AP42 Section: 11.1

Reference Number: 39

Title: NAPA Stack Emissions Program, Interim Status Report, National Asphalt Pavement Association, Baltimore, MD,

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February 1993.

NAPA Stack Emissions Program

INTERIM Status Report

NAPA Stack Emissions Program

INTERIM Status Report

Submitted to:

the
ENVIRONMENTAL PROTECTION AGENCY

at
RESEARCH TRIANGLE PARK

February 23, 1993

by:

the
NAPA's EMISSIONS TESTING TASK FORCE

NAPA Stack Emissions Program

INTERIM Status Report

Prepared for:

the

National Asphalt Pavement Association

Lanham, Maryland

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EXECUTIVE SUMMARY

During the 1989 NAPA Convention, the NAPA Environmental, Safety, and Plant Operations Committee (ESPOC) determined that a real threat to the Hot Mix Asphalt (HMA) Industry exists in terms of stack emission limits that could be established by the 50 individual states of the U.S.that might be based on limited or no actual emission information. Concerned about the limited stack emission data available in the public domain for five of the six USEPA criteria pollutants in addition to the toxic air pollutants emitted from the HMA manufacturing process, the ESPOC established a course of action that it felt would alleviate the threat it envisioned. This course of action involved establishing a stack emission sampling protocol that was reviewed and approved by the USEPA Office of Air Quality Programs and Standards (OAQPS); identifying HMA producers that would be willing to have their HMA facilities stack tested; establishing an "Equipment Profile" form that would provide pertinent information about the facility being considered for sampling; and, determining the costs and funding of the project.

After several years of work, NAPA has collected emission data from seven HMA facilities of various process configurations. The data have been combined and averaged for all the facilities sampled, and the results are provided in the following table in units of tons of pollutant per year for two different average annual production levels and as pounds of pollutant measured per ton of HMA produced. Two annual production levels were chosen for comparisons of annual tons of pollutant emissions. One production level was 125,000 tons which represents the national average annual production for a HMA facility. The other production level of 250,000 tons is a common annual production level for a HMA facility operating in the U.S. today.

EXECUTIVE SUMMARY TABLE			
	Overall Average lb/ton HMA	@ 125,000 tons HMA/yr tons/yr	@ 250,000 tons HMA/yr tons/yr
TTL PAH	0.000172	0.010779	0.021559
FORMALDEHYDE	0.001985	0.124056	0.248112
BENZENE	0.000293	0.018343	0.036686
TOLUENE	0.000252	0.015744	0.031488
ETHYL BENZENE	0.000148	0.009279	0.018558
XYLENE	0.000282	0.017608	0.035215
TOTAL HAPs	0.003133	0.195809	0.391619
Criteria Air Pollutants			
CARBON MONOXIDE	0.2149	13.4339	26.8677
SULFUR DIOXIDE	0.0385	2.4086	4.8172
NITROGEN OXIDES	0.0528	3.3022	6.6043
Other			
THC	0.0388	2.4234	4.8468
METHANE	0.0134	0.8374	1.6748
NON-MEHTANE THC	0.0254	1.5860	3.1720
CONDENSIBLES	0.0124	0.7719	1.5438

INTRODUCTION

Over the last 20 years, the USEPA has established annual emission limits for six pollutants which they have designated as criteria pollutants: Particulate Matter (PM), Volatile Organic Compounds (VOC), Oxides of Nitrogen (NO_x), Oxides of Sulfur (SO_x), Carbon Monoxide (CO), and Lead (Pb). HMA facilities have been targeted as a major source of PM emissions and a stack emission concentration exists for PM emissions under the New Source Performance Standards: 0.04 grains per dry, standard cubic foot of exhaust gas. However, similar national emission standards for HMA facilities for the other five criteria pollutants have not been established by the USEPA, and are not likely to be established by them. Hence, it will be up to the states to establish emission limits, if deemed necessary, depending on their compliance status with the National Ambient Air Quality Standards (NAAQS) for each of the criteria pollutants.

State air quality agencies are required to establish and maintain inventories of annual emissions of the criteria pollutants from all sources. This is typically accomplished within permitting and equipment registration programs, whereby applications for equipment registration, Permits to Construct/Install, and/or Permits to Operate require that the owner/operator report annual emission rates for the six criteria pollutants. These emission rates are generally derived by using emission factors established by the USEPA and published in USEPA's document titled: *Compilation of Air Pollutant Emission Factors*, designated as AP-42. Emission factors for HMA facilities are found in AP-42's Section 8.1, Table 8.1-5 (provided in Table 1). Unfortunately, while the particulate emission factor has a high quality rating, the emission factors for the other five criteria pollutants have very low quality ratings because they are derived from the stack test results of one stack test on

TABLE 1

POLLUTANT	Fuel Combustion Emission Factors								HMA Process Emission Factors	
	Natural Gas		2 Fuel Oil		6 Fuel Oil		LPG		AP-42 Section 8.1	
	lb/10^6 ft3	Emission Factor Rating	lb/1000 gal	Emission Factor Rating	lb/1000 gal	Emission Factor Rating	lb/1000 gal	Emission Factor Rating	lb/ton HMA	Emission Factor Rating
SO2	0.6	A	56.8	A	392.5	A	0.0144	C	0.058400	C
SO3	N/A		0.8	A	5	A		C		
CO	35	A	5	A	5	A	3.1	C	0.038000	D
NO2	140	A	20	A	55	A	12.4	C	0.036000	D
METHANE	3	C	0.052	A	1	A	0.27	C		
NMVO	2.8	C	0.2	A	0.28	A	0.25	C	0.028000	D
POM									0.000026	D
FORMALDEHYDE									0.000150	D

Assumptions: 0.4% Sulfur in No. 2 FO and 2.5% Sulfur in No. 6 FO, which is involved in obtaining the emission factors for particulate emissions from residual fuels and for SO2 emissions from both types of fuel oils. LPG contains 0.16 grains S per 100 ft3 vapor to obtain SO2 emission factor for LPG.

one HMA facility which was conducted in 1975. This was a batch mix facility fired on fuel oil with the particulate emissions being controlled by a wet scrubber.

With such a low quality rating, it is not unusual for regulators to turn to the emission factors for fuel combustion in industrial boilers to estimate annual emissions from combustion in HMA facilities because they have higher quality ratings as provided in Table 1. However, many people fail to recognize that this is not an appropriate comparison. Fuel combustion in industrial furnaces is a very controlled process and does not reflect the impact the aggregate drying process has on the combustion process in a HMA facility since aggregate is present in the combustion zone.

As states are faced with USEPA requirements to reduce emissions of criteria pollutants and establish standards for industry groups currently unregulated for any specified criteria or non-criteria pollutant, the first step where HMA facilities have been concerned, has been to use the AP-42 emission factors as a starting point for emission standards development. If emission limits are based on the current AP-42 emission factors, the NAPA stack test results indicate that typical HMA facilities would have compliance problems with most pollutant emission limits.

THE NAPA STACK TESTING PROTOCOL.

The NAPA protocol included stack sampling for the following pollutants:

Criteria Pollutants

- Volatile Organic Compounds . . . . VOC;
- Oxides of Nitrogen . . . . NO_x;
- Oxides of Sulfur . . . . SO_x;
- Carbon Monoxide . . . . CO.

Non-Criteria Pollutants (CAAA HAPs)

- Formaldehyde;
- Polynuclear Aromatic Hydrocarbons . . . . PAHs
  (synonyms: Polynuclear Organic Matter (POM), PNAs);

Acenaphthene	Chrysene
Acenaphthylene	Dibenzo(a,b)anthracene
Anthracene	Fluoranthane
Benz(a)anthracene	Fluorene
Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene
Benzo(b)fluoranthene	Methyl-naphthalene
Benzo(e)pyrene	Naphthalene
Benzo(g,h,i)perylene	Phenanthrene
Benzo(k)fluoranthene	Pyrene

- Benzene;
- Toluene;
- Ethyl-benzene;
- Xylene;
- Methane.

The following stack sampling and analytical methods were used to determine the exhaust gas conditions and the emission rates and concentrations of the above listed pollutants.

- Stack gas velocity, stack gas volumetric flow rate, stack gas moisture content . . . . USEPA RMs 1 thru 4;
- Carbon dioxide and oxygen (continuous) . . . USEPA RM 3A;
- Oxides of Nitrogen as NO_2 (continuous) . . . . USEPA RM 7E;
- Oxides of Sulfur as SO_2 (continuous) . . . . . . USEPA RM 6C;
- Carbon Monoxide (continuous) . . . . USEPA RM 10;
- Total Organic Hydrocarbons (continuous) . . USEPA RM 25A;
- PAHs . . . . USEPA MM5[1] (Analyzed by mass spectrometry/gas chromatography);
- Benzene, Toluene, Ethyl-benzene, Xylene . . . . USEPA RM 18 (Analyzed by gas chromatography);
- Methane (semi-continuous) . . . . USEPA RM 18;
- Formaldehyde . . . . USEPA Proposed RM 0011.

The complete protocol is provided in Appendix A.

[1] A modification of USEPA RM 5 is used to collect PAH samples from the stack.

STACK SAMPLING RESULTS.

Following are tables that provide the results of the stack testing program for the HMA facilities tested to date. The first three tables provide the average emission rate, in various units, of the three runs collected for each of the HMA facilities stack tested, as noted in the tables. Tables that provide the stack sampling results for each run for each HMA facility included in the testing program are provided in Appendix B. The fourth table provides the data as gaseous emission in units of PPM_v, corrected to 100% excess air.

The last three tables provide a comparison of the annual emissions that would be estimated using NAPA's overall average stack test results, AP-42 Section 8.1 emission factors, and fuel burning emission factors. As can be seen in virtually all cases, the emission rates estimated using the various AP-42 emission factors are smaller than those obtained from the NAPA stack testing program. The results from the five HMA facilities burning natural gas during stack testing have been averaged together for comparison to the AP-42 natural gas emission factor, the results from the HMA facility burning No. 2 fuel oil are compared to the distillate oil AP-42 emission factors, and likewise for the residual fuel emission factors.

TABLE 2

TONS OF POLLUTANT PER YEAR PER 125,000 HMA PRODUCED ANNUALLY									
	NAPA0692	NAPA0891	NAPA0991	NAPA0592	NAPA0992	NATGAS	NAPA1292	NAPA1392	OVERALL
RECLAIMED ASPHALT PAVEMENT		30%	15%			AVERAGES	30%	35%	AVERAGES
PROCESS CONFIGURATION	PFD-NG	CFD-NG	CFD-NG	CFB-NG	CFB-NG+CH4		CFB-6FO	CFD-2FO	
AVG. HMA PROCESS RATE	379	197	344	218	279	284	148	197	252
Hazardous Air Pollutants (HAPs)									
TTL PAH	0.010108	0.006943	0.008986	0.005907	0.003958	0.007180	0.013069	0.026485	0.010779
FORMALDEHYDE	0.000000	0.404608	0.071854	0.020132	0.007807	0.126100	0.049753	0.190182	0.124056
BENZENE	0.000000	0.074889	0.016609	0.031364	0.000000	0.024572	0.000000	0.005541	0.018343
TOLUENE	0.000000	0.013369	0.000000	0.096840	0.000000	0.022042	0.000000	0.000000	0.015744
ETHYL BENZENE	0.000000	0.011871	0.000000	0.053083	0.000000	0.012991	0.000000	0.000000	0.009279
XYLENE	0.000000	0.024578	0.000000	0.098675	0.000000	0.024651	0.000000	0.000000	0.017608
TOTAL HAPs	0.010108	0.536258	0.097449	0.306001	0.011764	0.217536	0.062822	0.222208	0.195809
Criteria Air Pollutants									
CARBON MONOXIDE	3.0	16.8	17.0	2.1	11.7	10.1	4.3	39.1	13.4
SULFUR DIOXIDE	0.3	0.3	0.1	0.4	0.2	0.2	15.2	0.4	2.4
NITROGEN OXIDES	2.9	0.9	1.1	0.9	1.3	1.4	10.5	5.4	3.3
Other									
THC	1.6	5.4	2.7	0.6	1.2	2.5	2.9	2.6	2.4
METHANE		2.4	0.2	0.0	1.2	1.0	0.2	0.9	0.8
NON-MEHTANE THC		3.1	2.5	0.5	-0.0	1.5	2.6	1.6	1.6
CONDENSIBLES	0.2	0.3	0.1	0.1	0.7	0.3	2.9	1.3	0.8

PFD = Parallel-flow Drum Mixer
CFD = Counter-flow Drum Mixer
CFB = Counter-flow Batch Mixer

TABLE 3

TONS OF POLLUTANT PER YEAR PER 250,000 HMA PRODUCED ANNUALLY									
	NAPA0692	NAPA0891	NAPA0991	NAPA0592	NAPA0992	NATGAS	NAPA1292	NAPA1392	OVERALL
RECLAIMED ASPHALT PAVEMENT		30%	15%			AVERAGES	30%	35%	AVERAGES
PROCESS CONFIGURATION	PFD-NG	CFD-NG	CFD-NG	CFB-NG	CFB-NG+CH4		CFB-6FO	CFD-2FO	
AVG. HMA PROCESS RATE	379	379	344	218	279	320	148	197	278
Hazardous Air Pollutants (HAPs)									
TTL PAH	0.020215	0.013886	0.017971	0.011815	0.007915	0.014361	0.026139	0.052971	0.021559
FORMALDEHYDE		0.809216	0.143708	0.040263	0.015614	0.252200	0.099505	0.380364	0.248112
BENZENE	0.000000	0.149778	0.033218	0.062727	0.000000	0.049145	0.000000	0.011082	0.036686
TOLUENE	0.000000	0.026738	0.000000	0.193680	0.000000	0.044084	0.000000	0.000000	0.031488
ETHYL BENZENE	0.000000	0.023742	0.000000	0.106165	0.000000	0.025982	0.000000	0.000000	0.018558
XYLENE	0.000000	0.049156	0.000000	0.197350	0.000000	0.049301	0.000000	0.000000	0.035215
TOTAL HAPs	0.020215	1.072516	0.194898	0.612001	0.023529	0.435072	0.125644	0.444416	0.391619
Criteria Air Pollutants									
CARBON MONOXIDE	6.0	33.6	34.0	4.2	23.4	20.2	8.6	78.3	26.9
SULFUR DIOXIDE	0.5	0.5	0.2	0.9	0.4	0.5	30.5	0.8	4.8
NITROGEN OXIDES	5.7	1.9	2.3	1.9	2.7	2.9	21.1	10.7	6.6
Other									
THC	3.2	10.9	5.3	1.2	2.5	5.0	5.8	5.2	4.8
METHANE		4.7	0.4	0.1	2.5	1.9	0.5	1.9	1.7
NON-MEHTANE THC		6.1	4.9	1.1	0.0	3.0	5.3	3.3	3.2
CONDENSIBLES	0.4	0.5	0.1	0.2	1.3	0.5	5.7	2.5	1.5

PFD = Parallel-flow Drum Mixer
CFD = Counter-flow Drum Mixer
CFB = Counter-flow Batch Mixer

TABLE 4

POUNDS OF POLLUTANT PER TON OF HMA PRODUCED									
	NAPA0692	NAPA0891	NAPA0991	NAPA0592	NAPA0992	NATGAS	NAPA1292	NAPA1392	OVERALL
RECLAIMED ASPHALT PAVEMENT		30%	15%			AVERAGES	30%	35%	AVERAGES
PROCESS CONFIGURATION	PFD-NG	CFD-NG	CFD-NG	CFB-NG	CFB-NG+CH4		CFB-6FO	CFD-2FO	
AVG. HMA PROCESS RATE	379	297	344	218	279	304	148	197	266
Hazardous Air Pollutants (HAPs)									
TTL PAH	0.000162	0.000111	0.000144	0.000095	0.000063	0.000115	0.000209	0.000424	0.000172
FORMALDEHYDE		0.006474	0.001150	0.000322	0.000125	0.002018	0.000796	0.003043	0.001985
BENZENE	0.000000	0.001198	0.000266	0.000502	0.000000	0.000393	0.000000	0.000089	0.000293
TOLUENE	0.000000	0.000214	0.000000	0.001549	0.000000	0.000353	0.000000	0.000000	0.000252
ETHYL BENZENE	0.000000	0.000190	0.000000	0.000849	0.000000	0.000208	0.000000	0.000000	0.000148
XYLENE	0.000000	0.000393	0.000000	0.001579	0.000000	0.000394	0.000000	0.000000	0.000282
TOTAL HAPs	0.000162	0.008580	0.001559	0.004896	0.000188	0.003481	0.001005	0.003555	0.003133
Criteria Air Pollutants									
CARBON MONOXIDE	0.0479	0.2691	0.2718	0.0335	0.1871	0.1619	0.0688	0.6263	0.2149
SULFUR DIOXIDE	0.0041	0.0041	0.0012	0.0070	0.0034	0.0040	0.2438	0.0061	0.0385
NITROGEN OXIDES	0.0459	0.0149	0.0183	0.0149	0.0214	0.0231	0.1685	0.0859	0.0528
Other									
THC	0.0254	0.0869	0.0427	0.0052	0.0198	0.0396	0.0462	0.0412	0.0388
METHANE		0.0378	0.0032	0.0008	0.0198	0.0154	0.0039	0.0150	0.0134
NON-MEHTANE THC		0.0491	0.0395	0.0044	0.0000	0.0243	0.0423	0.0262	0.0254
CONDENSIBLES	0.0029	0.0041	0.0010	0.0017	0.0107	0.0041	0.0459	0.0201	0.0124

PFD = Parallel-flow Drum Mixer
CFD = Counter-flow Drum Mixer
CFB = Counter-flow Batch Mixer

Not in Summary data sheets!

