatures (°F)				
					Desired	Actual		Stack	Filter	Probe	IMP	Meter
C1	20		947.17		1.05	1.05	1.0	219	239		64	84 80
2	22		044.220	1.2	1.30	1.30	1.0	224	240		64	84 80
3	24		045.295	1.5	1.50	1.50	1.0	226	245		63	86 81
4	26		046.540	1.7	1.25	1.25	1.0	226	240		63	86 80
5	28		047.895	1.4	1.05	1.05	1.0	229	243		63	87 81
6	30		048.985	1.2								
D1	32		050.040	1.0	0.90	0.90	1.0	237	279		63	86 81
2	34		051.190	1.3	1.15	1.15	1.0	242	273		63	86 81
3	36		052.310	1.5	1.30	1.30	1.0	247	242		63	86 81
4	38		053.500	1.0	0.90	0.90	1.0	249	247		65	88 82
5	40		054.554	1.1	0.96	0.96	1.0	247	241		66	87 82
E1	42		055.590	0.97	0.89	0.89	1.0	251	239		67	81 82
2	44		056.650	1.1	0.96	0.96	1.0	255	242		65	87 82
3	46		057.850	1.4	1.25	1.25	1.0	257	243		65	88 83
4	48		058.040	1.4	1.25	1.25	1.0	257	243		64	88 83
5	50		060.073	0.93	0.82	0.82	1.0	254	246		63	89 84
F1	52		060.155	0.73	0.64	0.64	1.0	253	238		64	87 83
2	54		061.885	0.82	0.72	0.72	1.0	255	240		63	87 84
3	56		062.920	1.0	0.90	0.90	1.0	254	247		63	87 83
4	58		064.015	1.1	0.96	0.96	1.0	252	245		64	89 84
5	60		065.050	0.96	0.89	0.89	1.0	252	243		65	89 84

SAMPLE RECOVERY DATA

Client: Bowser + Morner/Bath P.N.: 850.002 Date: 7-8-94
 Source: BAGHOUSE Site: OUTLET Run#: 1
 Sample Date: 7/13/94 Recovery Date: _____

Filter No: 0420 Glassware Set No: SM Sample Box No: 1

IMPINGER DATA

Gravimetric: X Volumetric: _____

	#1	#2	#3	#4	#5	Total
Contents	H ₂ O	H ₂ O	empty	silica gel.		
Final	686.6	500.4	428.0	734.1		
Initial	555.7g	480.5g	425.3g	723.3g		
Net	130.9	19.9	2.7	10.8		164.3 ✓

RECOVERED SAMPLE

Description of Particulate on Filter: _____

Color of Silica Gel: 100% BLUE

Recovered By: BI

METHOD 3 FYRITE DATA

Client: BOWSEA MANNEN PN: 850.000 Date: 7/14/94
Source: BAGHOUSE Site: OUTLET Run: 1
Operator: BF

	Oxygen (O2)	Carbon Dioxide (CO2)
Run 1	17.5	3.5
Run 2	17.5	3.5
Run 3	17.5	3.5
Average	17.5	3.5

EMISSION TESTING FIELD DATA

Client: BAUSEN MANAGER
 PN: 850.002
 Date: 7/11/94
 Source: BAUSEN
 Site: ORISKANY
 Sample Type: 4-5
 Run: 2
 Operators: BJ, BE
 Barometric Pressure (Pb): 30.25
 Static Pressure (Pg): -0.22

Meter Box #: N-2
 Sample Box #: 4
 Filter #: 7714
 Probe Length/Type: 4' 5101
 Stack Thermocouple #: 30
 Oven Thermocouple #: 0-4
 Impinger Thermocouple #: 0-2
 Pitot Tube #: 40
 Stack I.D.: 33 X 34
 Record Data Every 2 Minutes

Meter ΔH @: 1.790
 Meter Y Factor: 1.0058
 C Factor: 0.81
 Reference ΔP : 3.00
 Nozzle I.D.: — Avg. 0.173
 Pre-Test Leak Rate: 0.015 cfm @ 10 "Hg
 Post-Test Leak Rate: 0.01 cfm @ 3 "Hg
 Pitot Tube Leak Check: Pre: ✓ Post: ✓
 Orsat Train Leak Check: Pre: — Post: —
 Page 1 of 2

Traverse Point Number	Sampling Time (min)	Clock Time (hr)	Meter Reading (cu ft.)	Velocity Pressure ΔP ("H2O)	Orifice Pressure ΔH@ ("H2O)		Train Vacuum ("Hg)	Temperatures (°F)					
					Desired	Actual		Stack	Filter	Probe	IMP	Meter	
A 1	0	0911	038.261	0.97	0.60	0.62	2.0	265	244		64	87	88
2	2		039.185	1.60	0.98	0.98	2.0	265	244		69	87	87
3	4		040.260	2.00	1.25	1.25	2.0	261	240		67	87	87
4	6		041.460	1.80	1.10	1.10	2.0	255	239		68	87	88
5	8		042.645	1.70	0.80	0.80	2.0	250	239		69	88	88
	10		043.676	1.20									
				1.20									
B 1	12		044.660	1.20	0.74	0.74	2.0	253	241		65	91	90
2	14		045.720	1.50	0.93	0.93	2.0	253	240		65	89	89
3	16		046.910	1.90	1.20	1.20	2.0	254	238		66	90	89
4	18		048.055	1.60	0.98	0.98	2.0	253	240		67	90	89
5	20		049.077	1.30	0.80	0.80	2.0	249	239		68	91	90
				1.20									

