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Nova Environmental Services, Inc.

Nova Environmental Services, Inc.

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131.1

RESULTS OF THE EMISSIONS TESTING SERVICES AT MINNESOTA CORN PROCESSORS MARSHALL, MINNESOTA DECEMBER 20-21, 1994 NOVA PROJECT NO.: M4M-020

January 31, 1995

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1.0 EXECUTIVE SUMMARY

Nova Environmental Services, Inc. (Nova) was contracted by Minnesota Corn Processors (MCP) to perform emissions testing on the effluent gas stream from the inlet and outlet of one (1) CO_2 scrubber, and one (1) natural gas boiler at the MCP facility in Marshall, Minnesota on December 20-21, 1994.

Nova personnel conducted emissions testing for total organic compounds (TOC) from the inlet and outlet of the scrubber and particulate matter (PM) and particulate matter less than 10 microns (PM-10) from the natural gas boiler. On-site testing was conducted by D. Smith and D. Day of Nova. Testing was witnessed by Janelle Jacobson and Craig Averman of the Minnesota Pollution Control Agency.

The purpose of testing was to determine compliance with permit emission limitations and applicable New Source Performance Standards (NSPS) for the Synthetic Organic Chemical Manufacturing Industry (SOCMI). The applicable SOCMI NSPS for the scrubbers are promulgated in 40 CFR Part 60, Subparts NNN and RRR. The SOCMI NSPS require 98% reduction of TOC or a Total Resource Effectiveness (TRE) index greater than 1.0.

The TRE index was calculated using equations for a non-halogenated vent stream controlled by an incinerator and a flare. The SOCMI NSPS requires use of the lower of the two computed TRE index values for comparison to the minimum standard of 1.0. The TRE index using the incinerator equation was found to be less than the TRE index using the flare equation. The TRE index computed for the scrubber was found to exceed 1.0. In fact, the TRE index exceeded 8.0. Additionally, the scrubber TOC reduction efficiency was found to average 99.35%. Therefore, the scrubber unit was in compliance with SOCMI NSPS.

The natural gas boiler stack is limited to a PM emission rate of 0.0048 lb/MMBTU and a PM-10 emission rate of 0.0029 lb/MMBTU. The average PM emission rate was determined to be 0.0031 lb/MMBTU and the average PM-10 concentration was determined to be 0.0007 lb/MMBTU which was in compliance with the emission limitations.

2.0 INTRODUCTION

The objectives of this project were to quantify TOC, PM, and PM-10 emissions from certain processes at the plant. Three, one-hour determinations were conducted for TOC at the inlet and outlet of the scrubber and three, one-hour determinations were conducted for PM at the natural gas boiler stack.

The following emissions tests were conducted at the facility:

Test No.	Date	Emission Unit	Method	Parameter Tested
1	12/20/94	Scrubber No. 1 - Inlet/Outlet	M1, M2, M3, M4, M18	TOC
2	12/21/94	Natural Gas Boiler	M1, M2, M3, M4, M5	PM
3	12/21/94	Natural Gas Boiler	M1, M2, M3, M4, M201A	PM-10

Results are summarized in the next section followed by descriptions of the test methods used and the process under investigation. All supporting data are included in the Appendices.

3.0 RESULTS

The emissions testing results are summarized in the following tables:

TOC Emissions Determinations					
Test No.	Emission Point	Run 1	Run 2	Run 3	Average
		lb/hr	lb/hr	lb/hr	lb/hr
1	Scrubber - Inlet	82.2	3,196	51.9	1,110
1	Scrubber - Outlet	1.07	0.56	0.33	0.65

Reduction Efficiency (%)					
Test No.	Emission Point	Run 1	Run 2	Run 3	Average
1	Scrubber	98.66	99.98	99.42	99.35

TRE Index Values		
Test No.	Emission Point	TRE Index*
1	Scrubber	86.00

* Based on TRE equation for vent stream controlled by an incinerator.

Results of PM Emissions Determinations					
Test No.	Emission Point	Run 1	Run 2	Run 3	Average
		lb/MMBTU	lb/MMBTU	lb/MMBTU	lb/MMBTU
2	Natural Gas Boiler	0.0038	0.0031	0.0025	0.0031

Results of PM-10 Emissions Determinations					
Test No.	Emission Point	Run 1	Run 2	Run 3	Average
		lb/MMBTU	lb/MMBTU	lb/MMBTU	lb/MMBTU
3	Natural Gas Boiler	0.0009	0.0008	0.0003	0.0007

lb/MMBTU = pounds per million BTU

No problems were encountered during the sampling or analysis of emission samples. After complete review of the test results, we consider the information reported to be an accurate representation of the conditions at the time of testing.

4.0 TEST PROCEDURES

TOC TESTING

Total organic compounds were sampled in accordance with EPA Method 18, 40 CFR 60, Appendix A. A heated Teflon™ sampling line was used to extract a sample of the flue gas and deliver it to a Method 18 Sample Train consisting of a moisture knock-out impinger and two sorbent tubes containing absorbant media. Each sample tube has two chambers to ensure against breakthrough and loss of vapors. A flexible sampling line of tubing was used to connect the sampling train to an SKC Model 224-PCXR7 sampling pump which was calibrated on-site for known flow rates. Spike samples containing 50% of the expected concentrations were taken concurrently with the Method 18 samples to determine sample recovery efficiency. The results of Method 18 analyses are contained in Appendix B. Samples were analyzed for the total mass of the compounds being investigated via gas chromatography.

PARTICULATE TESTING

Particulate testing was conducted according to EPA Methods 1-5, 40 CFR 60 Appendix A. Using traverse points determined by EPA Method 1, a preliminary velocity profile was obtained with respect to velocity traverse, gas temperature, gas pressure, and the estimated gas moisture content. From this data, sampling nozzles of the appropriate diameter to ensure isokinetic sampling were selected. Additionally, a check was made to determine whether cyclonic flow was present.

The particulate sampling train (Figure 5) consisted of a temperature controlled glass-lined sampling probe equipped with an S-type pitot tube and Type K thermocouple. The sampling probe was attached to the sampling module which contained the all-glass in-line filter assembly in a temperature-controlled oven. The back half of the sampling train consisted of a series of glass impingers followed by a tared desiccant-packed drying column. The

sampling train was connected to a NuTech control module by means of an umbilical cord. The control module houses a temperature monitored dry-gas meter, a calibrated orifice, dual inclined oil manometers, temperature controllers and necessary flow rate control devices.

Particulate samples were collected by isokinetically extracting a sample gas stream by means of the sampling probe and passing the stream through the glass-fiber filter, the ice-cooled impinger assembly, and the packed drying column which collects all of the moisture remaining in the stream. The gas was then passed through a leakless sampling pump and a dry-test gas meter which integrated the sample volume throughout the testing. A calibrated orifice was connected to the gas meter outlet to facilitate sample flow rate adjustment.

Representative particulate samples were collected by sampling the centroid of equal area sections of the duct for equal time periods. The sampling rate at each point was adjusted to maintain isokinetic sampling. Pre-programmed hand-held computers were used to facilitate rapid determination of the correct sampling rate.

At the end of each particulate run, the sampling train was disassembled and the samples were recovered. The nozzle was acetone rinsed, brushed and rinsed again while the washings were collected in a labeled container. The probe was similarly cleaned, acetone rinsed and brushed and its washings were transferred to the same container. The sampling filter was transferred from the filter holder to its dedicated petri dish. The filter holder was wiped free of silicone grease, acetone rinsed, brushed and rinsed again and these washings too were added to the probe wash container. The probe wash container was capped and the liquid level was marked for transport. The impinger catch was transferred to a separate container, capped and the liquid level marked. The impinger catch volume was then determined gravimetrically to the nearest gram using a triple beam balance. The desiccant-packed drying column was weighed in the field to the nearest gram and the weight of the absorbed moisture was determined.

Oxygen and carbon dioxide concentrations were determined according to EPA Method 3A for determination of gas composition analysis. This data is included in the CEM certification report for the natural gas-fired boiler.

Particulate samples were transported to the laboratory and prepared for analysis. Filters were desiccated for 24 hours and weighed to a constant weight and the results were recorded to the nearest 0.1 mg. Probe wash samples were evaporated at ambient temperatures to dryness in tared evaporating dishes. They were then desiccated for 24 hours and weighed to a constant weight. Results were reported to the nearest 0.1 mg.

PM-10 TESTING

PM-10 testing was conducted according to EPA Method 201A. Using traverse points determined by EPA Method 1, a preliminary velocity profile was obtained with respect to velocity traverse, gas temperature, gas pressure, and the estimated gas moisture content. From this data, sampling nozzles of the appropriate diameter to ensure isokinetic sampling were selected.

The PM-10 sampling train consisted of a temperature controlled glass-lined sampling probe equipped with an S-type pitot tube, Type K thermocouple and an Andersen Mark III preimpactor for the separation of particulate matter under 10 microns. The sampling probe was attached to the sampling module which contains the all-glass in line filter assembly in a temperature controlled oven. The back half of the sampling train consisted of a series of glass impingers followed by a tared desiccant-packed drying column. The sampling train was connected to an NU-Tech control module by means of an umbilical cord. The control module houses a temperature monitored dry gas meter, a calibrated orifice, dual inclined oil manometers, temperature controllers and necessary flow rate control devices.

PM-10 samples were collected by isokinetically extracting a sample gas stream by means of the sampling probe and passing the stream through the preimpactor and glass-fiber filter, the ice-cooled impinger assembly, and the packed drying column which collects all of the moisture remaining in the stream. The gas was then passed through a leakless sampling pump and a dry test gas meter which integrated the sample volume throughout the testing. Variation in the dwell-time at each point was conducted to ensure isokinetic sampling while maintaining a constant flow through the impactor assembly.

Integrated gas samples were collected concurrently with the particulate samples to determine gas composition and molecular weight of the flue gas. To accomplish this, gas samples were collected in Tedlar bags throughout the duration of testing and later analyzed by chemical absorption using an Orsat gas analyzer.

Representative PM-10 samples were collected by sampling the centroid of equal area sections of the duct for varying time periods. The sampling time at each point was adjusted to maintain isokinetic sampling. Pre-programmed hand-held computers were used to facilitate rapid determination of the correct sampling duration.

At the end of each PM-10 run, the sampling train was disassembled and the samples were recovered. The nozzle was acetone rinsed, brushed and rinsed again while the washings were collected in a labeled container. The preimpactor and probe were similarly cleaned, acetone rinsed and brushed and its washings were transferred to separate containers. The sampling filter was transferred from the filter holder to its dedicated petri dish. The filter holder was wiped free of silicone grease, acetone rinsed, brushed and rinsed again and these washings too were added to the probe wash container. The probe wash and preimpactor containers were capped and the liquid level was marked for transport. The impinger catch volume was determined to the nearest milliliter using a triple beam balance. The impinger catch was transferred to a separate container, capped and the liquid level marked. The desiccant-packed drying column was weighed in the field to the nearest 0.5 grams and the weight of the absorbed moisture is determined.

PM-10 samples were transported to the laboratory and prepared for analysis. Filters were desiccated for 24 hours and weighted to a constant weight and the results were recorded to the nearest 0.1 mg. Probe wash samples were evaporated at ambient temperatures to dryness in tared evaporating dishes. They were then desiccated for 24 hours and weighed to a constant weight. Results were reported to the nearest 0.1 mg.

Oxygen and carbon dioxide concentrations were determined according to EPA Method 3A for determination of gas composition analysis. This data is included in the CEM certification report for the natural gas-fired boiler.

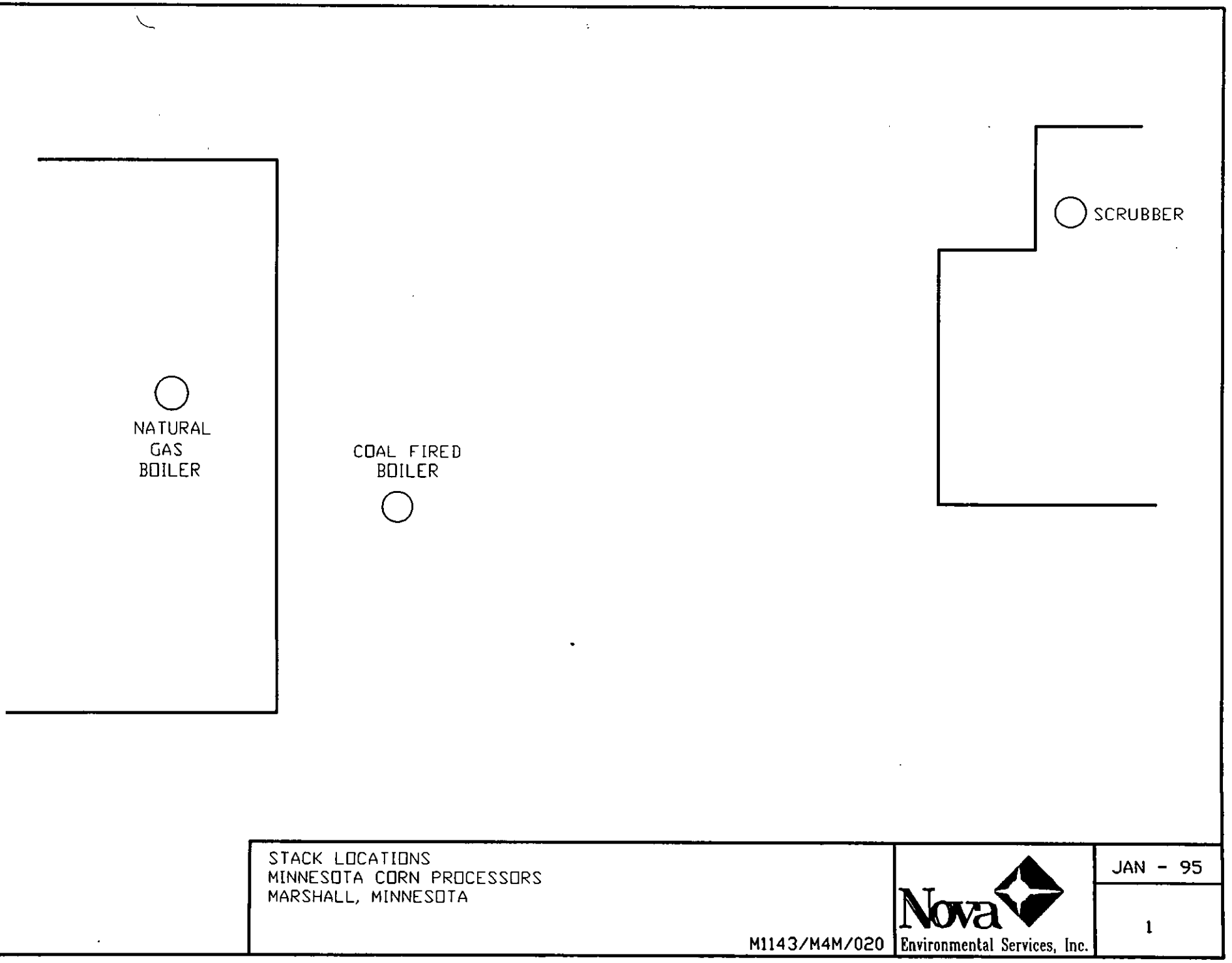
5.0 PROCESS DESCRIPTION

The CO_2 scrubber at the MCP - Marshall facility was designed to remove TOC from six (6) fermenters and one (1) beer well emission point numbers 7-17.