TABLE 5

POLLUTANT	AP-42 Section 8.1	POLLUTANT EMISSIONS FOR ANNUAL PRODUCTION OF 125,000 TONS HMA					
		AVG NAPA NG RESULTS	AP-42 NG	NAPA NO. 6 FO	AP-42 2 Fuel Oil	NAPA NO. 2 FO	AP-42 6 Fuel Oil
	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr
SO2	3.650000	0.248633	0.009503	15.234635	6.193265	0.382476	32.393044
SO3					0.094302		0.542961
CO	2.375000	10.118500	0.554364	4.298848	0.589386	39.145646	0.542961
NO2	2.250000	1.443546	2.217454	10.529480	2.357543	5.367974	5.972569
METHANE		0.961564	0.047517	0.240985	0.006130	0.937259	0.108592
NMVO	1.750000	1.516448	0.044349	2.645464	0.023575	1.639486	0.030406
POM	0.001625	0.007180		0.013069		0.026485	
FORMALDEHYDE	0.009375	0.126100		0.049753		0.190182	

Assumption for fuel combustion emission factors: 262,800 BTUs/ton obtained from Chart B.4 in NAPA's IS-52 for an exhaust gas temperature of 310 F and a mix temperature of 300 F, and, gal/ton calculated with the HHV of respective fuel as determined by analysis of the fuels.

TABLE 6

POLLUTANT	AP-42 Section 8.1	POLLUTANT EMISSIONS FOR ANNUAL PRODUCTION OF 250,000 TONS HMA					
		AVG NAPA NG RESULTS	AP-42 NG	NAPA NO. 6 FO	AP-42 2 Fuel Oil	NAPA NO. 2 FO	AP-42 6 Fuel Oil
	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr
SO2	7.300000	0.497267	0.019007	30.469271	12.386529	0.764953	64.786088
SO3					0.188603		1.085922
CO	4.750000	20.237000	1.108727	8.597696	1.178771	78.291291	1.085922
NO2	4.500000	2.887092	4.434908	21.058959	4.715085	10.735948	11.945139
METHANE		1.923128	0.095034	0.481970	0.012259	1.874517	0.217184
NMVO	0.028000	3.032897	0.088698	5.290928	0.047151	3.278972	0.060812
POM	0.028000	0.014361		0.026139		0.052971	
FORMALDEHYDE	0.028000	0.252200		0.099505		0.380364	

Assumption for fuel combustion emission factors: 262,800 BTUs/ton obtained from Chart B.4 in NAPA's IS-52 for an exhaust gas temperature of 310 F and a mix temperature of 300 F, and, gal/ton calculated with the HHV of respective fuel as determined by analysis of the fuels.

TABLE 7

POLLUTANT	HMA Process Emission Factors: AP-42 Section 8.1		POLLUTANT EMISSION FACTORS, LB/TON HMA					
	lb/ton HMA	Emission Factor Rating	AVG NAPA NG RESULTS lb/ton HMA	AP-42 NG lb/ton HMA	NAPA NO. 6 FO lb/ton HMA	AP-42 2 Fuel Oil lb/ton HMA	NAPA NO. 2 FO lb/ton HMA	AP-42 6 Fuel Oil lb/ton HMA
SO2	0.058400	C	0.003978	0.000152	0.243754	0.099092	0.006120	0.518289
SO3						0.001509		0.008687
CO	0.038000	D	0.161896	0.008870	0.068782	0.009430	0.626330	0.008687
NO2	0.036000	D	0.023097	0.035479	0.168472	0.037721	0.085888	0.095561
METHANE			0.015385	0.000760	0.003856	0.000098	0.014996	0.001737
NMVO	0.028000	D	0.024263	0.000710	0.042327	0.000377	0.026232	0.000486
POM	0.000026	D	0.000115		0.000209		0.000424	
FORMALDEHYDE	0.000150	D	0.002018		0.000796		0.003043	

Assumption for fuel combustion emission factors: 262,800 BTUs/ton obtained from Chart B.4 in NAPA's IS-52 for an exhaust gas temperature of 310 F and a mix temperature of 300 F, and, gal/ton calculated with the HHV of respective fuel as determined by analysis of the fuels.

Draft: Feb. 23, 1993

TABLE 8

POLLUTANT IN PARTS PER MILLION, volume to volume

	NAPA0692	NAPA0891	NAPA0991	NAPA0592	NAPA0992	NATGAS AVERAGES	NAPA1292	NAPA1392	OVERALL AVERAGES
RECLAIMED ASPHALT PAVEMENT		30%	15%				30%	35%	
PROCESS CONFIGURATION	PFD-NG	CFD-NG	CFD-NG	CFB-NG	CFB-NG+CH4		CFB-6FO	CFD-2FO	
AVG. HMA PROCESS RATE	379	344	344	218	279	313	148	197	273
Hazardous Air Pollutants (HAPs)									
TTL PAH	0.0962	0.0730	0.0755	0.0988	0.0305	0.0748	0.0956	0.1481	0.0882
FORMALDEHYDE		19.6983	10.5812	1.1707	0.2631	7.9283	1.6039	5.2616	6.4298
BENZENE	0.0000	1.3733	0.2387	0.7843	0.0000	0.4792	0.0000	0.0602	0.3509
TOLUENE	0.0000	0.2152	0.0000	2.0406	0.0000	0.4512	0.0000	0.0000	0.3223
ETHYL BENZENE	0.0000	0.1717	0.0000	0.9707	0.0000	0.2285	0.0000	0.0000	0.1632
XYLENE	0.0000	0.3474	0.0000	1.8026	0.0000	0.4300	0.0000	0.0000	0.3071
Criteria Air Pollutants									
CARBON MONOXIDE	128.2	881.7	706.8	144.4	435.2	459.3	141.7	1,075.9	502.0
SULFUR DIOXIDE	4.8	5.6	1.4	12.8	3.4	5.6	212.3	4.3	35.0
NITROGEN OXIDES	77.9	29.2	29.0	38.7	30.2	41.0	203.9	90.2	71.3
Other									
THC	125.2	478.8	192.4	62.0	80.9	203.5	162.6	122.0	174.9
METHANE		15.8	1.1	0.5	6.2	5.9	1.1	3.5	4.7
NON-MEHTANE THC		463.1	191.3	61.5	74.7	197.7	161.6	118.5	170.2
CONDENSIBLES									

PFD = Parallel-flow Drum Mixer
CFD = Counter-flow Drum Mixer
CFB = Counter-flow Batch Mixer

DISCUSSION OF RESULTS.

The HMA facilities that were stack tested were basically chosen at random, primarily because the owner/operators were willing to include the stack test results in the NAPA stack emissions program. Based on discussions between NAPA staff and the owner/operators, they appeared to be typical HMA facilities. No effort was made to adjust the HMA facilities that were tested in such a manner as to influence the results one way or the other. In addition, no effort was made to select only the best or worst HMA facilities to test. Therefore, we feel the results collected to date reflect the emissions for typical HMA facility operations.

PAH Sampling and Analysis Results.

The sample collection and analytical methods for the PAH samples were not uniform for all the stack sampling included in this report. In the case of the sample identified as NAPA 0592, each MM5 sample collected was done so for a duration of four hours for each run. This was done in accordance with California's requirements for stack testing of hazardous waste incinerators where the four hours of sampling time per run has been established to collect a sample of sufficient size to ensure detection of the compounds if they are present. In the case of the sample identified as NAPA0692, each MM5 sample collected was analyzed with high resolution MS/GC to ensure detection of all compounds if present. The sampling time exceeded the normal 60 minutes because of the number of ports present in the stack. Typically, for the other samples, all were collected over a 60 to 90 minute sampling period, actual time depended on the number of ports sampled, the number of points sampled in each port, and the sampling time required for each point. They were analyzed using low-resolution MS/GC.

Conclusions cannot be drawn immediately as to whether or not the compounds reported with the longer sampling time or the hi-res MS/GC analytical procedure would have been identified for the other facilities, because the source and chemical complexity of the asphalt cement and the role the process plays in releasing PAHs from the asphalt cement are not known. In addition, PAHs are generated as a result of incomplete combustion.

The annual average PAH emissions for 250,000 tons HMA produced per year, according to the NAPA results, would be 38.6 pounds. Using the highest PAH result reported in the NAPA results, the annual PAH emissions would be 106 pounds. It should be noted that 80% of the overall average PAHs reported consisted of the three naphthalene compounds: naphthalene, 2-methylnaphthalene, and 2-chloronaphthalene.

In terms of the Clean Air Act Amendments of 1990, Title III, the total annual HAPs would be 839.2 pounds per year. Of the HAPs reported, formaldehyde accounted for over 50% of the total HAPs.

Oxides of Sulfur Results.

The SO_2 results in the NAPA testing program are lower than the AP-42 fuel burning emission factors. The most likely explanation for this maybe the presence of the aggregate in the exhaust gas stream and its adsorptive capabilities with respect to SO_2, as has been reported in the literature.

Combustion Products Emissions Results.

There is not sufficient data collected for HMA facilities burning fuels other than natural gas to make any conclusions as to how those emissions compare to natural gas emissions.

APPENDIX A

SAMPLE OF PREFERRED TITLE PAGE:

Draft date: Wednesday, February 6, 1991, 12:19 pm

PROTOCOL FOR AIR POLLUTION SOURCE TESTING AT

Company Name
City in which Company is located

Submitted to:

Company Name
Company Street Address
City in which Company is located

and

NATIONAL ASPHALT PAVEMENT ASSOCIATION
5100 Forbes Boulevard
NAPA Building
Lanham, Maryland 20706-4413

Submitted on:

Date on which report is submitted

Submitted by:

Testing Firm Name
Company Street Address
City in which Company is located

telephone number of Company

NAPA

NATIONAL ASPHALT PAVEMENT ASSOCIATION
NAPA Building ■ 5100 Forbes Boulevard ■ Lanham, Maryland 20706-4413 ■ Tel: (301) 731-4748 ■ Fax: (301) 731-4621

GENERAL INFORMATION

Source Owner: ______________________
Address: ______________________
____

Contact: ______________________
Telephone: ______________________
Fax: ______________________

Association: National Asphalt Pavement Association
5100 Forbes Boulevard
NAPA Building
Lanham, Maryland 20706-4413

Contact: Thomas E. Brumagin or John Rugg
Telephone: 301-731-4748
Fax: 301-731-4621

Source Location: ______________________
____

Source Description: ______________________
Control Equip.: ______________________

Cognizant Agency: USEPA
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

Contact: Michael Hamlin MD-14
Telephone: 919-541-5232
Fax: 919-541-5663

Testing Firm: ______________________
____
____

Contact: ______________________
Telephone: ______________________
Fax: ______________________

Scheduled Test Date: ______________________

FORM FOR FILLING IN GENERAL INFORMATION ON PREVIOUS SHEET

Source Owner:	*Name of Source Owner*
Address:	*Street Address of Source Owner* *City, State, Zip*
Contact:	*Name of person to contact*
Telephone:	*Phone number of contact*
Fax:	*Fax number of contact*
Association:	National Asphalt Pavement Association 5100 Forbes Boulevard NAPA Building Lanham, Maryland 20706-4413
Contact:	Thomas E. Brumagin or John Rugg
Telephone:	301-731-4748
Fax:	301-731-4621
Source Location:	*Street address of source location* *City, State, Zip*
Source Description:	*Type of HMA facility to be tested*
Type of Control Equip.:	*Air Poll'n Control Equip.*
Cognizant Agency:	USEPA Office of Air Quality Planning and Standards Research Triangle Park, North Carolina 27711
Contact:	Michael Hamlin MD-14
Telephone:	919-541-5232
Fax:	919-541-5663
Testing Firm:	*Name of Testing Firm* *Company Address* *City, State, Zip*
Contact:	*Name of Contact*
Telephone:	*contact phone no.*
Fax:	*contact fax no.*
Scheduled Test Date:	*date of test*

PLEASE NOTE THE FOLLOWING:

The results of the Stack Sampling are to be submitted in report form (as described at the end of this document) within six (6) to eight (8) weeks from the day the sampling is completed.

Copies of the report are to be submitted according to the box(es) checked below:

☐ Submit _____ copy(s) to the Source Owner in care of the Contact Person listed in the General Information section, and _____ copy(s) to the NAPA office in care of the Contact Person listed for NAPA in the General Information Section. NO COPIES are to be sent to the EPA office by the Testing firm, to be handled by the NAPA staff.

☐ Submit _____ copy(s) to the Source Owner in care of the Contact Person listed in the General Information section. NO COPIES are to be sent to the NAPA or EPA offices by the Testing firm, to be handled by the Source Owner's Contact person. HOWEVER, Testing firm should send letter to NAPA Contact Person advising that the report has been submitted to the Source Owner.

☐ Submit _____ copy(s) to the Source Owner in care of the Contact Person listed in the General Information section. NO COPIES are to be sent to the NAPA or EPA offices by the Testing firm, to be handled by the Source Owner's Contact person.

☐ USEPA is funding stack sampling for Formaldehyde collection and analysis, therefore, a separate report for the Formaldehyde results should be sent to the USEPA Contact Person, along with the data collected by Methods 1 through 4 that would normally be included with Formaldehyde "ONLY" sampling.

FOLLOWING ARE SECTIONS OF TEXT THAT SHOULD BE INCLUDED IN THE PROPOSAL AND PROTOCOL AS THEY APPEAR:

Air pollution source testing will be conducted to determine the emission concentration and rates of nitrogen oxides (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), total hydrocarbons--which will be referred to as 'volatile organic compounds' throughout this protocol--(VOC), condensible particulate matter, lead (Pb), polynuclear-aromatic hydrocarbons (PAHs), benzene, toluene, xylenes (BTX), and methane. Additionally, the stack gas volumetric flow and stack gas temperature, and the concentrations of moisture (H_2O), oxygen (O_2), and carbon dioxide (CO_2) in the stack gas will also be determined.

PROCESS DESCRIPTION:

Choose one of the following paragraphs or follow the appropriate instructions:

BATCH HMA FACILITY DESCRIPTION:

The air pollution source is what is commonly called a Batch Mix Facility by the Hot Mix Asphalt Industry. The aggregate is dried continuously in a direct-fired, rotary drum, with counter-flow heat exchange being employed. The aggregate is transferred to a piece of equipment called a mixing tower. In the mixing tower, the hot aggregate is separated according to diameter and stored in bins. It is metered out according to specifications and mixed with asphalt cement in batches.

DRUM MIX HMA FACILITY DESCRIPTION:

The air pollution source being tested is commonly called a Drum Mixer by the Hot Mix Asphalt Industry. The aggregate is dried continuously in a direct-fired, rotary dryer with parallel-flow heat exchange being employed. The asphalt cement is injected into the drum, about one third of the drum length from the aggregate discharge point.

OTHER TYPE OF HMA FACILITY CONFIGURATION:

The air pollution source being tested is commonly called a Drum Mixer by the Hot Mix Asphalt Industry. However, it is a modification of the original drum mixer equipment as the mixing of the aggregate with the asphalt cement is performed outside of the exhaust gases. The ***Enter whether heat exchange is parallel or counter -flow***-flow heat exchange process is used in this equipment. The aggregate and asphalt cement are mixed together in another section of the drum. ***Describe this mixing section here***

ADDITIONAL FOR SOURCE DESCRIPTION:

The HMA facility being tested was originally manufactured by ***Enter manufacturer's name***, and installed ***Enter year (as "in 19XX") of installation or number of years ago (as "XX years ago)***. Modifications have ***if no modifications have been made to equipment enter "not", otherwise leave blank*** been made to the equipment since it was installed. Its maximum rated capacity is ***Enter production capacity as tons per hour"** TPH at ***Enter aggregate moisture % for rating***% moisture removal.

This HMA facility is equipped with a ***Enter type of particulate control equip., include primary collector description, if it exists*** for particulate emissions control. Emissions controls for other pollutants does ***Enter "not" if there are no other controls*** exist at this HMA facility.

Describe this additional control equipment here

This HMA facility has ***Enter "not" if it has never been stack tested*** been previously stack tested for ***Enter the pollutants for which it has been tested, if no testing has been done enter "any pollutant emissions"***. These tests were conducted in ***Enter month and year of previous tests***.

INCLUDE THIS TEXT WITH THE APPROPRIATE INFORMATION REQUESTED BETWEEN THE ASTERISKS IN YOUR DESCRIPTION OF THE SOURCE TESTING:

Three test runs per pollutant will be performed while the HMA facility is operating at its maximum capacity of ***Enter Production Rating (TPH) of facility*** TPH, or no lower than ***percentage amount*%** of its maximum capacity, as determined by customer demand. Each day's run will be at least ***Enter minimum no. of hours*** hours, up to ***Enter maximum no. of hours*** hours.