EMISSION TESTING FIELD DATA

Client: Bowser Run #: 2 Date: 7/14/97 Page 2 of 2

Traverse Point Number	Sampling Time (min)	Clock Time (hr)	Meter Reading (cu ft.)	Velocity Pressure ΔP ("H ₂ O)	Orifice Pressure $\Delta H @$ ("H ₂ O)		Train Vacuum ("Hg)	Temperatures (°F)				
					Desired	Actual		Stack	Filter	Probe	IMP	Meter
	20		042.07		0.74	0.74	2.0	251	239		67	91 90
1	22		049.562	1.20	0.74	0.74	2.0	252	240		65	93 92
2	24		051.815	1.50	0.93	0.93	2.0	252	237		66	92 90
7	26		053.275	1.80	1.10	1.10	2.0	251	236		66	92 90
4	28		053.790	1.50	0.93	0.93	2.0	250	243		66	93 91
5	30		054.364	1.20	0.74	0.74	2.0					
				1.19								
1	32		055.275	1.05	0.64	0.64	2.0	250	241		68	93 91
2	34		056.230	1.20	0.74	0.74	2.0	251	238		69	93 91
3	36		057.405	1.60	0.98	0.98	2.0	252	235		69	97 91
4	38		058.490	1.60	0.98	0.98	2.0	252	240		68	94 91
5	40		059.527	1.30	0.80	0.80	2.0	249	240		67	95 93
				1.158								
1	42		060.851	0.94	0.58	0.58	2.0	244	237		67	94 91
2	44		061.281	1.20	0.74	0.74	2.0	242	241		65	94 91
3	46		062.250	1.40	0.86	0.86	2.0	243	240		64	95 93
4	48		063.450	1.50	0.93	0.93	2.0	241	234		65	94 92
5	50		064.285	0.95	0.58	0.58	2.0	233	237		65	94 92
				1.089								
1	52		064.965	0.64	0.37	0.37	2.0	237	240		67	93 92
2	54		065.800	1.20	0.74	0.74	2.0	247	239		67	94 93
3	56		066.880	1.20	0.74	0.74	2.0	249	239		67	94 93
4	58		067.765	0.93	0.58	0.58	2.0	248	240		67	94 93
5	60		068.556	0.80	0.48	0.48	2.0	241	240		68	95 93

SAMPLE RECOVERY DATA

Client: BOWEN MCMAN PN: 150.000
 Source: MAGNUS Site: 005.17
 Sample Date: _____ Recovery Date: _____

Date: 1-8-99
 Run#: 2

Filter No: 1114 Glassware Set No: _____ Sample Box No: 4

IMPINGER DATA

Gravimetric: ☒ Volumetric: _____

	#1	#2	#3	#4	#5	Total
Contents	H ₂ O	H ₂ O	empty	silica gel.		
Final	677.2	527.0	457.2	601.9		
Initial	554.4	501.3g	450.2g	589.0g		
Net	122.8	19.7	64	10.9		161.8

Mc.

RECOVERED SAMPLE

Description of Particulate on Filter: BROWN COATING

Color of Silica Gel: 90 TO BLUE

Recovered By: BL

METHOD 3 FYRITE DATA

Client: BOWSER MARRAS PN: 859.002 Date: 7/14/94
Source: BAGHOUSE Site: OUTLET Run: 2
Operator: BS

	Oxygen (O2)	Carbon Dioxide (CO2)
Run 1	17.5	3.5
Run 2	17.5	3.5
Run 3	17.5	3.5
Average	17.5	3.5

EMISSION TESTING FIELD DATA

Client: Bowser Manner
 PN: 850.002
 Date: 7/14/84
 Source: BAGHOUSE
 Site: OUTLET
 Sample Type: A-5
 Run: 3
 Operators: BS, JS
 Barometric Pressure (Pb): 29.25
 Static Pressure (Pg): -0.25

Meter Box #: N-2
 Sample Box #: 2
 Filter #: 7628
 Probe Length/Type: 4.5' 0.170-10
 Stack Thermocouple #: 4A
 Oven Thermocouple #: 0-2
 Impinger Thermocouple #: 0-2
 Pitot Tube #: 4A
 Stack I.D.: 33x34
 Record Data Every 2.0 Minutes

Meter ΔH@: 1.790
 Meter Y Factor: 1.0054
 C Factor: 0.81
 Reference ΔP: 0.84
 Nozzle I.D.: — — Avg. 0.245
 Pre-Test Leak Rate: 0.02 cfm@ 10 "Hg
 Post-Test Leak Rate: 0.02 cfm@ 5 "Hg
 Pitot Tube Leak Check: Pre: ✓ Post: —
 Orsat Train Leak Check: Pre: — Post: —
 Page 1 of 2

Traverse Point Number	Sampling Time (min)	Clock Time (hr)	Meter Reading (cu ft.)	Velocity Pressure ΔP ("H ₂ O)	Orifice Pressure ΔH@ ("H ₂ O)		Train Vacuum ("Hg)	Temperatures (°F)			
					Desired	Actual		Stack	Filter	Probe	Meter
A1	0	1153	068.904	1.1	2.20	2.20	1.0	240	253		67 97 95
2	2		070.330	1.5	3.20	3.20	1.0	243	250		60 95 95
3	4		071.305	2.1	4.60	4.60	1.0	243	248		59 96 96
4	6		074.575	1.7	3.70	3.70	1.0	242	258		59 97 96
5	8		076.690	1.3	2.85	2.85	1.0	241	249		63 98 97
	10		078.554	1.333							
B1	12		080.280	1.2	2.60	2.60	1.0	243	249		64 99 98
2	14	1201	081.778	1.5	3.20	3.20	1.0	244	251		65 100 98
3	16	1221	083.730	2.1	4.60	4.60	1.0	181	244		62 98 98
4	18		084.300	1.9	4.20	4.20	1.0	193	249		55 96 98
5	20		086.650	1.6	3.50	3.50	1.0	207	252		55 96 98
6			088.674	1.282							