The natural gas-fired boiler (emission point no. 2) is a Zurn Model No. G01767 equipped with a low-NO_x burner, rated at 178.7 million BTU per hour. Steam heat from the boiler is used for process and space heating.

Process data and process operating data forms are included in Appendix D.

FIGURES



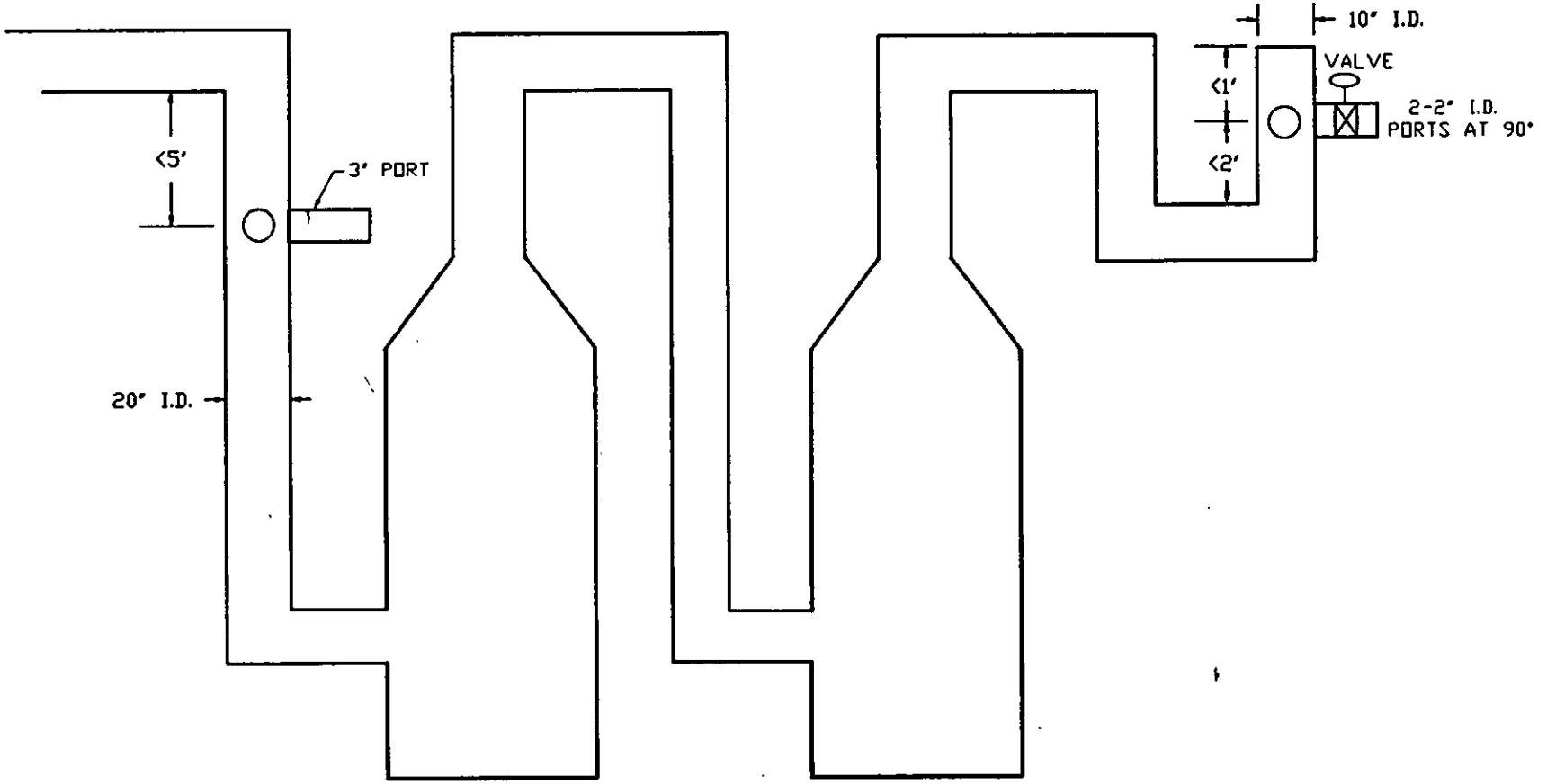
STACK LOCATIONS
MINNESOTA CORN PROCESSORS
MARSHALL, MINNESOTA

M1143/M4M/020

Nova
Environmental Services, Inc.

JAN - 95

1



SCRUBBER PORT LOCATION
MINNESOTA CORN PROCESSORS
MARSHALL, MINNESOTA

M1143/M4M/020

Nova Environmental Services, Inc.

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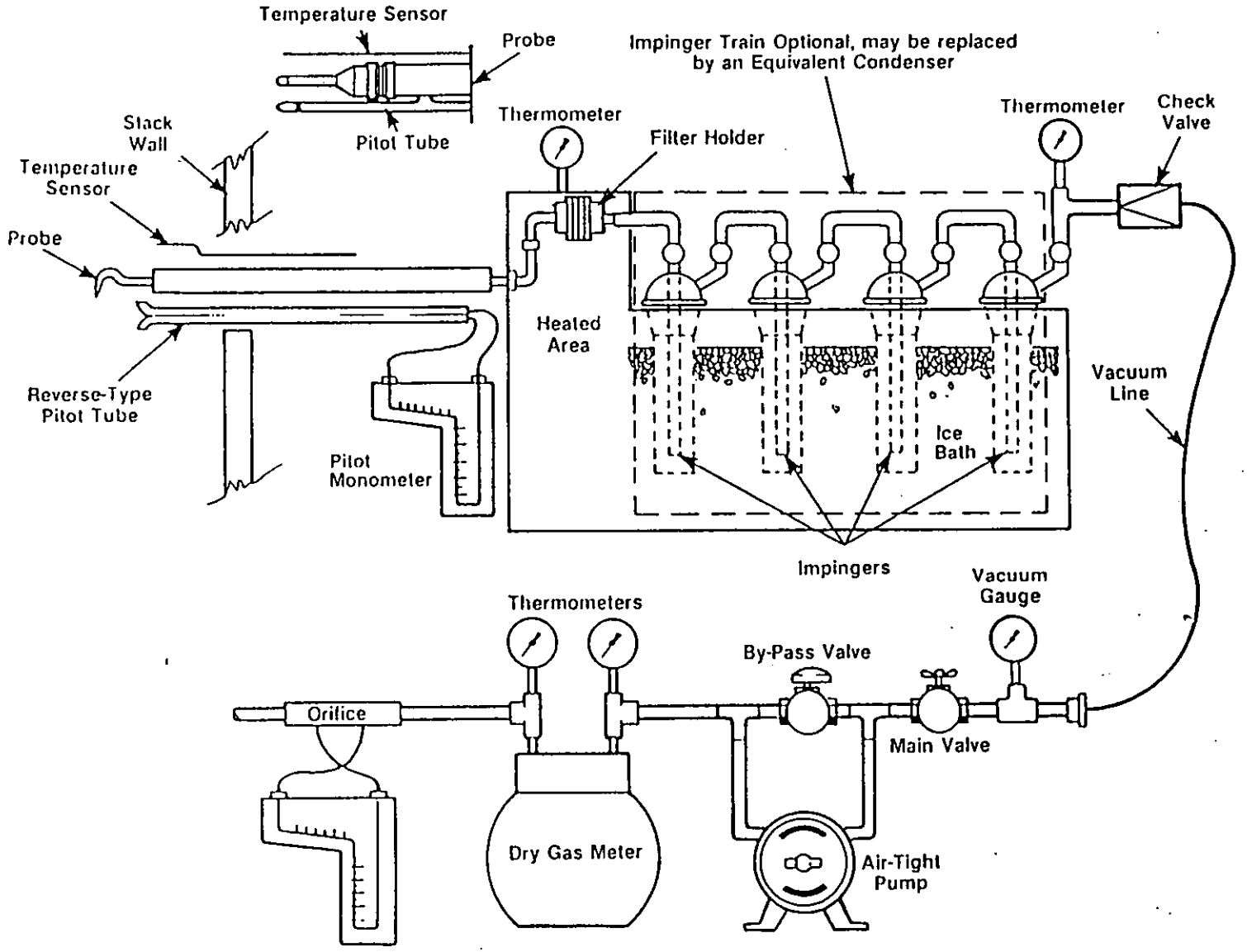
2



Method 5 Sampling Train

TABLES

TABLE 3

Minnesota Corn Processors
Marshall, Minnesota
Scrubber Outlet

Nova Environmental Services, Inc.
Project No. M4M-020

EPA Method 2 -- Determination of Stack Gas Velocity and Volumetric Flow Rate

Test No. 1	Run 1	Run 2	Run 3	Average
Date of Run	20-Dec-94	20-Dec-94	20-Dec-94	
Start Time	1300	1610	1815	
End Time	1320	1630	1838	
Stack Dimensions (in.)	10.0	10.0	10.0	
Cross Sectional Area (sq. ft)	0.5	0.5	0.5	
Pitot Tube Coefficient	0.840	0.840	0.840	0.840
Barometric Pressure (in. Hg)	29.80	29.80	29.80	29.80
Duct Static Pressure (in. H2O)	0.35	0.35	0.34	0.35
Avg. Effluent Gas Temp. (F)	52	52	52	52
Effluent Gas Moisture (% v/v)	3.35	7.62	3.47	4.81
Dry Molecular Weight (lb/lb-mole)	42.37	42.39	42.29	42.35
Wet Molecular Weight (lb/lb-mole)	41.56	40.54	41.45	41.18
Avg. Gas Velocity (ft/sec)	73.67	73.62	71.03	72.77
Volumetric Flow Rate				
Actual (acfm)	2,411	2,208	2,131	2,250
Standard (scfm)	2,479	2,270	2,190	2,313
Dry Standard (dscfm)	2,396	2,097	2,114	2,202

TABLE 4

MINNESOTA CORN PROCESSORS
MARSHALL, MINNESOTA
SCRUBBER OUTLET

Nova Environmental Services, Inc.
Project No. M4M-020

EPA Method 18 -- Determination of Volatile Organic Compound Emissions

Test No. 1	Run 1	Run 2	Run 3	Average
Date of Run	20-Dec-94	20-Dec-94	20-Dec-94	
Start Time	1343	1648	1845	
End Time	1443	1748	1945	
Duration (min)	60	60	60	
Stack Volumetric Flow Rate				
Actual (acfm)	2,411	2,208	2,131	2,250
Standard (scfm)	2,479	2,270	2,190	2,313
Dry Standard (dscfm)	2,396	2,097	2,114	2,202
Concentration (ppmw)				
ETHYL ACETATE	4	1	1	2
ACETALDHYDE	15	16	14	15
METHANOL	3	3	3	3
ETHANOL	31	13	2	15
Mass Rate (lb/hr)				
ETHYL ACETATE	0.157	0.035	0.034	0.076
ACETALDHYDE	0.280	0.267	0.219	0.255
METHANOL	0.042	0.038	0.037	0.039
ETHANOL	0.594	0.222	0.037	0.284
TOTAL	1.073	0.563	0.327	0.654

ND = NOT DETECTED

MINNESOTA CORN PROCESSORS TABLE 5
MARSHALL, MINNESOTA

PREPARED BY: NOVA ENV. SERVICES
JANUARY 1995

NET HEATING VALUE CALCULATIONS

TEST NO. 1
SCRUBBER NO. 1 OUTLET

$Ht = K1 \; SUM(Cj \times Hj \times (1-Bws))$

$Cj = Mj/Mw \times 22.4 \times 1000 \times 1/(Qj \times 60) \times 1/(1-Bws)$

WHERE,
K1 = 1.740 x 10-7 (l/ppm)(g-mole/scm)(MJ/kcal)
Mj = Mass of Compound in Sample, ug
Qj = Sample Flowrate, ml/min
Mw = Molecular Weight of Compound, g/g-mole
Cj = Concentration of Compound in Vent Stream, ppmd
Hj = Net Heat of Combustion of Compound, kcal/g-mole
Bws = Water Vapor Content of Vent Stream, Proportion by volume
Ht = Net Heating Value of Vent Stream, MJ/scm