The relative humidity will be determined with a wet bulb thermometer and recorded with the ambient temperature every two hours while the testing is in progress.

Responsibilities of NAPA Representative, or other designated individual:

One sample of aggregate will be collected during the middle of each test run of the testing program and will be analyzed for moisture content.[1] If only continuous sampling is being conducted on any particular day of the testing program, then a sample of aggregate is to be collected three times during the sampling, at the beginnning, at the estimated halfway-point, and just before sampling is going to be terminated. There should be three aggregate samples for each day of stack stampling. If the moisture content is determined by the Quality Control laboratory at the HMA facility, the remaining sample should saved and sent to the NAPA office with the other samples collected. The aggregate sample will be collected on the conveyor belt between the scalper screen and the drum.

One ***Enter fuel type*** fuel sample will be collected by ***Testing Firm name*** and will be analyzed for carbon, hydrogen, oxygen, nitrogen, sulfur (C, H, O, N, S) and heating value (in BTUs/unit of fuel). If fuel is a reclaimed oil, it will be analyzed to determine the concentrations of contaminants specified by USEPA's Used Oil rules.

One gallon samples of asphalt cement will be collected at the beginning of the first day and with each new delivery during testing.

One sample of baghouse fines will be collected during the testing program, when the opportunity arises (not to be collect before commencing operations for the testing program), e.g., before production is started on the second or third day, approximately one quart in size. This sample will be analyzed by USEPA's TCLP requirements to determine if it is a hazardous waste.

If Reclaimed Asphalt Pavement (RAP) is part of the mix being produced during the stack testing, collect a one gallon sample of the RAP from the pile being used for the mix, material should be crushed or milled (no large chunks).

Provide the superintendent and/or operator several copies of the Facility Operations form for

[1] If the HMA facility has a Quality Control laboratory on the premises they will be asked to perform the moisture checks.

recording the requested operating parameters, and review the form with them. Request HMA facility superintendent or operator, if available, to run a print-out of operational data after each entry to the HMA Facility Operating Data form. If the print-out machine is programmable through the equipment computer system, ask the superintendent or operator to program the print-out machine to print operating information every 15 minutes. (Please note, this should take the place of recording on the Operating Data form.)

Request the HMA facility superintendent or operator to insert an unused temperature chart, corresponding to the correct time of day, at the beginning of each operating day when stack sampling is conducted. Collect the temperature chart at the end of each day. If the company keeps this chart for its records, ask for five (5) copies (sometimes a copy of a copy loses clarity with these types of charts).

(end of NAPA rep. or designated ind'l. responsibilities)

. The testing procedures proposed herein are based on USEPA's and ______________________[1] published methods and are listed immediately below. Following this is a brief overview of each of the test methods (including sample collection and analytical procedures) to be used.

SAMPLE TO BE COLLECTED	*EPA REF. NO.*	*STATE REF. NO.*	*OTHER*
Gas Velocity/Volume/Stack Gas Moisture	Methods 1-4		
Carbon Dioxide and Oxygen (continuous)	Method 3A		
Particulate Matter	Method 5		
Oxides of Nitrogen (continuous)	Method 7E		
Sulfur Dioxide (continuous)	Method 6C		
Carbon Monoxide (continuous)	Method 10		
Volatile Organic Hydrocarbons (continuous)	Method 25A		
Toxic Compounds (PAHs)	Modified Meth. 5/SW-846 Method 8270: with Hi-resolution GC/MS analysis, DMSO extraction and 3-7 ring PAH wt. concentration determination (% wt. of total sample)		
Benzene & Ethyl- Toluene Xylene Methane	Method 18 (semi-continuous)		
Lead and other Heavy Metals (when used oil or RAP are used, ONLY, using RM5 filter, after particulate weight determination)	Method 12		
Condensible Particulate	Proposed Method 202		
Burner Fuel analyzed for: Higher Heating Value: ______________[2] Specific Gravity SSU Number Carbon Hydrogen Oxygen Nitrogen Sulfur			ASTM ________ ASTM D 1298 ____________ ____________ ____________ ____________ ____________ ASTM D 1552
Waste Fuel analyzed for: Lead PCBs Total halides Chloride pH Flash point	EPA 600/4-81-045		ASTM D 2788 ASTM D 1317 ASTM D 1093 ASTM D 93
Process Materials Moisture Determination			ASTM C 566
Ambient Humidity			ASTM D 4230 or ASTM E 337
Toxicity Characteristic Leaching Procedure (TCLP) on Baghouse fines, Used Oil, RAP	EPA ____________, FR, Vol. 51, No. 216, Appendix I to Part 268		
Formaldehyde (optional)	DRAFT EPA ________		

[1] Enter name of the state for which compliance sampling is being performed.

[2] Enter type of burner fuel being used, the ASTM method for HHV for oil is ASTM D 240.

SUBSTANCE	DETECTION LEVEL (include units)	SUBSTANCE	DETECTION LEVEL (include units)
Continuous, Semi-Continuous, and PM/Condensibles Results			
NO_x		BENZENE	
SO_2		TOLUENE	
CO		XYLENE	
O_2		METHANE	
CO_2		THC	
Particulate matter		Condensible matter	
Polynuclear Aromatics (PAHs):			
Acenaphthene		Chrysene	
Acenaphthylene		Dibenzo(a,b)anthracene	
Anthracene		Fluoranthene	
Benz(a)anthracene		Fluorene	
Benzo(a)pyrene		Indeno(1,2,3-cd)pyrene	
Benzo(b)fluoranthene		Naphthlalene	
Benzo(e)pyrene		Phenanthrene	
Bezno(g,h,i)perylene		Pyrene	
Benzo(k)fluoranthene		Cumene	
o-Cresol		p-Cresol	
m-Cresol			
Heavy Metals (required only with used oil or RAP in process)			
Arsenic		Lead	
Barium		Mercury	
Cadmium		Selenium	
Chromium		Silver	
Waste Fuel and/or RAP Analysis (when used)			
Lead		pH	
PCBs		Flash point	
Total Halides		Chloride	

SUBSTANCE	DETECTION LEVEL (include units)	SUBSTANCE	DETECTION LEVEL (include units)
Burner Fuel Analysis			
Higher Heating Value		Oxygen	
Specific Gravity		Nitrogen	
Carbon		Sulfur	
Hydrogen		SSU no.	
TCLP–Substances for Analysis			
Benzene		Tetrachloroethylene	
Carbon tetrachloride		Trichloroethylene	
Chlordane		2,4,5-trichlorophenol	
Chlorobenzene		2,4,6-trichlorophenol	
Chloroform		Vinyl chloride	
o-Cresol		Arsenic	
m-Cresol		Barium	
p-Cresol		Cadmium	
1,4-Dichlorobenzene		Chromium	
1,2-Dichloroethylene		Lead	
1,1-Dichloroethylene		Mercury	
2,4-Dinitrotoluene		Selenium	
Heptachlor		Silver	
Hexachlorobenzene		Endrin	
Hexachloro-1,3-butadiene		Lindane	
Hexachloroethane		Methoxychlor	
Methyl ethyl ketone		Toxaphene	
Nitrobenzene		2,4-D	
Pentachlorophenol		2,4,5-TP (silvex)	
Pyridine			

	(include units)		(include units)
Formaldehyde Collection and Sampling **(optional)**			
Formaldehyde			
Process Materials Moisture Determination			
Aggregate		Reclaimed Asphalt Pavement	

PROJECT DESCRIPTION AND SCOPE OF WORK

METHOD NUMBER	METHOD NAME	COMMENTS	COST	C	N
EPA METHOD 1	SAMPLING POINT DETERMINATION	The number and locations of the sampling or traverse points will be determined according to the procedures outlined in EPA Method 1. Yaw Angle Check: The yaw angle of the flow direction at each traverse point defined in EPA Method 1 is to be measured. The measured angles are to be averaged. If this reveals that the average of the measured yaw angles does not exceed 20°, then proceed with the testing program.			
EPA METHOD 2	FLUE GAS VELOCITY AND VOLUMETRIC FLOW RATE	The flue gas velocity and volumetric flow rate will be determined according to the procedures outlined in EPA Method 2. Velocity measurements will be made using Type S pitot tubes conforming to the geometric specifications outlined in EPA Method 2. Assign a coefficient of 0.84. Differential pressures will be measured with Magnehelic gauges of appropriate range or with fluid manometers. Effluent gas temperatures will be measured with chromel-alumel thermocouples equipped with hand-held digital readouts.			
EPA METHOD 3A	FLUE GAS COMPOSITION AND MOLECULAR WEIGHT	EPA Method 3A will be used to determine the oxygen (O2) and carbon dioxide (CO2) concentrations in the flue gas stream. Concentration measurements will be made using instrumentation and test procedures that conform with the requirements of EPA Method 3A. An extractive sampling system is to be used to provide a continuous, conditioned sample (i.e., free of water vapor and particulate matter) to the analyzers.			
EPA METHOD 4	FLUE GAS MOISTURE CONTENT	The flue gas moisture content is to be determined in conjunction with each EPA Method 5 type train and according to the sampling and analytical procedures outlined in EPA Method 4.			
EPA METHOD 5	PARTICULATE MATTER	If probe lengths are less than 10 feet, liners of borosilicate glass are to be used. For lengths over 10 feet, the probes should be clean, rust-free stainless steel. All nozzles, probe liners, and filter holders are to be rinsed thoroughly prior testing.			
EPA METHOD 6C	SULFUR DIOXIDE	SETUP COSTS FOR SO_2 COSTS AS ADDITIONAL POLLUTANT			
EPA METHOD 7E	NITROGEN OXIDES	SETUP COSTS FOR NO_x COSTS AS ADDITIONAL POLLUTANT			

METHOD NUMBER	METHOD NAME	COMMENTS	COST	C	N
EPA METHOD 10	CARBON MONOXIDE	To ensure data accuracy of the analyzer, a set of four calibration gases is to be injected through the reference Method 10 sampling system before the compliance testing to demonstrate the linearity of the analyzer. All gases will be documented traceable to National Bureau of Standards Reference Materials. The reported ppm CO measurements are to be corrected for the volume of CO_2 removed from the sample gas by the ascarite as determined by the Method 3A analysis results. SETUP COSTS FOR CO COSTS AS ADDITIONAL POLLUTANT			
EPA METHOD 12	INORGANIC LEAD	In all cases, the test runs will be performed within ± 10% of 100% isokinetic conditions. Pretest preparations, preliminary determinations, and leak check procedures are identical to those outlined in EPA Method 5. Each test run is to be a minimum of one (1) hour in duration with a 30 DSCF minimum sample volume. After filter and impinger adsorbing solution recovery, all sample exposed components of the sampling train are to be rinsed into appropriate containers with 0.1 N nitric acid. To avoid possible contamination, borosilicate glass probe liners are to be used. A reagent and filter blank are to be analyzed.			
EPA METHOD 18	GASEOUS ORGANIC COMPOUNDS - Benzene - Toluene - Ethyl-Benzene - Xylene - Methane	All transfer lines, connections, and pumps are to be heated to 220°F (104.4°C) to prevent condensation of the volatile organics or water in the line. A schematic of a typical Method 18 sampling train is to be provided. The gas chromatograph is to be calibrated before testing with three (3) concentrations of prepared standards or an external standard gas. If external standard gas is used, a response factor relating the response of the gas(es) being analyzed to the standard gas is to be determined. The calibration gas is to be introduced to the GC by the same heated gas injection port at the same conditions used for the sample. A gas of known concentration is to be introduced at the sampling probe and analyzed to ensure the integrity of the sampling system. This procedure is to be performed before and after each run. If the analysis does not agree with the known concentration, the cause of the discrepancy will be located and rectified. Upon request, an audit cylinder in the appropriate concentration range is to be analyzed and the results reported. A post test calibration is to be performed to assure that instrument drift does not vary greater than 5% from the mean of the pretest and post test calibrations.			

METHOD NUMBER	METHOD NAME	COMMENTS	COST	C	N
EPA METHOD 18 (continued)		Since this sampling procedure is a semi-continuous method, a minimum of one sample approximately two (2) times per hour, but as many samples should be taken as is possible, from the beginning of the first run through the end of the last run. The sampling time for this procedure will be a minimum of six (6) hours up to eight (8) hours.			
EPA METHOD 25A	NON-METHANE HYDROCARBONS	The instrument is to be calibrated using NIST Traceable concentrations of propane in nitrogen (N_2), EPA Protocol 1 propane. The wet-basis concentration of the total hydrocarbons is to be reported in p 20pmv as methane. Calibration and linearity checks are to be performed through the entire sampling system before and after each test period. "Zero drift" checks are to be made after each run to adjust the concentration bias due to drift. All parts of the sampling train are to be heated to a temperature of at least 250°F (121.1°C). The non-methane fraction of the gas sample is to be determined by analyzing for the methane concentration and subtracting it from the total hydrocarbon concentration. The results for methane of EPA Method 18 can be used for this determination and subtracted from the average total hydrocarbon concentration. SETUP COSTS FOR THC COSTS AS ADDITIONAL POLLUTANT			
MODIFIED EPA METHOD 5 (MM5) and EPA SW-846 METHOD 8270	SAMPLE AND COLLECTION FOR SEMIVOLATILE ORGANIC COMPOUNDS	This method will be used to collect semivolatile organic compounds for analysis for the following seventeen (17) polynuclear aromatic hydrocarbons (PAHs): Acenaphthene; Acenaphthylene; Anthracene; Benzo(a)anthracene; Benzo(a)pyrene; Benzo(b)fluoranthene; Benzo(e)pyrene Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenzo(a,h)anthracene; Fluoranthene; Fluorene; Indeno(1,2,3-cd)pyrene Naphthalene; Phenanthrene; Pyrene; Cumene; o-Cresol; m-Cresol; p-Cresol The MM5 sampling train will include a cartridge of precleaned XAD-2 resin to capture hydrocarbons that pass through the particulate filter. The sample gas will be cooled by a water-cooled condenser prior to entering the XAD-2 cartridge. Following are specific requirements for each component of the MM5 sampling train.			

METHOD NUMBER	METHOD NAME	COMMENTS	COST	C	N
MODIFIED METHOD 5 (continued)		Sampling Train Description. A schematic of the MM5 sampling train is to be provided. The flue gas will be pulled from the stack through a stainless steel nozzle and a borosilicate glass probe. Particulate matter will be removed from the gas stream by means of a glass fiber filter housed in a glass filter holder, supported by a Teflon frit, maintained at 248 ± 25°F (120 ± 14°C). The sample gas will pass through a water-cooled condenser and into the XAD-2 sorbent trap for removal of the organic constituents. The condenser and XAD-2 trap are arranged in a manner that allows the condensate to drain vertically through the XAD-2 trap. A chilled impinger train will be used to remove water from the flue gas and a dry gas meter will be used to measure the sample gas flow. Sealing greases are not be used on the sample train. XAD-2 Preparation. The XAD-2 resin will be purchased precleaned. Care is to be taken to ensure that the resin is kept at temperatures below 120°F (48.9°C) before and after sample collection to prevent decomposition of the resin. The sorbent trap will contain 20 to 30 grams of the precleaned resin. The period of time between when the cartridge is filled with the resin and when it is used in the field is to be kept to a minimum and is not to exceed 14 days. Glassware Preparation. All glass parts of the MM5 sampling train, including the sorbent trap glassware, will be precleaned prior to sampling according to the procedures listed: 1. Soak all glassware in hot soapy water (Alconox) at 122°F (50°C) or higher 2. H_2O rinse, three (3) times 3. Distilled/deionized H_2O 4. Pesticide grade methylene chloride rinse, three (3)times 5. Pesticide grade methanol/methylene chloride rinse, three (3) times 6. Bake at 450°F (232.2°C) for 2 hours 7. Cap glassware with clean glass plugs or methylene chloride rinsed aluminum foil. Clean glassware will be capped with precleaned foil or glass plugs until assembly of the sampling train. Following sample recovery, the glassware will be reused at the same sampling location. Operation of Sampling Train. The sample train will be operated according to SW-846 Method 0010. Special attention should be given to the following Quality Control checks: The entire sample train should be leak tested to ensure that leakage does not exceed the lesser of a) 4% of the average sampling rate, or b) 0.02 CFM. The probe exit temperature should be maintained above 248°F (120°C), and the filter compartment should be maintained at 248°F (120°C) ± 25°F (14°C) during sampling. Gas entering the sorbent module should be maintained at or below 68°F (20°C). Isokinetic sampling should be maintained within ± 10% of 100. Stored resin should be kept below 120°F (49°C) at all times.			