EMISSION TESTING FIELD DATA

Client: Bowser Mamen Run #: 3 Date: 7/14/99 Page 2 of 2

Traverse Point Number	Sampling Time (min)	Clock Time (hr)	Meter Reading (cu ft.)	Velocity Pressure (H ₂ O) ΔP	Orifice Pressure ΔH@ (H ₂ O)		Train Vacuum (H _g)	Temperatures (°F)				
					Desired	Actual		Stack	Filter	Probe	IMP	Meter
1	20		088.671	1.2	2.60	2.60	1.0	244	240		60	96
2	22		090.420	1.6	3.50	3.50	1.0	221	244		58	96
3	24		092.400	1.9	4.20	4.20	1.0	225	247		59	96
4	26		094.630	1.5	3.20	3.20	1.0	229	253		59	96
5	28		096.550	1.1	2.20	2.20	1.0	230	250		60	97
6	30		098.217	1.133								
7	32		099.770	0.97	2.10	2.10	1.0	246	246		63	97
8	34		101.660	1.5	3.20	3.20	1.0	238	246		60	97
9	36		103.660	1.6	3.50	3.60	1.0	241	253		60	98
10	38		105.490	1.2	2.60	2.60	1.0	243	256		62	100
11	40		107.251	1.2	2.60	2.60	1.0	244	251		63	100
12	42		108.715	0.91	1.95	1.95	1.0	242	249		67	101
13	44		110.640	1.2	2.60	2.60	1.0	245	250		65	102
14	46		112.425	1.4	3.00	3.00	1.0	246	250		66	103
15	48		114.420	1.6	3.50	3.50	1.0	246	253		66	104
16	50		116.242	1.2	2.60	2.60	1.0	245	254		67	104
17	52		117.610	0.77	1.70	1.70	1.0	242	247		68	104
18	54		119.180	1.0	2.15	2.15	1.0	246	245		69	104
19	56		120.960	1.2	2.60	2.60	1.0	252	247		69	103
20	58		122.781	1.2	2.60	2.60	1.0	256	255		69	104
21	60		124.358	1.1	2.20	2.20	1.0	250	250		71	104

SAMPLE RECOVERY DATA

Client: Bowser Manner PN: 857.002 Date: 7/14/99
 Source: BAGHOUSE Site: OUTLET Run#: 3
 Sample Date: 7/14/99 Recovery Date: _____

Filter No: 7693 Glassware Set No: _____ Sample Box No: 2

IMPINGER DATA

Gravimetric: _____ Volumetric: _____

	#1	#2	#3	#4	#5	Total
Contents						
Final	676.8	589.4	434.9	738.7		
Initial	495.4	527.8	428.3	718.6		
Net	181.4	61.6	6.6	20.1		269.7 ✓

RECOVERED SAMPLE

Description of Particulate on Filter: _____

Color of Silica Gel: 90% blue

Recovered By: AI

METHOD 3 FYRITE DATA

Client: Bowser Mower PN: 850.002 Date: 7/14/97
Source: BABINE Site: outlet Run: 3
Operator: BF

	Oxygen (O2)	Carbon Dioxide (CO2)
Run 1	17.5	3.5
Run 2	17.5	3.5
Run 3	17.5	3.5
Average	17.5	3.5

EMISSION TESTING FIELD DATA

Client: Bowling Green
 PN: 850.002
 Date: 7/14/84
 Source: BA646K
 Site: Quincy
 Sample Type: M-5
 Run: 4
 Operators: BS, BF
 Barometric Pressure (Pb): 29.25
 Static Pressure (Pg): -0.20

Meter Box #: 12-2
 Sample Box #: 4
 Filter #: 0422
 Probe Length/Type: 6' glass
 Stack Thermocouple #: 3B
 Oven Thermocouple #: 0-4
 Impinger Thermocouple #: 0-2
 Pitot Tube #: 4A
 Stack I.D.: 33 x 34
 Record Data Every 2 Minutes

Meter AH@: 1.79
 Meter Y Factor: 1.0059
 C Factor: 0.81
 Reference ΔP: 1.84
 Nozzle I.D.: — Avg. 0.245
 Pre-Test Leak Rate: 1.006 cfm @ 10 "Hg
 Post-Test Leak Rate: 1.022 cfm @ 15 "Hg
 Pitot Tube Leak Check: Pre: ✓ Post: ✓
 Orsat Train Leak Check: Pre: — Post: —
 Page 1 of 2

Traverse Point Number	Sampling Time (min)	Clock Time (hr)	Meter Reading (cu ft.)	Velocity Pressure AP ("H2O)	Orifice Pressure ΔH@ ("H2O)		Train Vacuum ("Hg)	Temperatures (°F)			
					Desired	Actual		Stack	Filter	Probe	Meter
A 1	0	1507	124.405	0.85	1.90	1.90	7.0	220	242		66 101 101
2	2		125.920	0.40	3.00	3.00	10.0	223	238		60 100 101
3	4		127.710	2.10	4.60	4.60	15.0	227	239		60 101 101
4	6		129.960	2.00	4.30	4.30	12.0	230	238		64 100 101
5	8		132.290	2.00	4.30	4.30	7.0	232	238		67 102 102
	10		134.575								
B 1	12		136.230	1.10	2.20	2.20	3.0	233	239		68 102 102
2	14		138.150	1.40	3.00	3.00	4.0	236	237		66 104 103
3	16		140.280	1.90	4.20	4.20	5.0	238	231		68 104 102
4	18		142.570	1.90	4.20	4.20	5.0	239	240		69 105 102
5	20		144.508	1.50	3.20	3.20	4.0	244	240		71 105 104
6											

13.18.17.5 3.5

Client: Agway Run #: 4 EMISSION TESTING FIELD DATA

Date: 7/14/17 Page 2 of 2

Traverse Point Number	Sampling Time (min)	Clock Time (hr)	Meter Reading (cu ft.)	Velocity Pressure ("H ₂ O)	Orifice Pressure ΔH@ ("H ₂ O)		Train Vacuum ("Hg)	Temperatures (°F)				
					Desired	Actual		Stack	Filter	Probe	IMP	Meter
1	20		144.508		2.85		4.0	239	228		71	106 103
2	22		146.350	1.30	3.20	3.20	4.0	241	240		71	107 104
3	26		150.410	1.50	3.90	3.90	5.0	243	243		70	107 105
4	28		152.450	1.50	3.20	3.20	4.0	242	238		68	107 105
5	30		154.205	1.20	2.60	2.60	4.0	243	237		66	107 105
6	32		156.180	1.90	3.00	3.00	4.0	247	231		69	106 104
7	34		158.025	1.40	3.00	3.00	4.0	250	237		69	107 105
8	36		160.025	1.60	3.50	3.50	5.0	251	240		67	101 106
9	38		161.940	1.40	3.00	3.00	4.0	250	240		66	101 106
10	40		163.886	1.30	2.85	2.85	4.0	255	238		65	101 106
11	42		165.675	1.30	2.85	2.85	4.0	254	243		64	101 106
12	44		167.470	1.30	2.60	2.60	4.0	257	243		64	110 107
13	46		169.340	1.30	2.85	2.85	4.0	260	241		66	111 107
14	48		171.200	1.50	3.20	3.20	5.0	260	238		68	111 108
15	50		173.284	1.60	3.50	3.50	5.0	256	235		69	113 108
16												
17	52		174.865	0.88	1.90	1.90	3.0	251	244		68	113 108
18	54		176.460	1.10	2.20	2.20	3.0	252	244		69	112 109
19	56		178.340	1.70	2.85	2.85	5.0	247	247		69	113 110
20	58		180.554	1.40	3.00	3.00	5.0	247	239		71	113 110
21	60		182.154	1.40	3.00	3.00	5.0	249	241		71	117 110



