

Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources*. AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

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APPENDIX K/ST
OEPA Stack Test Review Summary Form

25

COMPANY NAME Barnett Paving Materials Inc #143
COUNTY STELBY Co DATE SENT _____
PREMISE/ SOURCE NO. 0255140379 PM1 SCC CODE _____
SOURCE DESCRIPTION PORTABLE ASPHALT PLANT

CONTROL EQUIPMENT Venturi wet scrubber

MONITORING EQUIPMENT (CEM) _____

TEST FIRM Hayden Labs DATE(S) OF TEST 8/1/94

FINAL TEST REPORT RECEIVED ON 9/13/94

POLLUTANT(S) TESTED PM, LEAD

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

EMISSION RATES*: PM / LEAD
ACTUAL** 11.1 / 0.0328

OPERATING RATES*: 300 T/HR
MAXIMUM** 294.1 T/HR

ALLOWABLE** 16.5 / 0.35

DURING TEST PERIOD** 292.7 T/HR

TEST RESULTS: PASSED or FAILED or RETEST

WERE ALL THE RUNS WITNESSED BY THE OEPA/ LOCAL INSPECTOR(S) YES or NO * NO

COMMENTS: PLANT #143 FAILED THE PM PORTION OF
THEIR TEST

OEPA
SWDD

witnessed the test

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

9/26/94
Date of Review

Reviewed by

* Based on three run averages
** Specify applicable units

7/22/93

* #/HR
□ gm/DSCF

PARTICULATE EMISSION TEST REVIEW SHEET

1. Facility Name: C. J. Smith & Son, Inc. - 1001-12, 1001-13, 1001-14
2. Run Number: 3
3. Test Date: 2/1/74
4. Time of Test: 10:5 10:5 (min)
5. Volume Metered: 32.712 33.787 32.24 (ft³)
6. Dry Gas Meter Calb. Factor: 1.0308
7. Test Barometric Pressure: 29.9 29.9 29.4 (in. Hg)
8. Avg. Delta H: 2.748 1.77 1.08 (in. H₂O)
9. Avg. Meter Temp: 66.6 92.1 74.52 (Deg. F)
10. Volume H₂O (Impingers): 225.4 244.7 244.1 (ML)
11. Weight Gain of Silica Gel: 4.4 8.1 12.4 (GM)
12. % CO₂: 7.0 8.2 8.3
13. % CO: 0 0 0
14. % O₂: 11.2 11.0 10.7
15. % N₂: 22.3 21.0 21.1
16. Static Pressure of Stack: -0.26 -0.15 -0.15 (in. H₂O)
17. Stack Temp: 169.3 79.8 80 (Deg. F)
18. Pitot Coefficient: 0.84
19. Avg. Root Delta P: 2.42 4.73 4.18
20. Stack Diameter: 16.0 x 16.0 (in.)
21. Mass Particulate: 91.7 152.05 82 (mg)
22. Nozzle Diameter: 0.25 0.318 0.28 (in.)

Coal Data

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

PARTICULATE EMISSION TEST DATA

FACILITY :BARRETT PAVING - SIDNEY
PROCESS/RUN NUMBER :
SOURCE/RUN :2
TEST DATE :8/1/94

VOLUME METERED AT STD. CONDITIONS = 32.88501461145177 DSCF
VOLUME WATER COLLECTED AT STP. = 11.899296 SCF
PERCENT MOISTURE BY VOLUME = 26.5702337214436 %
MOLECULAR WEIGHT OF STACK GAS = 28.66200206364639 LB/LB-MOL
PERCENT EXCESS AIR =-100 %
AVERAGE STACK GAS VELOCITY = 26.09459341553416 FT/SEC
ABSOLUTE STACK PRESSURE = 29.43897058823529 IN. HG
STACK FLOW RATE AT ACTUAL COND. = 39145.0214745111 ACFM
STACK FLOW RATE AT STD. COND. = 23330.5859484974 DSCFM
STACK EMISSIONS = 7.12047729844882E-002 GR/DSCF
= 1.017516205948336E-005 LB/DSCF
STACK EMISSION RATE = 14.24354957811999 LB/HR
ISOKINETIC VARIATION = 108.9848244723108 %

✓
7.12
1.02
14.77
105.14%

TIME OF TEST = 62.5 MIN
VOLUME METERED = 33.787 CU.FT
DRY GAS METER CALB. FACT. = 1.0328
TEST BAR. PRESSURE = 29.45 IN HG
AVERAGE DELTA H = .978
AVG. METER TEMP. = 92.59999999999999 DEG. F
VOL. H2O (IMPINGERS) = 244.7 ML
WEIGHT GAIN OF SILICA GEL = 8.1 GM
%CO2 = 8 %
%CO = 11 %
%O2 = 81 %
%N2 = 0 %
STATIC P OF STACK =-.15 IN. H2O
STACK TEMP. = 179.8 DEG. F
PITOT COEFFICIENT = .84
AVG. ROOT DELTA P = .4173
STACK DIAMETER = 0 IN.
MASS PARTICULATE = 152.05 MG
NOZZLE DIAMETER = .308 IN

PARTICULATE EMISSION TEST DATA

FACILITY :BARRETT PAVING - SIDNEY
PROCESS/RUN NUMBER :
SOURCE/RUN :1
TEST DATE :8/1/94

VOLUME METERED AT STD. CONDITIONS = 32.13128406994915 DSCF
VOLUME WATER COLLECTED AT STP. = 10.957896 SCF
PERCENT MOISTURE BY VOLUME = 25.43073686296982 %
MOLECULAR WEIGHT OF STACK GAS = 26.76039703333831 LB/LB-MOL
PERCENT EXCESS AIR = 123.1682668014148 %
AVERAGE STACK GAS VELOCITY = 28.01117100785267 FT/SEC
ABSOLUTE STACK PRESSURE = 29.38088235294117 IN. HG
STACK FLOW RATE AT ACTUAL COND. = 42020.11785229995 ACFM
STACK FLOW RATE AT STD. COND. = 25806.12525890421 DSCFM
STACK EMISSIONS = 4.634673163880055E-002 GR/DSCF
= 6.622947951184599E-006 LB/DSCF
STACK EMISSION RATE = 10.25475746468837 LB/HR
ISOKINETIC VARIATION = 98.1746808194104 %

✓
4.63
6.62
10.3
97.8%

TIME OF TEST = 62.5 MIN
VOLUME METERED = 32.712 CU.FT
DRY GAS METER CALB. FACT. = 1.0328
TEST BAR. PRESSURE = 29.4 IN HG
AVERAGE DELTA H = .948
AVG. METER TEMP. = 86.59999999999999 DEG. F
VOL. H2O (IMPINGERS) = 225.4 ML
WEIGHT GAIN OF SILICA GEL = 7.4 GM
%CO2 = 8 %
%CO = 0 %
%O2 = 11.7 %
%N2 = 80.3 %
STATIC P OF STACK = -.26 IN. H2O
STACK TEMP. = 169.3 DEG. F
PITOT COEFFICIENT = .84
AVG. ROOT DELTA P = .436
STACK DIAMETER = 0 IN.
MASS PARTICULATE = 96.7 MG
NOZZLE DIAMETER = .305 IN

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PARTICULATE EMISSION TEST DATA

FACILITY :BARRETT PAVING - SIDNEY
 PROCESS/RUN NUMBER :
 SOURCE/RUN :3
 TEST DATE :8/1/94

VOLUME METERED AT STD. CONDITIONS = 32.03795329641448 DSCF

VOLUME WATER COLLECTED AT STP. = 12.073455 SCF
 PERCENT MOISTURE BY VOLUME = 27.37036849712497 %

MOLECULAR WEIGHT OF STACK GAS = 26.53833947947799 LB/LB-MOL
 PERCENT EXCESS AIR = 100.1497566454511 %

AVERAGE STACK GAS VELOCITY = 27.18969489219953 FT/SEC
 ABSOLUTE STACK PRESSURE = 29.44897058823529 IN. HG

STACK FLOW RATE AT ACTUAL COND. = 40787.80510168636 ACFM
 STACK FLOW RATE AT STD. COND. = 24045.4495635721 DSCFM

STACK EMISSIONS = 3.941575132208355E-002 GR/DSCF
 = 5.63251086392574E-006 LB/DSCF

STACK EMISSION RATE = 8.126175353687897 LB/HR

ISOKINETIC VARIATION = 103.0211332099481 %

✓
 3.94
 5.63
 8.21
 102.3

TIME OF TEST = 62.5 MIN
 VOLUME METERED = 33.024 CU.FT
 DRY GAS METER CALB. FACT. = 1.0328
 TEST BAR. PRESSURE = 29.46 IN HG
 AVERAGE DELTA H = .928
 AVG. METER TEMP. = 94.52 DEG. F
 VOL. H2O (IMPINGERS) = 244.1 ML
 WEIGHT GAIN OF SILICA GEL = 12.4 GM
 %CO2 = 8.300000000000001 %
 %CO = 0 %
 %O2 = 10.7 %
 %N2 = 81 %
 STATIC P OF STACK = -.15 IN. H2O
 STACK TEMP. = 180 DEG. F
 PITOT COEFFICIENT = .84
 AVG. ROOT DELTA P = .4184
 STACK DIAMETER = 0 IN.
 MASS PARTICULATE = 82 MG
 NOZZLE DIAMETER = .308 IN

VISIBLE EMISSION OBSERVATION FORM

Form #2
No. Run #2

COMPANY NAME Barrett Paving Materials #143	
STREET ADDRESS 4711 Hardin Wapak Road	
CITY Sidney	STATE Ohio
ZIP 45265	
PHONE (KEY CONTACT) 492-8503	SOURCE ID NUMBER 0855140379P001

PROCESS EQUIPMENT Portable Asphalt Concrete P.	OPERATING MODE
CONTROL EQUIPMENT Venturi Wet Scrubber	OPERATING MODE # AP=0.20 H₂O

DESCRIBE EMISSION POINT Square Opening in steel stack	
HEIGHT ABOVE GROUND LEVEL 45 feet	HEIGHT RELATIVE TO OBSERVER Start 37' End 37'
DISTANCE FROM OBSERVER Start 100' End 100'	DIRECTION FROM OBSERVER Start West End West

DESCRIBE EMISSIONS Start Lt. Gray / Brown particulate w/ steam	
EMISSION COLOR Start Lt. Gray / Brown	IF WATER DROPLET PLUME Attached ☒ Detached ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED Start 1/2 stack diameter from opening in stack	

DESCRIBE PLUME BACKGROUND Start Sky End Sky	
BACKGROUND COLOR Start Blue End Blue	SKY CONDITIONS Start Clear End Clear
WIND SPEED Start 0-5 End 0-5	WIND DIRECTION Start West End SW
AMBIENT TEMP Start End	WET BULB TEMP RH. percent

Stack with Plume Sun Wind	SOURCE LAYOUT SKETCH Draw North Arrow

ADDITIONAL INFORMATION Using virgin raw material
--

OBSERVATION DATE 8/1/94				START TIME 10:45	END TIME 11:15
SEC	0	15	30	45	COMMENTS
1	15	15	15	10	
2	15	20	20	20	
3	20	15	15	20	
4	20	15	15	15	
5	10	15	15	10	
6	20	10	10	10	
7	15	15	15	20	
8	15	20	15	10	
9	15	20	20	15	
10	20	20	20	15	
11	20	20	15	15	
12	20	20	15	20	
13	20	20	20	20	
14	20	20	20	20	
15	20	20	20	20	
16	20	20	15	20	
17	15	15	20	15	
18	10	15	15	15	
19	20	20	15	15	
20	20	15	15	20	
21	20	20	20	20	
22	20	15	15	15	
23	15	15	20	20	
24	15	15	20	15	
25	15	20	20	15	
26	20	20	20	15	
27	15	20	15	15	
28	15	20	20	20	
29	20	15	20	20	
30	20	20	20	20	

OBSERVER'S NAME (PRINT) S. MARK HINES	
OBSERVER'S SIGNATURE S. Mark Hines	DATE 8/1/94
ORGANIZATION OEPA / SWDO / DAPC	
CERTIFIED BY	DATE
CONTINUED ON VEO FORM NUMBER	

BARRETT PAVING #143

VISIBLE EMISSION OBSERVATION FORM

No. Run #2

COMPANY NAME Barrett Paving Materials #143		
STREET ADDRESS 4711 Hardin-Wopale Road		
CITY Sidney	STATE Ohio	ZIP 45265
PHONE (KEY CONTACT) 492-8503	SOURCE ID NUMBER 0855140379P001	

PROCESS EQUIPMENT Portable Hapach Concrete PT.	OPERATING MODE
CONTROL EQUIPMENT Venture Wet Scrubber	OPERATING MODE AP=0.21"H₂O

DESCRIBE EMISSION POINT Square opening in steel stack	
HEIGHT ABOVE GROUND LEVEL 45 feet	HEIGHT RELATIVE TO OBSERVER Start 37' End 37'
DISTANCE FROM OBSERVER Start 100' End 100'	DIRECTION FROM OBSERVER Start West End West

DESCRIBE EMISSIONS Brown Lt. Gray Particulate w/ steam	
EMISSION COLOR Start Lt. Gray/Brown	IF WATER DROPLET PLUME Attached ☒ Detached ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED Start 1 1/2 stack diameters from opening in steel	

DESCRIBE PLUME BACKGROUND Start Sky End Sky	
BACKGROUND COLOR Start Blue End Blue	SKY CONDITIONS Start Clear End Clear
WIND SPEED Start 0-S End 0-S	WIND DIRECTION Start SW End SW
AMBIENT TEMP Start End	WET BULB TEMP RH, percent