METHOD NUMBER	METHOD NAME	COMMENTS	C		N
MODIFIED METHOD 5 (continued)		<u>Recovery of the Sample.</u> The environment in which the MM5 samples are recovered and the sampling trains reassembled shall be free from uncontrolled dust, such as a lab or vehicle if a lab is not available. The sampling train components will be washed twice, once with acetone followed with an methylene chloride wash. The washes are to be sent to the analytical laboratory in separate containers. The sample containers from a typical MM5 test run should include: Container # 1: Filter(s) Container # 2: Acetone rinses of the nozzle, probe, and front half of the filter holder Container # 3: Methylene chloride rinses of the nozzle, probe, and front half filter holder Container # 4: XAD-2 cartridge and resin Container # 5: Knockout impinger contents (if one is used) Container # 6: Acetone rinses of the back-half of the filter holder, transfer line, condenser, knockout impinger, and connecting glassware Container # 7: Methylene chloride rinses of the back-half of the filter holder, transfer line, condenser, knockout impinger and connecting glassware Container # 8: First, second, and third impinger contents Container # 9: Acetone rinses of the first, second, and third impingers Container #10: Methylene chloride rinses of the first, second, and third impingers Container #11: Silica gel Blanks of each solvent lot used at the test site are to be saved in the event it is necessary to analyze them for potential contamination. All of the sample containers containing water will be extracted for analysis by the designated laboratory within 14 days after the sample has been collected. Depending on the particulate loading and/or the flue gas moisture, the actual number of containers for each sample collected may vary. <u>Sampling Train Blanks.</u> A field blank is to be recovered during each operating condition of the testing program. A field blank will consist of a complete MM5 sampling train (probe, filter, transfer line, condenser, XAD-2 trap, and impinger set) which is to be assembled as though a sample will be collected with it, but the flue gas is not to be pulled through it. The field blank train is to be leak checked the same number of times as a sampling train used during a test run. The field blank train is to be placed at the sampling location for the duration of one test run. This train is then to be returned to the laboratory and disassembled for recovery using the same procedure used to recover actual samples. The field blank is to be obtained using sampling train equipment that has previously been used to collect at least one actual sample from the test site.			

METHOD NUMBER	METHOD NAME	COMMENTS	COST		N
MODIFIED METHOD 5 (continued)		A proof blank is to be obtained by rinsing a complete set of MM5 sampling train glassware that has been cleaned according to the procedures presented previously with acetone and then with methylene chloride, keeping the washes separate until analysis by the laboratory. The pre-cleaned glassware is to consist of the probe liner, condenser coil, and the impinger set. These rinses are to be used to check the effectiveness of the glassware pre-cleaning procedure, if necessary.			
EPA SW-846 METHOD 8270	ANALYSIS FOR SEMI-VOLATILE ORGANIC COMPOUNDS COLLECTED WITH MODIFIED EPA METHOD 5	The XAD-2 traps, filters, washes, and impinger solutions are to be analyzed for Polynuclear Aromatic Hydrocarbons (PAHs). The PAHs for which specific identification is required have previously been listed. In addition, one of the samples from each site tested will include identification of PAHs from a semi-volatile GC/MS scan according to SW-846 Method 8270, except that high resolution mass spectrometry, gas chromatography analysis will be used. The analysis is to be performed on a high resolution gas chromatograph, mass spectrometer. All of the extracts and washes for each test run are to be combined and the volume reduced to 1 milliliter, resulting in one (1) extract per test run from which an aliquot is to be taken for analysis. DMSO (dimethylsulfoxide) extraction of an aliquot of the final extract obtained from MM5 and SW-846, and quantification of the weight percent in the extract of the PAHs made up of 3 to 7 benzene rings (for further details, please call the NAPA office).			
EPA DRAFT METHOD 202	FILTERABLE AND CONDENSIBLE PARTICULATE	The concentration and emission rate of condensible particulate is to be determined by using the procedures and equipment described in EPA Method 5 and EPA Draft Method 202, in conjunction with EPA Methods 1 through 4, which have previously been described. Each test run is to be followed by a gaseous nitrogen purge of the impinger contents. The post-test nitrogen purge is to be at a rate of 20 L/minute for a duration of one (1) hour. Analysis of the organic and inorganic fractions of the impinger contents will allow determination of emissions which condense at temperatures below the filter temperature. The filter particulate matter catch (front-half) is to be determined according to Method 5, 40 CFR Part 60, Appendix A. The particulate matter in the impinger catch (back-half) is to be analyzed and this back-half catch shall be included as particulate matter. The back-half weight will be the sum of the weight of the impinger catch (organic and inorganic) and the weight of the back-half acetone rinse. The impinger liquid is to be extracted and a back-half acetone rinse is to be performed for analysis of the back-half. The extraction of the impinger liquid will be completed as follows:			

METHOD NUMBER	METHOD NAME	COMMENTS			N
EPA DRAFT METHOD 202 (continued)		1. Separate the organic fraction from the sample by adding 75 mL of methylene chloride to the impinger contents in a 1,000 mL separatory funnel, and mix. 2. Allow the aqueous and organic phases to fully separate 3. Drain each phase into separate tared beakers, leaving a small amount of the organic/methylene chloride phase in the funnel to ensure that no water is collected in the organic phase 4. Repeat steps 1, 2, and 3 with the aqueous phases This extraction should yield about 250 mL of organic extract. Determine the weight of the organic fraction as follows: 1. Evaporate the organic extract at room temperature and pressure in a laboratory hood 2. Desiccate the evaporated organic fraction for 24 hours, weighing to a constant weight, reporting the results to the nearest 0.1 mg Determine the weight of the <u>inorganic</u> fraction as follows: 1. Evaporate the inorganic fraction to approximately 50 mL on a hot plate, then evaporate to dryness in an oven at 221°F (105°C). 2. Desiccate the evaporated inorganic fraction for 24 hours, weighing to a constant weight, reporting the results to the nearest 0.1 mg NOTE: Check the pH of the sample in the impinger contents. If it is less than 4.5, the inorganic residue must be redissolved in 100 mL of water. Add five (5) drops of phenolphthalein, then add concentrated NH_4OH (14.8 M) until the solution turns pink. Evaporate the sample again, desiccate, weigh to constant weight, report results to nearest 0.1 mg. If it is necessary to perform the steps outlined in the NOTE above, determine the amount of sulfate in the impinger contents using the aliquot taken before proceeding with the extraction using the procedures described in EPA Method 5A (Appendix A, 40 CFR Part 60). Blanks of water and methylene chloride are to be analyzed as described above. The sum of the values of the water blank and the methylene chloride blank must be less than 2 mg or 5% of the mass of the condensible particulate matter, whichever is greater. If the sum of the actual blank values is greater, then 2 mg or 5% of the mass of the condensible particulate matter, whichever is greater, is to be subtracted from the total sample value.			
EPA DRAFT METHOD 0011	FORMALDEHYDE, FOR THE COLLECTION AND ANALYSIS OF				
ANALYSIS OF BURNER FUEL		Basically, this analysis would include both a Proximate Analysis and an Ultimate Analysis.			

METHOD NUMBER	METHOD NAME	COMMENTS	COST	C	N
ANALYSIS OF WASTE FUEL (if used for burner fuel) OR RAP (if used in the process)		Lead, PCBs, Total halides, Chloride, pH, Flash point			
MOISTURE DETERMINATION OF PROCESS MATERIALS					
DATA REDUCTION		Include no. of hours estimated and cost per hour.			
REPORT PREPARATION		Include no. of hours estimated and cost per hour.			
MANHOURS		Include no. of manhours estimated and cost per hour, overtime rate, at what point overtime pay commences, no. of persons expected to be in the field.			
TRAVEL: PER DIEM PER MILE AIRFARE LODGING & FOOD OTHER		Include per diem rate and no. of days for per diem calc'n, estimated travel time to from testing site and hourly rate per person; "Other" might include rental car, etc.			
PROTOCOL PREPARATION		For the entire stack testing program for this HMA facility.			
STATE PROTOCOL PREPARATION		For just methods that are required by the State for compliance purposes.			
GRAND TOTAL					

QUALITY ASSURANCE PROGRAM

Provide a description and brief detail about the organization of your firm's quality assurance program and how responsibilities are handled. Include the names, resumes, and responsibilities of the Project Manager(s), Quality Assurance Manager(s), Field Operations Manager(s) and other technical people that will be involved in the testing program for this particular HMA facility.

For any work that is to be performed with a contract firm, provide a description and brief detail about how your firm will interface with the contract firm with respect to the samples collected. Include information about what the contract firm will be doing on the project, along with the names, resumes, and responsibilities of the individuals at the contract firm who will be handling samples collected for this project. Also, please provide information regarding the equipment that will be used to analyze these samples. List the name of the individuals from your firm that will be the key contact with the contract firms.

SAMPLE CUSTODY PROCEDURES

The sample custody procedures used for this program should be based on EPA's recommended procedures as found in their publication "Quality Assurance Handbook for Air Pollution Measurement Systems: Volume 3, Stationary Source-Specific Methods (1977)." Since it is likely that the samples will be analyzed by one or more laboratories as well as in the field, there should be an emphasis on documenting the samples collected and the field analytical data, as well as on the chain of custody records for the samples that are transported. Please provide a description and brief detail on the Sample Custody Procedures that your firm will utilize. If samples of the forms that will be used are available, please include them with the protocol.

INTERNAL QUALITY CONTROL

Describe the following:

Equipment inspection and maintenance
Equipment calibration and list of equipment requiring calibration with brief detail about the calibration procedure for each, including:

- Pitot Tubes
- Differential Pressure Gauges
- Impinger Thermometer
- Dry Gas Meter Thermometer
- Flue Gas Temperature Sensor
- Dry Gas Meter and Orifice
- Dry Gas Meter
- Orifice
- Barometer

- *Quality Control Procedures for SAMPLING*, including descriptions:

Pretest QC checks
QC checks made prior to start of tests
QC checks made prior to testing EACH day
QC checks made DURING testing on each day of testing
QC checks made AFTER testing each day

- *Quality Control Procedures for Determination of the Volumetric air flow rate, including:*

    Flue Gas Velocity
    Flue Gas Molecular Weight
    Moisture Content

- *Quality Control Procedures for ANALYTICAL work, including:*

    Procedures for the Orsat analyzer
    Procedures for the GC analysis used in Method 18
    Procedures for the GC/MS analysis used in SW-846

REQUIREMENTS FOR THE REPORT

1. At a minimum, three copies of the final report will be made. One copy is to go to the HMA company whose facility was stack tested, and two copies will be sent to the NAPA office.

2. The individual in your firm who is responsible for putting the report together will also have the responsibility of coordinating with NAPA to obtain copies of operational data and equipment information that was collected by other individuals other than your firm's employees. These copies are to be included as an appendix in the report.

3. Following is a basic outline of what is expected in the final report:

    Title Page: which should include the name of the company where the testing was performed, the company's location and location of the equipment tested, additional parties for whom the testing was performed, and the date(s) on which the testing was conducted.

    Report Certification: This should serve as verification that the report was reviewed and certified by the firm's individual who was present during the testing and a Professional Engineer.

    Table of Contents: The TOC should be an outline of the test report sections, including appendices, with the starting page number for each section.

    Introduction: The introduction should include a background statement that addresses the purpose of the sampling (which should be coordinated with NAPA), the location, and the dates of the testing. It should also include a table that outlines the program and indicates the dates of testing for each test method, the appropriate run numbers for each test, etc. It should also include a list of the participants that were present during the testing–from your firm, contract firm (if any), the host company, state agency, NAPA, etc.

    Summary of Results: This summary should present a summary of the emission rates and concentrations of the pollutants for which analysis was performed and of the constituents of the flue gas. Please provide concentrations as parts per million or percent by volume on a dry basis (ppmdv) for gaseous substances. Report concentrations for particulate substances in both "English" units (grains per dry standard cubic foot) and in metric units (grams per dry standard cubic meter)[1]. Also, please report the emission rates of both gaseous and particulate substances in both "English" units (lbs per hour) and metric units (grams per hour). The summary should list what values were used for Standard Temperature and Pressure. Additionally, it should contain a discussion of any sampling or analytical problems that were encountered during the test program.

Process Description and Operation: This section should be coordinated with NAPA. A final version should be signed off by NAPA before inclusion in the final report. It should include a description of the process that was tested and a summary of its operation during the testing. If necessary, use a table format for quick and easy reference. Also to be included is a schematic drawing of the process and the stack. Include the sampling locations on this drawing.

Sampling and Analytical Procedures: The sampling and analytical procedures for each method conducted should be discussed in separate sections wherever possible. The results for each run and the average of the runs should be placed at the beginning of each section discussion for quick reference.

Quality Assurance: Discuss the parameters that were established for quality assurance and show those parameters were met during the course of the sample collection and analyses.

Appendices: The appendices should include, but not be limited to, the following:

- test results and example calculations--test and analytical results & sample calcs
- field and analytical data--raw field and analytical data
- process data--burner and production process data
- sampling and analytical procedures copied from the regulations, primarily 40 CFR 60
- calibration data--including on-site calibrations of equipment
- temperature charts obtained from the HMA facility control room or copies

[1] Metric units should follow English units and be enclosed in parentheses.

- Upon submitting your cost proposal to the HMA company, please include three references for each method you propose to perform. By references, we are referring to the names of companies who have hired you to perform a specific test method and the individual contact with whom you worked. Please use the following form. On the following page is another form that can be copied for additional lists. PLEASE NOTE: If you are using any contract firms also submit a list of References for them.

REFERENCES

REFERENCES FOR TEST METHOD ____________	
DATES	*COMPANY NAME, CONTACT PERSON, ADDRESS & PHONE*
	1.
	2.

REFERENCES FOR TEST METHOD ______________________________

DATES	*COMPANY NAME, CONTACT PERSON, ADDRESS & PHONE*
	1.
	2.

REFERENCES FOR TEST METHOD ______________________________

DATES	*COMPANY NAME, CONTACT PERSON, ADDRESS & PHONE*
	1.
	2.

APPENDIX B

SUMMARY OF RESULTS

PLANT A
NAPA0891

Test Performed Run No. Date Time Production Rate Amount of RAP	PAH 1 08-09-91 11:26 to 12:45 305 - 375 tph 30 %	PAH 2 08-09-91 15:05 to 16:22 340 - 370 tph 30 %	PAH 3 08-10-91 08:57 to 10:07 290 - 330 tph 30 %	PAH AVERAGE 337 tph 30 %	PAH 1 08-09-91 11:26 to 12:45 305 - 375 tph 30 %	PAH 2 08-09-91 15:05 to 16:22 340 - 370 tph 30 %	PAH 3 08-10-91 08:57 to 10:07 290 - 330 tph 30 %	PAH AVERAGE 337 tph 30 %	PAH 1 08-09-91 11:26 to 12:45 305 - 375 tph 30 %	PAH 2 08-09-91 15:05 to 16:22 340 - 370 tph 30 %	PAH 3 08-10-91 08:57 to 10:07 290 - 330 tph 30 %	PAH AVERAGE 337 tph 30 %
Volumetric Flow Rate (acfm)	45,625	46,725	49,375	47,250	45,625	46,725	49,375	47,250	45,625	46,725	49,375	47,250
Volumetric Flow Rate (dscfm)	24,800	25,200	26,350	25,450	24,800	25,200	26,350	25,450	24,800	25,200	26,350	25,450
Stack Temperature (°F)	256	260	252	256	256	260	252	256	256	260	252	256
Percent Moisture	26.5	26.6	28.4	27.2	26.5	26.6	28.4	27.2	26.5	26.6	28.4	27.2
% CO_2	5.00	5.10	4.40	4.8	5.00	5.10	4.40	4.8	5.00	5.10	4.40	4.8
% O_2	11.5	10.9	12.7	11.7	11.5	10.9	12.7	11.7	11.5	10.9	12.7	11.7
% CO	> 0.1	> 0.1	0.05	0.08	> 0.1	> 0.1	0.05	0.08	> 0.1	> 0.1	0.05	0.08
% Excess Air	108.4	96.0	137.8	114.1	108.4	96.0	137.8	114.1	108.4	96.0	137.8	114.1
	mg/m³				ppm$_v$				lbs/hr			
CO	> 1164	> 1164	593	> 974	> 1000	> 1000	509	> 836	> 108.2	> 109.9	58.5	> 92.2
SO_2	13.31	10.65	18.64	14	5	4	7	5	1.24	1.01	1.84	1.36
NO_x	55.47	55.47	47.82	53	29	29	25	28	5.15	5.24	4.72	5.04
Total Hydrocarbon (as CH_4)	290.71	239.37	376.73	302	436	359	565	453	27.01	22.60	37.19	28.93
Methane	91.35	97.35	198.03	129	137	146	297	193	8.49	9.19	19.6	12.41
Benzene	3.90	4.55	4.22	4	1.2	1.4	1.3	1.3	0.36	0.43	0.42	0.40
Toluene	1.53	0.38	0.038	1	0.4	0.1	0.1	0.2	0.14	0.04	0.04	0.07
Ethyl Benzene	1.77	0.44	0.00	1	0.4	0.1	0.0	0.2	0.16	0.04	0.00	0.07
Xylene	2.21	1.77	0.44	1	0.5	0.4	0.1	0.3	0.21	0.16	0.04	0.14