57.746 / 1.198 ✓

3.132 ✓

1.743 ✓

106.1 ✓

METHOD 3 FYRITE DATA

Client: BOWSER MANNEN PN: 850.002 Date: 7/14/94
Source: GAGANSE Site: OUTLET Run: 4
Operator: AS

	Oxygen (O2)	Carbon Dioxide (CO2)
Run 1	18.0	3.5
Run 2	18.0	3.5
Run 3	17.5	3.5
Average	17.8 ✓	3.5

SAMPLE RECOVERY DATA

Client: Bowser Manner PN: 890.002 Date: 7/14/97
 Source: 1912 House Site: OUTLET Run#: 4
 Sample Date: _____ Recovery Date: _____

Filter No: 0479 Glassware Set No: _____ Sample Box No: _____

IMPINGER DATA

Gravimetric: _____ Volumetric: _____

	#1	#2	#3	#4	#5	Total
Contents						
Final	697.9	651.5	460.2	628.5		
Initial	525.5	558.6	455.6	600.5		
Net	174.4	92.9	4.6	28.0		299.9 ✓

RECOVERED SAMPLE

Description of Particulate on Filter: BROWN COATING HEAVY

Color of Silica Gel: 5090 BLUE

Recovered By: BJ

HAYDEN LABORATORIES

July 28, 1994

Mr. Henry Butcher
BOWSER MORNER
4518 Taylorsville Rd.
Dayton, OH 45401-0051

Subject: HEG Lab Task # 94070176
HEG Sample Number(s) 9409266 - 9409269

Project # : 850.002
Project Name: Bowser Morner

Dear Mr. Butcher:

We are pleased to submit the report of analysis for the sample(s) you recently submitted to our laboratory. This report contains results for samples you submitted on 7/15/94.

If you need additional information regarding these samples or if you have any questions regarding the results, please contact one of the persons listed below at 513/866-5908. We can provide additional report copies, method summaries or quality control data reports that you may require for full documentation of your samples. Please request pricing for these additional reports.

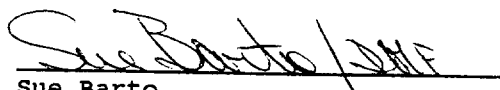
Thank you for choosing Hayden Laboratories for your environmental or industrial hygiene laboratory needs. We hope to continue to provide you with quality analytical services and support. If you have any comments on the services we have provided, we would appreciate hearing from you.

Sincerely,

HAYDEN LABORATORIES


Pamela S. Miller

Laboratory Director


Sue Barto
Client Services Manager

cc: Client File

LABORATORY ANALYSIS REPORT

Mr. Henry Butcher
BOWSER MORNER
4518 Taylorsville Rd.
Dayton, OH 45401-0051

Page 1
Report Date : 07/28/94
HEG Task # : 94070176
HEG P/N, Acct: 850.002

P.O. Number:
Proj Name: Bowser Morner

Date Received: 07/15/94
Proj #: 850.002

HEG Sample # : 9409266 Sample Date: 07/14/94 Sample Priority: Normal
Sample ID : Run 2

Parameter	Units	Results	Comments
EPA Method 5			
Acetone	mg	44.1	
Filter	mg	47.8	
Sample Volume Submitted	mL	150	

HEG Sample # : 9409267 Sample Date: 07/14/94 Sample Priority: Normal
Sample ID : Run 3

Parameter	Units	Results	Comments
EPA Method 5			
Acetone	mg	47.1	
Filter	mg	85.2	
Sample Volume Submitted	mL	165	

HEG Sample # : 9409268 Sample Date: 07/14/94 Sample Priority: Normal
Sample ID : Run 4

Parameter	Units	Results	Comments
EPA Method 5			
Acetone	mg	53.0	
Filter	mg	81.9	
Sample Volume Submitted	mL	225	

LABORATORY ANALYSIS REPORT

Mr. Henry Butcher
BOWSER MORNER
4518 Taylorsville Rd.
Dayton, OH 45401-0051

Page 2
Report Date : 07/28/94
HEG Task # : 94070176
HEG P/N, Acct: 850.002

=====

HEG Sample # : 9409269 Sample Date: 07/14/94 Sample Priority: Normal
Sample ID : Blank

Parameter	Units	Results	Comments
EPA Method 5			
Acetone	mg	Sample Correction	
Filter	mg	0.3	
Sample Volume Submitted	mL	265	

HEG / LIMS
Analysis Date Report
Report Date: 07/28/94

HEG Lab Task # 94070176
HEG Client: HAYDEN ENVIRONMENTAL GROUP, INC.