Stack with Plume

Sun

Wind

SOURCE LAYOUT SKETCH

Draw North Arrow

X Emission Point

Observer's Position

140°

Sun Location Line

OBSERVATION DATE 8/1/94				START TIME 11:16	END TIME 11:45
SEC MIN	0	15	30	45	COMMENTS
1	20	20	20	20	
2	20	20	15	15	
3	15	15	20	15	
4	15	15	15	15	
5	15	16	20	15	
6	15	20	20	15	
7	15	20	20	15	
8	15	15	20	20	
9	20	20	15	20	
10	20	20	15	15	
11	15	15	15	15	
12	15	15	10	15	
13	10	10	10	10	
14	5	5	10	5	
15	10	10	10	10	
16	10	10	10	10	
17	10	10	15	10	
18	15	15	15	10	
19	15	20	15	20	
20	20	15	20	15	
21	15	15	20	20	
22	20	20	20	20	
23	15	15	15	15	
24	20	15	15	15	
25	15	20	20	15	
26	20	15	20	15	
27	15	15	20	15	
28	10	15	20	20	
29	20	15	15	10	
30	20	15	10	15	

OBSERVER'S NAME (PRINT) S. MARK HINES	
OBSERVER'S SIGNATURE S. Mark Hines	DATE 8/1/94
ORGANIZATION OHIO EPA / SWDO / DAPC	
CERTIFIED BY	DATE

ADDITIONAL INFORMATION

CONTINUED ON VEO FORM NUMBER	2
------------------------------	----------

Visible Emission Observation Form

SOURCE NAME			OBSERVATION DATE					START TIME		STOP TIME			
Barnett Paving Materials #143			8/1/94					12:25		1:25			
ADDRESS			47111 Hardin - Wapak Road					SEC		SEC			
			MIN					0		0			
			15					15		15			
			30					30		30			
			45					45		45			
CITY			Sidney					STATE		Ohio			
ZIP			45265					PHONE		492-8503			
SOURCE ID NUMBER			0855140379P001					PROCESS EQUIPMENT		Portable Asphalt Concrete P.			
OPERATING MODE								CONTROL EQUIPMENT		Venturi Wet Scrubbers			
OPERATING MODE								DESCRIBE EMISSION POINT		START Square opening STOP steel studs			
HEIGHT ABOVE GROUND LEVEL			START 45' STOP 45'					HEIGHT RELATIVE TO OBSERVER		START STOP			
DISTANCE FROM OBSERVER			START STOP					DIRECTION FROM OBSERVER		START STOP			
DESCRIBE EMISSIONS			START Lt. Gray / Brown STOP Particulate					EMISSION COLOR		START Lt. Gray / Brown			
PLUME TYPE: CONTINUOUS ☒								FUGITIVE ☐		INTERMITTENT ☐			
WATER DROPLETS PRESENT: NO ☐ YES ☒								IF WATER DROPLET PLUME: ATTACHED ☒ DETACHED ☐					
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED			START 1/2 stack diameter					AVERAGE OPACITY FOR HIGHEST PERIOD		NUMBER OF READINGS ABOVE % WERE			
DESCRIBE BACKGROUND			START Sky STOP Sky					BACKGROUND COLOR		START Blue / White			
SKY CONDITIONS			START St. Cloudy					WIND SPEED		START 0-5 STOP 0-5			
WIND DIRECTION			START SW STOP SW					AMBIENT TEMP.		START STOP			
WET BULB TEMP.								RH, percent					
Source Layout Sketch			Draw North Arrow					24		15 15 15 10 54 15 10 10 10			
								25		15 10 10 10 55 15 20 10 10			
								26		10 10 15 10 56 10 20 10 10			
								27		20 15 15 10 57 15 10 15 15			
								28		10 10 10 10 58 10 10 15 15			
								29		10 10 10 15 59 20 20 15 15			
								30		15 15 15 15 60 15 10 10 15			
COMMENTS								OBSERVER'S NAME (PRINT)		S. MARK HINES			
								OBSERVER'S SIGNATURE		S. Mark Hines			
								DATE		8/1/94			
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS								ORGANIZATION		OHIO EPA / SWDO / DAPC			
SIGNATURE								CERTIFIED BY		DATE			
TITLE								VERIFIED BY		DATE			

RECEIVED

SEP 13 1994

**REGIONAL AIR POLLUTION
CONTROL AGENCY**

**COMPLIANCE EMISSIONS TEST REPORT
DETERMINATION OF
FILTERABLE PARTICULATE AND LEAD EMISSIONS
FROM ASPHALT PLANT
BARRETT PAVING MATERIALS, INCORPORATED
SIDNEY, OHIO**

prepared for

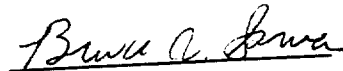
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727 East Ash Street
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August 26, 1994
P.N. 266.009

EXECUTIVE SUMMARY

Hayden Environmental Group, Incorporated was retained by the Barrett Paving Materials, Incorporated to perform a compliance filterable particulate and lead emissions evaluation on their drum mix asphalt plant located in Sidney, Ohio. The evaluation was performed to demonstrate compliance with Ohio Environmental Protection Agency regulations restricting air emissions from stationary sources. Emission samples were collected from the venturi scrubber system outlet stack using USEPA Reference Methods for stationary source sampling. The tests were conducted on August 1, 1994. The results of the evaluation are summarized below.

Summary of Emissions

Run No.	Particulate Emission Rate	Lead Emission Rate
	(lb/hr) ^a	(lb/hr) ^a
1	10.3	3.39E-02
2	14.8	3.39E-02
3	8.21	3.06E-02
Average	11.1	3.28E-02

^a pounds per hour

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1.0 INTRODUCTION

Hayden Environmental Group, Incorporated (Hayden) was contracted by Barrett Paving Materials, Incorporated (Barrett) to perform a compliance emissions evaluation to determine the filterable particulate and lead (Pb) emissions from their drum mix asphalt plant located in Sidney, Ohio. Emission samples were collected and stack gas parameters measured at the outlet stack of the venturi scrubber system. A composite waste fuel oil sample was collected and analyzed for arsenic (As), cadmium (Cd), chromium (Cr), lead (Pb), mercury (Hg), total halogens, polychlorinated biphenyls (PCBs), flash point, and heat content.

Testing was performed on Monday, August 1, 1994. Triplicate tests were performed using USEPA Reference Methods 1, 2, 3, 4, 5, and 12. The emissions testing was performed by the Hayden test team of Messrs. Dale Davidson and Bert Forsyth. Messrs. Kevin Pflum of Barrett coordinated test schedules with plant production and operations. Mr. Mark Hines from the Southwest District Office of the Ohio EPA's Division of Air Pollution (OEPA/SWDO) was on site to verify process conditions and witness test procedures. Analyses of the emissions and fuel oil samples were performed by Hayden Laboratories located in Miamisburg, Ohio.

2.0 PROCESS AND SAMPLING SITE DESCRIPTION

Barrett produces asphaltic paving materials at their drum mix asphalt plant located in Sidney, Ohio. The plant was manufactured by Astec and rated for an maximum production of approximately 300 tons per hour and typically operated between 250-300 tons per hour.

In the asphalt production process, raw aggregate of various sizes and proportions are fed from feeder bins into an oil fired rotary drum kiln where it is heated, mixed and dried. Asphalt cement is mixed with the dried materials as it exits the drum drier. Recycled asphalt can also be added into the drum. The finished product is loaded into one of two storage silos, one with a capacity of approximately 85 tons and the other 90 tons. The drum kiln can be fired with either #4 diesel fuel or waste oil.

Exhaust emissions from the drum kiln are ducted through an emissions control system consisting of a venturi scrubber system. The exhaust gases from the scrubber system are vented to the atmosphere through a 60 by 60 inch rectangular stack. A simplified diagram of the process and emissions control system is included in Figure 2.1.

Emissions sampling and testing were performed from five (5) sampling ports located on the scrubber system's outlet stack. The sampling ports were located approximately 206 inches (3.4 equivalent stack diameters) downstream and 72 inches (1.2 equivalent stack diameters) upstream from the nearest disturbances. Twenty-five sampling and velocity traverse points in a 5 x 5 matrix, were utilized. A simplified diagram of the sampling site is shown in Figure 2.2.

The drum kiln was fired with waste oil during the emissions testing. Production rates and

process operating conditions were monitored and recorded by Barrett personnel. A summary of the production rates during testing is shown in Table A.1 and included in Appendix A.