Test Performed Run No. Date Time Production Rate Amount of RAP	PAH 1 08-09-91 11:26 to 12:45 305 - 375 tph 30 %	PAH 2 08-09-91 15:05 to 16:22 340 - 370 tph 30 %	PAH 3 08-10-91 08:57 to 10:07 290 - 330 tph 30 %	PAH AVERAGE 337 tph 30 %	PAH 1 08-09-91 11:26 to 12:45 305 - 375 tph 30 %	PAH 2 08-09-91 15:05 to 16:22 340 - 370 tph 30 %	PAH 3 08-10-91 08:57 to 10:07 290 - 330 tph 30 %	PAH AVERAGE 337 tph 30 %	PAH 1 08-09-91 11:26 to 12:45 305 - 375 tph 30 %	PAH 2 08-09-91 15:05 to 16:22 340 - 370 tph 30 %	PAH 3 08-10-91 08:57 to 10:07 290 - 330 tph 30 %	PAH AVERAGE 337 tph 30 %
	mg/m^3				ppm_v				lbs/hr			
PAH's Naphthalene	0.2085	0.1960	0.19526	0.1857	0.0391	0.0368	0.0286	0.0348	0.0194	0.0185	0.0151	0.0176
2-Methylnaphthalene	0.2098	0.1601	0.1524	0.1741	0.0355	0.0271	0.0258	0.0295	0.0195	0.0151	0.0150	0.0166
2-Chloronaphthalene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Acenaphthylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Acenaphthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Fluorene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Phenanthrene	0.0362	0.0409	0.0299	0.0357	0.0049	0.0055	0.0040	0.0048	0.0034	0.0039	0.0030	0.0034
Anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(a)anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chrysene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(b)fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(k)fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(e)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(a)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Perylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Indeno(1,2,3-cd)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dibenz(a,h)anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(g,h,i)perylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Total PAH's	0.4545	0.3970	0.3350	0.3955	0.0795	0.0694	0.0585	0.0691	0.0422	0.0375	0.0331	0.0376

SUMMARY OF RESULTS

Test Performed Run No. Date Time Production Rate Amount of RAP	FORMALDEHYDE 1 08-14-91 09:23 to 11:01 245 - 255 tph 0 %	FORMALDEHYDE 2 08-14-91 12:07 to 14:21 250 - 255 tph 0 %	FORMALDEHYDE 3 08-15-91 07:19 to 08:56 ??? - ??? tph 0 %	FORMALHYD AVERAGE 251 tph 0 %	FORMALDEHYDE 1 08-14-91 09:23 to 11:01 245 - 255 tph 0 %	FORMALDEHYDE 2 08-14-91 12:07 to 14:21 250 - 255 tph 0 %	FORMALDEHYDE 3 08-15-91 07:19 to 08:56 ??? - ??? tph 0 %	FORMALHYD AVERAGE 251 tph 0 %	FORMALDEHYDE 1 08-14-91 09:23 to 11:01 245 - 255 tph 0 %	FORMALDEHYDE 2 08-14-91 12:07 to 14:21 250 - 255 tph 0 %	FORMALDEHYDE 3 08-15-91 07:19 to 08:56 ??? - ??? tph 0 %	FORMALHYD AVERAGE 251 tph 0 %
Volumetric Flow Rate (acfm)	48,930	41,155	39,910	43,325	48,930	41,155	39,910	43,325	48,930	41,155	39,910	43,325
Volumetric Flow Rate (dscfm)	28,760	25,685	23,115	25,825	28,760	25,685	23,115	25,825	28,760	25,685	23,115	25,825
Stack Temperature (°F)	249	243	244	245	249	243	244	245	249	243	244	245
Percent Moisture	21.9	17.6	23.3	20.9	21.9	17.6	23.3	20.9	21.9	17.6	23.3	20.9
% CO_2	5.00	5.10	4.40	4.8	5.00	5.10	4.40	4.8	5.00	5.10	4.40	4.8
% O_2	11.5	10.9	12.7	11.7	11.5	10.9	12.7	11.7	11.5	10.9	12.7	11.7
% CO												
% Excess Air	108.4	96.0	137.8	114.1	108.4	96.0	137.8	114.1	108.4	96.0	137.8	114.1
	mg/m^3				ppm$_v$				lbs/hr			
CO												
SO_2												
NO_x												
Total Hydrocarbon (as CH_4)												
Methane												
Benzene												
Toluene												
Ethyl Benzene												
Xylene												
Formaldehyde	18.71	20.44	29.14	22.8	15	16	23	18	2.01	1.97	2.52	2.17

SUMMARY OF RESULTS

Test Performed Run No. Date Time Production Rate Amount of RAP	Particulate 1 08-16-91 09:46 to 10:54 295 - 315 tph 30 %	Particulate 2 08-16-91 11:31 to 12:59 290 - 305 tph 30 %	Particulate 3 08-16-91 13:38 to 14:44 290 - 320 tph 30 %	Particulate AVERAGE 301 tph 30 %	Particulate 1 08-16-91 09:46 to 10:54 295 - 315 tph 30 %	Particulate 2 08-16-91 11:31 to 12:59 290 - 305 tph 30 %	Particulate 3 08-16-91 13:38 to 14:44 290 - 320 tph 30 %	Particulate AVERAGE 301 tph 30 %
Volumetric Flow Rate (acfm)	39,620	45,440	43,460	42,840	39,620	45,440	43,460	42,840
Volumetric Flow Rate (dscfm)	22,750	23,885	21,435	22,690	22,750	23,885	21,435	22,690
Stack Temperature (°F)	252	260	234	249	252	260	234	249
Percent Moisture	23.1	28.8	35.6	29.2	23.1	28.8	35.6	29.2
% CO_2	5.00	5.10	4.40	4.8	5.00	5.10	4.40	4.8
% O_2	11.5	10.9	12.7	11.7	11.5	10.9	12.7	11.7
% CO								
% Excess Air	108.4	96.0	137.8	114.1	108.4	96.0	137.8	114.1
	mg/m^3				lbs/hr			
CO								
SO_2								
NO_x								
Total Hydrocarbon (as CH_4)								
Methane								
Benzene								
Toluene								
Ethyl Benzene								
Xylene								
Condensible Particulate	12.04	22.24	14.41	16.23	1.03	1.99	1.16	1.39

SUMMARY OF RESULTS

PLANT B
NAPA0991

Test Performed Run No. Date Time Production Rate Amount of RAP	PAH 1 09-03-91 11:26 to 12:38 350 tph 15 %	PAH 2 09-03-91 14:23 to 15:30 377 tph 15 %	1AH 3 09-03-91 16:38 to 17:44 376 tph 15 %	PAH AVERAGE 368 tph 15 %	PAH 1 09-03-91 11:26 to 12:38 350 tph 15 %	PAH 2 09-03-91 14:23 to 15:30 377 tph 15 %	1AH 3 09-03-91 16:38 to 17:44 376 tph 15 %	PAH AVERAGE 368 tph 15 %	PAH 1 09-03-91 11:26 to 12:38 350 tph 15 %	PAH 2 09-03-91 14:23 to 15:30 377 tph 15 %	1AH 3 09-03-91 16:38 to 17:44 376 tph 15 %	PAH AVERAGE 368 tph 15 %
Volumetric Flow Rate (acfm)	52,479	55,716	57,389	55,195	52,479	55,716	57,389	55,195	52,479	55,716	57,389	55,195
Volumetric Flow Rate (dscfm)	20,900	23,500	24,400	22,933	20,900	23,500	24,400	22,933	20,900	23,500	24,400	22,933
Stack Temperature (°F)	255	255	255	255	255	255	255	255	255	255	255	255
Percent Moisture	46.2	43.0	42.6	44.0	46.2	43.0	42.6	44.0	46.2	43.0	42.6	44.0
% CO_2	7.7	7.1	7.1	7.3	7.7	7.1	7.1	7.3	7.7	7.1	7.1	7.3
% O_2	7.3	7.9	7.9	7.7	7.3	7.9	7.9	7.7	7.3	7.9	7.9	7.7
% CO	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1
% Excess Air	47.8	53.9	53.9	51.9	47.8	53.9	53.9	51.9	47.8	53.9	53.9	51.9
	mg/m^3				ppm$_v$				lbs/hr			
CO	> 1164	> 1164	> 1164	> 1164	> 1000	> 1000	> 1000	> 1000	> 91.2	> 102.5	> 106.4	>100.0
SO_2	5.33	5.33	5.33	5	2	2	2	2	0.42	0.47	0.49	0.46
NO_x	87.98	72.68	74.59	78	46	38	39	41	6.89	6.40	6.82	6.70
Total Hydrocarbon (as CH_4)	154.03	168.03	223.37	182	231	252	335	273	12.06	14.79	20.42	15.76
Methane	7.33	7.33	25.34	13	11.25	11.23	37.85 38	20	0.57	0.65	2.32	1.18
Benzene	0	0.97	2.27	1	0	0.28 0.3	0.69 0.7	0.3	0	0.09	0.21	0.10
Toluene	0	0	0	0	0	0	0	0	0	0	0	0
Ethyl Benzene	0	0	0	0	0	0	0	0	0	0	0	0
Xylene	0	0	0	0	0	0	0	0	0	0	0	0

Test Performed Run No. Date Time Production Rate Amount of RAP	PAH 1 09-03-91 11:26 to 12:38 350 tph 15 %	PAH 2 09-03-91 14:23 to 15:30 377 tph 15 %	PAH 3 09-03-91 16:38 to 17:44 376 tph 15 %	PAH AVERAGE 368 tph 15 %	PAH 1 09-03-91 11:26 to 12:38 350 tph 15 %	PAH 2 09-03-91 14:23 to 15:30 377 tph 15 %	PAH 3 09-03-91 16:38 to 17:44 376 tph 15 %	PAH AVERAGE 368 tph 15 %	PAH 1 09-03-91 11:26 to 12:38 350 tph 15 %	PAH 2 09-03-91 14:23 to 15:30 377 tph 15 %	PAH 3 09-03-91 16:38 to 17:44 376 tph 15 %	PAH AVERAGE 368 tph 15 %
	mg/m^3				ppm_v				lbs/hr			
PAH's Napthalene	0.3260	0.1960	0.19526	0.1857	0.0612	0.0596	0.0488	0.0565	0.0255	0.0279	0.0238	0.0257
2-Methylnaphthalene	0.1661	0.1601	0.1524	0.1741	0.0281	0.0232	0.0209	0.0241	0.0130	0.0121	0.0113	0.0121
2-Chloronaphthalene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Acenaphthylene	0.1008	0.1059	0.0869	0.0979	0.0159	0.0167	0.01373	0.0155	0.0079	0.0093	0.0079	0.0084
Acenaphthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Fluorene	0.0459	0.0374	0.0430	0.0421	0.0066	0.0054	0.0063	0.0061	0.0036	0.0033	0.0039	0.0036
Phenanthrene	0.0255	0.0322	0.0270	0.0282	0.0035	0.0043	0.0036	0.0038	0.0020	0.0028	0.0025	0.0024
Anthracene	0.0034	BDL	BDL	0.0011	0.0005	BDL	BDL	0.0002	0.0003	BDL	BDL	0.0001
Fluoranthene	0.0024	0.0035	0.0031	0.0030	0.0003	0.0004	0.0004	0.0004	0.0002	0.0003	0.0003	0.0003
Pyrene	0.0039	0.0024	BDL	0.0021	0.0005	0.0003	BDL	0.0003	0.0003	0.0002	BDL	0.0002
Benzo(a)anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chrysene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(b)fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(k)fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(e)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(a)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Perylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Indeno(1,2,3-cd)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dibenz(a,h)anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(g,h,i)perylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Total PAH's	0.6740	0.6360	0.5437	0.6179	0.1165	0.1100	0.0937	0.1067	0.0528	0.0560	0.0497	0.0528

SUMMARY OF RESULTS

Test Performed Run No. Date Time Production Rate Amount of RAP	FORMALDEHYDE 1 09-30-91 10:56 to 12:24 297 tph 15 %	FORMALDEHYDE 2 09-30-91 13:42 to 14:59 299 tph 15 %	FORMALDEHYDE 3 09-30-91 16:13 to 17:30 295 tph 15 %	FORMALHYD AVERAGE 297 tph 15 %	FORMALDEHYDE 1 09-30-91 10:56 to 12:24 297 tph 15 %	FORMALDEHYDE 2 09-30-91 13:42 to 14:59 299 tph 15 %	FORMALDEHYDE 3 09-30-91 16:13 to 17:30 295 tph 15 %	FORMALHYD AVERAGE 297 tph 15 %	FORMALDEHYDE 1 09-30-91 10:56 to 12:24 297 tph 15 %	FORMALDEHYDE 2 09-30-91 13:42 to 14:59 299 tph 15 %	FORMALDEHYDE 3 09-30-91 16:13 to 17:30 295 tph 15 %	FORMALHYD AVERAGE 297 tph 15 %
Volumetric Flow Rate (acfm)	45,821	46,112	45,962	45,965	45,821	46,112	45,962	45,965	45,821	46,112	45,962	45,965
Volumetric Flow Rate (dscfm)	24,883	24,367	24,750	24,667	24,883	24,367	24,750	24,667	24,883	24,367	24,750	24,667
Stack Temperature (°F)	237	247	241	242	237	247	241	242	237	247	241	242
Percent Moisture	28.8	29.8	29.0	29.2	28.8	29.8	29.0	29.2	28.8	29.8	29.0	29.2
% CO_2	2.0	4.3	2.2	2.8	2.0	4.3	2.2	2.8	2.0	4.3	2.2	2.8
% O_2	17.4	13.3	17.1	15.9	17.4	13.3	17.1	15.9	17.4	13.3	17.1	15.9
% CO												
% Excess Air	448.6	157.3	406.7	337.5	448.6	157.3	406.7	337.5	448.6	157.3	406.7	337.5
	mg/m^3				ppm$_v$				lbs/hr			
CO												
SO_2												
NO_x												
Total Hydrocarbon (as CH_4)												
Methane												
Benzene												
Toluene												
Ethyl Benzene												
Xylene												
Formaldehyde	6.62	7.76	0.70	5.0	5	6	1	4	0.52	0.68	0.06	0.42

SUMMARY OF RESULTS

Test Performed Run No. Date Time Production Rate Amount of RAP	Particulate 1 09-04-91 09:52 to 10:57 ??? tph ? %	Particulate 2 09-04-91 11:43 to 12:48 ??? tph ? %	Particulate 3 09-04-91 13:29 to 14:34 ??? tph ? %	Particulate AVERAGE ??? tph ? %	Particulate 1 09-04-91 09:52 to 10:57 ??? tph ? %	Particulate 2 09-04-91 11:43 to 12:48 ??? tph ? %	Particulate 3 09-04-91 13:29 to 14:34 ??? tph ? %	Particulate AVERAGE ??? tph ? %
Volumetric Flow Rate (acfm)	55,193	55,300	58,163	56,219	55,193	55,300	58,163	56,219
Volumetric Flow Rate (dscfm)	23,767	22,317	23,333	23,139	23,767	22,317	23,333	23,139
Stack Temperature (°F)	260	280	280	273	260	280	280	273
Percent Moisture	41.5	43.7	44.0	43.1	41.5	43.7	44.0	43.1
% CO_2	9.2	7.7	4.0	7.0	9.2	7.7	4.0	7.0
% O_2	8.7	5.0	3.2	5.6	8.7	5.0	3.2	5.6
% CO								
% Excess Air	67.1	27.7	15.0	36.6	67.1	27.7	15.0	36.6
	mg/m^3				lbs/hr			
CO								
SO_2								
NO_x								
Total Hydrocarbon (as CH_4)								
Methane								
Benzene								
Toluene								
Ethyl Benzene								
Xylene								
Condensible Particulate	5.5	4.8	3.0	4.4	0.43	0.42	0.27	0.38

SUMMARY OF RESULTS

PLANT C
NAPA0592

Test Performed Run No. Date Time Production Rate Amount of RAP	PAH 1 04-30-92 08:35 to 12:45 210 tph 0 %	PAH 2 05-01-92 08:40 to 12:40 210 tph 0 %	PAH 3 05-04-92 08:00 to 13:15 246 tph 0 %	PAH AVERAGE 222 tph 0 %	PAH 1 04-30-92 08:35 to 12:45 210 tph 0 %	PAH 2 05-01-92 08:40 to 12:40 210 tph 0 %	PAH 3 05-04-92 08:00 to 13:15 246 tph 0 %	PAH AVERAGE 222 tph 0 %	PAH 1 04-30-92 08:35 to 12:45 210 tph 0 %	PAH 2 05-01-92 08:40 to 12:40 210 tph 0 %	PAH 3 05-04-92 08:00 to 13:15 246 tph 0 %	PAH AVERAGE 222 tph 0 %
Volumetric Flow Rate (acfm)	27,151	26,275	25,174	26,200	27,151	26,275	25,174	26,200	27,151	26,275	25,174	26,200
Volumetric Flow Rate (dscfm)	16,998	15,932	16,059	16,330	16,998	15,932	16,059	16,330	16,998	15,932	16,059	16,330
Stack Temperature (°F)	211	214	205	210	211	214	205	210	211	214	205	210
Percent Moisture	20.1	22.3	19.4	20.6	20.1	22.3	19.4	20.6	20.1	22.3	19.4	20.6
% CO_2	3.8	3.8	4.7	4.1	3.8	3.8	4.7	4.1	3.8	3.8	4.7	4.1
% O_2	14.0	14.0	14.3	14.1	14.0	14.0	14.3	14.1	14.0	14.0	14.3	14.1
% CO	0.02	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.01	0.01	0.01
% Excess Air	181.8	181.8	201.9	188.5	181.8	181.8	201.9	188.5	181.8	181.8	201.9	188.5
	mg/m^3				ppm_v				lbs/hr			
CO	231.7	96.6	93.1	140.5	199	83	80	121	14.75	5.77	5.70	8.74
SO_2	24.0	26.6	10.7	20.4	9	10	4	8	1.53	1.59	0.65	1.26
NO_x	49.7	53.5	45.9	49.7	26	28	24	26	3.17	3.20	2.81	3.06
Total Hydrocarbon (as CH_4)	28.7			28.7	43			43	1.83			1.83
Methane	BDL	2.79	6.12	2.97	BDL	4.2	9.2	4.6	BDL	0.17	0.37	0.18
Benzene	0.19	4.50	0.64	1.78	0.06	1.40	0.20	0.6	0.01	0.27	0.04	0.11
Toluene	0.28	15.00	0.60	5.40	0.07	4.00	0.16	1.4	0.02	0.92	0.04	0.32
Ethyl Benzene	0.18	8.10	0.28	2.96	0.04	1.90	0.07	0.7	0.01	0.51	0.02	0.18
Xylene	0.48	15.40	0.73	5.54	0.11	3.50	0.16	1.3	0.03	.93	0.04	0.33