RUN NO. 1

COMPOUND	Mj (ug)	Qj (ml/min)	Mw (g/g-mole)	Cj (ppmd)	Hj (kcal/g-mole)	Bws	Ht (MJ/scm)
ACETALDEHYDE	335	200	44.05	16	279.00	3.5%	0.001
ETHANOL	711	200	46.07	32	326.68	3.5%	0.002
ETHYL ACETATE	203	185	88.10	5	536.90	3.5%	0.000
METHANOL	50	200	32.04	3	170.90	3.5%	0.000
TOTAL	1299			56			0.003

RUN NO. 2

COMPOUND	Mj (ug)	Qj (ml/min)	Mw (g/g-mole)	Cj (ppmd)	Hj (kcal/g-mole)	Bws	Ht (MJ/scm)
ACETALDEHYDE	349	200	44.05	16	279.00	7.6%	0.001
ETHANOL	290	200	46.07	13	326.68	7.6%	0.001
ETHYL ACETATE	50	185	88.10	1	536.90	7.6%	0.000
METHANOL	50	200	32.04	3	170.90	7.6%	0.000
TOTAL	739			33			0.002

RUN NO. 3

COMPOUND	Mj (ug)	Qj (ml/min)	Mw (g/g-mole)	Cj (ppmd)	Hj (kcal/g-mole)	Bws	Ht (MJ/scm)
ACETALDEHYDE	296	200	44.05	13	279.00	3.5%	0.001
ETHANOL	50	200	46.07	2	326.68	3.5%	0.000
ETHYL ACETATE	50	185	88.10	1	536.90	3.5%	0.000
METHANOL	50	200	32.04	3	170.90	3.5%	0.000
TOTAL	446			19			0.001

MINNESOTA CORN PROCESSORS TABLE 6 PREPARED BY: NOVA ENV. SERVICES
MARSHALL, MINNESOTA JANUARY 1995

TRE INDEX CALCULATION SPREADSHEET FOR VENT STREAM CONTROLLED BY INCINERATOR

TEST NO. 1
SCRUBBER NO. 1 OUTLET

$$TRE = 1/Etoc\ (a + b(Qs)^{0.88} \bullet c(Qs) + d(Qs)(Ht) + e(Qs) \times (Ht) + f(Ys))$$

WHERE,
TRE = Total Resource Effectiveness
Etoc = Emission Rate for Total Organic Compounds (kg/hr)
a, b, c, d, e, & f = coefficients
Qs = Vent Stream Flowrate, scm/min
Ht = Net Heating Value of Vent Stream, MJ/scm
Ys = Qs, scm/min

RUN NO.	Etoc (lb/hr)	Etoc (kg/hr)	Qs (scf/min)	Qs (scm/min)	Ht (MJ/scm)	a	b	c	d	e	f	TRE
1	1.07	0.49	2479	70	0.003	8.54245	0.10555	0.09030	-0.17109	0	0.01025	43.99
2	0.56	0.26	2270	64	0.002	8.54245	0.10555	0.09030	-0.17109	0	0.01025	79.63
3	0.33	0.15	2190	62	0.001	8.54245	0.10555	0.09030	-0.17109	0	0.01025	134.38
AVERAGE		0.30	2313	65.50	0.002							86.00

MINNESOTA CORN PROCESSORS TABLE 7 PREPARED BY: NOVA ENV. SERVICES
MARSHALL, MINNESOTA JANUARY 1995

TRE INDEX CALCULATION SPREADSHEET FOR VENT STREAM CONTROLLED BY FLARE

TEST NO. 1
SCRUBBER NO. 1 OUTLET

TRE = 1/Etoc (a(Qs) + b(Qs)exp0.88 + c(Qs)(Ht) + d(Etoc) + e)

WHERE,
TRE = Total Resource Effectiveness
Etoc = Emission Rate for Total Organic Compounds (kg/hr)
a, b, c, d, & e = coefficients
Qs = Vent Stream Flowrate, scm/min
Ht = Net Heating Value of Vent Stream, MJ/scm
Ys = Qs, scm/min

RUN NO.	Etoc (lb/hr)	Etoc (kg/hr)	Qs (scf/min)	Qs (scm/min)	Ht (MJ/scm)	a	b	c	d	e	TRE
1	1.07	0.49	2479	70	0.003	2.25	0.288	-0.193	-0.0051	2.08	345.76
2	0.56	0.26	2270	64	0.002	2.25	0.288	-0.193	-0.0051	2.08	604.71
3	0.33	0.15	2190	62	0.001	2.25	0.288	-0.193	-0.0051	2.08	1005.39
AVERAGE		0.30	2313	65.50							651.95

TABLE 8

Minnesota Corn Processors
Marshall, Minnesota
Natural Gas Fired Boiler

Nova Environmental Services, Inc.
Project No. M4M-020

EPA METHOD 3 & 4 -- RESULTS OF GAS COMPOSITION & MOISTURE ANALYSES

Test No:2	RUN 1	RUN 2	RUN 3	AVERAGE
DATE OF TEST	21-Dec-94	21-Dec-94	21-Dec-94	
GAS COMPOSITION, DRY BASIS (ORSAT), %				
CARBON DIOXIDE	10.60	10.80	10.60	10.67
OXYGEN	2.50	2.50	2.50	2.50
CARBON MONOXIDE	NT	NT	NT	NT
NITROGEN	86.90	86.70	86.90	86.83
GAS COMPOSITION, WET BASIS (ORSAT), %				
CARBON DIOXIDE	8.78	8.92	8.70	8.80
OXYGEN	2.07	2.06	2.05	2.06
CARBON MONOXIDE	NT	NT	NT	NT
NITROGEN	71.97	71.57	71.31	71.62
WATER VAPOR	17.18	17.45	17.94	17.52
DRY MOLECULAR WEIGHT	29.80	29.83	29.80	29.81
WET MOLECULAR WEIGHT	27.77	27.76	27.68	27.74

NT = NOT TESTED

F:14. PM

TABLE 9

Minnesota Corn Processors
Marshall, Minnesota
Natural Gas Fired Boiler

Nova Environmental Services, Inc.
Project No. M4M-020

EPA METHOD 5 - DETERMINATION OF PARTICULATE EMISSIONS FROM STATIONARY SOURCES

Test No:2	RUN 1	RUN 2	RUN 3	AVERAGE
DATE OF RUN	21-Dec-94	21-Dec-94	21-Dec-94	
RUN START TIME	1309	1555	1743	
RUN END TIME	1412	1700	1850	
STACK STATIC PRESSURE (in. H2O)	-0.54	-0.54	-0.54	-0.54
CROSS SECTIONAL AREA (sq. ft.)	18.985	18.985	18.985	18.985
PITOT TUBE COEFFICIENT	0.840	0.840	0.840	0.840
SAMPLE GAS MOISTURE ANALYSES				
IMPINGERS (g)	154	155	172	160
DESSICCANT (g)	10	9	8	9
TOTAL MOISTURE COLLECTED (g)	164	164	180	169
SAMPLE GAS MOISTURE CONTENT (%)	17.18	17.45	17.94	17.52
PARTICULATE DATA				
FILTER PARTICULATE (g)	-0.0019	-0.0020	-0.0042	-0.0027
PROBE WASH PARTICULATE (g)	0.0083	0.0072	0.0086	0.0080
CONDENSIBLE PARTICULATE (g)	NT	NT	NT	0.0000
TOTAL PARTICULATE COLLECTED (g)	0.0064	0.0052	0.0044	0.0053
DRY GAS METER COEFFICIENT	0.9982	0.9982	0.9982	0.9982
BAROMETRIC PRESSURE (in. Hg)	29.75	29.75	29.75	29.75
AVG. ORIFICE PRESS. DROP (in. H2	1.37	1.34	1.49	1.40
AVG. GAS METER TEMP. (degrees F)	86.9	96.3	94.2	92.47
VOLUME THROUGH GAS METER				
AT METER CONDITIONS (cf)	38.74	38.69	40.87	39.43
STANDARD CONDITIONS (dscf)	37.23	36.55	38.78	37.52
TOTAL SAMPLING TIME (min.)	60.0	60.0	60.0	60.0
NOZZLE DIAMETER (in.)	0.276	0.276	0.276	0.276
AVG. STACK GAS TEMP. (degrees F)	326	325	327	326
VOLUMETRIC FLOWRATE				
AVG. STACK GAS VELOCITY (ft/sec)	45.05	44.75	47.43	45.74
ACTUAL (acfm)	51,313	50,974	54,028	52,105
STANDARD (scfm)	34,232	34,028	35,997	34,752
DRY STANDARD (dscfm)	28,350	28,091	29,539	28,660
ISOKINETIC VARIATION (%)	100.07	99.16	100.03	99.75
PARTICULATE CONCENTRATION				
ACTUAL (gr/acf)	0.001	0.001	0.001	0.001
DRY STANDARD (gr/dscf)	0.003	0.002	0.002	0.002
PARTICLE MASS RATE (lb/hr)	0.644	0.528	0.443	0.538

TABLE 10

Minnesota Corn Processors
Marshall, Minnesota
Natural Gas Fired Boiler

Nova Environmental Services, Inc.
Project No. M4M-020

EPA METHOD 3 & 4 -- RESULTS OF GAS COMPOSITION & MOISTURE ANALYSES

Test No: 3	RUN 1	RUN 2	RUN 3	AVERAGE
DATE OF TEST	21-Dec-94	21-Dec-94	21-Dec-94	
GAS COMPOSITION, DRY BASIS (ORSAT), %				
CARBON DIOXIDE	10.80	10.80	10.60	10.73
OXYGEN	2.50	2.80	2.50	2.60
CARBON MONOXIDE	NT	NT	NT	NT
NITROGEN	86.70	86.40	86.90	86.67
GAS COMPOSITION, WET BASIS (ORSAT), %				
CARBON DIOXIDE	9.04	9.01	8.81	8.95
OXYGEN	2.09	2.34	2.08	2.17
CARBON MONOXIDE	NT	NT	NT	NT
NITROGEN	72.60	72.06	72.20	72.29
WATER VAPOR	16.27	16.59	16.91	16.59
DRY MOLECULAR WEIGHT	29.83	29.84	29.80	29.82
WET MOLECULAR WEIGHT	27.90	27.88	27.80	27.86

NT = NOT TESTED

PM10

TABLE 11

Minnesota Corn Processors
Marshall, Minnesota
Natural Gas Fired Boiler

Nova Environmental Services, Inc.
Project No. M4M-020

EPA METHOD 201A - DETERMINATION OF PM-10 EMISSIONS FROM STATIONARY SOURCES

Test No: 3	RUN 1	RUN 2	RUN 3	AVERAGE
DATE OF RUN	21-Dec-94	21-Dec-94	21-Dec-94	
RUN START TIME	1947	2120	2248	
RUN END TIME	2052	2220	2352	
STACK STATIC PRESSURE (in. H2O)	-0.54	-0.54	-0.54	-0.54
CROSS SECTIONAL AREA (sq. ft.)	18.985	18.985	18.985	18.985
PITOT TUBE COEFFICIENT	0.840	0.840	0.840	0.840
SAMPLE GAS MOISTURE ANALYSES				
IMPINGERS (g)	160	161	176	166
DESSICCANT (g)	11	13	9	11
TOTAL MOISTURE COLLECTED (g)	171	174	185	177
SAMPLE GAS MOISTURE CONTENT (%)	16.27	16.59	16.91	16.59
PARTICULATE DATA				
FILTER PARTICULATE (g)	-0.0007	-0.0019	-0.0018	-0.0015
PRE-PROBE WASH PARTICULATE (g)	0.0010	0.0010	0.0005	0.0008
POST-PROBE WASH PARTICULATE (g)	0.0024	0.0034	0.0024	0.0027
IMPINGER PARTICULATE (g)	NT	NT	NT	0.0000
PM-10 PARTICULATE (g)	0.0017	0.0015	0.0006	0.0013
TOTAL PARTICULATE COLLECTED (g)	0.0027	0.0025	0.0011	0.0021
DRY GAS METER COEFFICIENT	0.9982	0.9982	0.9982	0.9982
BAROMETRIC PRESSURE (in. Hg)	29.75	29.75	29.75	29.75
AVG. ORIFICE PRESS. DROP (in. H2	1.90	1.90	1.90	1.90
AVG. GAS METER TEMP. (degrees F)	90.5	93.0	89.2	90.89
VOLUME THROUGH GAS METER				
AT METER CONDITIONS (cf)	43.37	43.28	44.67	43.77
STANDARD CONDITIONS (dscf)	41.46	41.19	42.81	41.82
TOTAL SAMPLING TIME (min.)	59.90	59.90	61.90	60.57
NOZZLE DIAMETER (in.)	0.276	0.276	0.276	0.276
AVG. STACK GAS TEMP. (degrees F)	321	321	322	322
VOLUMETRIC FLOWRATE				
AVG. STACK GAS VELOCITY (ft/sec)	45.09	45.03	47.14	45.75
ACTUAL (acfm)	51,360	51,290	53,697	52,115
STANDARD (scfm)	34,460	34,421	36,001	34,961
DRY STANDARD (dscfm)	28,855	28,709	29,913	29,159

TABLE 11 CONTINUED

Minnesota Corn Processors
Marshall, Minnesota
Natural Gas Fired Boiler

Nova Environmental Services, Inc.
Project No. M4M-020

EPA METHOD 201A - DETERMINATION OF PM-10 EMISSIONS FROM STATIONARY SOURCES

Test No: 3	RUN 1	Test No: 3	RUN 3	AVERAGE
ISOKINETIC VARIATION (%)	109.68	109.52	105.71	108.31
PARTICLE CUT DIAMETER, Dp50 (um)	10.99	11.00	11.01	11.00
STACK GAS TEMP. (degrees K)	434	434	434	434
GAS VISCOSITY (poise)	2.37E-04	2.36E-04	2.37E-04	2.37E-04
MEAN FREE PATH LENGTH, (cm)	5.81E-05	5.81E-05	5.83E-05	5.81E-05
CUNNINGHAM SLIP CORRECTION	1.146	1.146	1.146	1.146
PM-10 CONCENTRATION				
ACTUAL (gr/acf)	0.0004	0.0003	0.0001	0.0003
DRY STANDARD (gr/dscf)	0.0006	0.0006	0.0002	0.0005
PM-10 MASS RATE (lb/hr)	0.1563	0.1381	0.0554	0.1166

APPENDIX A

FIELD DATA

EPA METHOD 2 FIELD DATA

PROJECT NAME MCP- MARSHALL ~~COLUMBUS~~
SOURCE SCRUBBER INLET
TEST 1 RUN 1 DATE 12/20/94
STACK DIA. 22 IN.
DRY BULB --- °F WET BULB ____ °F
MANOMETER: ✓ REG. ___ EXP. ___ ELEC.
BAROMETRIC PRESSURE 29.8 IN Hg
STATIC PRESSURE +.16 IN WC
OPERATORS RCL/TRW
PITOT NO. ~~B-2~~ Cp 0.840
FLOW INTO PAPER ___ /FLOW OUT OF PAPER ___

SCHEMATIC OF CROSS-SECTION

TRAVERSE POINT NO.	FRACTION OF DIAMETER	DISTANCE FROM STACK WALL (IN.)	DISTANCE FROM END OF PORT (IN.)	VELOCITY PRESSURE (IN WC)	TEMPERATURE OF GAS (°F)	CYCLONIC FLOW (Resultant Angle)
		Port Length: 2 In.		Time Start: 1210 Hrs.		
A-1		0.46	2.97	0.33	65	
-2		1.47	5.21	0.54	65	
-3		2.60	8.57	0.58	67	
-4		3.89	17.49	0.60	66	
-5		5.50	20.79	0.55	66	
-6		7.23	23.03	0.57	66	
Temp. Meas. Tool & S/N:				Time End: 12:30 Hrs.		