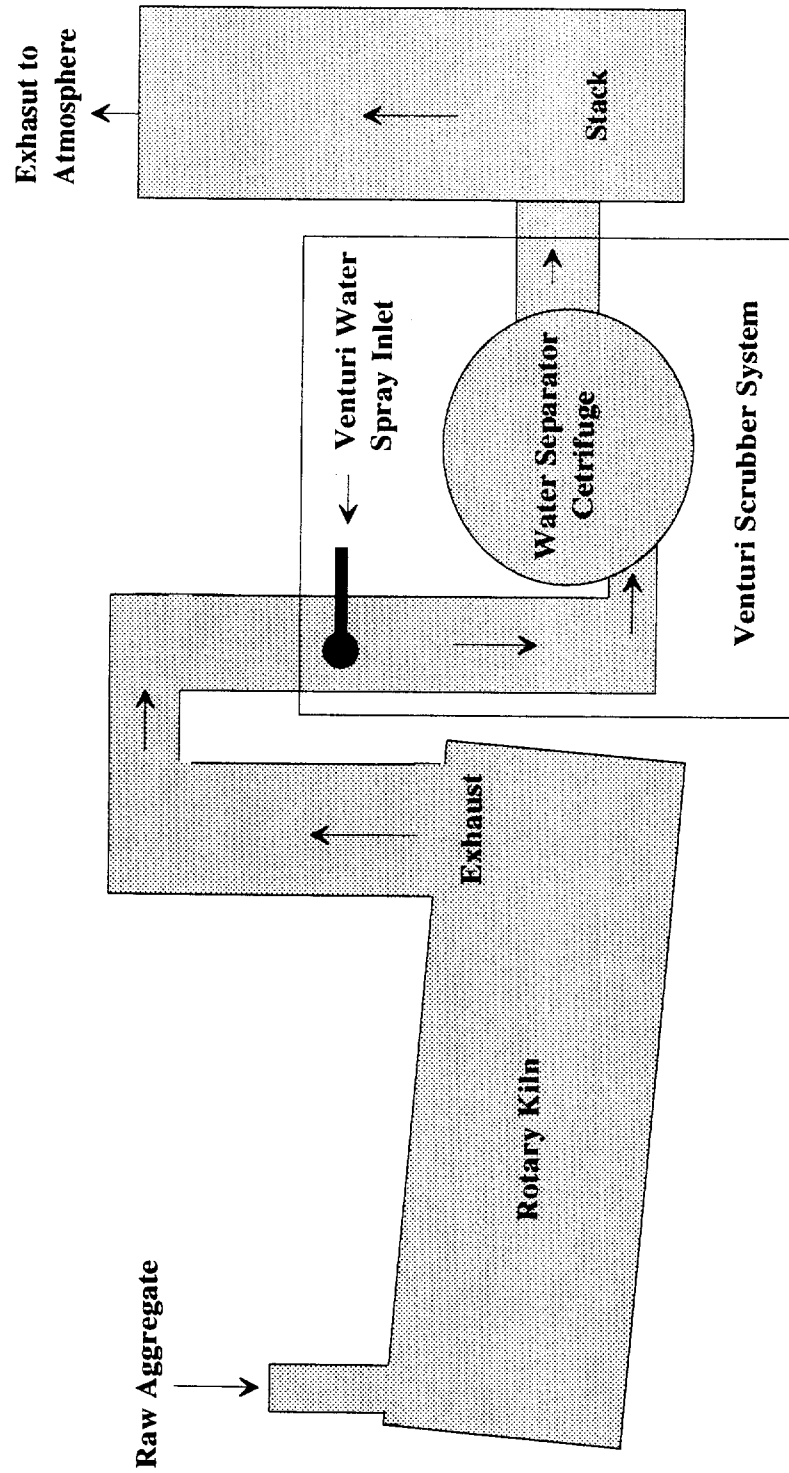


Figure 2.1 Process Diagram

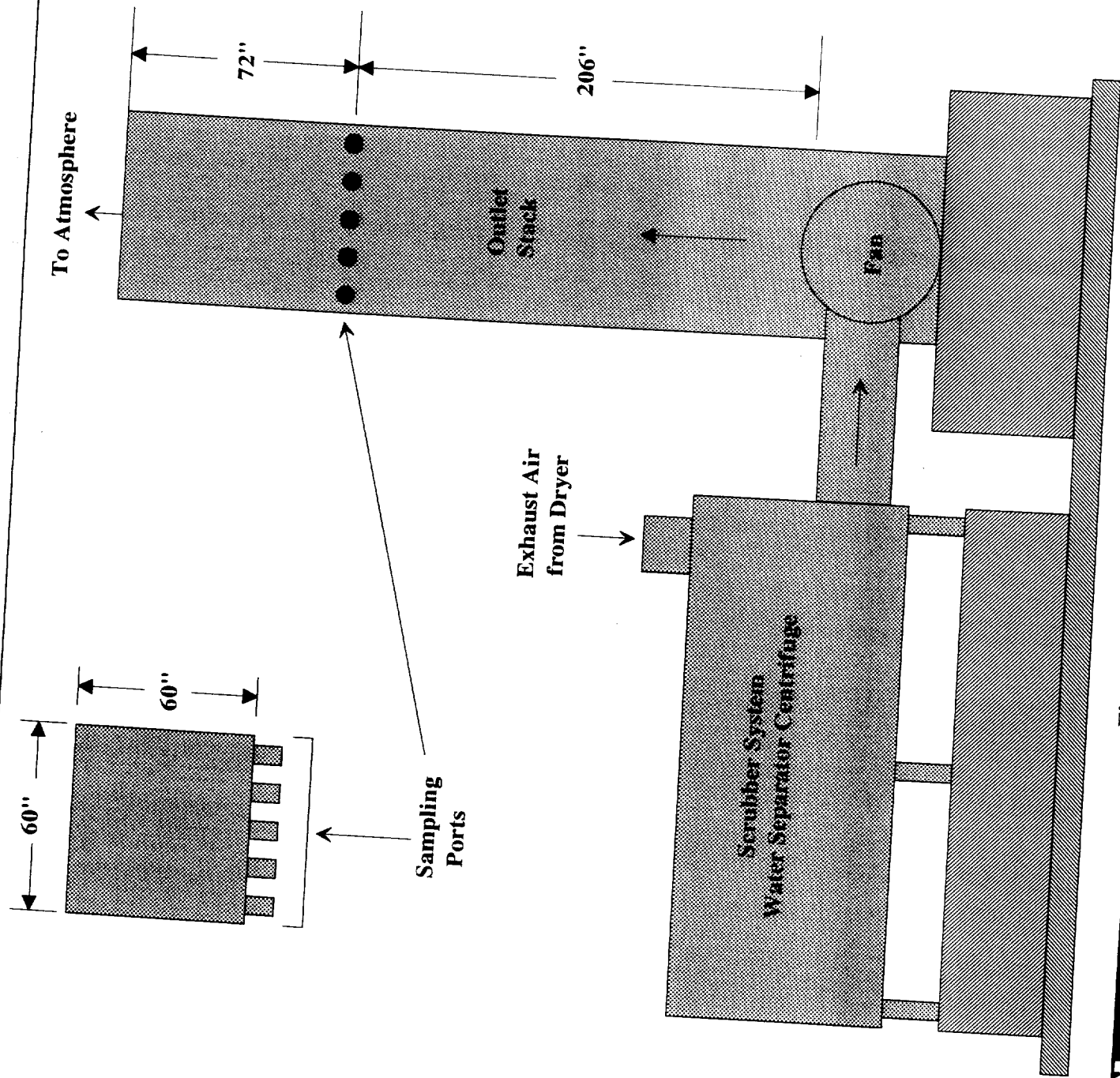


Figure 2.2. Simplified Drawing of Sampling Site

3.0 SAMPLING AND ANALYTICAL PROCEDURES

The sampling and analytical procedures used were performed in general conformance to the most recent revisions of the USEPA Reference Methods for stationary sources. A brief description of each procedure used is included below:

3.1 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."

3.2 Velocities and Volumetric Flow Rates (USEPA Method 2)

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

3.3 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 were collected and analyzed during each test with Fyrite combustion gas analyzers which directly measured concentrations of O₂ and CO₂.

3.4 Moisture (USEPA Method 4)

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

3.5 Particulate Matter (USEPA Method 5)

The filterable 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 lined or stainless steel 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. The acetone was evaporated at a temperature below its boiling point. The filter and the residue from the probe rinse were analyzed by gravimetric analysis.

3.6 Lead (USEPA Method 12)

The Lead (Pb) emissions were determined using USEPA Reference Method 12, "Determination of Inorganic Lead Emissions from Stationary Sources." The Pb emissions were collected in conjunction with the particulate emissions. The impingers of the Method 5 train were charged with 0.1N nitric acid to absorb any lead passing through the filter. After the acetone rinse all of the front half glassware was rinsed with nitric acid to remove any lead that was not removed with the acetone rinse. The particulate from the filter and acetone rinse were digested and re-suspended in nitric acid after the particulate had been analyzed. The re-suspended filter and acetone rinse was combined with the 0.1N nitric acid probe rinse and impinger solution. The Pb was analyzed by an inductively coupled argon plasma spectrophotometer (ICAP). A simplified drawing of the particulate and lead sampling train is included in Figure 3.1.

3.7 Fuel Analysis

A composite sample of the fuel oil was be collected during the emissions testing by Barrett personnel. The sample was analyzed for arsenic (As), cadmium (Cd), chromium (Cr), lead (Pb), mercury (Hg), total halogens, polychlorinated biphenyls (PCBs), flash point, and heat content. The metals content of the fuel oil, except for Hg, was analyzed on an inductively coupled argon plasma spectrophotometer (ICAP). The Hg content of the fuel oil was analyzed by cold vapor atomic absorption spectroscopy (CVAAS). The total halogen content of the fuel oil was analyzed by ion chromatograph (IC). The PCBs was analyzed on a gas chromatograph (GC).

Triplicate measurements will be performed for all parameters.

The Hayden 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. Hayden participate's in the USEPA's National Source Audit Program for Methods 3, 5, 6, 7 and 25.

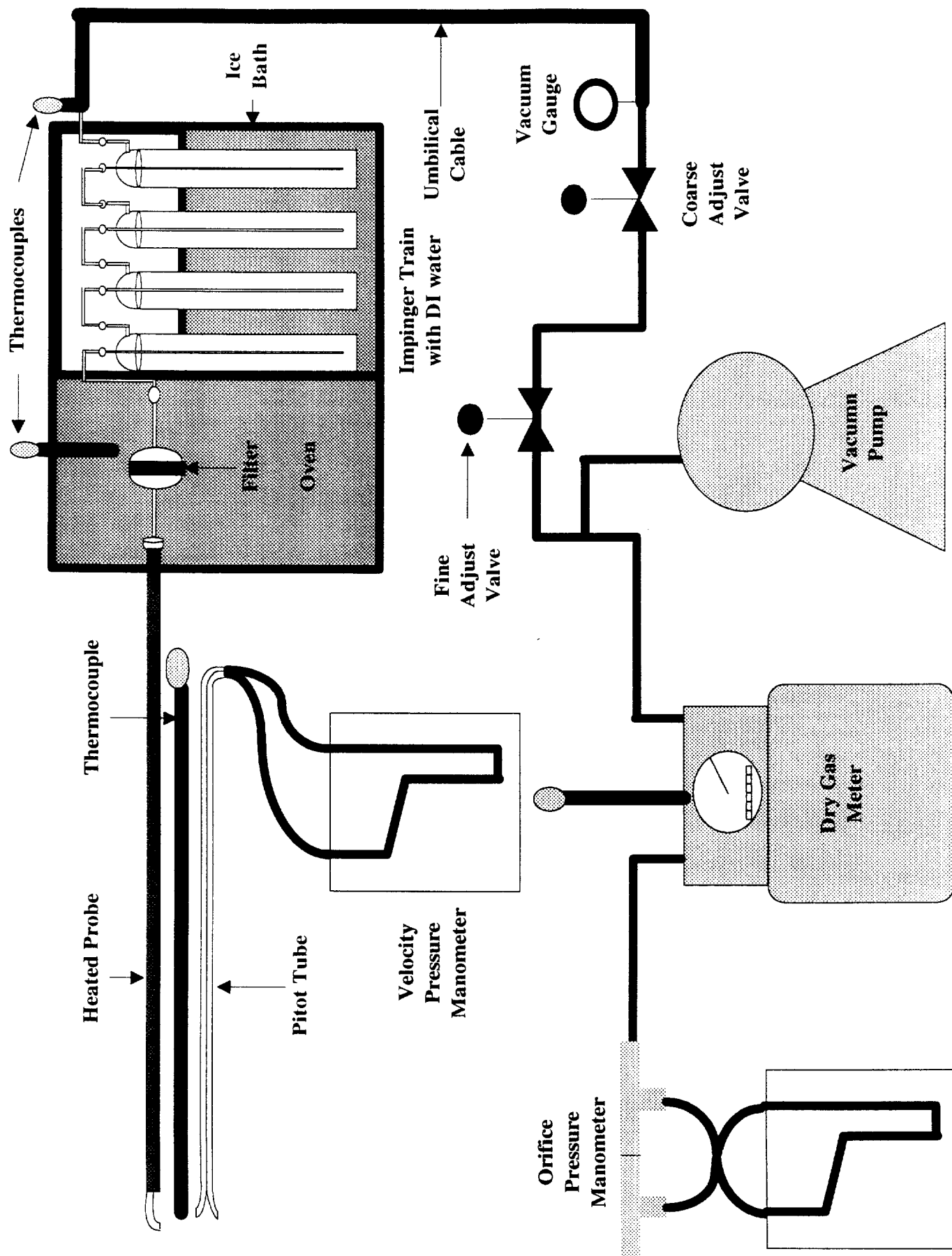


Figure 3.1 Particulate and Lead Sampling Train

4.0 TEST RESULTS

The stack gas conditions are summarized in Table 4.1. The stack gas velocity averaged 27.4 feet per second (fps). The stack gas flow rate averaged 41,031 actual cubic feet per minute (acfm) or 24,817 dry standard cubic feet per minute (dscfm) at 172°F and 26.5% moisture. The average concentrations of oxygen (O₂) and carbon dioxide (CO₂) were 11.1% and 8.1%, respectively.

The filterable particulate and lead emissions are summarized in Table 4.2. The average filterable particulate concentration was 5.23E-02 grains per dry standard cubic foot (gr/dscf) or 7.48E-06 pounds per dry standard cubic foot (lb/dscf). The average filterable particulate mass emission rate was 11.1 pounds per hour (lb/hr). The average lead concentration was 2.20E-08 lb/dscf. The average lead mass emission rate was 3.28E-02 lb/hr.

Results from analyses of the waste fuel oil sample are contained in Appendix C, "Analytical Data".

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Table 4.1 Summary of Stack Gas Conditions

Run No.	Time (8/1/94)	Velocity (fps) ^a	Flow Rate		Temp. (°F) ^d	Moisture (%)	O ₂ (%)	CO ₂ (%)
			(acfm) ^b	(dscfm) ^c				
1	0834-0941	28.1	42,208	25,936	169	25.4	11.7	8.0
2	1051-1158	27.1	40,596	24,209	180	26.6	11.0	8.0
3	1236-1343	26.9	40,290	24,305	166	27.4	10.7	8.3
Averages		27.4	41,031	24,817	172	26.5	11.1	8.1

^a feet per second

^b actual cubic feet per minute

^c dry standard cubic feet per minute

^d degrees Fahrenheit

Barrett Paving Materials / Sidney

Table 4.2 Summary of Particulate and Lead Emissions

Run No.	Time (8/1/94)	Particulate Emissions			Lead Emissions	
		(gr/dscf) ^a	(lb/dscf) ^b	(lb/hr) ^c	(lb/dscf) ^b	(lb/hr) ^c
1	0834-0941	4.63E-02	6.62E-06	10.3	2.18E-08	3.39E-02
2	1051-1158	7.12E-02	1.02E-05	14.8	2.33E-08	3.39E-02
3	1236-1343	3.94E-02	5.63E-06	8.2	2.10E-08	3.06E-02
Averages		5.23E-02	7.48E-06	11.1	2.20E-08	3.28E-02

^a grains per dry standard cubic foot

^b pounds per dry standard cubic foot

^c pounds per hour

Barrett Paving Materials / Sidney

Table A.1 Summary of Production and Operating Conditions

Run No.	Time (8/1/94)	Asphalt Production (tph) ¹
1	0834-0941	294.1
2	1051-1158	292.8
3	1236-1343	291.2
Averages		292.7

¹ tons per hour

TEST #1

09:28 08/01/94 JMF # = 404 MIX # = 1

	DES %	ACT %	TPH	TONS
AGG	95.2	95.2	279.4	499.46
RCY	.0	.0	.0	.00
AC	4.8	4.77	14.0	27.01
MF	.0	.0	.0	.00
ASA	.0	.0	.00	.00

TOTAL MIX TONS= 526.47

MIX TPH = 293.4

AC SP. GR. = 1.033

AGG MOIST. = 5.0%

RCY MOIST. = 2.0%

AC IN RCY. = 5.5%

VIRGIN AC TONS= 27.01, TPH= 14.0, ACT % = 4.77

AC ACCUM. PERCENT= 5.13%

09:30 08/01/94 JMF # = 404 MIX # = 1

	DES %	ACT %	TPH	TONS
AGG	95.2	95.2	279.5	507.15
RCY	.0	.0	.0	.00
AC	4.8	4.84	14.2	27.40
MF	.0	.0	.0	.00
ASA	.0	.0	.00	.00

TOTAL MIX TONS= 534.55

MIX TPH = 293.7

AC SP. GR. = 1.033

AGG MOIST. = 5.0%

RCY MOIST. = 2.0%

AC IN RCY. = 5.5%

VIRGIN AC TONS= 27.40, TPH= 14.2, ACT % = 4.83

AC ACCUM. PERCENT= 5.12%

09:31 08/01/94 JMF # = 404 MIX # = 1

	DES %	ACT %	TPH	TONS
AGG	95.2	95.2	280.2	515.08
RCY	.0	.0	.0	.00
AC	4.8	4.79	14.1	27.80
MF	.0	.0	.0	.00
ASA	.0	.0	.00	.00