Date Received : 07/15/94 Date Reported: 07/28/94

Sample #: 9409266 Sample Date: 07/14/94
Sample ID: Run 2

Analysis Date	Analyst	Test Performed	Hold Time (Days)
07/28/94	rst	Sample Volume Submitted	
07/28/94	rst	EPA5-Particulate	28

Sample #: 9409267 Sample Date: 07/14/94
Sample ID: Run 3

Analysis Date	Analyst	Test Performed	Hold Time (Days)
07/28/94	rst	Sample Volume Submitted	
07/28/94	rst	EPA5-Particulate	28

Sample #: 9409268 Sample Date: 07/14/94
Sample ID: Run 4

Analysis Date	Analyst	Test Performed	Hold Time (Days)
07/28/94	rst	Sample Volume Submitted	
07/28/94	rst	EPA5-Particulate	28

Sample #: 9409269 Sample Date: 07/14/94
Sample ID: Blank

Analysis Date	Analyst	Test Performed	Hold Time (Days)
07/28/94	rst	Sample Volume Submitted	
07/28/94	rst	EPA5-Particulate	28

EXAMPLE CALCULATION RUN # 2

1. Volume Metered, Standard Conditions (68°F, 29.92 In Hg)

$$V_{mstd} = (17.647) \times (V_m) \times (Y) \times \frac{(P_b) + \frac{(\Delta H)}{(13.6)}}{(T_m + 460)}$$

$$V_{mstd} = (17.647) \times (30.295) \times (1.006) \times \frac{(29.25) + \frac{(0.82)}{(13.6)}}{(91.3 + 460)} = 28.588$$

2. Volume Water Vapor Collected, Standard Conditions

$$V_{wstd} = (0.04707) \times (V_{lc})$$

$$V_{wstd} = (0.04707) \times () = 7.616$$

3. Proportion Water Vapor, By Volume

$$B_{ws} = \frac{(V_{wstd})}{(V_{wstd} + V_{mstd})}$$

$$B_{ws} = \frac{(7.616)}{(7.616 + 28.588)} = 0.2104$$

4. Molecular Weight of Stack Gas, Dry Conditions

$$M_d = (0.44 \times CO_2) + (0.32 \times O_2) + (0.28 \times (N_2 + CO))$$

$$M_d = (0.44 \times 3.5) + (0.32 \times 17.5) + (0.28 \times 79.0) = 29.26$$

5. Molecular Weight of Stack Gas, Stack Conditions

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws})$$

$$M_s = 29.26 \times (1 - 0.2104) + (18 \times 0.2104) = 26.89$$

6. Stack Gas Velocity, fps

$$V_s = (85.49) \times (c_p) \times (\sqrt{\Delta p}) \times \sqrt{\frac{(T_s + 460)}{(P_s) \times (M_s)}}$$

$$V_s = (85.49) \times (0.84) \times (1.144) \times \sqrt{\frac{(249.7 + 460)}{(29.23) \times (26.89)}} = 78.06$$

7. Stack Gas Flow Rate, acfm

$$Q_a = (60) \times (V_s) \times (6.944E-03) \times (L) \times (W)$$

$$Q_a = (60) \times (78.06) \times (6.944E-03) \times (34) \times (33) = 36,491.4$$

8. Stack Gas Flow Rate, dscf

$$Q_{std} = (17.647) \times (Q_a) \times (1 - B_{ws}) \times \frac{(P_s)}{(T_s + 460)}$$

$$Q_{std} = (17.647) \times (36,491.4) \times (1 - 0.2104) \times \frac{(29.23)}{(249.7 + 460)} = 20,946.0$$

9. Isonkinetic Variation, %

$$\%I = 0.0944 \times \frac{(T_s + 460) \times (V_{std})}{(P_s) \times (V_s) \times (A_n) \times (\theta) \times (1 - B_{ws})}$$

$$\%I = 0.0944 \times \frac{(249.7 + 460) \times (30.295)}{(29.23) \times (78.06) \times (1.63E-04) \times (60) \times (1 - 0.2104)} = 108.64$$

10. Filterable Particulate Concentration, gr/dscf

$$C_{Filterable1} = \frac{(0.0154) \times (Mn)}{(V_{std})}$$

$$C_{Filterable1} = \frac{(0.0154) \times (91.9)}{(28.588)} = 4.95E-02$$

11. Filterable Particulate Concentration, lb/dscf

$$C_{Filterable2} = (1.429E-03) \times (C_{Filterable1})$$

$$C_{Filterable2} = (1.429E-03) \times (4.95E-02) = 7.07E-06$$

12. Filterable Particulate Emission Rate, lb/hr

$$ER_{Filterable} = (C_{Filterable2}) \times (Q_{std}) \times (60)$$

$$ER_{Filterable} = (7.07E-06) \times (20,946.0) \times (60) = 8.891$$

CLIENT/PROJECT #: Bowser Morner 850.002
 SAMPLE LOCATION: Butler Asphalt
 DATE/TIME: 7/14/94 0742-0751
 RUN #: 1

STATIC PRESSURE ("H2O):	-0.19	"HG	29.24
BAROMETRIC ("HG):	29.25		
SAMPLE TIME(min):	60.00	Vm(corr)	34.871
ACTUAL METER VOLUME:	34.871	DSCF	34.038
SQ. ROOT /\P:	1.140		
AVG ORIFICE /\H:	1.18		
AVG STACK TEMP °F:	231.6	°R	691.6
AVG METER TEMP °F:	83.1		
Cp PITOT :	0.84		
NOZZLE DIA.(inches):	0.178	An(ft^2)	1.73E-04
METER GAMMA:	1.024		
LEAK RATE(IF>0.02):			
CIRC STACK? 1=Y,0=N:	0	As(ft^2)	7.79
DIA OR DIM (inches):	1122.00		
% O2 :	17.50	DRY MOLE WT	29.26
% CO2 :	3.50	ST MOLE WT	27.18
VOL CONDENSATE(ml):	164.30	% H2O	18.51
FILTER GAIN(mg):			
RINSE GAIN(mg):		NET WT(mg)	0.00
ANALYTE #1 :			
MOLE WEIGHT:			
µg/sample :			
PPM :			

***** CALCULATED RESULTS *****

Gas Velocity (Vs):	76.38	FT/SEC
Stack Gas Flow (Qs):	35707.7	ACFM
:	21706.0	DSCFM
Stack Gas Temp :	232	Deg F
Moisture (H2O):	18.51	%
Isokinetic :	117.91	%

FILTERABLE PARTICULATE SUMMARY

Concentration (Cs):	NA	Gr/DSCF
:	NA	lb/DSCF
Emission Rate (Er):	NA	lb/hr
EMISSION DATA FOR	0	
Concentration (Cs):	NA	lb/DSCF
:	NA	PPM
Emission Rate (Er):	NA	lb/hr

COMMENTS:

HAYDEN

ENVIRONMENTAL GROUP, INC.