Nova
Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER MYM-020
SOURCE Scrubber Inlet I
DATE 12/20/94
TEST 1 RUN 1

PUMP NUMBER 3
PUMP SN 523-415
OPERATOR B. Wolff
Pb 29.80
TEST FOR EA

* @ Sample Train (Charcoal tube)

FIELD DATA SHEET

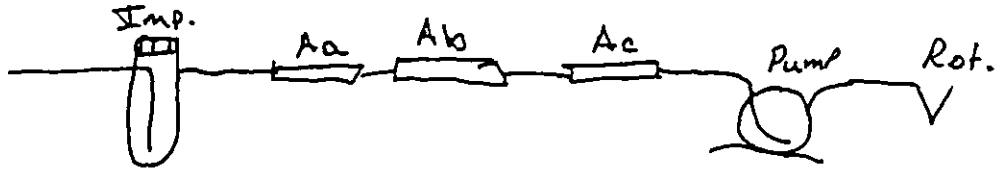
SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)	
(1343)						
	45 cc/min	45 cc/min		60		
(1343)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. Catch
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



Nova
Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER M4M-020
SOURCE Scrubber - Inlet
DATE 12-20-94
TEST 1 RUN 1

PUMP NUMBER 2
PUMP SN S23-213
OPERATOR B. Wolff
Pb 29.8
TEST FOR MEOH
EtOH
Acteyl.

* Sampling TRAIN (Silica Gel)

FIELD DATA SHEET

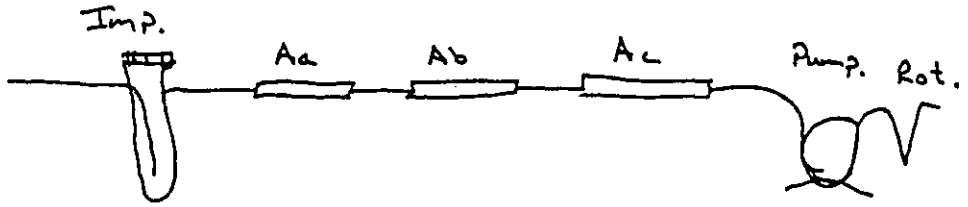
SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)	
(1343)						
	56 cc/min	56 cc/min		60		
(1443)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. Catch
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



Nova
Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER M4M-020
SOURCE Scrubber - Inlet
DATE 12-20-94
TEST 1 RUN 1

PUMP NUMBER 2
PUMP SN 583-213
OPERATOR B. Wolff
Pb 29.8
TEST FOR MEOH
EtOH
Acetyl.

* Sampling Train (Silica Gel Spike)

FIELD DATA SHEET

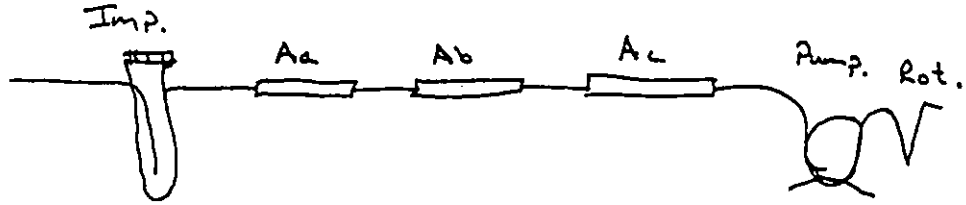
SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)	
(1343)						
	53 cc/min	53 cc/min.		60		
(1443)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. Catch
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



Nova
Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER MYM-020
SOURCE Scrubber - Inlet
DATE 12/20/94
TEST 1 RUN 1

PUMP NUMBER 3
PUMP SN S23-415
OPERATOR B. Wolcf
Pb 29.80
TEST FOR [redacted] EA

* @ Sample Train (Charcoal Spike)

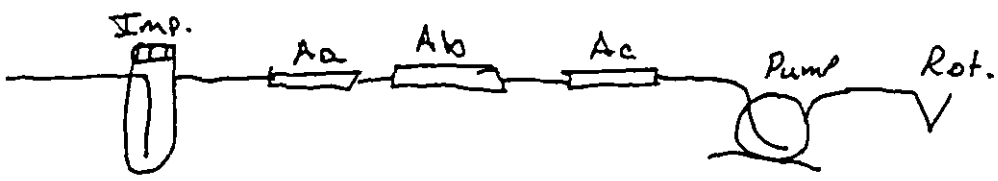
FIELD DATA SHEET

SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)
(1343)					
	55 cc/min	55 cc/min		60	
(1443)					AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)
☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. CATCH
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



EPA METHOD 5 FIELD DATA

PROJECT NAME MCP - MARSHAL OPERATORS PCL METER BOX NO. 1 ΔH@ 1.EC IN WC

SOURCE SCRUBBER-INLET DATE 12/[illegible]/94 TEST 2 RUN 1 GASMETER COEFF. 0.97 EC

TRAVERSE POINT NO.	SAMPLING TIME (MIN.)	SAMPLE VOL (cf)	VELOCITY HEAD (IN WC)	ORIFICE METER (IN WC)	DES. VOL (cf)	VAC IN Hg	TEMPERATURE (°F) STACK	PROBE	OVEN	IMPG.	GAS/IN	GAS/OUT	OXYGEN (% v/v)
	13:43	ECE.74											
	5	872.49		1.89		9				52	76	67	
	10	875.75		1.89		10				52	73	68	
	15	878.77		1.89		10				52	77	68	
	20	882.10		1.89		10				52	80	69	
	25	885.01		1.89		10				52	82	70	
	30	887.80		1.89		10				52	83	71	
	35	891.39		1.89		10				52	84	72	
	40	894.31		1.89		10				52	86	73	
	45	897.90		1.89		10				52	87	74	
	50	900.89		1.89		10				52	88	76	
	55	904.15		1.89		10				52	89	76	
	60	907.40		1.89		10				52	89	76	
	(14:43)						242						
	θ = 60	Vm = 38.66		ΔH = 1.89							AVG. = 77		

EPA METHOD 3/4/5 FIELD DATA

PROJECT NAME MCP Marshall METHOD 4

SOURCE Scrubber # 1 Inlet DATE _____ TEST 2 RUN 1

SAMPLE TRAIN LEAK CHECK:

PRETEST: (≤0.02 CFM AT 15 IN. Hg (vac) ☐ POSTTEST: (0 CFM AT 10 IN. Hg (vac) ☑

PARTICULATE CATCH DATA:

NO.S OF FILTERS USED: _____ _____

CONDENSATE DATA:

ITEM	WEIGHT (g)		
	FINAL	TARE	DIFFERENCE
IMPINGER NO. 1	242	200	42
IMPINGER NO. 2			
IMPINGER NO. 3			
CONDENSER			
DESICCANT	1345	1332	13
TOTAL			55

☐ AMBIENT AIR 20.9% O_2 (V/V)

INTEGRATED GAS SAMPLING DATA:

BAG PUMP NO. _____ BOX NO. _____ BAG NO. _____

BAG MATERIAL: _____ SIZE: _____

PRETEST LEAK CHECK: _____ cc/MIN AT _____ IN. Hg

TIME START: _____ (HRS) TIME END: _____ (HRS)

SAMPLING RATE: _____ cc/MIN OPERATOR: _____

S/N OF O_2 ANALYZER USED TO MONITOR TRAIN OUTLET: _____

PITOT NO. 840 Cp _____

BAR. PRESS. 29.8 IN Hg H2O _____ %

NOZZLE NO. ~~<~~ NOZZLE DIA. ~~<~~ IN.

[redacted]

EPA METHOD 2 FIELD DATA

PROJECT NAME MCP - Marshall
SOURCE Scrubber Inlet
TEST 1 RUN 2 DATE 12/20/94
STACK DIA. 22 IN.
DRY BULB _____ °F WET BULB _____ °F
MANOMETER: ___ REG. ___ EXP. ___ ELEC.
BAROMETRIC PRESSURE 29.8 IN Hg
STATIC PRESSURE +.15 IN WC
OPERATORS JRW / PCL
PITOT NO. ~~S40~~ Cp .850
FLOW INTO PAPER __ /FLOW OUT OF PAPER __

SCHEMATIC OF CROSS-SECTION

TRAVERSE POINT NO.	FRACTION OF DIAMETER	DISTANCE FROM STACK WALL (IN.)	DISTANCE FROM END OF PORT (IN.)	VELOCITY PRESSURE (IN WC)	TEMPERATURE OF GAS (°F)	CYCLONIC FLOW (Resultant Angle)
		Port Length: 2 In.		Time Start: 1530 Hrs.		
A 1				0.33	63	
2				.52	63	
3				.55	62	
4				.61	63	
5				.56	63	
6				.54	63	
Temp. Meas. Tool & S/N:				Time End: 1550 Hrs.		

METHOD2.FRM\ADITRN

Nova
Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER MYM-020
SOURCE Scrubber - INLET
DATE 12/20/94
TEST 1 RUN 2

PUMP NUMBER 3
PUMP SN 523-415
OPERATOR B. Wolcf
Pb 29.80
TEST FOR [redacted] EA

* @ Sample Train (Charcoal Tube)

FIELD DATA SHEET

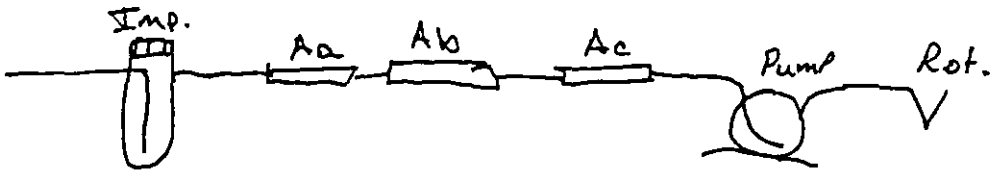
SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)	
(1648)						
	45cc/min	45 cc/m		40		
(1748)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. Catch
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



Nova
Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER M4M-020
SOURCE Scrubber - Inlet
DATE 12-20-94
TEST 1 RUN 2

PUMP NUMBER 2
PUMP SN 523-213
OPERATOR B. Wolff
Pb 29.8
TEST FOR MEOH
EtOH
Acteyl.

* Sampling TRAIN (Silica Gel)

FIELD DATA SHEET

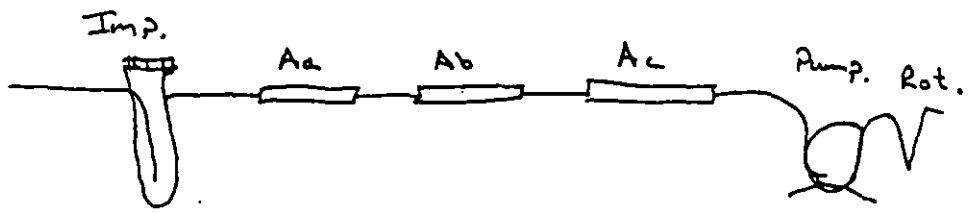
SAMPLING TIME	PUMP SETTING	FLOW RATE (cc/min)	STACK TEMP (f)	PUMP TEMP (f)	PROBE TEMP (f)	
(1648)						
	56 cc/m	56 cc/m		32		
(1748)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. Catch
2: As
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



Nova
Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER M4M-020
SOURCE Scrubber - Inlet
DATE 12-20-94
TEST 1 RUN 2

PUMP NUMBER 2
PUMP SN S23-213
OPERATOR B. Wolff
Pb 29.8
TEST FOR MEOH
EtOH
Acteyl.