TOTAL MIX TONS= 542.88

MIX TPH = 294.2

AC SP. GR. = 1.033

AGG MOIST. = 5.0%

RCY MOIST. = 2.0%

AC IN RCY. = 5.5%

VIRGIN AC TONS= 27.80, TPH= 14.1, ACT % = 4.79

AC ACCUM. PERCENT= 5.12%

09:33 08/01/94 JMF # = 404 MIX # = 1

	DES %	ACT %	TPH	TONS
AGG	95.2	95.2	281.7	522.85
RCY	.0	.0	.0	.00
AC	4.8	4.75	14.1	28.19
MF	.0	.0	.0	.00
ASA	.0	.0	.00	.00

TOTAL MIX TONS= 551.04

MIX TPH = 295.8

AC SP. GR. = 1.033

AGG MOIST. = 5.0%

RCY MOIST. = 2.0%

VIRGIN AC TONS= 22.19, TPH= 14.1, ACT %= 4.76
AC ACCUM. PERCENT= 5.11%

09:35 08/01/94 JMF #= 404 MIX #= 1

	DES %	ACT %	TPH	TONS
AGG	95.2	95.6	279.2	530.52
RCY	.0	.0	.0	.00
AC	4.8	4.74	13.9	28.58
MF	.0	.0	.0	.00
ASA	.0	.0	.00	.00
TOTAL MIX TONS=				559.10

MIX TPH =293.1

AC SP. GR. =1.033

AGG MOIST. = 3.0%

RCY MOIST. = 2.0%

AC IN RCY. = 5.5%

VIRGIN AC TONS= 28.58, TPH= 13.9, ACT %= 4.74

AC ACCUM. PERCENT= 5.11%

09:36 08/01/94 JMF #= 404 MIX #= 1

	DES %	ACT %	TPH	TONS
AGG	95.2	95.2	280.0	536.45
RCY	.0	.0	.0	.00
AC	4.8	4.85	14.3	28.98
MF	.0	.0	.0	.00
ASA	.0	.0	.00	.00
TOTAL MIX TONS=				567.43

MIX TPH =294.2

AC SP. GR. =1.033

AGG MOIST. = 5.0%

RCY MOIST. = 2.0%

AC IN RCY. = 5.5%

VIRGIN AC TONS= 28.98, TPH= 14.3, ACT %= 4.86

AC ACCUM. PERCENT= 5.10%

09:38 08/01/94 JMF #= 404 MIX #= 1

	DES %	ACT %	TPH	TONS
AGG	95.2	95.1	280.0	546.15
RCY	.0	.0	.0	.00
AC	4.8	4.86	14.3	29.37
MF	.0	.0	.0	.00
ASA	.0	.0	.00	.00
TOTAL MIX TONS=				575.52

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MIX TPH =294.3

AC SP. GR. =1.033

AGG MOIST. = 5.0%

RCY MOIST. = 2.0%

AC IN RCY. = 5.5%

VIRGIN AC TONS= 29.37, TPH= 14.3, ACT %= 4.85

AC ACCUM. PERCENT= 5.10%

TEST I

TEST #2

10:54 08/01/94 JMF #= 404 MIX #= 1

	DES %	ACT %	TPH	TONS
AGG	95.6	95.6	286.1	630.80
RCY	.0	.0	.0	.00
AC	4.4	4.39	13.1	34.34
MF	.0	.0	.0	.00

MP .0 .0 .0 .00
ASA .0 .0 .00 .00
TOTAL MIX TONS= 665.14

MIX TPH =299.2

AC SP. GR. =1.033

AGG MOIST. = 5.5%

RCY MOIST. = 2.0%

AC IN RCY. = 5.5%

VIRGIN AC TONS= 34.34, TPH= 13.1, ACT % = 4.37

AC ACCUM. PERCENT= 5.16%

10:59 08/01/94 JMF # = 404 MIX # = 1

	DES %	ACT %	TPH	TONS
AGG	95.6	95.6	282.4	654.43
RCY	.0	.0	.0	.00
AC	4.4	4.43	13.1	35.43
MF	.0	.0	.0	.00
ASA	.0	.0	.00	.00

TOTAL MIX TONS= 689.86

MIX TPH =295.5

AC SP. GR. =1.033

AGG MOIST. = 5.5%

RCY MOIST. = 2.0%

AC IN RCY. = 5.5%

VIRGIN AC TONS= 35.43, TPH= 13.1, ACT % = 4.43

AC ACCUM. PERCENT= 5.13%

11:04 08/01/94 JMF # = 404 MIX # = 1

	DES %	ACT %	TPH	TONS
AGG	95.6	95.6	283.2	677.94
RCY	.0	.0	.0	.00
AC	4.4	4.44	13.2	36.51
MF	.0	.0	.0	.00
ASA	.0	.0	.00	.00

TOTAL MIX TONS= 714.45

MIX TPH =296.3

AC SP. GR. =1.033

AGG MOIST. = 5.5%

RCY MOIST. = 2.0%

AC IN RCY. = 5.5%

VIRGIN AC TONS= 36.51, TPH= 13.2, ACT % = 4.45

AC ACCUM. PERCENT= 5.11%

11:09 08/01/94 JMF # = 404 MIX # = 1

	DES %	ACT %	TPH	TONS
AGG	95.6	95.6	280.4	701.35
RCY	.0	.0	.0	.00
AC	4.4	4.43	13.0	37.59
MF	.0	.0	.0	.00
ASA	.0	.0	.00	.00

TOTAL MIX TONS= 738.94

MIX TPH =293.4

AC SP. GR. =1.033

AGG MOIST. = 5.5%

RCY MOIST. = 2.0%

AC IN RCY. = 5.5%

VIRGIN AC TONS= 37.59, TPH= 13.0, ACT % = 4.43

AC ACCUM. PERCENT= 5.08%

11:14 08/01/94 JMF # = 404 MIX # = 1

	DES %	ACT %	TPH	TONS
AGG	95.6	95.6	278.9	724.56
RCY	.0	.0	.0	.00
AC	4.4	4.37	12.7	38.66
MF	.0	.0	.0	.00
ASA	.0	.0	.00	.00

AC SP. GR. = 1.033
 AGG MOIST. = 5.5%
 RCY MOIST. = 2.0%
 AC IN RCY. = 5.5%
 VIRGIN AC TONS= 39.66, TPH= 12.7, ACT %= 4.35
 AC ACCUM. PERCENT= 5.06%

11:19 08/01/94 JMF # = 404 MIX # = 1
 DES % ACT % TPH TONS
 AGG 95.6 95.6 279.0 747.83
 RCY .0 .0 .0 .00
 AC 4.4 4.44 13.0 39.73
 MF .0 .0 .0 .00
 ASA .0 .0 .00 .00
 TOTAL MIX TONS= 787.56
 MIX TPH = 291.9
 AC SP. GR. = 1.033
 AGG MOIST. = 5.5%
 RCY MOIST. = 2.0%
 AC IN RCY. = 5.5%
 VIRGIN AC TONS= 39.73, TPH= 13.0, ACT %= 4.45
 AC ACCUM. PERCENT= 5.04%

11:24 08/01/94 JMF # = 404 MIX # = 1
 DES % ACT % TPH TONS
 AGG 95.6 95.6 280.8 771.18
 RCY .0 .0 .0 .00
 AC 4.4 4.37 12.8 40.80
 MF .0 .0 .0 .00
 ASA .0 .0 .00 .00
 TOTAL MIX TONS= 811.98
 MIX TPH = 293.6
 AC SP. GR. = 1.033
 AGG MOIST. = 5.5%
 RCY MOIST. = 2.0%
 AC IN RCY. = 5.5%
 VIRGIN AC TONS= 40.80, TPH= 12.8, ACT %= 4.35
 AC ACCUM. PERCENT= 5.02%

11:29 08/01/94 JMF # = 404 MIX # = 1
 DES % ACT % TPH TONS
 AGG 95.6 95.6 278.4 794.45
 RCY .0 .0 .0 .00
 AC 4.4 4.38 12.8 41.88
 MF .0 .0 .0 .00
 ASA .0 .0 .00 .00
 TOTAL MIX TONS= 836.33
 MIX TPH = 291.2
 AC SP. GR. = 1.033
 AGG MOIST. = 5.5%
 RCY MOIST. = 2.0%
 AC IN RCY. = 5.5%
 VIRGIN AC TONS= 41.88, TPH= 12.8, ACT %= 4.39
 AC ACCUM. PERCENT= 5.00%

11:34 08/01/94 JMF # = 404 MIX # = 1
 DES % ACT % TPH TONS
 AGG 95.6 95.6 277.6 817.62
 RCY .0 .0 .0 .00
 AC 4.4 4.40 12.8 42.94
 MF .0 .0 .0 .00
 ASA .0 .0 .00 .00
 TOTAL MIX TONS= 860.56
 MIX TPH = 290.3

AGG MOIST. = 5.5%
RCY MOIST. = 2.0%
AC IN RCY. = 5.5%
VIRGIN AC TONS= 42.94, TPH= 12.8, ACT %= 4.40
AC ACCUM. PERCENT= 4.95%

11:39 08/01/94 JMF # = 404 MIX # = 1

	DES %	ACT %	TPH	TONS
AGG	95.6	95.6	277.0	840.68
RCY	.0	.0	.0	.00
AC	4.4	4.44	12.9	44.00
MF	.0	.0	.0	.00
ASA	.0	.0	.00	.00
TOTAL MIX TONS= 884.68				

MIX TPH =289.9

AC SP. GR. =1.033
AGG MOIST. = 5.5%
RCY MOIST. = 2.0%
AC IN RCY. = 5.5%
VIRGIN AC TONS= 44.00, TPH= 12.9, ACT %= 4.44
AC ACCUM. PERCENT= 4.97%

11:44 08/01/94 JMF # = 404 MIX # = 1

	DES %	ACT %	TPH	TONS
AGG	95.6	95.6	278.3	863.83
RCY	.0	.0	.0	.00
AC	4.4	4.43	12.9	45.07
MF	.0	.0	.0	.00
ASA	.0	.0	.00	.00
TOTAL MIX TONS= 908.90				

MIX TPH =291.2

AC SP. GR. =1.033
AGG MOIST. = 5.5%
RCY MOIST. = 2.0%
AC IN RCY. = 5.5%
VIRGIN AC TONS= 45.07, TPH= 12.9, ACT %= 4.42
AC ACCUM. PERCENT= 4.95%

11:49 08/01/94 JMF # = 404 MIX # = 1

	DES %	ACT %	TPH	TONS
AGG	95.6	95.6	278.2	866.99
RCY	.0	.0	.0	.00
AC	4.4	4.40	12.8	46.13
MF	.0	.0	.0	.00
ASA	.0	.0	.00	.00
TOTAL MIX TONS= 933.12				

MIX TPH =291.0

AC SP. GR. =1.033
AGG MOIST. = 5.5%
RCY MOIST. = 2.0%
AC IN RCY. = 5.5%
VIRGIN AC TONS= 46.13, TPH= 12.8, ACT %= 4.39
AC ACCUM. PERCENT= 4.94%

11:54 08/01/94 JMF # = 404 MIX # = 1

	DES %	ACT %	TPH	TONS
AGG	95.6	95.6	278.4	910.23
RCY	.0	.0	.0	.00
AC	4.4	4.42	12.9	47.20
MF	.0	.0	.0	.00
ASA	.0	.0	.00	.00
TOTAL MIX TONS= 957.43				

MIX TPH =291.3

AC SP. GR. =1.033
AGG MOIST. = 5.5%

AC IN RCY. = 5.5%
VIRGIN AC TONS= 47.20, TPH= 12.0, ACT %= 4.42
AC ACCUM. PERCENT= 4.92%

TEST #3

12:34 08/01/94 JMF # = 404 MIX # = 1
DES % ACT % TPH TONS
AGG 95.6 95.6 332.0 1051.73
RCY .0 .0 .0 .00
AC 4.4 4.41 13.0 55.56
MF .0 .0 .0 .00
ASA .0 .0 .00 .00
TOTAL MIX TONS= 1107.29
MIX TPH =295.0
AC SP. GR. =1.033
AGG MOIST. = 6.0%
RCY MOIST. = 2.0%
AC IN RCY. = 5.5%
VIRGIN AC TONS= 55.56, TPH= 13.0, ACT %= 4.40
AC ACCUM. PERCENT= 5.01%

12:39 08/01/94 JMF # = 404 MIX # = 1
DES % ACT % TPH TONS
AGG 95.6 95.6 278.7 1074.92
RCY .0 .0 .0 .00
AC 4.4 4.45 13.0 56.63
MF .0 .0 .0 .00
ASA .0 .0 .00 .00
TOTAL MIX TONS= 1131.55
MIX TPH =291.7
AC SP. GR. =1.033
AGG MOIST. = 6.0%
RCY MOIST. = 2.0%
AC IN RCY. = 5.5%
VIRGIN AC TONS= 56.63, TPH= 13.0, ACT %= 4.45
AC ACCUM. PERCENT= 5.00%

12:44 08/01/94 JMF # = 404 MIX # = 1
DES % ACT % TPH TONS
AGG 95.6 95.6 280.0 1098.27
RCY .0 .0 .0 .00
AC 4.4 4.41 12.9 57.70
MF .0 .0 .0 .00
ASA .0 .0 .00 .00
TOTAL MIX TONS= 1155.97
MIX TPH =292.9
AC SP. GR. =1.033
AGG MOIST. = 6.0%
RCY MOIST. = 2.0%
AC IN RCY. = 5.5%
VIRGIN AC TONS= 57.70, TPH= 12.9, ACT %= 4.40