Test Performed Run No. Date Time Production Rate Amount of RAP	PAH 1 04-30-92 08:35 to 12:45 210 tph 0 %	PAH 2 05-01-92 08:40 to 12:40 210 tph 0 %	PAH 3 05-04-92 08:00 to 13:15 246 tph 0 %	PAH AVERAGE 222 tph 0 %	PAH 1 04-30-92 08:35 to 12:45 210 tph 0 %	PAH 2 05-01-92 08:40 to 12:40 210 tph 0 %	PAH 3 05-04-92 08:00 to 13:15 246 tph 0 %	PAH AVERAGE 222 tph 0 %	PAH 1 04-30-92 08:35 to 12:45 210 tph 0 %	PAH 2 05-01-92 08:40 to 12:40 210 tph 0 %	PAH 3 05-04-92 08:00 to 13:15 246 tph 0 %	PAH AVERAGE 222 tph 0 %
	mg/m^3				ppm_v				lbs/hr			
PAH's Naphthalene	0.2190	0.1660	0.5280	0.3050	0.0412	0.0312	0.0993	0.0572	0.0140	0.0099	0.0318	0.0186
2-Methylnaphthalene												
2-Chloronaphthalene												
Acenaphthylene	0.0052	0.0050	0.0050	0.0051	0.0008	0.0008	0.0008	0.0008	0.0003	0.0003	0.0003	0.0003
Acenaphthene	0.0052	0.0055	0.0122	0.0077	0.0008	0.0009	0.0019	0.0012	0.0003	0.0003	0.0007	0.0005
Fluorene	0.0102	0.0108	0.0214	0.0141	0.0015	0.0016	0.0031	0.0021	0.0006	0.0006	0.0013	0.0009
Phenanthrene	0.0136	0.0169	0.0306	0.0203	0.0018	0.0023	0.0041	0.0027	0.0009	0.0010	0.0018	0.0012
Anthracene	0.0013	0.0016	0.0031	0.0020	0.00017	0.00022	0.00041	0.00027	0.00008	0.00010	0.00018	0.00012
Fluoranthene	0.0003	0.0005	0.0003	0.0004	0.00004	0.00006	0.00004	0.00005	0.00002	0.00003	0.000302	0.00002
Pyrene	0.0002	0.0004	0.0003	0.0003	0.00003	0.00004	0.00003	0.00003	0.00001	0.00002	0.00002	0.00002
Benzo(a)anthracene	0.00001	0.00001	0.00001	0.00001	0.000001	0.000001	0.000001	.000001	0.000001	0.000001	0.000001	.000001
Chrysene	0.00003	0.00002	0.00002	0.00002	0.000003	0.000002	0.000002	.000002	0.000002	0.000001	0.000001	.000001
Benzo(b)fluoranthene	0.000007	0.000006	0.000006	.000006	0.000001	0.000001	0.000001	.000001	0.000001	0.000001	0.000001	.000001
Benzo(k)fluoranthene	0.000003	BDL	BDL	.000001	0.000001	BDL	BDL	.000001	0.000001	BDL	BDL	.000001
Benzo(e)pyrene												
Benzo(a)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Perylene												
Indeno(1,2,3-cd)pyrene	0.000003	BDL	BDL	.000001	0.000001	BDL	BDL	.000001	0.000001	BDL	BDL	.000001
Dibenz(a,h)anthracene	0.000003	BDL	BDL	.000001	0.000001	BDL	BDL	.000001	0.000001	BDL	BDL	.000001
Benzo(g,h,i)perylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Total PAH's	0.2550	0.2067	0.6009	0.3549	0.0463	0.0371	0.1097	0.0643	0.0154	0.0123	0.0361	0.0216

SLIGHTLY OFF!

SUMMARY OF RESULTS

Test Performed Run No. Date Time Production Rate Amount of RAP	FORMALDEHYDE 1 04-30-92 12:17 to 14:03 210 tph 0 %	FORMALDEHYDE 2 05-01-92 08:45 to 10:26 210 tph 0 %	FORMALDEHYDE 3 05-01-92 16:13 to 17:30 210 tph 0 %	FORMALHYD AVERAGE 210 tph 0 %	FORMALDEHYDE 1 04-30-92 12:17 to 14:03 210 tph 0 %	FORMALDEHYDE 2 05-01-92 08:45 to 10:26 210 tph 0 %	FORMALDEHYDE 3 05-01-92 16:13 to 17:30 210 tph 0 %	FORMALHYD AVERAGE 210 tph 0 %	FORMALDEHYDE 1 04-30-92 12:17 to 14:03 210 tph 0 %	FORMALDEHYDE 2 05-01-92 08:45 to 10:26 210 tph 0 %	FORMALDEHYDE 3 05-01-92 16:13 to 17:30 210 tph 0 %	FORMALHYD AVERAGE 210 tph 0 %
Volumetric Flow Rate (acfm)	26,276	24,816	26,669	25,920	26,276	24,816	26,669	25,920	26,276	24,816	26,669	25,920
Volumetric Flow Rate (dscfm)	17,036	14,648	17,295	16,326	17,036	14,648	17,295	16,326	17,036	14,648	17,295	16,326
Stack Temperature (°F)	215	516 215	205	212	215	516	205	212	215	516	205	212
Percent Moisture	16.8	24.1	18.0	19.6	16.8	24.1	18.0	19.6	16.8	24.1	18.0	19.6
% CO_2	4.7	4.2	3.7	4.2	4.7	4.2	3.7	4.2	4.7	4.2	3.7	4.2
% O_2	14.3	14.0	14.7	14.3	14.3	14.0	14.7	14.3	14.3	14.0	14.7	14.3
% CO	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
% Excess Air	201.8	184.3	214.8	200.3	201.8	184.3	214.8	200.3	201.8	184.3	214.8	200.3
	mg/m³				ppm_v				lbs/hr			
CO	13.97	52.40	131.57	65.98	12	45	113	57	0.89	2.88	8.52	4.10
SO_2	21.30	26.63	31.96	26.63	8	10	12	10	1.30	1.46	2.07	1.63
NO_x	59.29	63.12	51.64	58.02	31	33	27	30	3.78	3.46	3.35	3.53
Total Hydrocarbon (as CH_4)	32.01			32.01	48			48	2.04			2.04
Methane	BDL	2.79	6.12	2.97	BDL	4.2	9.2	4.6	BDL	0.17	0.37	0.18
Benzene	0.19	4.50	0.64	1.78	0.06	1.40	0.20	0.6	0.01	0.27	0.04	0.11
Toluene	0.28	15.00	0.60	5.40	0.07	4.00	0.16	1.4	0.02	0.92	0.04	0.32
Ethyl Benzene	0.18	8.10	0.28	2.96	0.04	1.90	0.07	0.7	0.01	0.51	0.02	0.18
Xylene	0.48	15.40	0.73	5.54	0.11	3.50	0.16	1.3	0.03	.93	0.04	0.33
Formaldehyde	0.399	1.627	1.191	1.072	0.320	1.300	1.280	0.967	0.026	0.089	0.103	0.073

SAME AS PAH TEST DATA.

SUMMARY OF RESULTS

Test Performed Run No. Date Time Production Rate Amount of RAP	Particulate 1 04-30-92 10:32 to 11:49 210 tph 0 %	Particulate 2 05-01-92 13:20 to 14:36 210 tph 0 %	Particulate 3 05-04-92 08:30 to 10:39 246 tph 0 %	Particulate AVERAGE 222 tph 0 %	Particulate 1 04-30-92 10:32 to 11:49 210 tph 0 %	Particulate 2 05-01-92 13:20 to 14:36 210 tph 0 %	Particulate 3 05-04-92 08:30 to 10:39 246 tph 0 %	Particulate AVERAGE 222 tph 0 %
Volumetric Flow Rate (acfm)	26,680	264530	24,901	26,011	26,680	264530	24,901	26,011
Volumetric Flow Rate (dscfm)	15,882	17,672	15,521	16,358	15,882	17,672	15,521	16,358
Stack Temperature (°F)	205	208	205	206	205	208	205	206
Percent Moisture	24.7	15.1	21.3	20.4	24.7	15.1	21.3	20.4
% CO_2	3.6	3.7	5.8	4.4	3.6	3.7	5.8	4.4
% O_2	14.8	14.7	14.4	14.6	14.8	14.7	14.4	14.6
% CO	0.03	0.01	0.01	0.02	0.03	0.01	0.01	0.02
% Excess Air	219.1	214.7	215.8	216.5	219.1	214.7	215.8	216.5
	mg/m^3				lbs/hr			
CO	341.2	131.6	88.5	187.1	20.30	8.71	5.15	11.38
SO_2	18.64	31.96	10.65	20.42	1.11	2.12	0.62	1.28
NO_x	43.99	51.64	34.43	43.55	2.62	3.42	2.00	2.68
Total Hydrocarbon (as CH_4)	24.00			24.00	1.43			1.43
Methane	BDL	2.79	6.12	2.97	BDL	0.17	0.37	0.18
Benzene	0.19	4.50	0.64	1.78	0.012	0.274	0.039	0.108
Toluene	0.28	15.00	0.60	5.40	0.017	0.924	0.037	0.321
Ethyl Benzene	0.18	8.10	0.28	2.96	0.011	0.506	0.017	0.175
Xylene	0.48	15.40	0.73	5.54	0.029	0.931	0.042	0.334
Condensible Particulate	4.12	1.14	14.64	6.63	0.25	0.07	0.85	0.39

SAME AS PAH TEST DATA!

SUMMARY OF RESULTS

PLANT D
NAPA0992

Test Performed Run No. Date Time Production Rate Amount of RAP	PAH 1 09-03-92 13:14 to 14:13 323 tph 0 %	PAH 2 09-04-92 07:09 to 08:50 ___ tph 0 %	PAH 3 09-04-92 12:08 to 13:48 ___ tph 0 %	PAH AVERAGE 320 tph 0 %	PAH 1 09-03-92 13:14 to 14:13 323 tph 0 %	PAH 2 09-04-92 07:09 to 08:50 ___ tph 0 %	PAH 3 09-04-92 12:08 to 13:48 ___ tph 0 %	PAH AVERAGE 320 tph 0 %	PAH 1 09-03-92 13:14 to 14:13 323 tph 0 %	PAH 2 09-04-92 07:09 to 08:50 ___ tph 0 %	PAH 3 09-04-92 12:08 to 13:48 ___ tph 0 %	PAH AVERAGE 320 tph 0 %
Volumetric Flow Rate (acfm)	38,447	44,850	48,238	43,845	38,447	44,850	48,238	43,845	38,447	44,850	48,238	43,845
Volumetric Flow Rate (dscfm)	24,433	28,383	29,550	27,455	24,433	28,383	29,550	27,455	24,433	28,383	29,550	27,455
Stack Temperature (°F)	189	180	197	189	189	180	197	189	189	180	197	189
Percent Moisture	22.3	23.7	24.2	23.4	22.3	23.7	24.2	23.4	22.3	23.7	24.2	23.4
% CO_2	7.4	6.4	6.5	6.8	7.4	6.4	6.5	6.8	7.4	6.4	6.5	6.8
% O_2	12.2	13.2	12.2	12.5	12.2	13.2	12.2	12.5	12.2	13.2	12.2	12.5
% CO	0.04	0.02	0.03	0.03	0.05	0.02	0.03	0.03	0.05	0.02	0.03	0.03
% Excess Air	134.8	164.2	131.5	143.5	134.8	164.4	131.7	143.6	134.8	164.4	131.7	143.6
	mg/m^3				ppm_v				lbs/hr			
CO	459	250	323	344	394	215	277	295	41.87	26.50	35.68	34.68
SO_2	6.7	10.7	16.5	11.3	2.5	4.0	6.2	4.2	0.60	1.13	1.82	1.18
NO_x	57.6	54.2	65.8	59.2	30.1	28.3	34.4	30.9	5.26	5.74	7.27	6.09
Total Hydrocarbon (as CH_4)	43.9	59.0	51.3	51.4	65.8	88.5	76.9	77.1	4.01	6.26	5.66	5.31
Methane	32.6	56.2	82.3	57.0	48.8	84.2	123.4	85.5	2.97	5.96	9.09	6.00
Benzene	< 0.32	< 0.32	< 0.32	< 0.32	< 0.1	< 0.1	< 0.1	< 0.1	< 0.03	< 0.03	< 0.04	< 0.03
Toluene	< 0.38	< 0.38	< 0.38	< 0.38	< 0.1	< 0.1	< 0.1	< 0.1	< 0.04	< 0.04	< 0.04	< 0.04
Ethyl Benzene	< 0.44	< 0.44	< 0.44	< 0.44	< 0.1	< 0.1	< 0.1	< 0.1	< 0.04	< 0.05	< 0.05	< 0.05
Xylene	< 0.44	< 0.44	< 0.44	< 0.44	< 0.1	< 0.1	< 0.1	< 0.1	< 0.04	< 0.05	< 0.05	< 0.05

Test Performed Run No. Date Time Production Rate Amount of RAP	PAH 1 09-03-92 13:14 to 14:13 323 tph 0 %	PAH 2 09-04-92 07:09 to 08:50 ___ tph 0 %	PAH 3 09-04-92 12:08 to 13:48 ___ tph 0 %	PAH AVERAGE 320 tph 0 %	PAH 1 09-03-92 13:14 to 14:13 323 tph 0 %	PAH 2 09-04-92 07:09 to 08:50 ___ tph 0 %	PAH 3 09-04-92 12:08 to 13:48 ___ tph 0 %	PAH AVERAGE 320 tph 0 %	PAH 1 09-03-92 13:14 to 14:13 323 tph 0 %	PAH 2 09-04-92 07:09 to 08:50 ___ tph 0 %	PAH 3 09-04-92 12:08 to 13:48 ___ tph 0 %	PAH AVERAGE 320 tph 0 %
	mg/m^3				ppm_v				lbs/hr			
PAH's Naphthalene	0.0920	0.0680	0.0800	0.0800	0.0173	0.0128	0.0150	0.0150	0.0084	0.0072	0.0088	0.0081
2-Methylnaphthalene	0.1310	0.0890	0.0910	0.1040	0.0222	0.0151	0.0154	0.0176	0.0120	0.0094	0.0101	0.0105
2-Chloronaphthalene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Acenaphthylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Acenaphthene	BDL	BDL	0.0060	0.0020	BDL	BDL	0.0009	0.0003	BDL	BDL	0.0007	0.0002
Fluorene	0.0060	0.0050	0.0060	0.0060	0.0008	0.0007	0.0009	0.0008	0.0005	0.0005	0.0007	0.0006
Phenanthrene	0.0070	0.0070	0.0070	0.0070	0.0009	0.0009	0.0009	0.0009	0.0006	0.0007	0.0008	0.0007
Anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Fluoranthene	0.0010	0.0010	0.0020	0.0010	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0002	0.0001
Pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(a)anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chrysene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(b)fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(k)fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(e)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(a)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Perylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Indeno(1,2,3-cd)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dibenz(a,h)anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(g,h,i)perylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Total PAH's	0.2360	0.1680	0.1910	0.1980	0.0413	0.0296	0.0333	0.1042	0.0216	0.0179	0.0212	0.0202