* Sampling TRAIN (Silica Gel spike)

FIELD DATA SHEET

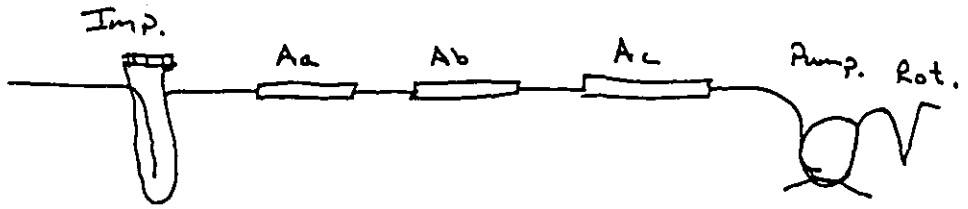
SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)	
(1648)						
	53 cc/min	53 cc/m		60		
(1748)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. Catch
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



Nova Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER MYM-020
SOURCE Scrubber Inlet
DATE 12/20/94
TEST 1 RUN 2

PUMP NUMBER 3
PUMP SN 523-415
OPERATOR B. Wolcf
Pb 29.80
TEST FOR [redacted] EA

* @ Sample Train (Charcoal Spike)

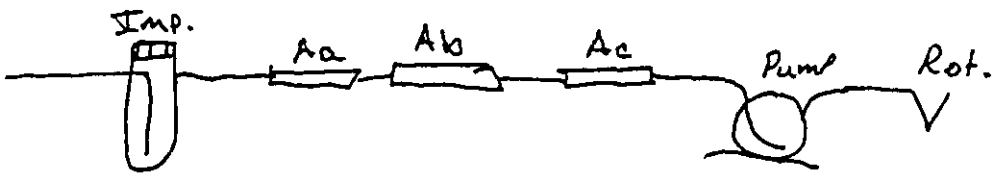
FIELD DATA SHEET

SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)	
(1648)						
	55 cc/min	55 cc/min		60		
(1748)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)
☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. Catch
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



EPA METHOD 5 FIELD DATA

PROJECT NAME MCP-Marshall OPERATORS RLW METER BOX NO. _____ ΔH@ 1.89 IN WC

SOURCE Scrubber Inlet DATE 8/20/94 TEST T2 RUN 2 GASMETER COEFF. .9982

TRAVERSE POINT NO.	SAMPLING TIME (MIN.)	SAMPLE VOL. (cf)	VELOCITY HEAD (IN WC)	ORIFICE METER (IN WC)	DES. VOL. (cf)	VAC IN Hg	TEMPERATURE (°F)						OXYGEN (% v/v)
							STACK	PROBE	OVEN	IMPG.	GAS/IN	GAS/OUT	
	(16:48)	908.51											
	5												
	10	913.99		1.89		10				52	80	77	
	15												
	20	920.50		1.89		10				52	79	73	
	25												
	30	926.95		1.89		10				52	80	71	
	35												
	40	933.58		1.89		10				52	79	69	
	45												
	50	939.87		1.89		10				52	80	68	
	55												
	60	946.40		1.84		10				52	80	68	
	(17:48)												
	θ = 60	Vm = 37.89		ΔH = 1.86							AVG. = 75		

EPA METHOD 3/4/5 FIELD DATA

PROJECT NAME MCP. Marshall METHOD 4

SOURCE Scrubber — Inlet DATE 12/20/96 TEST 1 RUN 2

SAMPLE TRAIN LEAK CHECK:

PRETEST: (≤0.02 CFM AT 15 IN. Hg (vac) ☒ POSTTEST: (.0 CFM AT 10 IN. Hg (vac) ☒

PARTICULATE CATCH DATA:

NO.S OF FILTERS USED: —

CONDENSATE DATA:

ITEM	WEIGHT (g)		
	FINAL	TARE	DIFFERENCE
IMPINGER NO. 1	236	200	36
IMPINGER NO. 2			
IMPINGER NO. 3			
CONDENSER			
DESICCANT	1282	1264	18
TOTAL			54

☒ AMBIENT AIR 20.9% O_2 (V/V)

INTEGRATED GAS SAMPLING DATA:

BAG PUMP NO. _____ BOX NO. _____ BAG NO. _____

BAG MATERIAL: _____ SIZE: _____

PRETEST LEAK CHECK: _____ cc/MIN AT _____ IN. Hg

TIME START: _____ (HRS) TIME END: _____ (HRS)

SAMPLING RATE: _____ cc/MIN OPERATOR: _____

S/N OF O_2 ANALYZER USED TO MONITOR TRAIN OUTLET: _____

PITOT NO. 840 Cp _____

BAR. PRESS. 29.3 IN Hg H2O _____ %

NOZZLE NO. — NOZZLE DIA. — IN.

EPA METHOD 2 FIELD DATA

PROJECT NAME MCP - MARSHALL
SOURCE Scrubber Inlet
TEST 1 RUN 3 DATE 12/20/94
STACK DIA. 22 IN.
DRY BULB _____ °F WET BULB _____ °F
MANOMETER: ___ REG. ___ EXP. ___ ELEC.
BAROMETRIC PRESSURE 29.8 IN Hg
STATIC PRESSURE -.15 IN WC
OPERATORS RLW / PCL
PITOT NO. _____ Cp .840
FLOW INTO PAPER X /FLOW OUT OF PAPER ___

SCHEMATIC OF CROSS-SECTION

TRAVERSE POINT NO.	FRACTION OF DIAMETER	DISTANCE FROM STACK WALL (IN.)	DISTANCE FROM END OF PORT (IN.)	VELOCITY PRESSURE (IN WC)	TEMPERATURE OF GAS (°F)	CYCLONIC FLOW (Resultant Angle)
		Port Length: In.		Time Start: 1730 Hrs.		
A1				.31	64	
2				.50	67	
3				.56	67	
4				.61	64	
5				.61	67	
6				.51	61	
Temp. Meas. Tool & S/N:				Time End: 1750 Hrs.		

Nova
Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER MYM-020
SOURCE Scrubber Inlet
DATE 12/20/94
TEST 1 RUN 3

PUMP NUMBER 3
PUMP SN 523-415
OPERATOR B. Wolcott
Pb 29.80
TEST FOR MEA

* @ Sample Train (charcoal tube)

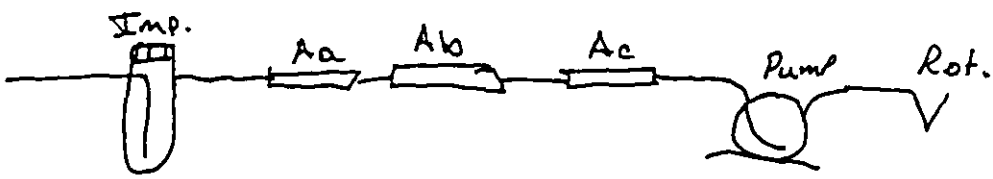
FIELD DATA SHEET

SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)	
(1845)						
	49 cc/min	49 cc/min		60		
(1945)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)
☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. Catch
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



Nova
Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER M4M-020
SOURCE Scrubber - Inlet
DATE 12-20-94
TEST 1 RUN 3

PUMP NUMBER 2
PUMP SN 583-213
OPERATOR B. Wolff
Pb 29.8
TEST FOR MEOH
EtOH
Acetyl.

* Sampling TRAIN (Silica Gel)

FIELD DATA SHEET

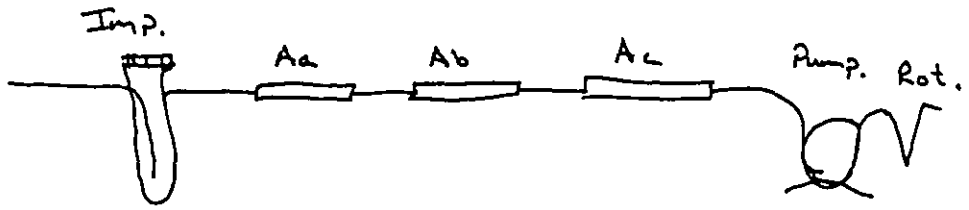
SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)	
(1845)						
	56 cc/min	56 cc/min		80		
(1945)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. Catch
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



Nova
Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER MYM-020
SOURCE Scrubber INLET
DATE 12/20/94
TEST 1 RUN 3

PUMP NUMBER 3
PUMP SN 523-415
OPERATOR B. WOLCE
Pb 29.80
TEST FOR [redacted] EA

* @ Sample Train (Charcoal spike)

FIELD DATA SHEET

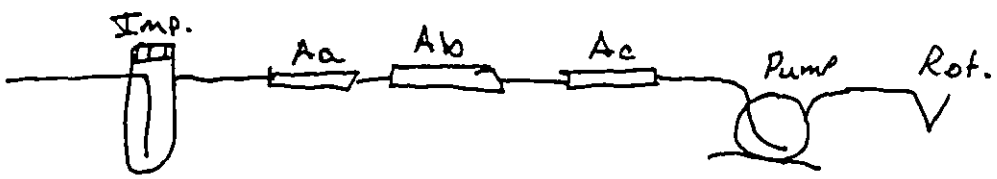
SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)	
(1545)						
	55 cc/min	55 cc/min		60		
(1945)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. CATCH
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



Nova
Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER M4M-020
SOURCE Scrubber -
DATE 12-20-94
TEST # 1 RUN 3

PUMP NUMBER 2
PUMP SN 523-213
OPERATOR B. Wolff
Pb 29.8
TEST FOR MEOH
EtOH
Acteyl.

* Sampling TRAIN (Silica Gel Spike)

FIELD DATA SHEET

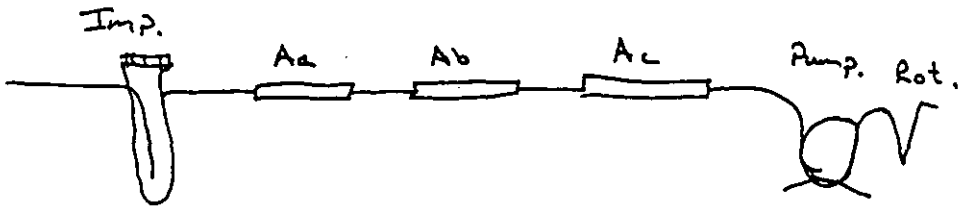
SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)	
(1845)						
	53 cc/min	53 cc/a.		80		
(1945)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. Catch
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



EPA METHOD 5 FIELD DATA

PROJECT NAME MCP- MARSHALL OPERATORS ZRW METER BOX NO. 4 ΔH@ 1.89 IN WC

SOURCE Scrubber - Inlet DATE 12/20 TEST 1 RUN 3 GASMETER COEFF. .9982

TRAVERSE POINT NO.	SAMPLING TIME (MIN.)	SAMPLE VOL (cf)	VELOCITY HEAD (IN WC)	ORIFICE METER (IN WC)	DES. VOL (cf)	VAC IN Hg	TEMPERATURE (°F)						OXYGEN
							STACK	PROBE	OVEN	IMPG.	GAS/IN	GAS/OUT	(% v/v)
	(1845)	946.50											
	5	949.47		1.89		10				52	76	61	
	10	952.21		1.89		10				52	76	61	
	15	955.31		1.89		10				52	76	61	
	20	957.87		1.89		10				52	76	61	
	25	961.03		1.89		10				52	77	62	
	30	963.55		1.89		10				52	76	61	
	35	966.71		1.89		10				52	76	61	
	40	969.23		1.89		10				52	76	61	
	45	972.39		1.89		10				53	76	62	
	50	975.24		1.89		10				53	77	61	
	55	978.07		1.89		10				52	76	61	
	60	980.92		1.89		10				52	76	61	
	19:45												
	Θ=60	Vm=34.42		ΔH= 1.89							AVG.= 65.5		

EPA METHOD 3/4/5 FIELD DATA

PROJECT NAME MCP - Marshal METHOD _____

SOURCE Scrubber Inlet DATE 12/22 TEST 1 RUN 3

SAMPLE TRAIN LEAK CHECK:

PRETEST: (≤0.02 CFM AT 15 IN. Hg (vac) [X] POSTTEST: (0 CFM AT 15 IN. Hg (vac) [X]

PARTICULATE CATCH DATA:

NO.S OF FILTERS USED: _____ _____

CONDENSATE DATA:

ITEM	WEIGHT (g)		
	FINAL	TARE	DIFFERENCE
IMPINGER NO. 1	246	200	46
IMPINGER NO. 2			
IMPINGER NO. 3			
CONDENSER			
DESICCANT	1294	1282	12
TOTAL			58

[X] AMBIENT AIR 20.9% O_2 (V/V)

INTEGRATED GAS SAMPLING DATA:

BAG PUMP NO. _____ BOX NO. _____ BAG NO. _____

BAG MATERIAL: _____ SIZE: _____

PRETEST LEAK CHECK: _____ cc/MIN AT _____ IN. Hg

TIME START: _____ (HRS) TIME END: _____ (HRS)

SAMPLING RATE: _____ cc/MIN OPERATOR: _____

S/N OF O_2 ANALYZER USED TO MONITOR TRAIN OUTLET: _____

PITOT NO. .840 Cp _____

BAR. PRESS. 29.3 IN Hg H2O _____ %

NOZZLE NO. _____ NOZZLE DIA. _____ IN.

Environmental Services, Inc.