CLIENT/PROJECT #: Bowser Morner 850.002
 SAMPLE LOCATION: Butler Asphalt
 DATE/TIME: 7/14/94 0911-0922
 RUN #: 2

STATIC PRESSURE ("H2O):	-0.22	"HG	29.23
BAROMETRIC ("HG):	29.25		
SAMPLE TIME(min):	60.00	Vm(corr)	30.295
ACTUAL METER VOLUME:	30.295	DSCF	28.588
SQ. ROOT /Vp:	1.144		
AVG ORIFICE /Vh:	0.82		
AVG STACK TEMP °F:	249.7	°R	709.7
AVG METER TEMP °F:	91.3		
Cp PITOT :	0.84		
NOZZLE DIA. (inches):	0.173	An(ft^2)	1.63E-04
METER GAMMA:	1.006		
LEAK RATE (IF > 0.02):	0	As(ft^2)	7.79
CIRC STACK? 1=Y, 0=N:	0		
NOZZLE DIA. (inches):	1122.00		
% O2 :	17.50	DRY MOLE WT	29.26
% CO2 :	3.50	ST MOLE WT	26.89
VOL CONDENSATE(ml):	161.80	% H2O	21.04
FILTER GAIN(mg):	47.80		
RINSE GAIN(mg):	44.10	NET WT(mg)	91.90
ANALYTE #1 :			
MOLE WEIGHT:			
µg/sample :			
PPM :			

***** CALCULATED RESULTS *****

Stack Gas Temp (Tg):	78.06	FT/SEC
Stack Gas Flow (Qs):	36491.4	ACFM
:	20946.0	DSCFM
Stack Gas Temp :	250	Deg_F
Moisture (H2O):	21.04	%
Isokinetic :	108.64	%

FILTERABLE PARTICULATE SUMMARY

Concentration (Cs):	4.95E-02	Gr/DSCF
:	7.07E-06	lb/DSCF

Emission Rate (Er):	8.891	lb/hr
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EMISSION DATA FOR

Concentration (Cs):	NA	lb/DSCF
:	NA	PPM

Emission Rate (Er):	NA	lb/hr
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COMMENTS:

CLIENT/PROJECT #: Bowser Morner 850.002
SAMPLE LOCATION: Butler Asphalt
DATE/TIME: 7/14/94 1153-1320
RUN #: 3

STATIC PRESSURE("H2O):	-0.25	"HG	29.23
BAROMETRIC("HG):	29.25		
SAMPLE TIME(min):	60.00	Vm(corr)	55.454
ACTUAL METER VOLUME:	55.454	DSCF	51.920
SQ. ROOT /\P:	1.166		
AVG ORIFICE /\H:	3.01		
AVG STACK TEMP °F:	236.1	°R	696.1
AVG METER TEMP °F:	98.7		
Cp PITOT :	0.84		
NOZZLE DIA.(inches):	0.245	An(ft ²)	3.27E-04
METER GAMMA:	1.006		
LEAK RATE(IF>0.02):			
CIRC STACK? 1=Y,0=N:	0	As(ft ²)	7.79
DIA OR DIM (inches):	1122.00		
% O2 :	17.50	DRY MOLE WT	29.26
% CO2 :	3.50	ST MOLE WT	27.05
VOL CONDENSATE(ml):	269.70	% H2O	19.65
FILTER GAIN(mg):	85.20		
RINSE GAIN(mg):	47.10	NET WT(mg)	132.30
ANALYTE #1 :			
MOLE WEIGHT:			
µg/sample :			
PPM :			

***** CALCULATED RESULTS *****

Gas Velocity (Vs):	78.57	FT/SEC
Stack Gas Flow (Qs):	36729.8	ACFM
:	21871.3	DSCFM
Stack Gas Temp :	236	Deg F
Moisture (H2O):	19.65	%
Isokinetic :	94.22	%

FILTERABLE PARTICULATE SUMMARY

Concentration (Cs):	3.92E-02	Gr/DSCF
:	5.61E-06	lb/DSCF
Emission Rate (Er):	7.359	lb/hr
EMISSION DATA FOR	0	
Concentration (Cs):	NA	lb/DSCF
:	NA	PPM
Emission Rate (Er):	NA	lb/hr

COMMENTS:

CLIENT/PROJECT #: Bowser Morner 850.002
SAMPLE LOCATION: Butler Asphalt
DATE/TIME: 7/14/94 1507-1515
RUN #: 4

STATIC PRESSURE("H2O):	-0.20	"HG	29.24
BAROMETRIC("HG):	29.25		
SAMPLE TIME(min):	60.00	Vm(corr)	57.746
ACTUAL METER VOLUME:	57.746	DSCF	53.376
SQ. ROOT /\P:	1.198		
AVG ORIFICE /\H:	3.13		
AVG STACK TEMP °F:	243.8	°R	703.8
AVG METER TEMP °F:	106.1		
Cp PITOT :	0.84		
NOZZLE DIA.(inches):	0.245	An(ft^2)	3.27E-04
METER GAMMA:	1.006		
LEAK RATE(IF>0.02):			
CIRC STACK? 1=Y,0=N:	0	As(ft^2)	7.79
DIA OR DIM (inches):	1122.00		
% O2 :	17.80	DRY MOLE WT	29.27
% CO2 :	3.50	ST MOLE WT	26.91
VOL CONDENSATE(ml):	299.90	% H2O	20.92
FILTER GAIN(mg):	81.90		
RINSE GAIN(mg):	53.00	NET WT(mg)	134.90
ANALYTE #1 :			
MOLE WEIGHT:			
µg/sample :			
PPM :			

***** CALCULATED RESULTS *****

Gas Velocity (Vs):	81.36	FT/SEC
Stack Gas Flow (Qs):	38037.5	ACFM
	22051.2	DSCFM
Stack Gas Temp :	244	Deg F
Moisture (H2O):	20.92	%
Isokinetic :	96.07	%

FILTERABLE PARTICULATE SUMMARY

Concentration (Cs):	3.89E-02	Gr/DSCF
	5.56E-06	lb/DSCF

Emission Rate (Er):	7.359	lb/hr
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EMISSION DATA FOR 0

Concentration (Cs):	NA	lb/DSCF
	NA	PPM

Emission Rate (Er):	NA	lb/hr
---------------------	----	-------

COMMENTS:

HAYDEN

ENVIRONMENTAL GROUP, INC.