12:49 08/01/94 JMF # = 404 MIX # = 1

	DES %	ACT %	TPH	TONS
AGG	95.6	95.6	277.8	1121.50
RCY	.0	.0	.0	.00
AC	4.4	4.43	12.9	58.77
MF	.0	.0	.0	.00
ASA	.0	.0	.00	.00

TOTAL MIX TONS= 1180.27

MIX TPH = 290.7

AC SP. GR. = 1.033

AGG MOIST. = 6.0%

RCY MOIST. = 2.0%

AC IN RCY. = 5.5%

VIRGIN AC TONS= 58.77, TPH= 12.9, ACT % = 4.43

AC ACCUM. PERCENT= 4.97%

12:54 08/01/94 JMF # = 404 MIX # = 1

	DES %	ACT %	TPH	TONS
AGG	95.6	95.6	279.1	1144.68
RCY	.0	.0	.0	.00
AC	4.4	4.37	12.8	59.84
MF	.0	.0	.0	.00
ASA	.0	.0	.00	.00

TOTAL MIX TONS= 1204.52

MIX TPH = 291.8

AC SP. GR. = 1.033

AGG MOIST. = 6.0%

RCY MOIST. = 2.0%

AC IN RCY. = 5.5%

VIRGIN AC TONS= 59.84, TPH= 12.8, ACT % = 4.38

AC ACCUM. PERCENT= 4.96%

12:59 08/01/94 JMF # = 404 MIX # = 1

	DES %	ACT %	TPH	TONS
AGG	95.6	95.6	274.4	1167.67
RCY	.0	.0	.0	.00
AC	4.4	4.40	12.6	60.90
MF	.0	.0	.0	.00
ASA	.0	.0	.00	.00

TOTAL MIX TONS= 1228.57

MIX TPH = 287.0

AC SP. GR. = 1.033

AGG MOIST. = 6.0%

RCY MOIST. = 2.0%

AC IN RCY. = 5.5%

VIRGIN AC TONS= 60.90, TPH= 12.6, ACT % = 4.39

AC ACCUM. PERCENT= 4.95%

13:04 08/01/94 JMF # = 404 MIX # = 1

	DES %	ACT %	TPH	TONS
AGG	95.6	95.6	282.0	1190.89
RCY	.0	.0	.0	.00
AC	4.4	4.36	12.8	61.96
MF	.0	.0	.0	.00
ASA	.0	.0	.00	.00

TOTAL MIX TONS= 1252.85

MIX TPH = 294.8

AC SP. GR. = 1.033

AGG MOIST. = 6.0%

RCY MOIST. = 2.0%

AC IN RCY. = 5.5%

VIRGIN AC TONS= 61.96, TPH= 12.8, ACT % = 4.34

AC ACCUM. PERCENT= 4.94%

DES % ACT % TPH TONS
 AGG 95.6 95.6 278.2 1214.17
 RCY .0 .0 .0 .00
 AC 4.4 4.39 12.8 63.03
 MF .0 .0 .0 .00
 ASA .0 .0 .00 .00

TOTAL MIX TONS= 1277.20

MIX TPH =291.0

AC SP. GR. =1.033

AGG MOIST. = 6.0%

RCY MOIST. = 2.0%

AC IN RCY. = 5.5%

VIRGIN AC TONS= 63.03, TPH= 12.8, ACT % = 4.39

AC ACCUM. PERCENT= 4.93%

13:14 08/01/94 JMF # = 404 MIX # = 1

DES % ACT % TPH TONS
 AGG 95.6 95.6 277.4 1237.39
 RCY .0 .0 .0 .00
 AC 4.4 4.40 12.8 64.10
 MF .0 .0 .0 .00
 ASA .0 .0 .00 .00

TOTAL MIX TONS= 1301.49

MIX TPH =290.1

AC SP. GR. =1.033

AGG MOIST. = 6.0%

RCY MOIST. = 2.0%

AC IN RCY. = 5.5%

VIRGIN AC TONS= 64.10, TPH= 12.8, ACT % = 4.41

AC ACCUM. PERCENT= 4.92%

13:19 08/01/94 JMF # = 404 MIX # = 1

DES % ACT % TPH TONS
 AGG 95.6 95.7 278.2 1260.49
 RCY .0 .0 .0 .00
 AC 4.4 4.35 12.7 65.17
 MF .0 .0 .0 .00
 ASA .0 .0 .00 .00

TOTAL MIX TONS= 1325.66

MIX TPH =290.8

AC SP. GR. =1.033

AGG MOIST. = 6.0%

RCY MOIST. = 2.0%

AC IN RCY. = 5.5%

VIRGIN AC TONS= 65.17, TPH= 12.7, ACT % = 4.36

AC ACCUM. PERCENT= 4.91%

13:24 08/01/94 JMF # = 404 MIX # = 1

DES % ACT % TPH TONS
 AGG 95.6 95.6 275.3 1283.54
 RCY .0 .0 .0 .00
 AC 4.4 4.41 12.7 66.23
 MF .0 .0 .0 .00
 ASA .0 .0 .00 .00

TOTAL MIX TONS= 1349.77

MIX TPH =288.0

AC SP. GR. =1.033

AGG MOIST. = 6.0%

RCY MOIST. = 2.0%

AC IN RCY. = 5.5%

VIRGIN AC TONS= 66.23, TPH= 12.7, ACT % = 4.40

AC ACCUM. PERCENT= 4.90%

13:29 08/01/94 JMF # = 404 MIX # = 1

DES % ACT % TPH TONS

RCY	.0	.0	.0	.00
AC	4.4	4.46	12.9	67.29
MF	.0	.0	.0	.00
ASA	.0	.0	.00	.00

TOTAL MIX TONS= 1373.96

MIX TPH =290.0

AC SP. GR. =1.033

AGG MOIST. = 6.0%

RCY MOIST. = 2.0%

AC IN RCY. = 5.5%

VIRGIN AC TONS= 67.29, TPH= 12.9, ACT %= 4.44

AC ACCUM. PERCENT= 4.89%

13:34 08/01/94 JMF #= 404 MIX #= 1

	DES %	ACT %	TPH	TONS
AGG	95.6	95.6	278.4	1329.99
RCY	.0	.0	.0	.00
AC	4.4	4.41	12.8	68.36
MF	.0	.0	.0	.00
ASA	.0	.0	.00	.00

TOTAL MIX TONS= 1398.35

MIX TPH =291.2

AC SP. GR. =1.033

AGG MOIST. = 6.0%

RCY MOIST. = 2.0%

AC IN RCY. = 5.5%

VIRGIN AC TONS= 68.36, TPH= 12.8, ACT %= 4.39

AC ACCUM. PERCENT= 4.88%

Client: BARRATT SIMNEY PN: 266.009 Date: 7/27/94
Source: ASPHALT PLANT Site: SCRUBBER OUTLET Run: ALL
Calculated By: DENT FOLLY

MATRIX: 5x5

[illegible]

NOMOGRAPH DATA

Client: Burdett/Sidney PN: 266 009 Date: 8/1/94
 Source: Asphalt Plant Site: Scrubber Outlet Run: #1, 2
 Calculated By: DLI

	#1	#2	#3
Barometric Pressure, Pb (in. Hg)	<u>29.4</u>	<u>29.4</u>	<u>29.4</u>
Static Pressure, Pg (in. Hg)	<u>-.14</u>	<u>-.14</u>	<u>-.14</u>
Orifice Constant, ΔH@ (in. H2O)	<u>1.77</u>	<u>1.77</u>	<u>1.77</u>
Average Meter Temperature, Tm (°F)	<u>80</u>	<u>90</u>	<u>95</u>
Moisture in the Stack Gas, Bws (%)	<u>28%</u>	<u>26</u>	<u>28</u>
Meter Pressure, Pm (in. Hg)	<u>—</u>	<u>—</u>	<u>—</u>
Absolute Pressure of the Stack Gas, Ps (in. Hg)	<u>—</u>	<u>—</u>	<u>—</u>
Ps/Pm	<u>≈ 1</u>	<u>≈ 1</u>	<u>≈ 1</u>
Average Stack Temperature, Ts (°F)	<u>155</u>	<u>180</u>	<u>180</u>
Average Velocity Pressure, ΔP (in. H2O)	<u>.18</u>	<u>.19</u>	<u>.19</u>
Maximum Velocity Pressure, ΔP (in. H2O)	<u>.32</u>	<u>.32</u>	<u>.32</u>
C Factor	<u>.62</u>	<u>.65</u>	<u>.64</u>
Calculated Nozzle Diameter (in.)	<u>.360</u>	<u>.360</u>	<u>.365</u>
Actual Nozzle Diameter (in.)	<u>.305</u>	<u>.308</u>	<u>.308</u>
Reference ΔP (in H2O)	<u>.38</u>	<u>.34</u>	<u>.36</u>

EMISSION TESTING FIELD DATA

Client: Sappett/Schney
 PN: 266.009
 Date: 8/1/94
 Source: Asphalt Plant
 Site: Scrubby Oaklet
 Sample Type: Particulate + lead
 Run: 1
 Operators: DD + BF
 Barometric Pressure (Pb): 29.4
 Static Pressure (Pg): -26

Meter Box #: N2
 Sample Box #: 1
 Filter #: 4565
 Probe Length/Type: 6' SS
 Stack Thermocouple #: 6F
 Oven Thermocouple #: OV-1
 Impinger Thermocouple #: 44D
 Pitot Tube #: 6E S-type
 Stack I.D.: 60 x 60
 Record Data Every 2.5 Minutes

Meter ΔH @: 1.766
 Meter Y Factor: 1.0328
 C Factor: .61
 Reference ΔP : .38
 Nozzle I.D.: — Avg. .305
 Pre-Test Leak Rate: .003 cfm @ 10 "Hg
 Post-Test Leak Rate: .007 cfm @ 4 "Hg
 Pitot Tube Leak Check: Pre: — Post: —
 Orsat Train Leak Check: Pre: 1/4 Posin/A
 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	0834	451.563		.28	.28	2	158	258	802	80
2	2.5		452.410	.06	.53	.53	2	158	260		80 79
3	5.0		453.359	.11	.44	.44	2	156	262		80 79
4	7.5		454.355	.09	.92	.92	2	156	258		80 79
5	10.0		455.615	.19	1.20	1.20	2	159	262		80 80
B1	12.5	0856	457.109	.24	.88	.88	2	160	249		83 81
2	15.0		458.380	.18	.44	.44	2	162	252		83 81
3	17.5		—	.09	.44	.44	2	167	256		83 82
4	20.0		460.250	.09	.74	.74	2	170	253		83 82
5	22.5		461.510	.15	.96	.96	2	171	254		85 83
5	25.0	0859	462.605	.20			2				
5	27.5										
5	30.0										
5	32.5										
5	35.0										

PN 266.009

EMISSION TESTING FIELD DATA

Client: Burgett/Sidney Meter Box #: 1 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	27.5	0900	462.605	.21	1.05	1.65	2	174	255	808	65	87/84
2	30.0		464.265	.15	.72	.72	2	171	252		62	88/85
3	32.5		465.500	.11	.53	.53	2	170	255		60	88/84
4	35.0		466.528	.20	.97	.97	2	172	257		62	90/85
5	37.5	0913	467.870	.25	1.20	1.20	3	174	254		62	90/86
D1	40.0	0915	469.387	.28	1.40	1.40	3	177	257		66	91/87
2	42.5		470.480	.25	.73	.73	2	178	254		67	92/87
3	45.0		472.265	.25	.73	.73	2	179	263		66	92/88
4	47.5		473.460	.30	1.50	1.50	3	179	255		66	93/89
5	50.0	0927	475.050	.20	.97	.97	3	177	253		65	94/89
E1	52.5	0929	476.550	.23	1.15	1.15	3	177	256		65	94/90
2	55.0		479.660	.40	1.95	1.95	3	176	256		64	95/91
3	57.5		481.450	.42	2.10	2.10	4	171	255		65	96/92
4	60.0		483.100	.26	1.25	1.25	4	170	251		65	97/92
5	62.5	0941	484.225	.13	.62	.62	4	171	252	↓	64	97/92
			32.712	$\Delta P = .430$		0.948		169.3				86.6
			✓	✓		✓		✓				✓
			✓	.43								84.9

SAMPLE RECOVERY DATA

Client: Bennett/Sidney PN: 216.009 Date: 7-21-94
 Source: Asphalt Plant Site: scrubber outlet Run#: 1
 Sample Date: 8/1/94 Recovery Date: 8/1/94

Filter No: 4565 Glassware Set No: _____ Sample Box No: 1

IMPINGER DATA

Gravimetric: X Volumetric: _____

	#1	#2	#3	#4	#5	Total
Contents	HNO ₃	HNO ₃	empty	silica gel		
Final	770.0	599.2	444.2	703.5		2476.9
Initial	564.3g	541.4g	442.3g	696.6g		2244.1
Net	205.7	157.8	0.1	2.9		232.8

RECOVERED SAMPLE

Description of Particulate on Filter: _____

Color of Silica Gel: _____

Recovered By: _____

METHOD 3 FYRITE DATA

Client: Barnett/Sidney PN: 266.002 Date: 8/1/94
 Source: Asphalt Plant Site: Scrubber Outlet Run#: 1
 Operator: DD + BF

	Oxygen (O ₂)	Carbon Dioxide (CO ₂)
Run 1	8.11.0	8.0
Run 2	12.0	7.0
Run 3	12.0	9.0
Average	11.7	8.0