E.P.A. METHOD 3 ANALYSIS

JOB# M4M-019 DATE OF ANALYSIS 1/9/94
SOURCE Scrubber # 1 LEAK CHECK PERFORMED Yes
SITE ~~Marshall~~ Inlet TECHNICIAN RRW
CITY/STATE MARSHALL (MCP) TYPE OF FUEL PROCESS EMISSIONS

TEST/ RUN	READING NO.	BURET READING			CONCENTRATION (%v/v,dry)		F_o
		ZERO POINT	AFTER CO 2	AFTER O 2	CO_2	O_2	
AMBIENT AIR		0.00	99.07	~~279.07~~	0.03	20.9	0.000
T_2/R_1	1	0.00	33.00	26.5	67.00	6.50	0.2150
	2	0.00	33.50	26.5	66.50	7.00	0.2090
	3	0.00	34.50	27.0	65.50	7.50	0.2060
T_2/R_2	1	0.00	23.10	18.60	76.90	4.50	0.2133
	2	0.00	22.73	17.73	77.27	5.00	0.2058
	3	0.00	23.00	17.75	77.00	5.25	0.2032
T_2/R_3	1	0.00	17.50	14.0	82.5	3.50	0.210
	2	0.00	21.50	16.5	78.5	5.00	0.197
	3	0.00	22.50	17.5	77.5	5.00	0.205

CO_2	O_2	F_o
AVERAGE RUN 1 66.33	AVERAGE RUN 1 7.00	AVERAGE RUN 1 0.2100
AVERAGE RUN 2 77.06	AVERAGE RUN 2 4.75	AVERAGE RUN 2 0.2074
AVERAGE RUN 3 79.50	AVERAGE RUN 3 4.50	AVERAGE RUN 3 0.2040

EPA METHOD 2 FIELD DATA

PROJECT NAME MCP - MARSHALL
SOURCE SCRUBBER OUTLET
TEST 1 RUN 1 DATE 12-20-94
STACK DIA. 10 IN.
DRY BULB _____ °F WET BULB _____ °F
MANOMETER: ___ REG. ___ EXP. ___ ELEC.
BAROMETRIC PRESSURE 29.8 IN Hg
STATIC PRESSURE +.35 IN WC
OPERATORS RLW
PITOT NO. .840 Cp _____
FLOW INTO PAPER ___ /FLOW OUT OF PAPER ___

SCHEMATIC OF CROSS-SECTION

TRAVERSE POINT NO.	FRACTION OF DIAMETER	DISTANCE FROM STACK WALL (IN.)	DISTANCE FROM END OF PORT (IN.)	VELOCITY PRESSURE (IN WC)	TEMPERATURE OF GAS (°F)	CYCLONIC FLOW (Resultant Angle)
		Port Length:	In.	Time Start: 13:00	Hrs.	
A-1				3.30	51	
-2				3.80	52	
-3				3.50	52	
-4				2.20	52	
-5				1.90	52	
-6				1.10	53	
B-1				2.70	51	
-2				2.50	52	
-3				2.80	52	
-4				2.60	52	
-5				2.40	52	
-6				2.40	52	
Temp. Meas. Tool & S/N:				Time End: 13:20	Hrs.	

Nova
Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER MYM-020
SOURCE Scrubber Outlet
DATE 12/20/94
TEST 1 RUN 1

PUMP NUMBER 1
PUMP SN 523-211
OPERATOR B. Wolff
Pb 29.80
TEST FOR EA

* @ Sample Train (Charcoal)

FIELD DATA SHEET

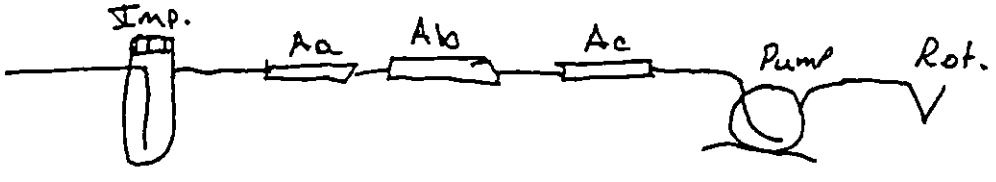
SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)	
(1343)						
	200 cc/m	~200 cc/m		32		
(1443)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. Catch
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



Nova Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER MYM-020
SOURCE Scrubber - Outlet
DATE 12/20/94
TEST # 1 RUN 1

PUMP NUMBER 1
PUMP SN 523-211
OPERATOR B. Wolcf
Pb 29.80
TEST FOR [redacted] EA

* @ Sample Train (Charcoal Spike)

FIELD DATA SHEET

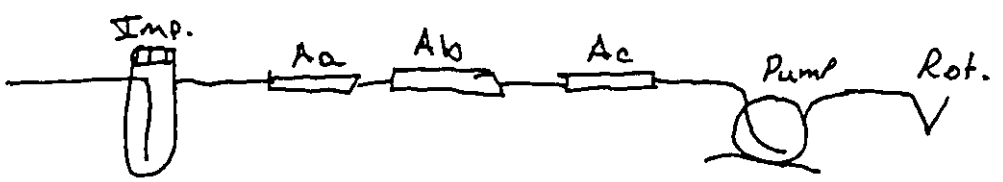
SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)	
(1343)						
	178 cc/min	~178 cc/m		32		
(1443)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. CATCH
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



Nova
Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER M4M-020
SOURCE Scrubber
DATE 12-20-94
TEST 1 RUN 1

PUMP NUMBER 5
PUMP SN 523-224
OPERATOR B. Wolff
Pb 29.8
TEST FOR MEOH
EtOH
Acteyl.

* Sampling TRAIN (Silica Gel)

FIELD DATA SHEET

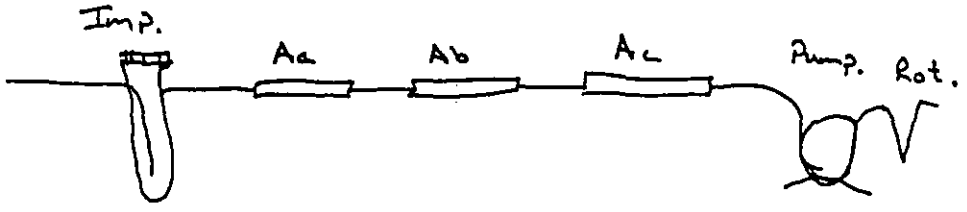
SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)	
(1343)						
	185 cc/min	185 cc/min		32		
(1443)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. Catch
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



Nova
Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER M4M-820
SOURCE Scrubber - Outlet
DATE 12-20-94
TEST 1 RUN 1

PUMP NUMBER 5
PUMP SN 523-224
OPERATOR B. Wolff
Pb 29.8
TEST FOR MEOH
EtOH
Acteyl.

+ Sampling TRAIN (Silica Gel spike)

FIELD DATA SHEET

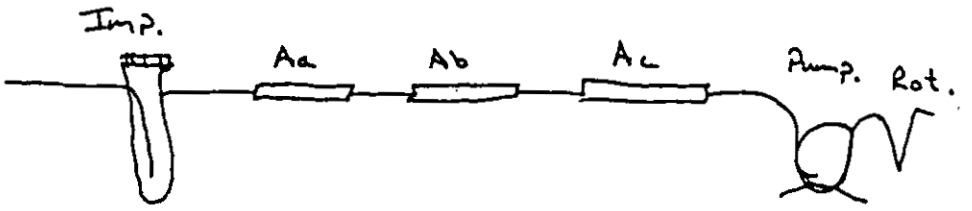
SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)	
(1343)						
	180 cc/min	180 cc/min		32		
(1443)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. Catch
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



EPA METHOD 5 FIELD DATA

PROJECT NAME MCP- Marshall OPERATORS RRW / PCL METER BOX NO. 2 ΔH@ ~~1.89~~ 1.90 IN WC

SOURCE Tobler Scrubber #1 outlet DATE 12/20/94 TEST 1 RUN 1 GASMETER COEFF. .9984

TRAVERSE POINT NO.	SAMPLING TIME (MIN.)	SAMPLE VOL (cf) 439.079	VELOCITY HEAD (IN WC)	ORIFICE METER (IN WC)	DES. VOL. (cf)	VAC IN Hg	TEMPERATURE (°F) STACK	PROBE	OVEN	IMPG.	GAS/IN	GAS/OUT	OXYGEN (% v/v)
	(3:43)	~~[illegible]~~											
	5	443.43		1.90		5	32			32	72	67	
	10	446.53		1.90		5				32	77	68	
	15	449.59		1.90		5				32	81	68	
	20	452.91		1.90		5				34	82	70	
	25	456.38		1.90		5				36	84	71	
	30	458.75		1.90		5				38	84	72	
	35	461.81		1.90		5				38	84	73	
	40	464.48		1.90		5				38	85	73	
	45	468.01		1.90		5				38	86	74	
	50	471.19		1.90		5				38	87	75	
	55	474.09		1.90		5	36			36	87	76	
	60	477.20		1.90		5	38			38	88	76	
	(14:43)												
							220						
	θ = 60	Vm = 37.41		ΔH = 1.9							AVG. = 77.5		

EPA METHOD 3/4/5 FIELD DATA

PROJECT NAME McP- Marshall METHOD Method 4

SOURCE Scrubber #1 outlet DATE 12/20/94 TEST 1 RUN 1

SAMPLE TRAIN LEAK CHECK:

PRETEST: (≤0.02 CFM AT 15 IN. Hg (vac) ☒ POSTTEST: 0 CFM AT 14 IN. Hg (vac) ☒

PARTICULATE CATCH DATA:

NOS OF FILTERS USED: —

CONDENSATE DATA:

ITEM	WEIGHT (g)		
	FINAL	TARE	DIFFERENCE
IMPINGER NO. 1	220	200	20
IMPINGER NO. 2			
IMPINGER NO. 3			
CONDENSER			
DESICCANT	1229	1222	7
TOTAL			27

☒ AMBIENT AIR 20.9% O_2 (V/V)

INTEGRATED GAS SAMPLING DATA:

BAG PUMP NO. _____ BOX NO. _____ BAG NO. _____

BAG MATERIAL: _____ SIZE: _____

PRETEST LEAK CHECK: 0 cc/MIN AT 14 IN. Hg

TIME START: _____ (HRS) TIME END: _____ (HRS)

SAMPLING RATE: _____ cc/MIN OPERATOR: RLW

S/N OF O_2 ANALYZER USED TO MONITOR TRAIN OUTLET: _____

PITOT NO. .840 Cp _____

BAR. PRESS. 29.8 IN Hg H20 _____ %

NOZZLE NO. — NOZZLE DIA. — IN.

EPA METHOD 2 FIELD DATA

PROJECT NAME MCP. Marshall
SOURCE SCRUBBER OUTLET
TEST 1 RUN 2 DATE 12/20
STACK DIA. _____ IN.
DRY BULB _____ °F WET BULB _____ °F
MANOMETER: ___ REG. ___ EXP. ___ ELEC.
BAROMETRIC PRESSURE 28.8 IN Hg
STATIC PRESSURE +.35 IN WC
OPERATORS RLW / PCL
PITOT NO. .84 Cp _____
FLOW INTO PAPER ___ /FLOW OUT OF PAPER ___

SCHEMATIC OF CROSS-SECTION

TRAVERSE POINT NO.	FRACTION OF DIAMETER	DISTANCE FROM STACK WALL (IN.)	DISTANCE FROM END OF PORT (IN.)	VELOCITY PRESSURE (IN WC)	TEMPERATURE OF GAS (°F)	CYCLONIC FLOW (Resultant Angle)
		Port Length:	In.	Time Start: 16:10	Hrs.	
A-1				4.0	51	
-2				4.0	52	
-3				3.2	52	
-4				2.0	52	
-5				1.4	52	
-6				1.0	52	
B 1				2.7	53	
2				2.5	52	
3				2.5	52	
4				2.3	52	
5				2.5	52	
6				2.6	53	
Temp. Meas. Tool & S/N:				Time End: 16:30	Hrs.	

Nova
Environmental Services, Inc.

PROJECT NAME MCP - MARSHALL
PROJECT NUMBER MYM-020
SOURCE Scrubber - Outlet
DATE 12/20/94
TEST 1 RUN 2

PUMP NUMBER 1
PUMP SN 523-211
OPERATOR B. Wolcf
Pb 29.80
TEST FOR [redacted] EA

* @ Sample Train (Charcoal Tube)

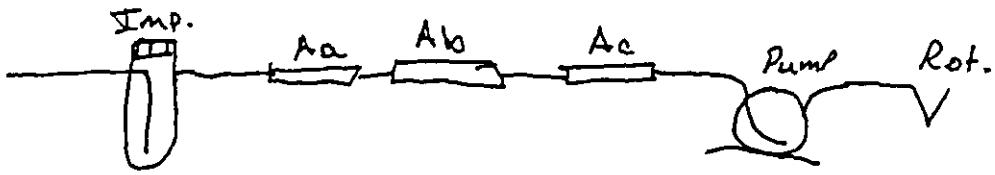
FIELD DATA SHEET

SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)
(1648)					
	200 cc/min	200 cc/min		32	
(1748)					AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)
☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. CATCH
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



Nova
Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER MYM-020
SOURCE Scrubber - OUTLET
DATE 12/20/94
TEST 1 RUN 2

PUMP NUMBER 1
PUMP SN S23-211
OPERATOR B. WOLCOTT
Pb 29.80
TEST FOR [redacted] EA

* @ Sample Train (Charcoal Spike)

FIELD DATA SHEET

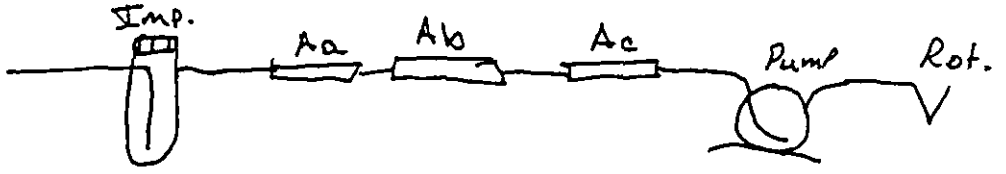
SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)	
(1648)						
	178 cc/min	178 cc/min		32		
(1748)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS:
1: Imp. CATCH
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



Nova
Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER M4M-020
SOURCE Scrubber - Outlet
DATE 12-20-94
TEST 1 RUN 2

PUMP NUMBER 5
PUMP SN 523.224
OPERATOR B. Wolff
Pb 29.8
TEST FOR MEOH
EtOH
Acteyl.