QUALITY ASSURANCE PROCEDURES AND RESULTS

The sampling equipment used in this test series has been calibrated in accordance with procedures outlined in the USEPA Reference Methods for stationary source sampling and also in the Quality Assurance Handbook for Air Pollution Measurement Systems. All pertinent calibration data for the equipment used in this test series are included in this appendix. The following calibration procedures are employed.

a. **Probe-tips (Nozzles)**

Probe-tips are inspected before use to detect damage or irregularities. If the nozzle shows signs of damage, it is repaired and measured before use. The nozzle diameter is determined in the field by measuring three diameters with a precision micrometer. The average of the three measurements is the nozzle diameter.

b. **Pitot Tubes**

The S-type pitot tubes are built to the design specifications cited in Reference Method 2 and are calibrated annually in a wind tunnel. Standard pitot tubes are supplied from the manufacturer with a coefficient of 0.99. The pitot tubes, connecting lines, and manometers are leak-checked in the field before and after each test run.

c. **Thermocouples**

Thermocouples are calibrated upon receipt and annually thereafter. The thermocouples are calibrated at 32°F, ambient temperature, 212°F, and approximately 450°F.

d. **Fyrite Analyzers**

The fyrite analyzers are leak-checked on-site and the reagents are replenished as needed.

e. **Method 5 Control Consoles**

The dry gas meter and the orifice in the Method 5 control consoles are calibrated at six (6) points from 0 to 4 inches of mercury. The dry gas meter coefficient (y-factor) and the orifice constant (Delta H) are established from this calibration. The dry gas meter is calibrated after each test series to confirm the y-factors is used in all sample volume calculations. Hayden Environmental participates in the USEPA Method 5 Dry Gas Meter Inter-Laboratory Performance Audit.

f. **Barometers**

The aneroid field barometers are calibrated with a stationary mercury column barometer prior to each use. The reference barometer is permanently mounted in the Hayden Environmental Laboratory.

Meter Post Test Calibration

Client Butler P.N. 850.002 Date 7/26/94
 Ref. Meter 1334637 Yr 0.9996 Pb 29.25
 Meter Box N-3 Pre Test Yb 1.024 Δ H 1.18
 Vacuum 11.0 Calib. Time 10

Performed By: *Bert Forsyth (BS)*

Run #	Vr(f-i)	Tr(avg)	Pa(ref)	Vd(f-i)	Td(avg)	γ
1	6.050	80.0	29.25	6.016	93.0	1.026
2	6.024	80.0	29.250	6.008	93.0	1.023
3	6.033	80.0	29.25	6.009	93.3	1.025
Average Y						1.025

$$Y - Y_r * \frac{(V_r) * (T_d + 460) * (Pb)}{(V_d) * (T_r + 460) * (Pb + \frac{\Delta H}{13.6})}$$

DGM/ORIFICE CALIBRATION

DATE 3/21/94

BAROMETRIC PRESSURE 28.85 in. Hg

CALIBRATOR B. Forgh

METER BOX NO. N-3

REFERENCE METER NO. 1334637

REFERENCE Y 0.9996

ORIFICE SETTING in. H ₂ O	REFERENCE METER		DRY GAS METER			TIME Θ min.	VACUUM
	GAS VOLUME V _R ft ³	TEMP. T _R °F	GAS VOLUME V _D ft ³	IN TEMP T _i °F	OUT TEMP T _o °F		
0.5	722.051	67°	557.228	74°	71°	10	5
	718.022	67°	553.261	74°	71°		
	4.029	67°	3.967	72.5°			
1.0	729.288	67°	564.373	75	72	10	5
	723.669	67°	558.822	74	71		
	5.619	67°	5.551	73°			
1.5	741.531	68°	576.432	79	74	10	5
	734.751	68°	569.758	77	73		
	6.780	68°	6.674	75.75			
2.0	752.126	70°	586.868	81	75	10	5
	744.361	69°	579.210	80	74		
	7.765	69.5°	7.658	77.5			
3.0	763.636	71°	598.198	81	76	10	5
	754.031	70°	588.734	80	75		
	9.605	70.5	9.424	78°			
4.0	778.542	72°	612.684	80	76	10	5
	767.449	72°	601.857	78	75		
	11.093	72°	10.827	77.25			

orifice leak check ✓
 Inlet leak check ✓
 B. Forgh

	N-3	N-3	N-3
Meter Box #	3/21/94	3/21/94	3/21/94
Date	1334637	1334637	1334637
Reference Meter #	0.9996	0.9996	0.9996
Y Reference	28.85	28.85	28.85
Barometric Pressure	0.5	1	1.5
Orifice Setting ^ H (" H2O)	4.029	5.619	6.78
Total Gas Volume Reference	67	67	68
Average Temperature Reference	3.967	5.551	6.674
Total Gas Volume Dry Gas Meter	72.5	73	75.75
Average Temperature Dry Gas Meter	10	10	10
Time (min)	5	5	5
Vacumn			

***** Calculations *****

Meter Box Y	1.0245	1.0208	1.0265
Meter Box ^ H ₀	1.765	1.813	1.866

	N-3	N-3	N-3
Meter Box #	3/21/94	3/21/94	3/21/94
Date	1334637	1334637	1334637
Reference Meter #	0.9996	0.9996	0.9996
Y Reference	28.85	28.85	28.85
Barometric Pressure	2	3	4
Orifice Setting ^ H (" H2O)	7.765	9.605	11.093
Total Gas Volume Reference	69.5	70.5	72
Average Temperature Reference	7.658	9.424	10.827
Total Gas Volume Dry Gas Meter	77.5	78	77.25
Average Temperature Dry Gas Meter	10	10	10
Time (min)	5	5	5
Vacumn			

***** Calculations *****

Meter Box Y	1.0237	1.0254	1.0238
Meter Box ^ H ₀	1.901	1.869	1.882

Average y	1.0241
Average delta H	1.84935

Meter Box Field Check

Meter Box #: N-3 Date: 3/21/94 Barometric: 28.85
 Y: 1.024 Calibrator: B. Forster
 delta H: 1.8494 Leak Check: B. Forster