SUMMARY OF RESULTS

Test Performed Run No. Date Time Production Rate Amount of RAP	FORMALDEHYDE 1 09-03-92 06:42 to 08:05 319 tph 0 %	FORMALDEHYDE 2 09-03-92 08:37 to 09:59 310 tph 0 %	FORMALDEHYDE 3 09-03-92 10:32 to 11:53 328 tph 0 %	FORMALHYD AVERAGE 322 tph 0 %	FORMALDEHYDE 1 09-03-92 06:42 to 08:05 319 tph 0 %	FORMALDEHYDE 2 09-03-92 08:37 to 09:59 310 tph 0 %	FORMALDEHYDE 3 09-03-92 10:32 to 11:53 328 tph 0 %	FORMALHYD AVERAGE 322 tph 0 %	FORMALDEHYDE 1 09-03-92 06:42 to 08:05 319 tph 0 %	FORMALDEHYDE 2 09-03-92 08:37 to 09:59 310 tph 0 %	FORMALDEHYDE 3 09-03-92 10:32 to 11:53 328 tph 0 %	FORMALHYD AVERAGE 322 tph 0 %
Volumetric Flow Rate (acfm)	45,536	45,062	46,143	45,580	45,536	45,062	46,143	45,580	45,536	45,062	46,143	45,580
Volumetric Flow Rate (dscfm)	26,900	27,750	28,667	27,772	26,900	27,750	28,667	27,772	26,900	27,750	28,667	27,772
Stack Temperature (°F)	177	183	185	182	177	183	185	182	177	183	185	182
Percent Moisture	24.1	25.3	24.5	24.6	24.1	25.3	24.5	24.6	24.1	25.3	24.5	24.6
% CO_2	7.7	7.2	7.2	7.4	7.7	7.2	7.2	7.4	7.7	7.2	7.2	7.4
% O_2	11.8	11.9	11.5	11.7	11.8	11.9	11.5	11.7	11.8	11.9	11.5	11.7
% CO	0.06	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
% Excess Air	124.2	125.2	114.8	121.4	124.2	125.2	114.8	121.4	124.2	125.2	114.8	121.4
	mg/m^3				ppm_v				lbs/hr			
CO	750	758	833	780	644	651	715	670	75.4	78.7	89.3	81.1
SO_2	11.5	7.2	8.0	8.9	4.3	2.7	3.0	3.3	1.15	0.75	0.86	0.92
NO_x	79.0	82.7	71.6	77.8	41.3	43.2	37.4	40.6	7.95	8.58	7.67	8.07
Total Hydrocarbon (as CH_4)	110.1	59.1	45.6	71.6	165.0	88.6	68.3	107.3	11.07	6.13	4.88	7.36
Methane	104.9	35.6	52.0	64.2	157.2	53.3	77.9	96.1	10.55	3.69	5.57	6.60
Benzene	< 0.32	< 0.32	< 0.32	< 0.32	< 0.1	< 0.1	< 0.1	< 0.1	< 0.03	< 0.03	< 0.04	< 0.03
Toluene	< 0.38	< 0.38	< 0.38	< 0.38	< 0.1	< 0.1	< 0.1	< 0.1	< 0.04	< 0.04	< 0.04	< 0.04
Ethyl Benzene	< 0.44	< 0.44	< 0.44	< 0.44	< 0.1	< 0.1	< 0.1	< 0.1	< 0.04	< 0.05	< 0.05	< 0.05
Xylene	< 0.44	< 0.44	< 0.44	< 0.44	< 0.1	< 0.1	< 0.1	< 0.1	< 0.04	< 0.05	< 0.05	< 0.05
Formaldehyde	0.46	0.23	0.46	0.382	0.4	0.2	0.3	0.3	0.05	0.02	0.05	0.04

SUMMARY OF RESULTS

Test Performed Run No. Date Time Production Rate Amount of RAP	Particulate 1 09-01-92 12:10 to 13:17 316 tph 0 %	Particulate 2 09-02-92 11:01 to 14:00 280 tph 0 %	Particulate 3 09-02-92 15:16 to 15:26 270 tph 0 %	Particulate AVERAGE 298 tph 0 %	Particulate 1 09-01-92 12:10 to 13:17 316 tph 0 %	Particulate 2 09-02-92 11:01 to 14:00 280 tph 0 %	Particulate 3 09-02-92 15:16 to 15:26 270 tph 0 %	Particulate AVERAGE 298 tph 0 %
Volumetric Flow Rate (acfm)	42,392	40,179		41,286	42,392	40,179		41,286
Volumetric Flow Rate (dscfm)	27,417	25,933		26,675	27,417	25,933		26,675
Stack Temperature (°F)	178	172		175	178	172		175
Percent Moisture	22.4	23.2		22.8	22.4	23.2		22.8
% CO_2	7.3	7.2		7.3	7.3	7.2		7.3
% O_2	12.2	12.6		12.4	12.2	12.6		12.4
% CO	0.06	0.05		0.06	0.06	0.05		0.06
% Excess Air	134.2	145.7		140.0	134.2	145.7		140.0
	mg/m^3				lbs/hr			
CO	666.8	625.8		646.3	68.34	60.64		64.49
SO_2	14.1	8.0		11.0	1.45	0.77		1.11
NO_x	64.7	53.5		59.1	6.63	5.18		5.91
Total Hydrocarbon (as CH_4)	60.3	77.8		69.1	6.18	7.54		6.86
Methane	33.9	86.4		60.2	3.47	8.37		5.92
Benzene	< 0.32	< 0.32		1.78	< 0.03	< 0.03		< 0.03
Toluene	< 0.38	< 0.38		5.40	< 0.04	< 0.04		< 0.04
Ethyl Benzene	< 0.44	< 0.44		2.96	< 0.04	< 0.05		< 0.05
Xylene	< 0.44	< 0.44		5.54	< 0.04	< 0.05		< 0.05
Condensible Particulate	33.86	35.24		34.55	3.48	3.42		3.45

PLANT E
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SUMMARY OF RESULTS

Test Performed Run No. Date Time Production Rate Amount of RAP	PAH 1 06-08-92 07:49 to 09:57 362 tph 0 %	PAH 2 06-08-92 11:14 to 12:54 379 tph 0 %	PAH 3 06-10-92 08:23 to 10:26 365 tph 0 %	PAH AVERAGE 369 tph 0 %	PAH 1 06-08-92 07:49 to 09:57 362 tph 0 %	PAH 2 06-08-92 11:14 to 12:54 379 tph 0 %	PAH 3 06-10-92 08:23 to 10:26 365 tph 0 %	PAH AVERAGE 369 tph 0 %	PAH 1 06-08-92 07:49 to 09:57 362 tph 0 %	PAH 2 06-08-92 11:14 to 12:54 379 tph 0 %	PAH 3 06-10-92 08:23 to 10:26 365 tph 0 %	PAH AVERAGE 369 tph 0 %
Volumetric Flow Rate (acfm)	80,163	79,326	65,990	75,160	80,163	79,326	65,990	75,160	80,163	79,326	65,990	75,160
Volumetric Flow Rate (dscfm)	43,050	42,991	34,525	40,188	43,050	42,991	34,525	40,188	43,050	42,991	34,525	40,188
Stack Temperature (°F)	282	272	270	275	282	272	270	275	282	272	270	275
Percent Moisture	24.0	24.3	27.1	25.2	24.0	24.3	27.1	25.2	24.0	24.3	27.1	25.2
% CO_2	4.4	5.3	4.0	4.5	4.4	5.3	4.0	4.5	4.4	5.3	4.0	4.5
% O_2	13.9	13.0	13.9	13.6	13.9	13.0	13.9	13.6	13.9	13.0	13.9	13.6
% CO	0.02	0.01		0.01	0.02	0.01		0.01	0.02	0.01		0.01
% Excess Air	107.2	72.4	123.6	101.1	107.2	72.4	123.6	101.1	107.2	72.4	123.6	101.1
	mg/m³				ppm$_v$				lbs/hr			
CO	197.9	121.4		160	170	104		137	31.38	19.23		25.31
SO_2	7.23	20.94		14.09	2.9	8.4		5.6	1.22	3.54		2.38
NO_x	75.31	79.71	77.03	77.35	39.4	41.7	40.3	40.5	18.50	18.47	14.83	17.27
Total Hydrocarbon (as CH_4)	34.20	19.80	20.80	24.93	51.3	29.7	31.2	37.4	14.92	8.62	7.28	10.27
Methane as	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzene propane, C_3H_8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Toluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Xylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Test Performed Run No. Date Time Production Rate Amount of RAP	PAH 1 06-08-92 07:49 to 09:57 362 tph 0 %	PAH 2 06-08-92 11:14 to 12:54 379 tph 0 %	PAH 3 06-10-92 08:23 to 10:26 365 tph 0 %	PAH AVERAGE 369 tph 0 %	PAH 1 06-08-92 07:49 to 09:57 362 tph 0 %	PAH 2 06-08-92 11:14 to 12:54 379 tph 0 %	PAH 3 06-10-92 08:23 to 10:26 365 tph 0 %	PAH AVERAGE 369 tph 0 %	PAH 1 06-08-92 07:49 to 09:57 362 tph 0 %	PAH 2 06-08-92 11:14 to 12:54 379 tph 0 %	PAH 3 06-10-92 08:23 to 10:26 365 tph 0 %	PAH AVERAGE 369 tph 0 %
	mg/m^3				ppm$_v$				lbs/hr			
PAH's Naphthalene	0.123395	0.128900	0.160883	.137726	0.023173	0.024207	0.030213	.025864	0.020040	0.020906	0.020955	.020634
2-Methylnaphthalene	0.293577	0.323620	0.406346	.341181	0.049690	0.054775	0.068777	.057747	0.047679	0.052487	0.052925	.051030
2-Chloronaphthalene	0.004099	0.003970	0.004967	.004345	0.000694	0.000672	0.000841	.000735	0.000666	0.000644	0.000647	.000652
Acenaphthylene	0.005673	0.003961	0.007427	.005687	0.000897	0.000626	0.001174	.000899	0.000921	0.000642	0.000967	.000844
Acenaphthene	0.002745	0.002590	0.010023	.005120	0.000429	0.000404	0.001566	.000800	0.000446	0.000420	0.001306	.000724
Fluorene	0.003980	BDL	0.000001	.001326	0.000576	BDL	0.000000	.000192	0.000646	BDL	0.000000	.000215
Phenanthrene	0.024800	0.020500	0.057300	.034200	0.003349	0.002768	0.007737	.004618	0.004024	0.003325	0.007466	.004938
Anthracene	0.000635	0.000535	0.001500	.000890	0.000086	0.000072	0.000203	.000120	0.000103	0.000087	0.000195	.000128
Fluoranthene	0.003806	0.002065	0.001433	.002435	0.000453	0.000245	0.000170	.000290	0.000618	0.000335	0.000187	.000380
Pyrene	0.002546	0.002171	0.001594	.002104	0.000303	0.000258	0.000189	.000250	0.000414	0.000352	0.000208	.000324
Benzo(a)anthracene	0.000996	0.000262	0.000151	.000470	0.000105	0.000028	0.000016	.000050	0.000162	0.000042	0.000020	.000075
Chrysene	0.001228	0.000784	0.000492	.000834	0.000130	0.000083	0.000052	.000088	0.000199	0.000127	0.000064	.000130
Benzo(b)fluoranthene	0.000547	0.000284	0.000222	.000351	0.000052	0.000027	0.000021	.000033	0.000089	0.000046	0.000029	.000055
Benzo(k)fluoranthene	0.000196	0.000097	0.000076	.000123	0.000019	0.000009	0.000007	.000012	0.000032	0.000016	0.000010	.000019
Benzo(e)pyrene	0.000519	0.000122	0.000087	.000243	0.000050	0.000012	0.000008	.000023	0.000084	0.000020	0.000011	.000039
Benzo(a)pyrene	0.000049	0.000008	0.000010	.000022	0.000005	0.000001	0.000001	.000002	0.000008	0.000001	0.000001	.000004
Perylene	0.000017	0.000002	0.000048	.000022	0.000002	0.000000	0.000005	.000002	0.000003	0.000000	0.000006	.000003
Indeno(1,2,3-cd)pyrene	0.000016	0.000012	0.000024	.000017	0.000001	0.000001	0.000002	.000001	0.000003	0.000002	0.000003	.000003
Dibenz(a,h)anthracene	0.000003	0.000007	0.000010	.000007	0.0000003	0.0000007	0.0000010	.000001	0.000000	0.000001	0.000001	.000001
Benzo(g,h,i)perylene	0.000039	0.000113	0.000148	.000100	0.000003	0.000010	0.000013	.000009	0.000006	0.000018	0.000019	.000015
Total PAH's	0.468856	0.490000	0.652760	.537202	0.080961	0.084200	0.110997	.092053	0.076144	0.079471	0.085020	.080212

SUMMARY OF RESULTS

Test Performed Run No. Date Time Production Rate Amount of RAP	Particulate 1 06-02-92 12:49 to 14:56 411 tph 0 %	Particulate 2 06-03-92 12:33 to 14:37 374 tph 0 %	Particulate 3 06-09-92 08:00 to 09:56 386 tph 0 %	Particulate AVERAGE 390 tph 0 %	Particulate 1 06-02-92 12:49 to 14:56 411 tph 0 %	Particulate 2 06-03-92 12:33 to 14:37 374 tph 0 %	Particulate 3 06-09-92 08:00 to 09:56 386 tph 0 %	Particulate AVERAGE 390 tph 0 %
Volumetric Flow Rate (acfm)	73,664	85,102	72,589	77,208	73,664	85,102	72,589	77,208
Volumetric Flow Rate (dscfm)	38,649	38,985	38,172	38,602	38,649	38,985	38,172	38,602
Stack Temperature (°F)	281	270	268	273	281	270	268	273
Percent Moisture	25.8	36.1	27.3	29.7	25.8	36.1	27.3	29.7
% CO_2	5.1	5.3	4.7	5.0	5.1	5.3	4.7	5.0
% O_2	11.0	12.0	12.8	11.9	11.0	12.0	12.8	11.9
% CO	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
% Excess Air	57.6	63.0	85.8	68.8	57.6	63.0	85.8	68.8
	mg/m^3				lbs/hr			
CO	145.0	109.8	132.6	129.1	20.65	15.76	18.64	18.35
SO_2	6.0	4.0	18.4	9.5	0.91	0.61	2.77	1.43
NO_x	374.3	96.9	93.3	188.1	53.31	13.92	13.12	26.78
Total Hydrocarbon (as CH_4)	5.2	17.4	22.4	15.0	2.04	6.87	8.66	5.86
Methane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Toluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Xylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Condensible Particulate	7.09	8.47	5.49	7.02	1.15	1.36	0.71	1.07

Can't calc. these #s. NO_x different than test report.

AS PROPANE!!

SAME AS PAH TEST!

SUMMARY OF RESULTS

Test Performed Run No. Date Time Production Rate Amount of RAP	PAH 1 12-03-92 10:25 to 12:22 142 tph 30 %	PAH 2 12-03-92 12:55 to 16:39 153 tph 30 %	PAH 3 12-04-92 08:11 to 11:26 149 tph 30 %	PAH AVERAGE 148 tph 30 %	PAH 1 12-03-92 10:25 to 12:22 142 tph 30 %	PAH 2 12-03-92 12:55 to 16:39 153 tph 30 %	PAH 3 12-04-92 08:11 to 11:26 149 tph 30 %	PAH AVERAGE 148 tph 30 %	PAH 1 12-03-92 10:25 to 12:22 142 tph 30 %	PAH 2 12-03-92 12:55 to 16:39 153 tph 30 %	PAH 3 12-04-92 08:11 to 11:26 149 tph 30 %	PAH AVERAGE 148 tph 30 %
Volumetric Flow Rate (acfm)	48,903	47,642	46,984	47,843	48,903	47,642	46,984	47,843	48,903	47,642	46,984	47,843
Volumetric Flow Rate (dscfm)	28,197	28,131	27,299	27,875	28,197	28,131	27,299	27,875	28,197	28,131	27,299	27,875
Stack Temperature (°F)	280	266	266	270	280	266	266	270	280	266	266	270
Percent Moisture	19.5	19.1	20.3	19.6	19.5	19.1	20.3	19.6	19.5	19.1	20.3	19.6
% CO_2	4.6	4.5	4.8	4.6	4.6	4.5	4.8	4.6	4.6	4.5	4.8	4.6
% O_2	14.4	14.9	15.1	14.8	14.4	14.9	15.1	14.8	14.4	14.9	15.1	14.8
% CO	0.004	0.005	0.007	0.005	0.004	0.005	0.007	0.005	0.004	0.005	0.007	0.005
% Excess Air	206.1	233.5	249.6	229.7	206.1	233.5	249.6	229.7	206.1	233.5	249.6	229.7
	mg/m^3				ppm$_v$				lbs/hr			
CO	51.6	58.4	80.9	63.6	44.3	50.1	69.4	54.6	5.44	6.13	8.25	6.60
SO_2	399.8	363.0	317.1	359.9	150.0	136.2	119.0	135.0	42.11	38.15	32.34	37.53
NO_x	274.8	249.9	267.6	264.1	143.6	130.6	139.8	138.0	29.00	26.27	27.29	27.52
Total Hydrocarbon (as CH_4)	67.0	52.2	66.3	61.8	100.6	78.2	99.4	92.7	7.06	5.49	6.76	6.43
Methane	BDL	0.38	6.19	2.19	BDL	0.58	9.27	3.28	BDL	0.04	0.63	0.22
Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Toluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Xylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Test Performed *Run No.* Date Time *Production Rate* Amount of RAP	PAH 1 12-03-92 10:25 to 12:22 142 tph 30 %	PAH 2 12-03-92 12:55 to 16:39 153 tph 30 %	PAH 3 12-04-92 08:11 to 11:26 149 tph 30 %	PAH AVERAGE 148 tph 30 %	PAH 1 12-03-92 10:25 to 12:22 142 tph 30 %	PAH 2 12-03-92 12:55 to 16:39 153 tph 30 %	PAH 3 12-04-92 08:11 to 11:26 149 tph 30 %	PAH AVERAGE 148 tph 30 %	PAH 1 12-03-92 10:25 to 12:22 142 tph 30 %	PAH 2 12-03-92 12:55 to 16:39 153 tph 30 %	PAH 3 12-04-92 08:11 to 11:26 149 tph 30 %	PAH AVERAGE 148 tph 30 %
	mg/m^3				ppm_v				lbs/hr			
PAH's Naphthalene	0.0564	0.0489	0.0843	0.0632	0.0106	0.0092	0.0158	0.0119	0.0060	0.0052	0.0086	0.0066
2-Methylnaphthalene	*0.0815*	*0.0711*	*0.1002*	*0.0843*	*0.0138*	0.0120	0.0170	0.0143	0.0086	0.0075	0.0103	0.0088
2-Chloronaphthalene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Acenaphthylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Acenaphthene												
Fluorene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Phenanthrene	BDL	0.0691	0.0380	0.0357	BDL	0.0093	0.0051	0.0048	BDL	0.0073	0.0039	0.0037
Anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Fluoranthene	0.0144	0.0698	0.0203	0.0348	0.0017	0.0083	0.0024	0.0041	0.0015	0.0074	0.0021	0.0037
Pyrene	0.0187	0.1937	0.0233	0.0786	0.0022	0.0231	0.0028	0.0094	0.0020	0.0204	0.0024	0.0083
Benzo(a)anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chrysene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(b)fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(k)fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(e)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(a)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Perylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Indeno(1,2,3-cd)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dibenz(a,h)anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(g,h,i)perylene	0.0054	BDL	BDL	0.0018	0.0005	BDL	BDL	0.0002	0.0006	BDL	BDL	0.0002
Total PAH's	0.1764	0.4526	0.2661	0.2966	0.0288	0.0619	0.0431	0.0445	0.0187	0.0478	0.0273	0.0311