EMISSION TESTING FIELD DATA

Client: Bennett / Sidney
 PN: 266,009
 Date: 8/1/94
 Source: Asphalt Plant
 Site: Scrubber Outlet
 Sample Type: Particulate & lead
 Run: 2
 Operators: DD & BF
 Barometric Pressure (Pb): 29.45
 Static Pressure (Pg): -1.5

Meter Box #: N2
 Sample Box #: 2
 Filter #: 0421
 Probe Length/Type: 6' SS
 Stack Thermocouple #: 6E
 Oven Thermocouple #: OV-2
 Impinger Thermocouple #: F-2
 Pitot Tube #: 5-T-421
 Stack I.D.: 66" X 60"
 Record Data Every 2.5 Minutes

Meter ΔH@: 1.766
 Meter Y Factor: 1.0328
 C Factor: 65
 Reference ΔP: 34
 Nozzle I.D.: — Avg. 308
 Pre-Test Leak Rate: 0.03 cfm@ 10 "Hg
 Post-Test Leak Rate: 0.00 cfm@ 3 "Hg
 Pitot Tube Leak Check: Pre: — Post: —
 Orsat Train Leak Check: Pre: N/A Post: N/A
 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
A1	10.5 2.5	1051	484.618	.12	.64	.64	2	175	255	809	67	111
2	5.0		485.760	.15	.81	.81	2	178	253		67	93
3	7.5		488.080	.10	.54	.54	2	182	255		65	89
4	10.0		489.300	.14	.76	.76	2	183	260		65	90
5	12.5	1103	490.486	.13	.69	.69	2	181	261		66	93
B1	15.0		491.915	.20	1.10	1.10	2	176	248		66	93
2	17.5		492.856	.09	.47	.47	2	181	246		63	89
3	20.0		493.830	.07	.38	.38	1	185	258		67	89
4	22.5		495.00	.13	.70	.70	2	185	260		68	89
5	25.0	1117	496.230	.15	.80	.80	2	178	255		66	90

SAMPLE RECOVERY DATA

Client: Bennett/Sidney PN: 266.009 Date: 1-21-94
 Source: Asphalt Plant Site: Scrubber Outlet Run#: 2
 Sample Date: 0/1/94 Recovery Date: 8/1/94

Filter No: 0421 Glassware Set No: _____ Sample Box No: 2

IMPINGER DATA

Gravimetric: ☒ Volumetric: _____

	#1	#2	#3	#4	#5	Total
Contents	HNO ₃	HNO ₃	empty	silica gel		
Final	764.3	543.9	350.9	706.5		2365.7
Initial	531.4g	534.9g	348.2g	698.4g		2112.9
Net						252.8

RECOVERED SAMPLE

Description of Particulate on Filter: _____

Color of Silica Gel: _____

Recovered By: _____

METHOD 3 FYRITE DATA

Client: Bonett/Sidney PN: _____ Date: 8/1/94
 Source: Asphalt Plant Site: scrubber outlet Run#: 2
 Operator: DD & BF

	Oxygen (O ₂)	Carbon Dioxide (CO ₂)
Run 1	11.0	8.0
Run 2	11.0	8.0
Run 3	11.0	8.0
Average	11.0	8.0

UP/85

EMISSION TESTING FIELD DATA

Client: Bonett/Sidney
 PN: 266.009
 Date: 01/14/4
 Source: Asphalt Plant
 Site: Scrubby Quail
 Sample Type: Particulate & lead
 Run: 3
 Operators: DD & BF
 Barometric Pressure (Pb): 26.46
 Static Pressure (Pg): -1.15

Meter Box #: N2
 Sample Box #: 4
 Filter #: 7693
 Probe Length/Type: 6' glass
 Stack Thermocouple #: 61
 Oven Thermocouple #: 00-4
 Impinger Thermocouple #: I-2
 Pitot Tube #: 2-type
 Stack I.D.: 60" x 66"
 Record Data Every 2.5 Minutes

Meter ΔH@: 1.786
 Meter Y Factor: 1.0328
 C Factor: 64
 Reference ΔP: .36
 Nozzle I.D.: — Avg. .308
 Pre-Test Leak Rate: .007 cfm @ 10" Hg
 Post-Test Leak Rate: .003 cfm @ 5" Hg
 Pitot Tube Leak Check: Pre: — Post: —
 Orsat Train Leak Check: Pre: 1.88 Post: 2.11
 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
A/	0	1236	518.550	.14	.72	.72	2	173	254	80%	93 94
2	2.5		519.740	.17	.86	.86	2	173	256		89 90
3	5.0		521.005	.12	.62	.62	2	170	246		90 91
4	7.5		524.125	.11	.56	.56	2	164	245		92 92
5	10.0		523.170	.13	.66	.66	2	163	244		93 92
6/	12.5	1249	524.315	.17	.86	.86	2	154	243		94 92
7/	15.0	1250	525.575	.11	.57	.57	2	161	244		92 92
8	17.5		—	.10	.52	.52	2	167	253		91 91
9	20.0		527.690	.14	.72	.72	2	168	253		90 92
10	22.5		528.865	.20	1.05	1.05	2	172	253	✓	90 92
11	25.0	1302	529.987					240			

PN 266.009

EMISSION TESTING FIELD DATA

Client: Bonett/Bridney Meter Box #: 3 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 ΔH ("H ₂ O)		Train Vacuum ("Hg)	Temperatures (°F)				
					Desired	Actual		Stack	Filter	Probe	IMP	Meter
C1	27.5	1303	529.987	.21	1.10	1.10	2	168	249	80%	62	94/94
2	30.0		531.735	.10	.52	.52	2	168	249		61	97/95
3	32.5		532.800	.13	.66	.66	2	167	245		60	95/94
4	35.0		535.280	.19	.96	.96	2	166	247		62	96/94
5	37.5	1316	536.689	.20	1.05	1.05	2	168	251		62	97/95
D1	40.0	1317	538.290	.20	1.05	1.05	2	167	250		63	96/94
2	42.5		539.400	.17	.86	.86	2	165	246		61	96/94
3	45.0		540.715	.18	.93	.93	3	167	244		61	96/95
4	47.5		542.280	.26	1.35	1.35	3	165	246		61	97/96
5	50.0	1329	543.608	.17	.86	.86	3	156	246		61	99/96
E1	52.5		545.148	.24	1.25	1.25	3	162	238		66	99/96
2	55.0		546.690	.24	1.25	1.25	3	163	243		64	100/97
3	57.5		548.380	.29	1.50	1.50	4	165	242		64	100/97
4	60.0		550.180	.36	1.85	1.85	4	167	244		64	100/97
5	62.5	1343	551.574	.17	.88	.88	3	166	245		65	101/97
			33024	$\Delta P = 410$		.920		165.8				9452

SAMPLE RECOVERY DATA

Client: Banett/Sidney PN: 266.009 Date: 7-22-99
 Source: Asphalt Plant Site: Scrubber Outlet Run#: 3
 Sample Date: 8/1/99 Recovery Date: 8/1/99

Filter No: 11293 Glassware Set No: _____ Sample Box No: 4

IMPINGER DATA

Gravimetric: X Volumetric: _____

	#1	#2	#3	#4	#5	Total
Contents	HNO ₃	HNO ₃	empty	silica gel		
Final	772.3	573.0	451.3	755.3		2551.9
Initial	544.80g	548.50g	449.2g	142.9g		2295.4
Net				151		256.5

RECOVERED SAMPLE

Description of Particulate on Filter: _____

Color of Silica Gel: _____

Recovered By: _____

METHOD 3 FYRITE DATA

Client: Bennett/Sidney PN: 266.009 Date: 8/1/94
 Source: Asphalt Plant Site: Scrubber Run#: 3
 Operator: DD+BF

	Oxygen (O ₂)	Carbon Dioxide (CO ₂)
Run 1	11.0	8.0
Run 2	11.0	8.0
Run 3	10.0	9.0
Average	10.7	8.3

✓ 9/85

HAYDEN LABORATORIES

August 16, 1994

Mr. Chris Ziehler
BARRETT PAVING MATERIALS, INC.
P.O. Box 1458
727 East Ash Street
Piqua, OH 45356

Subject: HEG Lab Task # 94080026
HEG Sample Number(s) 9409782 - 9409786

Project # : 266.009
Project Name: Barrett Paving Materials

Dear Mr. Ziehler:

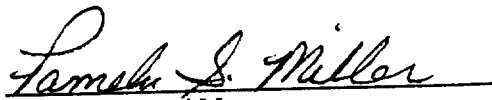
We are pleased to submit the report of analysis for the sample(s) you recently submitted to our laboratory. This report contains results for samples you submitted on 8/2/94.

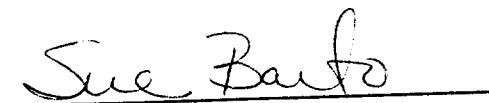
If you need additional information regarding these samples or if you have any questions regarding the results, please contact one of the persons listed below at 513/866-5908. We can provide additional report copies, method summaries or quality control data reports that you may require for full documentation 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. Chris Ziehler
 BARRETT PAVING MATERIALS, INC.
 P.O. Box 1458
 727 East Ash Street
 Piqua, OH 45356

Page 1
 Report Date : 08/16/94
 HEG Task # : 94080026
 HEG P/N, Acct: 266.009

P.O. Number:
 Proj Name: Barrett Paving Materials

Date Received: 08/02/94
 Proj #: 266.009

HEG Sample # : 9409782 Sample Date: 08/01/94 Sample Priority: Normal
 Sample ID : Run 1

Parameter	Units	Results	Comments
EPA Method 5			
Acetone	mg	18.85	
Filter	mg	77.85	
Sample Volume Submitted	mL	429	
Lead			
Sample Volume Submitted	mg	0.318	
	mL	790	

HEG Sample # : 9409783 Sample Date: 08/01/94 Sample Priority: Normal
 Sample ID : Run 2

Parameter	Units	Results	Comments
EPA Method 5			
Acetone	mg	78.6	
Filter	mg	73.45	
Sample Volume Submitted	mL	470	
Lead			
Sample Volume Submitted	mg	0.349	
	mL	760	

LABORATORY ANALYSIS REPORT

Mr. Chris Ziehler
 BARRETT PAVING MATERIALS, INC.
 P.O. Box 1458
 727 East Ash Street
 Piqua, OH 45356

Page 2
 Report Date : 08/16/94
 HEG Task # : 94080026
 HEG P/N, Acct: 266.009

=====

HEG Sample # : 9409784 Sample Date: 08/01/94 Sample Priority: Normal
 Sample ID : Run 3

Parameter	Units	Results	Comments
EPA Method 5			
Acetone	mg	9.45	
Filter	mg	72.55	
Sample Volume Submitted	mL	385	
Lead			
Sample Volume Submitted	mg	0.306	
	mL	760	

=====

HEG Sample # : 9409785 Sample Date: 08/01/94 Sample Priority: Normal
 Sample ID : Blank

Parameter	Units	Results	Comments
EPA Method 5			
Acetone	mg	2.1	24
Filter	mg	0.3	24
Sample Volume Submitted	mL	320	
Lead			
Sample Volume Submitted	mg	< 0.005	
	mL	575	

LABORATORY ANALYSIS REPORT

Mr. Chris Ziehler
 BARRETT PAVING MATERIALS, INC.
 P.O. Box 1458
 727 East Ash Street
 Piqua, OH 45356

Page 3
 Report Date : 08/16/94
 HEG Task # : 94080026
 HEG P/N, Acct: 266.009

=====

HEG Sample # : 9409786 Sample Date: 08/01/94 Sample Priority: Normal
 Sample ID : Fuel Sample

Parameter	Units	Results	Comments
T.Chlorine, ASTM D808	%	0.04	
Flashpoint	deg. C	> 65.8	
Heat of Combustion	BTU/lb	17975	
Lead	mg/kg	7.29	
Chromium	mg/kg	< 0.83	
Cadmium	mg/kg	< 0.42	
Mercury	mg/kg	< 0.1	
Arsenic	mg/kg	< 0.21	
PCB, oil			
Aroclor 1016	mg/kg	< 2.4	02
Aroclor 1221	mg/kg	< 2.4	
Aroclor 1232	mg/kg	< 2.4	
Aroclor 1242	mg/kg	< 2.4	
Aroclor 1248	mg/kg	< 2.4	
Aroclor 1254	mg/kg	< 2.4	
Aroclor 1260	mg/kg	< 2.4	
Total	mg/kg	< 2.4	

02 Sample matrix interferences

24 Analyte found in field blank at the indicated concentration

HEG / LIMS
Analysis Date Report
Report Date: 08/16/94

HEG Lab Task # 94080026
HEG Client: HAYDEN ENVIRONMENTAL GROUP

Date Received : 08/02/94 Date Reported: 08/16/94

Sample #: 9409782 Sample Date: 08/01/94
Sample ID: Run 1

Analysis Date	Analyst	Test Performed	Hold Time (Days)
08/16/94	kw	Lead total, volumesubmitted ICP	180
08/11/94	ovp	Sample Volume Submitted	
08/11/94	ovp	EPA5-Particulate	28

Sample #: 9409783 Sample Date: 08/01/94
Sample ID: Run 2

Analysis Date	Analyst	Test Performed	Hold Time (Days)
08/16/94	kw	Lead total, volumesubmitted ICP	180
08/11/94	ovp	Sample Volume Submitted	
08/11/94	ovp	EPA5-Particulate	28

Sample #: 9409784 Sample Date: 08/01/94
Sample ID: Run 3

Analysis Date	Analyst	Test Performed	Hold Time (Days)
08/16/94	kw	Lead total, volumesubmitted ICP	180
08/11/94	ovp	Sample Volume Submitted	
08/11/94	ovp	EPA5-Particulate	28