* Sampling TRAIN (Silica Gel)

FIELD DATA SHEET

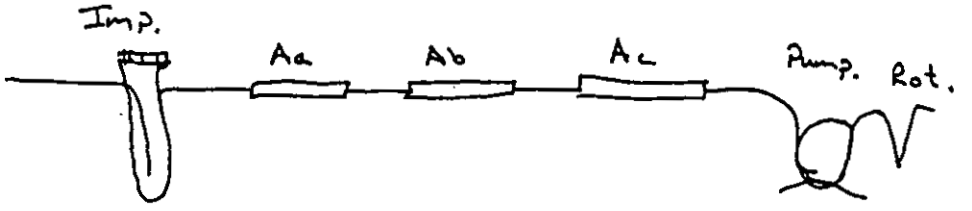
SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)	
(1648)						
	185 cc/min	185 cc/min		32		
(1748)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. Catch
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



Nova
Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER M4M-020
SOURCE Scrubber - OUTLET
DATE 12-20-94
TEST 1 RUN 2

PUMP NUMBER 5
PUMP SN S23-224
OPERATOR B. Wolff
Pb 29.8
TEST FOR MEOH
EtOH
Acteyl.

+ Sampling TRAIN (Silica Gel spike)

FIELD DATA SHEET

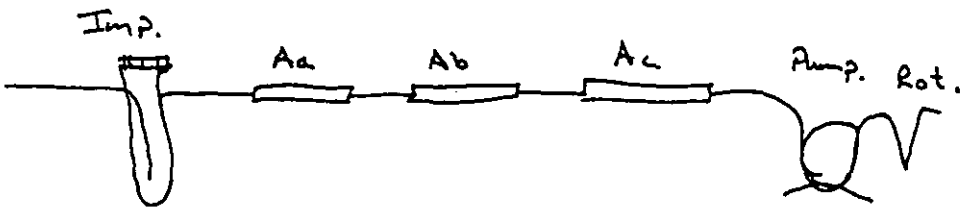
SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)	
(1648)						
	180 cc/m.	180 cc/min		32		
(1748)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. Catch
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



EPA METHOD 5 FIELD DATA

PROJECT NAME MCP-Marshall OPERATORS RLW/PCL METER BOX NO. ____ ΔH@ 1.90 IN WC

SOURCE Outlet Scrubber #1 DATE 12/20/94 TEST 1 RUN 1 GASMETER COEFF. .9984

TRAVERSE POINT NO.	SAMPLING TIME (MIN.)	SAMPLE VOL. (cf)	VELOCITY HEAD (IN WC)	ORIFICE METER (IN WC)	DES. VOL. (cf)	VAC IN Hg	TEMPERATURE (°F) STACK	PROBE	OVEN	IMPG.	GAS/IN	GAS/OUT	OXYGEN (% v/v)
	4:48	477.51											
	5												
	10	485.13		1.90	5		34			33	86	75	
	15												
	20	492.74		1.90	7		35			33	85	72	
	25												
	30	500.43		1.90	7		34			34	80	69	
	35												
	40	508.23		1.90	5		34			34	77	67	
	45												
	50	512.74		1.90	5		34			34	71	66	
	55												
	60	519.35		1.90	5		34			34	70	65	
	θ = 60	Vm = 41.84		ΔH = 1.90							AVG. = 77		

EPA METHOD 3/4/5 FIELD DATA

PROJECT NAME _____ METHOD _____

SOURCE OUTLET DATE _____ TEST 2 RUN 2

SAMPLE TRAIN LEAK CHECK:

PRETEST: (≤0.02 CFM AT 15 IN. Hg (vac) ☒ POSTTEST: (0 CFM AT 15 IN. Hg (vac) ☐

PARTICULATE CATCH DATA:

NO.S OF FILTERS USED: _____ _____

CONDENSATE DATA:

ITEM	WEIGHT (g)		
	FINAL	TARE	DIFFERENCE
IMPINGER NO. 1	265	200	65
IMPINGER NO. 2			
IMPINGER NO. 3			
CONDENSER			
DESICCANT	1241	1234	7
TOTAL			

☐ AMBIENT AIR 20.9% O_2 (V/V)

INTEGRATED GAS SAMPLING DATA:

BAG PUMP NO. _____ BOX NO. _____ BAG NO. _____

BAG MATERIAL: _____ SIZE: _____

PRETEST LEAK CHECK: _____ cc/MIN AT _____ IN. Hg

TIME START: _____ (HRS) TIME END: _____ (HRS)

SAMPLING RATE: _____ cc/MIN OPERATOR: _____

S/N OF O_2 ANALYZER USED TO MONITOR TRAIN OUTLET: _____

PITOT NO. _____ Cp _____

BAR. PRESS. _____ IN Hg H2O _____ %

NOZZLE NO. _____ NOZZLE DIA. _____ IN.

EPA METHOD 2 FIELD DATA

PROJECT NAME MCP - Marshall
SOURCE Scrubber #1 outlet
TEST 1 RUN 3 DATE 12/30/94
STACK DIA. 10 IN.
DRY BULB _____ °F WET BULB _____ °F
MANOMETER: ___ REG. ___ EXP. ___ ELEC.
BAROMETRIC PRESSURE 29.9 IN Hg
STATIC PRESSURE +.34 IN WC
OPERATORS RRW / ACC
PITOT NO. .840 Cp _____
FLOW INTO PAPER ___ /FLOW OUT OF PAPER ___

SCHEMATIC OF CROSS-SECTION

TRAVERSE POINT NO.	FRACTION OF DIAMETER	DISTANCE FROM STACK WALL (IN.)	DISTANCE FROM END OF PORT (IN.)	VELOCITY PRESSURE (IN WC)	TEMPERATURE OF GAS (°F)	CYCLONIC FLOW (Resultant Angle)
		Port Length: In.		Time Start: 18:15 Hrs.		
A 1				4.3	51	
2				4.0	52	
3				2.8	52	
4				1.4	52	
5				1.0	52	
6				1.0	52	
B 1				2.6	52	
2				2.4	52	
3				2.6	52	
4				2.1	53	
5				2.6	53	
6				2.8	53	
Temp. Meas. Tool & S/N:				Time End: 19:38 Hrs.		

Nova
Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER MYM-020
SOURCE Scrubber - OUTLET
DATE 12/20/94
TEST 1 RUN 3

PUMP NUMBER 1
PUMP SN 523-211
OPERATOR B. WOLFF
Pb 29.80
TEST FOR [redacted] EA

* @ Sample Train (Charcoal)

FIELD DATA SHEET

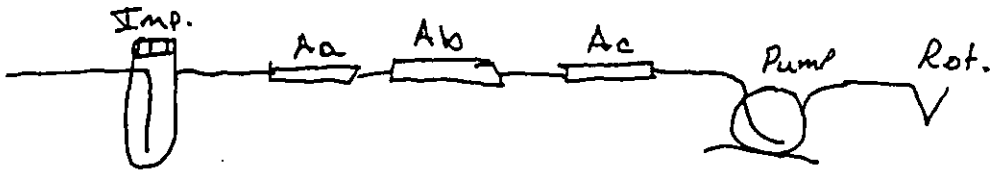
SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)	
(1845)						
	200 cc/min	200 cc/min		32		
(1945)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS:
1: Imp. CATCH
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



Nova
Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER MYM-020
SOURCE Scrubber - OUTLET
DATE 12/20/94
TEST 1 RUN 3

PUMP NUMBER 1
PUMP SN 523-211
OPERATOR B. WOLCOTT
Pb 29.80
TEST FOR [redacted] EA

* @ Sample Train (Charcoal spike)

FIELD DATA SHEET

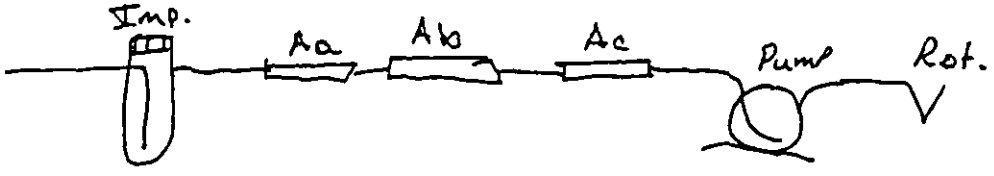
SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)	
(1845)						
	178 cc/min	178 cc/min		82°		
(1945)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. CATCH
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



Nova
Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER M4M-020
SOURCE Scrubber - Outlet
DATE 12-20-94
TEST 1 RUN 3

PUMP NUMBER 5
PUMP SN 523-224
OPERATOR B. Wolff
Pb 29.8
TEST FOR MEOH
EtOH
Acteyl.

* Sampling TRAIN (Silica Gel)

FIELD DATA SHEET

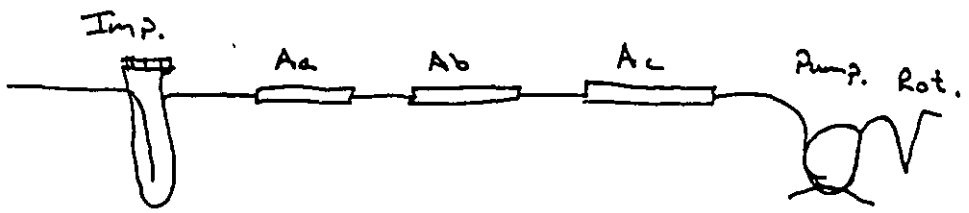
SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)	
(1845)						
	185 cc/min	185 cc/min		32		
(1945)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. Catch
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



Nova
Environmental Services, Inc.

PROJECT NAME MCP-MARSHALL
PROJECT NUMBER M4M-020
SOURCE Scrubber - Outlet
DATE 12-20-94
TEST 1 RUN 3

PUMP NUMBER 5
PUMP SN [illegible] 523-224
OPERATOR B. Wolff
Pb 29.8
TEST FOR MEOH
EtOH
Acteyl.

+ Sampling TRAIN (Silica Gel spike)

FIELD DATA SHEET

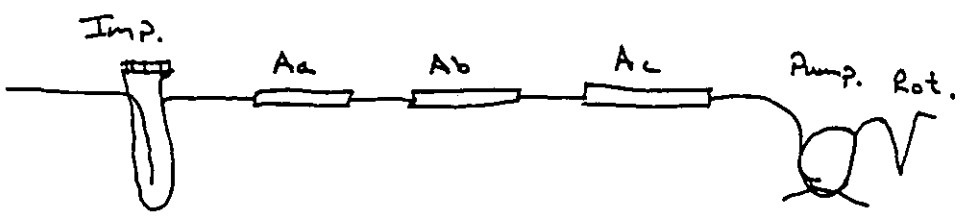
SAMPLING TIME	PUMP SETTING	FLOW RATE(cc/min)	STACK TEMP(f)	PUMP TEMP(f)	PROBE TEMP(f)	
(1845)						
	180 cc/min	180 cc/min		32		
(1945)						AVG.

☒ PRE-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

☒ POST-TEST LEAK CHECK (0 cc/min at 15 in. hg. vac)

TUBE NUMBERS: 1: Imp. Catch
2: Aa
3: Ab
4: Ac

SAMPLING TRAIN DRAWING



EPA METHOD 5 FIELD DATA

PROJECT NAME MCP-Marshall OPERATORS RLW/PEC METER BOX NO. 2 ΔH@ 1.90 IN WC

SOURCE Scrubber # Outlet DATE 12/20 TEST 1 RUN 3 GASMETER COEFF. .9984

TRAVERSE POINT NO.	SAMPLING TIME (MIN.)	SAMPLE VOL. (cf)	VELOCITY HEAD (IN WC)	ORIFICE METER (IN WC)	DES. VOL. (cf)	VAC IN Hg	TEMPERATURE (°F)						OXYGEN (% v/v)
							STACK	PROBE	OVEN	IMPG.	GAS/IN	GAS/OUT	
	18:45	519.89											
	5												
	10			1.90		5	36			33	72	59	
	15												
	20			1.90		5	36			33	73	60	
	25												
	30	541.50		1.90		5	36			33	72	59	
	35												
	40	547.27		1.90		5	38			34	72	60	
	45												
	50									[illegible]	[illegible]	[illegible]	
	55	556.10		1.90		5	38			35	73	61	
	60	559.03		1.90		5	38			34	73	61	
	19:45												
	θ=60	Vm=39.14		ΔH=1.90							AVG.=66.25		

EPA METHOD 3/4/5 FIELD DATA

PROJECT NAME MR - MARSHALL METHOD 4

SOURCE SCRUBBER OUTLET DATE 12/22 TEST 1 RUN 3

SAMPLE TRAIN LEAK CHECK:

PRETEST: (≤0.02 CFM AT 15 IN. Hg (vac) ☑ POSTTEST: 0 CFM AT ____ IN. Hg (vac) ☐

PARTICULATE CATCH DATA:

NOS OF FILTERS USED: _____ _____

CONDENSATE DATA:

ITEM	WEIGHT (g)		
	FINAL	TARE	DIFFERENCE
IMPINGER NO. 1	214	200.1	14
IMPINGER NO. 2			
IMPINGER NO. 3			
CONDENSER			
DESICCANT	245	229	16
TOTAL			30

☑ AMBIENT AIR 20.9% O_2 (V/V)

INTEGRATED GAS SAMPLING DATA:

BAG PUMP NO. _____ BOX NO. _____ BAG NO. _____

BAG MATERIAL: _____ SIZE: _____

PRETEST LEAK CHECK: _____ cc/MIN AT _____ IN. Hg

TIME START: _____ (HRS) TIME END: _____ (HRS)

SAMPLING RATE: _____ cc/MIN OPERATOR: _____

S/N OF O_2 ANALYZER USED TO MONITOR TRAIN OUTLET: _____

PITOT NO. 840 Cp _____

BAR. PRESS. 29.8 IN Hg H2O _____ %

NOZZLE NO. ✓ NOZZLE DIA. ✓ IN.

Environmental Services, Inc.