Run No.	Initial Volume	Final Volume	Net Volume	Initial Temp.	Final Temp.	Avg. Temp.	Y _c Comparison
1	619.635	627.043	7.408	74/72	78/73	74.25	1.0375
2	627.043	634.463	7.420	78/73	80/74	76.25	1.0378
3	634.463	641.911	7.448	80/74	81/75	77.5	1.0351

$$Y_c = \frac{10}{V_m} \times \sqrt{\frac{(0.0319) \times (T_m)}{(P_b)}}$$

Compare with Y_c
 0.97 * Y < Y_c < 1.03 * Y
 0.97 * Y = 0.9933
 1.03 * Y = 1.0547

THERMOCOUPLE CALIBRATION

THERMOCOUPLE I.D.: 3A LENGTH: 3' DATE: 5/2/94

CALIBRATED BY: Betty H. Foyt

REFERENCE THERMOMETER: 402 947 452

Source	Reference Thermometer Temperature °F	Test Thermocouple Temperature °F	Temperature Difference °F	Thermocouple Simulator	
				Display	Setting
HOT OIL	420.0	420.7	0.7°	399.0°	400°
BOILING H ₂ O	208.2	208.7	0.5°	201.5°	200°
AM. AIR	51.4	51.8	0.4°	99.1°	100°
ICE BATH	28.5	28.4	0.1°	99.7°	100°

THERMOCOUPLE CALIBRATION

THERMOCOUPLE I.D.: 4A LENGTH: 4' DATE: 6/20/94
 CALIBRATED BY: D. Michelle Conroy 6/23/94
 REFERENCE THERMOMETER: 402 947452

Source	Reference Thermometer Temperature	Test Thermocouple Temperature	Temperature Difference	Thermocouple Simulator	
	°R	°R	°R	Display	Setting
Amb. Air	535.9	532.0	3.9 0.7%	552.1	560
Ice H ₂ O	490.0	487.6	2.4 0.5%	558.6	560
Boil H ₂ O	608.9	610.0	1.1 0.16%	759.4	760
Hot oil.	924.1	924.3	0.2 0.04%	959.1	960

THERMOCOUPLE CALIBRATION

THERMOCOUPLE I.D.: 40 LENGTH: 4' DATE: 5/2/94
 CALIBRATED BY: Ben Forgy
 REFERENCE THERMOMETER: 402947452

Source	Reference Thermometer Temperature °F	Test Thermocouple Temperature °F	Temperature Difference °F	Thermocouple Simulator	
				Display	Setting
HOT OIL	428.9°F	430.7°	1.8°	497.3°	500°
Boil-H ₂ O	209.3°F	208.2	1.1°	201.0°	200°
AMBIENT AIR	51.6°F	51.7°	0.1°	98.6°	100°
ICE BATH	28.4°F	28.4°	0.0°	98.7°	100°

(see note below)

THERMOCOUPLE CALIBRATION

THERMOCOUPLE I.D.: 4C LENGTH: 4 DATE: 6/20/94

CALIBRATED BY: B. Michelle Connery 6/23/94

REFERENCE THERMOMETER: 402 941 952

Source	Reference Thermometer Temperature	Test Thermocouple Temperature	Temperature Difference	Thermocouple Simulator	
	°C <u>R</u>	°C <u>R</u>	°C <u>R</u>	Display	Setting
Amb. Air	535.1	534.6	1.1 0.22	558.6	560.
Ice H ₂ O	491.8	490.3	2.5 0.57	558.6	560.
Boil H ₂ O	609.9	605.9	43 6.42	759.4	760
Hot oil					

* Note! loose connection found; needs repair... MK.

THERMOCOUPLE CALIBRATION

Thermocouple I.D.: OV-1 Length: OVEN Therm. Date: 8/19/93

Calibrated By: Bert G. Foyt

Reference Thermometer: 1248

Source	Reference Thermometer Temperature °F	Test Thermocouple Temperature °F	Temperature Difference °F
AM. AIR	24.7	24.6	0.1
ICE BATH	6.5	6 5.7	0.8
Boiling H ₂ O	100.0	99.0	1.0
HOT OIL	172.0	172.9	0.9

THERMOCOUPLE CALIBRATION

Thermocouple I.D.: OV-2 Length: OVEN Therm. Date: 8/19/93

Calibrated By: Det. G. Foy

Reference Thermometer: 1248

Source	Reference Thermometer Temperature °F	Test Thermocouple Temperature °F	Temperature Difference °F
AM. AIR	25.0	24.7	0.3
ICE BATH	9.0	7.9	1.1
Boiling H ₂ O	100.0	99.0	1.0
HOT OIL	165.5	166.7	1.2

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THERMOCOUPLE CALIBRATION

Thermocouple I.D.: OV-3 Length: OVEN THERM Date: 8/19/93

Calibrated By: Bert G. Forysth

Reference Thermometer: 1248

Source	Reference Thermometer Temperature °F	Test Thermocouple Temperature °F	Temperature Difference °F
AM. AIR	25.0	25.0	0.0
ICE WATER	8.0	7.7	0.3
BOILING H ₂ O	100.0	99.1	0.9
HOT OIL	175.5	176.2	0.7

THERMOCOUPLE CALIBRATION

Thermocouple I.D.: OV-4 Length: OVER Therm. Date: 8/19/93

Calibrated By: Bert H. Foyt

Reference Thermometer: 1248

Source	Reference Thermometer Temperature °F	Test Thermocouple Temperature °F	Temperature Difference °F
AM. AIR	25.0	25.1	0.1
ICE BATH	7.0	5.7	1.3
BOILING H ₂ O	100.0	99.1	0.9
HOT OIL	167.5	168.4	0.9

THERMOCOUPLE CALIBRATION

Thermocouple I.D.: 440 Length: Emp. Lead Date: 8/19/93

Calibrated By: Betty Jorgensen

Reference Thermometer: 1248

Source	Reference Thermometer Temperature °F	Test Thermocouple Temperature °F	Temperature Difference °F
AM AIR	24.7	24.1	0.6
ICE BATH	6.0	5.3	0.7
BOILING H ₂ O	100.0	98.7	1.3
HOT OIL	161.0	158.0	3.0