HEG / LIMS
Analysis Date Report
Report Date: 08/16/94

Sample #: 9409785 Sample Date: 08/01/94
Sample ID: Blank

Analysis Date	Analyst	Test Performed	Hold Time (Days)
08/16/94	kw	Lead total, volumesubmitted ICP	180
08/11/94	ovp	Sample Volume Submitted	
08/11/94	ovp	EPA5-Particulate	28

Sample #: 9409786 Sample Date: 08/01/94
Sample ID: Fuel Sample

Analysis Date	Analyst	Test Performed	Hold Time (Days)
08/05/94	jep	PCB Extraction(Oil)	28
08/08/94	jrw	Arsenic total, furnace, solid	180
08/08/94	ksw	Polychlorinated Bi-phenyls-Oil	40
08/04/94	kw	Mercury total, solid	28
08/05/94	kw	Cadmium total solidICP	180
08/05/94	kw	Chromium total solidICP	180
08/05/94	kw	Lead total solidICP	180
08/04/94	msn	Solid Sample Prep for metals	28
08/10/94	rst	Flashpoint	28
08/11/94	sub	Total Halogens****(as Chlorine)	28
08/11/94	sub	BTU *** Heat on Combustion	28

CHAIN OF CUSTODY

Project Number:	266.009	Scaled By Signature:	<i>Betty. Joyce</i>
Company:	Bacett Paving	Date Sealed:	8/2/94
City:	Sidney	Time Sealed:	1030
State:	OH	Seal Number:	N/A

Container Type (petri dish, 1000 ml polyethylene, 1000 ml glass etc.)	Sample media (acetone, 0.1N HNO ₃ , etc.)	Analyses	Run Numbers (Number of bottles are recorded in the squares below)			
			Run 1	Run 2	Run 3	Field Sample
petri dish	glass fiber filter	} USEPA Method 5 for filterable particulate	1	1	1	
1000ml poly	Acetone		1	1	1	
1000ml poly	0.1N Nitric	} USEPA Method 12 for lead.	1	1	1	
1000ml poly	Fuel Oil	} Al, Cd, Cr, Pb, PCB, Hg, Total Hydrocarbons, Slack point, heat content			7	1

Received By:	Affiliation:	Date:	Time:
Received By:	Affiliation:	Date:	Time:
Opened at lab by:	Date opened: 8/2/94	Time opened:	Seal Intact:
			Y N

IN HOUSE PROJECT INFORMATION FORM

PROJECT MANAGER:

NAME

EMP. #

JOB #

SAMPLES SUBMITTED BY/DATE:

PRIORTIY (N/R/E):

DUE DATE:

PROJECT CLIENT:

CONTACT

COMPANY

PO#MAIL REPORT DIRECTLY TO CLIENT: YES _____ NO X

ANALYTICAL INFORMATION

OF SAMPLES: 5 (4-petroleum & lead; 1-fuel analysis)

DESCRIPTIONS/TEST:

- USEPA Method 5 for particulate (filterable)
- USEPA Method 12 for Lead

→ Analyse particulate samples. Each sample consists of: 1- filter

1- Acetone probe pens

1- if N nitric impinges contents & Rinse

- Analyze fuel sample for Ar, Cd, Cr, Pb, PCB, Hg, total halogens, flash point, and heat content.

SPECIAL NOTES: For lead $\rightarrow$ report total concentrations for sample $\rightarrow$ do not need to list filter or solution contents separately.

CLIENT/PROJECT #: Barrett (Sidney)/ 266.009
 SAMPLE LOCATION: Scrubber Outlet
 DATE/TIME: 8/1/94; 0834-0941
 RUN #: 1

STATIC PRESSURE("H2O):	-0.26	"HG	29.38
BAROMETRIC("HG):	29.40		
SAMPLE TIME(min):	62.50	Vm(corr)	32.712
ACTUAL METER VOLUME:	32.712	DSCF	32.150
SQ. ROOT /\P:	0.438		
AVG ORIFICE /\H:	0.95		
AVG STACK TEMP °F:	169.3	°R	629.3
AVG METER TEMP °F:	86.6		
Cp PITOT :	0.84		
NOZZLE DIA.(inches):	0.305	An(ft^2)	5.07E-04
METER GAMMA:	1.033		
LEAK RATE(IF>0.02):			
CIRC STACK? 1=Y,0=N:	0	As(ft^2)	25.00
DIA OR DIM (inches):	3600.00		
% O2 :	11.70	DRY MOLE WT	29.75
% CO2 :	8.00	ST MOLE WT	26.76
VOL CONDENSATE(ml):	232.80	% H2O	25.42
FILTER GAIN(mg):	77.85		
RINSE GAIN(mg):	18.85	NET WT(mg)	96.70
ANALYTE #1 :	Lead		
MOLE WEIGHT:	207.19		
µg/sample :	318.0		
PPM :			

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

Gas Velocity (Vs):	28.14	FT/SEC
Stack Gas Flow (Qs):	42208.4	ACFM
:	25936.0	DSCFM
Stack Gas Temp :	169	Deg F
Moisture (H2O):	25.42	%
Isokinetic :	97.78	%

FILTERABLE PARTICULATE SUMMARY

Concentration (Cs):	4.63E-02	Gr/DSCF
:	6.62E-06	lb/DSCF
Emission Rate (Er):	10.30	lb/hr

LEAD EMISSIONS SUMMARY

Concentration (Cs):	2.18E-08	lb/DSCF
Emission Rate (Er):	3.39E-02	lb/hr

COMMENTS: *** Moisture sample unmeasurable. Moistue result is average of run 2 and 3.

CLIENT/PROJECT #: Barrett (Sidney)/ 266.009
 SAMPLE LOCATION: Scrubber Outlet
 DATE/TIME: 8/1/94; 1051-1158
 RUN #: 2

STATIC PRESSURE("H2O):	-0.15	"HG	29.44
BAROMETRIC("HG):	29.45		
SAMPLE TIME(min):	62.50	Vm(corr)	33.787
ACTUAL METER VOLUME:	33.787	DSCF	32.905
SQ. ROOT /\P:	0.417		
AVG ORIFICE /\H:	0.98		
AVG STACK TEMP °F:	179.8	°R	639.8
AVG METER TEMP °F:	92.6		
Cp PITOT :	0.84		
NOZZLE DIA.(inches):	0.308	An(ft^2)	5.17E-04
METER GAMMA:	1.033		
LEAK RATE(IF>0.02):			
CIRC STACK? 1=Y,0=N:	0	As(ft^2)	25.00
DIA OR DIM (inches):	3600.00		
% O2 :	11.00	DRY MOLE WT	29.72
% CO2 :	8.00	ST MOLE WT	26.61
VOL CONDENSATE(ml):	252.80	% H2O	26.56
FILTER GAIN(mg):	73.45		
RINSE GAIN(mg):	78.60	NET WT(mg)	152.05
ANALYTE #1 :	Lead		
MOLE WEIGHT:	207.19		
µg/sample :	349.0		
PPM :			

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

Gas Velocity (Vs):	27.06	FT/SEC
Stack Gas Flow (Qs):	40595.9	ACFM
:	24208.7	DSCFM
Stack Gas Temp :	180	Deg F
Moisture (H2O):	26.56	%
Isokinetic :	105.14	%

FILTERABLE PARTICULATE SUMMARY

Concentration (Cs):	7.12E-02	Gr/DSCF
:	1.02E-05	lb/DSCF
Emission Rate (Er):	14.77	lb/hr

LEAD EMISSIONS SUMMARY

Concentration (Cs):	2.33E-08	lb/DSCF
Emission Rate (Er):	3.39E-02	lb/hr

COMMENTS:

CLIENT/PROJECT #: Barrett (Sidney)/ 266.009
 SAMPLE LOCATION: Scrubber Outlet
 DATE/TIME: 8/1/94; 1236-1343
 RUN #: 3

STATIC PRESSURE("H2O):	-0.15	"HG	29.45
BAROMETRIC("HG):	29.46		
SAMPLE TIME(min):	62.50	Vm(corr)	33.024
ACTUAL METER VOLUME:	33.024	DSCF	32.057
SQ. ROOT /\P:	0.418		
AVG ORIFICE /\H:	0.93		
AVG STACK TEMP °F:	165.8	°R	625.8
AVG METER TEMP °F:	94.5		
Cp PITOT :	0.84		
NOZZLE DIA.(inches):	0.308	An(ft^2)	5.17E-04
METER GAMMA:	1.033		
LEAK RATE(IF>0.02):			
CIRC STACK? 1=Y,0=N:	0	As(ft^2)	25.00
DIA OR DIM (inches):	3600.00		
% O2 :	10.70	DRY MOLE WT	29.76
% CO2 :	8.30	ST MOLE WT	26.54
VOL CONDENSATE(ml):	256.50	% H2O	27.36
FILTER GAIN(mg):	72.55		
RINSE GAIN(mg):	9.45	NET WT(mg)	82.00
ANALYTE #1 :	Lead		
MOLE WEIGHT:	207.19		
µg/sample :	306.0		
PPM :			

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

Gas Velocity (Vs):	26.86	FT/SEC
Stack Gas Flow (Qs):	40289.7	ACFM
:	24304.6	DSCFM
Stack Gas Temp :	166	Deg F
Moisture (H2O):	27.36	%
Isokinetic :	102.03	%

FILTERABLE PARTICULATE SUMMARY

Concentration (Cs):	3.94E-02	Gr/DSCF
:	5.63E-06	lb/DSCF
Emission Rate (Er):	8.21	lb/hr

LEAD EMISSIONS SUMMARY

Concentration (Cs):	2.10E-08	lb/DSCF
Emission Rate (Er):	3.06E-02	lb/hr

COMMENTS:

BARRETT PAVING / Fairborn - PN 266.009

EXAMPLE CALCULATIONS

RUN #1

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

$$V_{mstd} = (17.647) \times (V_m) \times (Y) \times \frac{(P_b) + \frac{(\Delta H)}{(13.6)}}{(T_m + 460)}$$
$$V_{mstd} = (17.647) \times (32.712) \times (1.033) \times \frac{(29.40) + \frac{(0.95)}{(13.6)}}{(86.6 + 460)} = 32.150$$

2.0 Volume Water Vapor Collected, Standard Conditions

$$V_{wstd} = (0.04707) \times (V_{lc})$$
$$V_{wstd} = (0.04707) \times (232.8) = 10.958$$

3.0 Proportion Water Vapor, By Volume

$$B_{ws} = \frac{(V_{wstd})}{(V_{wstd} + V_{mstd})}$$
$$B_{ws} = \frac{(10.958)}{(10.958 + 32.150)} = 0.2542$$

4.0 Molecular Weight of Stack Gas, Dry Conditions

$$M_d = (0.44 \times CO_2) + (0.32 \times O_2) + (0.28 \times (N_2 + CO))$$
$$M_d = (0.44 \times 8.0) + (0.32 \times 11.7) + (0.28 \times 80.3) = 29.748$$

5.0 Molecular Weight of Stack Gas, Stack Conditions

$$M_s = M_d \times (1 - B_{ws}) + (18 \times B_{ws})$$
$$M_s = 29.748 \times (1 - 0.2542) + (18 \times 0.2542) = 26.76$$

6.0 Absolute Stack Gas Pressure, inches Hg

$$P_g = P_B + \frac{(P_g)}{(13.6)}$$

$$P_g = 29.40 + \frac{(-0.26)}{(13.6)} = 29.38$$

7.0 Stack Gas Velocity, fps

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

$$V_s = (85.49) \times (0.84) \times (0.438) \times \sqrt{\frac{(169.3 + 460)}{(29.38) \times (26.76)}} = 28.1$$

8.0 Stack Gas Flow Rate, acfm

$$Q_a = (60) \times (V_s) \times (6.944E-03) \times (L) \times (W)^2$$

$$Q_a = (60) \times (6.944E-03) \times (28.1) \times (60) \times (60) = 42,208$$

9.0 Stack Gas Flow Rate, dscf

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

$$Q_{std} = (17.647) \times (42,208) \times (1 - 0.2542) \times \frac{(29.38)}{(169.3 + 460)} = 25,936$$

10.0 Isokinetic Variation, %

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

$$\%I = 0.0944 \frac{(169.3 + 460) \times (32.150)}{(29.38) \times (28.1) \times (5.074E-04) \times (62.5) \times (1 - 0.2542)} = 97.8$$

11.0 Filterable Particulate Concentration, gr/dscf

$$C_1 = \frac{(0.0154) \times (Mn)}{(V_{std})}$$
$$C_1 = \frac{(0.0154) \times (96.7)}{(32.150)} = 4.63E-02$$

12.0 Filterable Particulate Concentration, lb/dscf

$$C_2 = (1.429E-04) \times (C_1)$$
$$C_2 = (1.429E-04) \times (4.96E-02) = 6.62E-06$$

13.0 Filterable Particulate Emission Rate, lb/hr

$$ER = (C_2) \times (Q_{std}) \times (60)$$
$$ER = (6.62E-06) \times (25,936) \times (60) = 10.3$$

14.0 Lead Concentration, lb/dscf

$$C_{Pbl} = \frac{(2.205E-09) \times (Mn_{Pb})}{(V_{std})}$$
$$C_{Pbl} = \frac{(2.205E-09) \times (318.0)}{(32.150)} = 2.18E-08$$