SUMMARY OF RESULTS

Test Performed Run No. Date Time Production Rate Amount of RAP	FORMALDEHYDE 1 12-04-92 11:49 to 13:04 134 tph 30 %	FORMALDEHYDE 2 12-04-92 13:03 to 14:04 151 tph 30 %	FORMALDEHYDE 3 12-04-92 14:48 to 16:02 150 tph 30 %	FORMALHYD AVERAGE 145 tph 30 %	FORMALDEHYDE 1 12-04-92 11:49 to 13:04 134 tph 30 %	FORMALDEHYDE 2 12-04-92 13:03 to 14:04 151 tph 30 %	FORMALDEHYDE 3 12-04-92 14:48 to 16:02 150 tph 30 %	FORMALHYD AVERAGE 145 tph 30 %	FORMALDEHYDE 1 12-04-92 11:49 to 13:04 134 tph 30 %	FORMALDEHYDE 2 12-04-92 13:03 to 14:04 151 tph 30 %	FORMALDEHYDE 3 12-04-92 14:48 to 16:02 150 tph 30 %	FORMALHYD AVERAGE 145 tph 30 %
Volumetric Flow Rate (acfm)	41,638	47,542	44,796	44,658	41,638	47,542	44,796	44,658	41,638	47,542	44,796	44,658
Volumetric Flow Rate (dscfm)	24,469	27,036	25,632	25,712	24,469	27,036	25,632	25,712	24,469	27,036	25,632	25,712
Stack Temperature (°F)	268	284	264	272	268	284	264	272	268	284	264	272
Percent Moisture	19.2	20.1	21.7	20.3	19.2	20.1	21.7	20.3	19.2	20.1	21.7	20.3
% CO_2	4.8	4.8	4.7	4.8	4.8	4.8	4.7	4.8	4.8	4.8	4.7	4.8
% O_2	15.0	15.0	15.3	15.1	15.0	15.0	15.3	15.1	15.0	15.0	15.3	15.1
% CO	0.014	0.014	0.017	0.015	0.014	0.014	0.017	0.015	0.014	0.014	0.017	0.015
% Excess Air	242.8	242.8	262.6	249.4	242.8	242.8	262.6	249.4	242.8	242.8	262.6	249.4
	mg/m³				ppm$_v$				lbs/hr			
CO	161.2	161.2	201.4	174.6	138.4	138.4	172.9	149.90	14.74	16.29	19.29	16.77
SO_2	389.4	389.4	346.2	375.0	146.1	146.1	129.9	140.7	35.59	39.33	33.15	36.02
NO_x	245.2	245.2	212.8	234.4	128.1	128.1	111.2	122.5	22.41	24.76	20.38	22.52
Total Hydrocarbon (as CH_4)	79.7	80.5	95.6	85.3	119.4	120.7	143.3	127.8	7.28	8.13	9.16	8.19
Methane	4.18	14.02	15.01	11.1	6.273	21.02	22.50	16.60	0.38	1.42	1.44	1.08
Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Toluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Xylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Formaldehyde	0.05	3.21	0.46	1.24	0.04	2.60	0.30	1.00	0.004	0.32	0.04	0.12

SUMMARY OF RESULTS

Test Performed Run No. Date Time Production Rate Amount of RAP	Particulate 1 12-02-92 14:18 to 15:21 154 tph 30 %	Particulate 2 12-03-92 14:59 to 16:18 153 tph 30 %	Particulate 3 12-04-92 08:26 to 10:58 146 tph 30 %	Particulate AVERAGE 151 tph 30 %	Particulate 1 12-02-92 14:18 to 15:21 154 tph 30 %	Particulate 2 12-03-92 14:59 to 16:18 153 tph 30 %	Particulate 3 12-04-92 08:26 to 10:58 146 tph 30 %	Particulate AVERAGE 151 tph 30 %
Volumetric Flow Rate (acfm)	44,975	43,624	42,933	43,933	44,975	43,624	42,933	43,933
Volumetric Flow Rate (dscfm)	25,452	26,549	25,721	25,907	25,452	26,549	25,721	25,907
Stack Temperature (°F)	272	264	264	267	272	264	264	267
Percent Moisture	21.8	16.8	18.1	18.9	21.8	16.8	18.1	18.9
% CO_2	5.5	4.2	4.8	4.8	5.5	4.2	4.8	4.8
% O_2	14.4	15.1	15.1	14.9	14.4	15.1	15.1	14.9
% CO	0.007	0.005	0.007	0.006	0.007	0.005	0.007	0.006
% Excess Air	213.3	243.3	249.6	235.4	213.3	243.3	249.6	235.4
	mg/m^3				lbs/hr			
CO	80.3	61.2	80.9	74.1	7.63	6.07	7.77	7.16
SO_2	398.4	353.9	317.1	356.5	37.88	35.10	30.47	34.48
NO_x	254.3	243.6	267.6	255.2	24.18	24.16	25.71	24.68
Total Hydrocarbon (as CH_4)	66.4	50.4	64.4	60.4	6.32	5.00	6.20	5.84
Methane	6.60	0.37	6.02	4.33	0.63	0.04	0.58	0.42
Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Toluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Xylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Condensible Particulate	89.2	40.8	79.6	69.9	8.49	4.05	7.65	6.73

SUMMARY OF RESULTS

Test Performed Run No. Date Time Production Rate Amount of RAP	PAH 1 12-08-92 11:24 to 12:37 185 tph 35 %	PAH 2 12-08-92 13:34 to 17:11 188 tph 35 %	PAH 3 12-09-92 09:46 to 12:16 182 tph 35 %	PAH AVERAGE 185 tph 35 %	PAH 1 12-08-92 11:24 to 12:37 185 tph 35 %	PAH 2 12-08-92 13:34 to 17:11 188 tph 35 %	PAH 3 12-09-92 09:46 to 12:16 182 tph 35 %	PAH AVERAGE 185 tph 35 %	PAH 1 12-08-92 11:24 to 12:37 185 tph 35 %	PAH 2 12-08-92 13:34 to 17:11 188 tph 35 %	PAH 3 12-09-92 09:46 to 12:16 182 tph 35 %	PAH AVERAGE 185 tph 35 %
Volumetric Flow Rate (acfm)	54,857	53,521	53,657	54,011	54,857	53,521	53,657	54,011	54,857	53,521	53,657	54,011
Volumetric Flow Rate (dscfm)	28,779	28,057	28,391	28,409	28,779	28,057	28,391	28,409	28,779	28,057	28,391	28,409
Stack Temperature (°F)	259	264	270	264	259	264	270	264	259	264	270	264
Percent Moisture	28.9	28.5	27.3	28.3	28.9	28.5	27.3	28.3	28.9	28.5	27.3	28.3
% CO_2	6.6	7.1	6.5	6.7	6.6	7.1	6.5	6.7	6.6	7.1	6.5	6.7
% O_2	12.8	13.3	12.8	13.0	12.8	13.3	12.8	13.0	12.8	13.3	12.8	13.0
% CO	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1
% Excess Air	150.0	171.2	149.5	156.9	150.0	171.2	149.5	156.9	150.0	171.2	149.5	156.9
	mg/m³				ppm$_v$				lbs/hr			
CO	> 1165	> 1165	> 1165	> 1165	> 1000	> 1000	> 1000	> 1000	> 125.3	> 122.1	> 123.6	> 123.7
SO_2	18.12	20.25		19.19	6.8	7.6		7.2	1.95	2.12		2.04
NO_x	168.0	158.8	136.1	154.3	87.8	83.0	71.1	80.6	18.07	16.65	14.43	16.38
Total Hydrocarbon (as CH_4)	73.79	59.18	81.13	71.37	110.6	88.7	121.6	107.0	7.93	6.20	8.61	7.58
Methane	30.40	24.42	29.92	28.25	45.57	36.60	44.85	42.34	3.27	2.56	3.17	3.00
Benzene	BDL	1.40	BDL	0.47	BDL	0.43	BDL	0.14	BDL	0.15	BDL	0.05
Toluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Xylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Test Performed Run No. Date Time Production Rate Amount of RAP	PAH 1 12-08-92 11:24 to 12:37 185 tph 35 %	PAH 2 12-08-92 13:34 to 17:11 188 tph 35 %	PAH 3 12-09-92 09:46 to 12:16 182 tph 35 %	PAH AVERAGE 185 tph 35 %	PAH 1 12-08-92 11:24 to 12:37 185 tph 35 %	PAH 2 12-08-92 13:34 to 17:11 188 tph 35 %	PAH 3 12-09-92 09:46 to 12:16 182 tph 35 %	PAH AVERAGE 185 tph 35 %	PAH 1 12-08-92 11:24 to 12:37 185 tph 35 %	PAH 2 12-08-92 13:34 to 17:11 188 tph 35 %	PAH 3 12-09-92 09:46 to 12:16 182 tph 35 %	PAH AVERAGE 185 tph 35 %
	mg/m^3				ppm_v				lbs/hr			
PAH's Naphthalene	0.2493	0.2590	0.2909	0.2664	0.0468	0.0486	0.0547	0.0500	0.0268	0.0271	0.0309	0.0283
2-Methylnaphthalene	0.2882	0.2969	0.3016	0.2956	0.0488	0.0503	0.0511	0.0500	0.0310	0.0311	0.0320	0.0314
2-Chloronaphthalene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Acenaphthylene	0.0346	0.0339	0.0469	0.0385	0.0055	0.0054	0.0074	0.0061	0.0037	0.0036	0.0050	0.0041
Acenaphthene												
Fluorene	0.0286	0.0290	0.0327	0.0301	0.0041	0.0042	0.0047	0.0043	0.0030	0.0030	0.0034	0.0031
Phenanthrene	0.0909	0.0926	0.1033	0.0956	0.0123	0.0125	0.0140	0.0129	0.0098	0.0097	0.0110	0.0102
Anthracene	0.0059	0.0060	0.0076	0.0065	0.0008	0.0008	0.0010	0.0009	0.0006	0.0006	0.0008	0.0007
Fluoranthene	BDL	BDL	0.0072	0.0024	BDL	BDL	0.0009	0.0003	BDL	BDL	0.0008	0.0003
Pyrene	BDL	0.0035	0.0064	0.0033	BDL	0.0004	0.0008	0.0004	BDL	0.0004	0.0007	0.0004
Benzo(a)anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chrysene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(b)fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(k)fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(e)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(a)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Perylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Indeno(1,2,3-cd)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dibenz(a,h)anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(g,h,i)perylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Total PAH's	0.6975	0.7209	0.7966	0.7383	0.1183	0.1222	0.1346	0.1250	0.0749	0.0755	0.0846	0.0783

SUMMARY OF RESULTS

Test Performed Run No. Date Time Production Rate Amount of RAP	FORMALDEHYDE 1 12-09-92 12:48 to 13:53 194 tph 35 %	FORMALDEHYDE 2 12-09-92 14:24 to 15:34 214 tph 35 %	FORMALDEHYDE 3 12-09-92 16:11 to 17:06 222 tph 35 %	FORMALHYD AVERAGE 210 tph 35 %	FORMALDEHYDE 1 12-09-92 12:48 to 13:53 194 tph 35 %	FORMALDEHYDE 2 12-09-92 14:24 to 15:34 214 tph 35 %	FORMALDEHYDE 3 12-09-92 16:11 to 17:06 222 tph 35 %	FORMALHYD AVERAGE 210 tph 35 %	FORMALDEHYDE 1 12-09-92 12:48 to 13:53 194 tph 35 %	FORMALDEHYDE 2 12-09-92 14:24 to 15:34 214 tph 35 %	FORMALDEHYDE 3 12-09-92 16:11 to 17:06 222 tph 35 %	FORMALHYD AVERAGE 210 tph 35 %
Volumetric Flow Rate (acfm)	54,532	53,115	52,891	53,513	54,532	53,115	52,891	53,513	54,532	53,115	52,891	53,513
Volumetric Flow Rate (dscfm)	28,810	26,682	24,521	26,671	28,810	26,682	24,521	26,671	28,810	26,682	24,521	26,671
Stack Temperature (°F)	267	276	336	293	267	276	336	293	267	276	336	293
Percent Moisture	27.7	30.4	30.6	29.6	27.7	30.4	30.6	29.6	27.7	30.4	30.6	29.6
% CO_2	6.5	7.2	8.0	7.2	6.5	7.2	8.0	7.2	6.5	7.2	8.0	7.2
% O_2	12.6	11.7	10.5	11.6	12.6	11.7	10.5	11.6	12.6	11.7	10.5	11.6
% CO	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1
% Excess Air	142.9	119.7	94.7	119.1	142.9	119.7	94.7	119.1	142.9	119.7	94.7	119.1
	mg/m^3				ppm_v				lbs/hr			
CO	> 1165	> 1165	> 1165	> 1165	> 1000	> 1000	> 1000	> 1000	> 125.4	> 116.1	> 106.7	> 116.7
SO_2												
NO_x	151.6	158.3	150.2	153.4	79.2	82.7	78.5	80.1	16.31	15.78	13.76	15.28
Total Hydrocarbon (as CH_4)	83.0	67.1	79.5	76.5	124.4	100.5	119.1	114.7	8.93	6.68	7.28	7.63
Methane	27.0	24.0	49.3	33.4	40.53	35.94	73.84	50.10	2.91	2.39	4.51	3.27
Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Toluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Xylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Formaldehyde	5.96	5.73	5.27	5.65	4.78	4.61	4.20	4.53	0.64	0.57	0.48	0.56

SUMMARY OF RESULTS

Test Performed Run No. Date Time Production Rate Amount of RAP	Particulate 1 12-07-92 12:59 to 14:03 198 tph 35 %	Particulate 2 12-07-92 14:52 to 16:07 208 tph 35 %	Particulate 3 12-08-92 08:30 to 10:24 181 tph 35 %	Particulate AVERAGE 196 tph 35 %	Particulate 1 12-07-92 12:59 to 14:03 198 tph 35 %	Particulate 2 12-07-92 14:52 to 16:07 208 tph 35 %	Particulate 3 12-08-92 08:30 to 10:24 181 tph 35 %	Particulate AVERAGE 196 tph 35 %
Volumetric Flow Rate (acfm)	53,479	57,827	60,079	57,128	53,479	57,827	60,079	57,128
Volumetric Flow Rate (dscfm)	20,962	24,641	28,678	24,760	20,962	24,641	28,678	24,760
Stack Temperature (°F)	410	356	341	369	410	356	341	369
Percent Moisture	35.8	34.5	28.0	32.8	35.8	34.5	28.0	32.8
% CO_2	8.6	7.0	5.5	7.0	8.6	7.0	5.5	7.0
% O_2	11.0	11.7	13.0	11.9	11.0	11.7	13.0	11.9
% CO	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1	> 0.1
% Excess Air	106.8	119.0	151.6	125.8	106.8	119.0	151.6	125.8
	mg/m^3				lbs/hr			
CO	> 1165	> 1165	> 1165	> 1165	> 91.2	> 107.3	> 124.8	> 107.8
SO_2	16.8	18.9	28.8	21.5	1.31	1.74	3.08	2.00
NO_x	226.2	148.5	155.0	176.6	17.72	13.67	16.61	16.00
Total Hydrocarbon (as CH_4)	65.7	85.4	92.6	81.2	5.14	7.86	9.92	7.64
Methane	12.82	21.06	29.44	21.11	1.00	1.94	3.15	2.03
Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Toluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl Benzene	1.59	BDL	BDL	0.53	0.12	BDL	BDL	0.04
Xylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Condensible Particulate	58.01	37.60	29.58	41.73	4.55	3.46	3.17	3.73