15.0 Lead Emission Rate, lb/hr

$$ER = (C_{Pbl}) \times (Q_{std}) \times (60)$$
$$ER = (2.18E-08) \times (25,936) \times (60) = 3.39E-02$$

NOMENCLATURE

A_n = Area of sampling nozzle, ft^2

A_s = Cross-sectional area of stack at sampling site, ft^2

B_{ws} = Proportion water vapor in stack gas by volume

CO = Percent carbon monoxide in stack gas by volume, dry basis, %

CO_2 = Percent carbon dioxide in stack gas by volume, dry basis, %

C_p = Pitot tube coefficient

C_1 = Concentration of filterable particulate in stack gas, grains/dscf

C_2 = Concentration of filterable particulate in stack gas, lb/dscf

C_{Pbl} = Concentration of lead in stack gas, lb/dscf

Dia = Diameter of stack at sampling site, inches

ER = Emission rate, lb/hr

ΔH = Average pressure drop across orifice

%I = Percent isokinetic sampling rate, %

M_d = Molecular weight of stack gas, dry conditions, lb/lb-mole

M_n = Particulate catch, mg

$M_{n_{\text{pb}}}$ = Lead catch, ug

M_s = Molecular weight of stack gas, stack conditions, lb/lb-mole

N_2 = Percent nitrogen in stack gas by volume, dry basis, %

O_2 = Percent oxygen in stack gas by volume, dry basis, %

Δp = Average velocity head of stack gas, inches H_2O

$\sqrt{\Delta p}$ = Average square root of velocity head pressure, inches H_2O

P_b = Barometric pressure, inches Hg

P_g = Static pressure of stack gas, inches H_2O

P_s = Absolute stack gas pressure, inches Hg

Q_a = Volumetric stack gas flow rate, stack conditions, acfm

Q_{std} = Volumetric stack gas flow rate, dry standard conditions, dscfm

Θ = Elapsed time of test, minutes

T_m = Average dry gas meter temperature, °F

T_s = Average stack gas temperature, °F

V_{lc} = Mass of water collected, g

V_m = Volume of gas measured by dry gas meter, ft^3

V_{mc} = Volume of dry gas meter corrected for leak rate, ft^3

V_{mstd} = Volume of dry gas meter corrected to standard conditions, ft^3

V_s = Stack gas velocity, fps

V_{wstd} = Volume of water collected, standard conditions, ft^3

Y = dry gas meter calibration factor, dimensionless

Note: Standard conditions = 68°F and 29.92 inches Hg.

QUALITY ASSURANCE PROCEDURES

The sampling and analytical equipment used in this test series was 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. The following calibration procedures were employed:

- a. Probe-tips (Nozzles)
Probe-tips were inspected before use to detect damage or irregularities. If the nozzle showed signs of damage, it was repaired and measured before use. The nozzle diameter was determined in the field by measuring three diameters with a precision micrometer. The average of the three measurements was the measured nozzle diameter.
- b. Pitot Tubes
The S-type pitot tubes were built to the design specifications cited in reference Method 2. Standard pitot tubes are supplied from the manufacturer with a coefficient of 0.99. The pitot tubes, connecting lines, and manometers were leak-checked in the field before and after each test.
- c. Thermocouples
Thermocouples were calibrated upon receipt and annually thereafter. The thermocouples were calibrated at approximately 32°F, ambient temperature, 212°F, and approximately 450°F.
- d. Fyrite Analyzers
The Fyrite analyzers were leak-checked on-site and the reagents were replenished as needed.
- e. Method 5 Control Consoles
The dry gas meter and the orifice in the Method 5 control console were calibrated at six (6) points from 0 to 4 inches of mercury. The dry gas meter coefficients (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-factor has not changed more than plus or minus 5%. The lower of the pre-test and post-test 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 Barrett P.N. 266.009 Date 8/26/94
 Ref. Meter 1334637 Yr 1.000 Pb 29.53
 Meter Box N-3 Pre Test Y 1.033 H 0.95
 Vacuum 4 Calib. Time 10

Performed By: Scott Forsyth (wrs)

Run #	Vr(f-i)	Tr(avg)	Pb	Vd(f-i)	Td(avg)	Y
1	5.640	78.5	29.530	5.547	89.5	1.035
2	5.644	78.0	29.530	5.554	89.5	1.035
3	5.636	78.0	29.530	5.539	89.5	1.036
Average Y						1.035

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

POST TEST METER BOX CALIBRATION

CLIENT Barrett (Snyder) DATE 8/26/94 Ref Meter # 1334637
 PN 266.009 Pb ("Hg) 29.53 Test Meter Y 0.9994
 METER BOX N-2 PRE-TEST Y 1.03281

ΔH@	Vr (Reference)	Tr (Reference)	Vd (Meter Box)	Td (Meter Box)	Time	Vaccum
95	547.498	79°F	592.311	92/87	0	4
95	541.858	78°F	586.764	92/87	10	4
95	547.498	79°F	592.311	92/87	0	4
95	553.142	78°F	597.865	92/87	10	4
95	553.142	78°F	597.865	92/87	0	4
95	558.778	78°F	603.404	93/89	10	4

Leak-Check / But Forged

DGM/ORIFICE CALIBRATION

DATE July 28 1994

METER BOX NO. N-2

BAROMETRIC PRESSURE 29.24 in. Hg

REFERENCE METER NO. 1334637

CALIBRATOR B. B. Joseph

REFERENCE Y 0.9996

ORIFICE SETTING in. H ₂ O	REFERENCE METER		DRY GAS METER			TIME ⊖ 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	457.182	72°F	378.424	85°	82°	12.45	5
	452.060	72°	373.345	84°	81°		
	5.122	72°	5.079	83°			
1.0	464.707	73°	385.865	85°	82°	10.0	5
	458.923	73°F	380.148	84°F	82°		
	5.784	73°F	5.717	83.25°			
1.5	473.321	74°	394.362	86°	84°	10.0	5
	466.382	73°	387.523	85°	83°		
	6.939	73.5°	6.839	84.5°			
2.0	481.886	74°	402.797	87°	83°	10.0	5
	474.024	74°	395.057	85°	84°		
	7.862	74°	7.740	84.75°			
3.0	492.902	74°	413.569	85°	89°	10.0	5
	483.247	74°	404.137	87°	84°		
	9.655	74°	9.432	86.25°			
4.0	506.118	74°	426.431	90°	86°	10.0	5
	494.943	74°	415.542	88°	84°		
	11.175	74°	10.889	87°			

Leah Chech B. Joseph

Meter Box #	N-2	N-2	N-2
Date	7/28/94	7/28/94	7/28/94
Reference Meter #	1334637	1334637	1334637
Y Reference	0.9996	0.9996	0.9996
Barometric Pressure	29.24	29.24	29.24
Orifice Setting ^ H (" H2O)	0.5	1	1.5
Total Gas Volume Reference	5.122	5.784	6.939
Average Temperature Reference	72	73	73.5
Total Gas Volume Dry Gas Meter	5.079	5.717	6.839
Average Temperature Dry Gas Meter	83	83.25	84.5
Time (min)	12.45	10	10
Vacumn	5	5	5

***** Calculations *****
 Meter Box Y
 Meter Box ^ H@

1.0276	1.0282	1.0312
1.669	1.695	1.765

Meter Box #	N-2	N-2	N-2
Date	7/28/94	7/28/94	7/28/94
Reference Meter #	1334637	1334637	1334637
Y Reference	0.9996	0.9996	0.9996
Barometric Pressure	29.24	29.24	29.24
Orifice Setting ^ H (" H2O)	2	3	4
Total Gas Volume Reference	7.862	9.655	11.175
Average Temperature Reference	74	74	74
Total Gas Volume Dry Gas Meter	7.74	9.432	10.889
Average Temperature Dry Gas Meter	84.75	86.25	87
Time (min)	10	10	10
Vacumn	5	5	5

***** Calculations *****
 Meter Box Y
 Meter Box ^ H@

1.0306	1.0389	1.0404
1.836	1.821	1.810

Average y
 Average delta H

1.03281
1.7662

Meter Box Field Check

Meter Box #: N-2
 Y: 1.03281
 delta H: 1.7662

Date: 7/28/94
 Calibrator: B. Joyak
 Leak Check: ✓

Barometric: 29.24

Run No.	Initial Volume	Final Volume	Net Volume	Initial Temp.	Final Temp.	Avg. Temp.	Y _c Comparison
1	429.426	436.711	7.285	81/82	84/83	82.5	1.05603
2	436.711	443.988	7.277	84/84	87/83	84.25	1.0589
3	443.988	451.268	7.280	87/83	88/83	85.25	1.05943

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

Compare with Y_c
 0.97 * Y < Y_c < 1.03 * Y
 0.97 * Y = 1.00183
 1.03 * Y = 1.06379

Accuracy Test Data for Calibration Test Meter

Rockwell Model #R275 Test Meter S/N 1334637

Calibrated April 4, 1993

Test Point	Flow Rate % of Max.Capacity	% Accuracy	% Error +/-
1	100	99.97	-0.03
2	66	99.98	-0.02
3	52	100.15	+0.15
4	26	100.12	+0.12
5	12	99.98	-0.02

Average % Accuracy = 100.04 %

Average % Error = +0.04 %

$Y = 1 - (+0.04) = 0.9996$

HEAT EQUIPMENT AND TECHNOLOGY INC.

951 NORTH BEND ROAD • CINCINNATI, OHIO 45224 • 513-591-3000 • FAX 513-591-0024

METER TEST DATA SHEET

CUSTOMER: HAYDEN ENVIRONMENTAL
 METER DESCRIPTION: Rockwell R275 Test Meter
 SERIAL NUMBER: 1334637
 DATE: 4-7-93

TEST DATA

ACCURACY TEST					
Test Point	Flow Rate CFH	Percent of Max. Cap.	Percent Accuracy	Differential Inches W.C.	Percent of Error $\pm$
1	272	100%	99.97	N.A.	-0.3
2	180	66%	99.98	N.A.	-0.2
3	144	52%	100.15	N.A.	+0.15
4	72	26%	100.12	11-14	+0.12
5	35	12%	99.98	0.6-1.1	-0.02
Static Pressure Test				Average 90 mm $\rightarrow$	0.04%
Test Pressure		Length of Test		Means of Testing	
5 #		5 MINUTES		BUBBLE TANK	

The above data has been determined from tests performed with air at atmospheric pressure and ambient temperature. The tests were done using positive displacement proving devices, dimensionally traceable to the United States National Bureau of Standards.

$$y = 1 - 0.0004 = 0.9996$$

Dayton
 1931 Cudgel Drive
 Miamisburg, Ohio 45342
 513-847-8064

Cleveland
 8030 Deepwood Blvd.
 Mentor, Ohio 44060
 216-255-3000
 FAX 216-255-6588

Columbus
 4780 Sportsman Club Road
 Johnstown, Ohio 43031
 614-967-3111

THERMOCOUPLE CALIBRATION

THERMOCOUPLE I.D.: 60 LENGTH: 6 DATE: 6/20/94
CALIBRATED BY: D. Michelle Connery 6/23/94
REFERENCE THERMOMETER: 402 947 452

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	531.0	530.8	0.2 0.03%	558.1	560
Ice H ₂ O	490.1	490.0	0.1 0.19%	558.1	560
Boil H ₂ O	668.9	664.8	4.1 0.6%	1579.4	1600
Hot oil	918.0	915.9	2.1 0.2%	959.1	960

THERMOCOUPLE CALIBRATION

THERMOCOUPLE I. D.: 6E LENGTH: 6' DATE: 10/25/93

CALIBRATED BY: Rut Foyt

REFERENCE THERMOMETER: VWR 9992 -20°-150°

SOURCE	REFERENCE THERMOMETER TEMPERATURE °F	TEST THERMOCOUPLE TEMPERATURE °F	TEMPERATURE DIFFERENCE °F
Am. Air	15.4°C	15.4°C	0.0°
ICE BATH	6.0°C	6.0°C	0.0°
Boiling H ₂ O	100.0°C	99.5°C	0.5°
Hot oil	146.5°C	145.0°C	1.5°

THERMOCOUPLE CALIBRATION

THERMOCOUPLE I. D.: 6F LENGTH: 6' DATE: 10/25/93
 CALIBRATED BY: Bert Jones
 REFERENCE THERMOMETER: VWR 9992 -20°-150°

SOURCE	REFERENCE THERMOMETER TEMPERATURE °F	TEST THERMOCOUPLE TEMPERATURE °F	TEMPERATURE DIFFERENCE °F
Am. Air	16.8 16.5°C	16.8°C	.3°
ICE BATH	5.0°C	3.8°C	1.2°
Boiling H ₂ O	100.0°C	100.0°C	0.0°
HOT OIL	146.5	146.3	0.2°

THERMOCOUPLE CALIBRATION

Thermocouple I.D.: OV-4 Length: Oven 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.: OV-2 Length: Oven Therm. Date: 8/19/93

Calibrated By: Pat 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

THERMOCOUPLE CALIBRATION

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

Calibrated By: Bert H. Forst

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	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.: I-2 Length: FMP HEAD Date: 8/19/93

Calibrated By: Betty J. Jorgensen

Reference Thermometer: 1248

Source	Reference Thermometer Temperature °F	Test Thermocouple Temperature °F	Temperature Difference °F
AM. AIR	24.7	24.3	0.4
ICE BATH	7.0	6.2	0.8
BOILING H ₂ O	100.0	99.0	1.0
HOT OIL	157.0	156.6	0.4

THERMOCOUPLE CALIBRATION

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

Calibrated By: Betty Joynt

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