E.P.A. METHOD 3 ANALYSIS

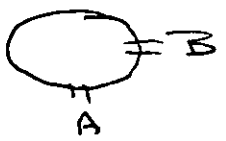
JOB# M4M-019 DATE OF ANALYSIS 1/9/96
SOURCE Scrubber #1 LEAK CHECK PERFORMED yes
SITE Outlet - MCP TECHNICIAN RKW
CITY/STATE Marshall, mn TYPE OF FUEL PROCESS EMISSIONS

TEST/ RUN	READING NO.	BURET READING			CONCENTRATION (%v/v,dry)		F_o
		ZERO POINT	AFTER CO 2	AFTER O 2	CO_2	O_2	
AMBIENT AIR		0.00	99.9%	79.07	0.03	20.90	0.0000
T_1 / R_1	1	0.00	11.00	6.50	89.00	4.50	0.1840
	2	0.00	10.50	8.50	89.50	2.00	0.2110
	3	0.00	10.00	6.50	90.00	3.50	0.1930
T_1 / R_2	1	0.00	10.78	7.53	89.22	3.25	0.1978
	2	0.00	10.76	7.31	89.24	3.45	0.1955
	3	0.00	11.01	7.91	88.99	3.10	0.2000
T_1 / R_3	1	0.00	10.50	7.5	89.50	3.00	0.2000
	2	0.00	11.00	8.0	89.00	3.00	0.2060
	3	0.00	12.50	10.5	87.50	2.60	0.2160

CO_2	O_2	F_o
AVERAGE RUN 1 89.50	AVERAGE RUN 1 3.33	AVERAGE RUN 1 0.1960
AVERAGE RUN 2 89.15	AVERAGE RUN 2 3.27	AVERAGE RUN 2 0.1978
AVERAGE RUN 3 88.66	AVERAGE RUN 3 2.66	AVERAGE RUN 3 0.2060

EPA METHOD 2 FIELD DATA

PROJECT NAME MCP - MARSHALL
SOURCE NC BOILER
TEST 2 RUN 1 DATE 12/2[illegible]/94
STACK DIA. 59 IN.
DRY BULB _____ °F WET BULB _____ °F
MANOMETER: X REG. ___ EXP. ___ ELEC.
BAROMETRIC PRESSURE 29.75 IN Hg
STATIC PRESSURE -0.54 IN WC
OPERATORS PAL
PITOT NO. PB6 Cp 0.840
FLOW INTO PAPER __ /FLOW OUT OF PAPER X



SCHEMATIC OF CROSS-SECTION

TRAVERSE POINT NO.	FRACTION OF DIAMETER	DISTANCE FROM STACK WALL (IN.)	DISTANCE FROM END OF PORT (IN.)	VELOCITY PRESSURE (IN WC)	TEMPERATURE OF GAS (°F)	CYCLONIC FLOW (Resultant Angle)
		Port Length: 4.5 In.		Time Start:	Hrs.	
A-1		1.24	5.74			
-2		3.95	8.45			
-3		6.96	11.46			
-4		10.44	14.94			
-5		14.75	19.25			
-6		21.0	25.50			
-7		38	42.5			
-8		44.25	48.75			
-9		48.56	53.06			
-10		52.04	56.54			
-11		55.06	59.55			
-12		57.76	62.26			
B-1						
-2						
-3						
-4						
-5						
-6						
-7						
-8						
-9						
-10						
-11						
-12						
Temp. Meas. Tool & S/N: UNIT 2 DIGITAL T/C DP-002				Time End:	Hrs.	

EPA METHOD 5 FIELD DATA

PROJECT NAME MCT-MARSHALL OPERATORS RCL/RRW METER BOX NO. 08 ΔH@ 1.69 IN WC

SOURCE NG BOILER DATE 12/21/94 TEST 2 RUN 1 GASMETER COEFF. 0.9964

TRAVERSE POINT NO.	SAMPLING TIME (MIN.)	SAMPLE VOL (cf)	VELOCITY HEAD (IN WC)	ORIFICE METER (IN WC)	DES. VOL (cf)	VAC IN Hg	TEMPERATURE (°F)						OXYGEN
							STACK	PROBE	OVEN	IMPG.	GAS/IN	GAS/OUT	(% v/v)
	13:09	559.40											
A-1	2.5	560.82	0.37	1.18	0.90	4	336	250	250	43	77	76	2.5
-2	5.0	562.41	0.45	1.40	2.54	4	336	250	250	43	78	77	2.5
-3	7.5	564.60	0.48	1.54	4.25	5	331	250	250	43	EC	78	2.5
-4	10	566.50	0.50	1.60	6.00	5	331	250	250	44	E2	78	2.5
-5	12.5	567.60	0.52	1.61	7.75	5	331	250	250	44	E3	78	2.5
-6	15	569.31	0.47	1.57	9.49	5	331	250	250	44	E4	79	2.5
-7	17.5	571.02	0.44	1.43	1.14	4.5	323	250	250	44	E6	79	2.5
-8	20	572.70	0.44	1.43	2.80	5	323	250	250	44	E8	E0	2.0
-9	22.5	574.32	0.45	1.46	4.49	5	329	250	250	45	E0	E2	2.0
-10	25	575.91	0.40	1.37	6.10	5	327	250	250	45	E9	E1	2.5
-11	27.5	577.52	0.38	1.25	7.65	5	321	250	250	44	90	E2	2.5
-12	30	578.95	0.28	0.89	8.96	3	320	250	250	44	91	E4	2.5
B-1	32.5	580.14	0.24	0.79	0.20	3	320	250	250	42	E9	E4	2.0
-2	35	581.51	0.34	1.12	1.68	4	322	250	250	42	91	E4	2.0
-3	37.5	583.17	0.40	1.32	3.27	5	323	250	250	43	93	E5	2.0
-4	40	584.80	0.44	1.48	4.97	5	323	250	250	44	94	E6	1.5
-5	42.5	586.54	0.44	1.49	6.67	5	325	250	250	45	96	E6	2.0
-6	45	588.23	0.44	1.45	8.35	5	325	250	250	45	97	E7	2.0
-7	47.5	589.92	0.44	1.46	0.04	5	323	250	250	45	98	E8	1.5
-8	50	591.70	0.50	1.46	1.73	5	323	250	250	45	99	E8	2.0
-9	52.5	593.38	0.42	1.40	3.38	6	324	250	250	46	99	E9	2.0
-10	55	595.02	0.42	1.39	5.01	5	326	250	250	47	100	E9	1.0
-11	57.5	596.62	0.40	1.34	6.65	5	325	250	250	47	100	90	1.5
-12	60	598.14	0.34	1.13	8.14	5	325	250	250	47	101	91	1.0
	(14:15)												
	θ= 60	Vm= 38.74		ΔH=							AVG.=		

AIR 7A

EPA METHOD 3/4/5 FIELD DATA

PROJECT NAME MCP-MARSHINC METHOD 5

SOURCE N.C. BOILER DATE 12/21/94 TEST 2 RUN 1

SAMPLE TRAIN LEAK CHECK:

PRETEST: (≤0.02 CFM AT 15 IN. Hg (vac) ☑ POSTTEST: 0 CFM AT 10 IN. Hg (vac) ☑

PARTICULATE CATCH DATA:

NO.S OF FILTERS USED: 1 #0090

CONDENSATE DATA:

ITEM	WEIGHT (g)		
	FINAL	TARE	DIFFERENCE
IMPINGER NO. 1	755	601	154
IMPINGER NO. 2			
IMPINGER NO. 3			
CONDENSER			
DESICCANT	1271	1261	10
TOTAL			164

☐ AMBIENT AIR 20.9% O_2 (V/V)

INTEGRATED GAS SAMPLING DATA:

BAG PUMP NO. BP-2 BOX NO. 1 BAG NO. 1

BAG MATERIAL: TEDLAR SIZE: 44L

PRETEST LEAK CHECK: 0 cc/MIN AT 15 IN. Hg

TIME START: 1309 (HRS) TIME END: 1415 (HRS)

SAMPLING RATE: 400 cc/MIN OPERATOR: RW

S/N OF O_2 ANALYZER USED TO MONITOR TRAIN OUTLET: 133728

PITOT NO. PTB-6 Cp 0.840

BAR. PRESS. 29.75 IN Hg H2O 17.17 %

NOZZLE NO. NS-9 NOZZLE DIA. 0.276 IN.

EPA METHOD 5 FIELD DATA

PROJECT NAME MCP-MARSHAL OPERATORS RCW / DOT METER BOX NO. 2 ΔH@ 1.89 IN WC

SOURCE N. Co. BOILER DATE 12/21/94 TEST 2 RUN 2 GASMETER COEFF. 0.9924

TRAVERSE POINT NO.	SAMPLING TIME (MIN.)	SAMPLE VOL. (cf)	VELOCITY HEAD (IN WC)	ORIFICE METER (IN WC)	DES. VOL. (cf)	VAC IN Hg	TEMPERATURE (° F)						OXYGEN
							STACK	PROBE	OVEN	IMPG.	GAS/IN	GAS/OUT	(% v/v)
	15:55	601.39											
A-1	2.5	602.90	0.35	1.13	2E7	4	319	250	250	39	90	E9	2.5
-2	5.0	604.47	0.44	1.40	4.52	4	533	250	250	38	91	E9	2.5
-3	7.5	606.12	0.49	1.57	6.27	5	330	250	250	38	93	E9	2.5
-4	10.0	607.74	0.44	1.57	E.0	5	530	250	250	38	95	90	2.5
-5	12.5	609.44	.43	1.53	9.74	5	325	250	250	38	96	90	2.5
-6	15.0	611.19	.47	1.52	1.46	5	325	250	250	37	97	91	2.5
-7	17.5	612.17	.46	1.49	3.17	5	325	250	250	37	102	91	2.5
-8	20.0	614.15	.41	1.22	[illegible]	5	325	250	250	37	98	91	2.5
-9	22.5	616.15	.42	1.36	6.12	5	330	250	250	37	102	92	2.5
-10	25.0	617.55	.42	1.36	7.93	5	330	250	250	37	99	92	2.5
-11	27.5	619.14	.41	1.33	9.54	5	330	250	250	37	99	91	2.5
-12	30.0	621.14	.40	1.29	1.14	5	330	250	250	37	100	92	2.5
B-1	32.5	622.20	.20	.65	2.27	3	[illegible]	250	250	38	97	92	2.5
-2	35.0	623.86	.30	.98	3.65	3	320	250	250	38	99	93	2.5
-3	37.5	625.31	.40	1.31	5.26	4	323	250	250	38	100	93	2.5
-4	40.0	626.75	.43	1.41	6.92	4	323	250	250	41	101	94	2.5
-5	42.5	628.33	.44	1.44	8.61	5	323	250	250	41	103	95	2.5
-6	45.0	629.93	.44	1.44	0.29	5	324	250	250	41	104	95	2.5
-7	47.5	631.67	.44	1.44	1.98	5	325	250	250	41	104	95	2.5
-8	50.0	633.17	.42	1.38	3.64	5	321	250	250	41	105	96	2.5
-9	52.5	634.82	.41	1.35	5.28	5	321	250	250	41	105	96	2.5
-10	55.0	636.40	.41	1.35	6.91	5	322	250	250	41	105	96	2.50
-11	57.5	638.04	.40	1.32	8.53	5	323	250	250	41	105	96	2.50
-12	60	640.08	.37	1.22	0.08	5	323	250	250	41	105	96	2.50
	17:00												
	θ= 60	Vm= 38.69		ΔH=							AVG.=		

AIR 7A

EPA METHOD 3/4/5 FIELD DATA

PROJECT NAME MCP/MARSHALL METHOD 1-5

SOURCE N.G. BOILER DATE 12-21-94 TEST 3 RUN 2

SAMPLE TRAIN LEAK CHECK:

PRETEST: (≤0.02 CFM AT 15 IN. Hg (vac) ☒ POSTTEST: 0 CFM AT 15 IN. Hg (vac) ☒

PARTICULATE CATCH DATA:

NO.S OF FILTERS USED: 1

CONDENSATE DATA:

ITEM	WEIGHT (g)		
	FINAL	TARE	DIFFERENCE
IMPINGER NO. 1	755	600	155
IMPINGER NO. 2			
IMPINGER NO. 3			
CONDENSER			
DESICCANT	1283	1274	90
TOTAL			164

☐ AMBIENT AIR 20.9% O_2 (V/V)

INTEGRATED GAS SAMPLING DATA:

BAG PUMP NO. BP-2 BOX NO. 1 BAG NO. 2

BAG MATERIAL: TEDLAR SIZE: 44L

PRETEST LEAK CHECK: 0 cc/MIN AT 15 IN. Hg

TIME START: 1555 (HRS) TIME END: 1700 (HRS)

SAMPLING RATE: 400 cc/MIN OPERATOR: RW

S/N OF O_2 ANALYZER USED TO MONITOR TRAIN OUTLET: _____

PITOT NO. PTB-6 Cp .840

BAR. PRESS. 29.75 IN Hg H2O 17 %

NOZZLE NO. NSI-9 NOZZLE DIA .226 IN.

EPA METHOD 5 FIELD DATA

PROJECT NAME MCP-MARSHALL OPERATORS FRW / DCD METER BOX NO. 2 ΔH@ 1.67 IN WC

SOURCE N. G. BOILER DATE 12/21/94 TEST 2 RUN 3 GASMETER COEFF. 0.9964

TRAVERSE POINT NO.	SAMPLING TIME (MIN.)	SAMPLE VOL (cf)	VELOCITY HEAD (IN WC)	ORIFICE METER (IN WC)	DES. VOL (cf)	VAC IN Hg	TEMPERATURE (°F)						OXYGEN
							STACK	PROBE	OVEN	IMPG.	GAS/IN	GAS/OUT	(% v/v)
	17:43	640.71											
A 1	2.5	642.39	.46	1.48	2.41	5	337	250	250	36	89	89	2.5
2	5.0	644.02	.56	1.59	4.17	5	336	250	250	36	91	89	2.5
3	7.5	645.75	.54	1.73	6.00	5	333	250	250	37	93	89	2.5
4	10.0	647.41	.54	1.73	7.84	6	332	250	250	37	95	90	2.5
5	12.5	649.32	.53	1.71	9.66	6	329	250	250	37	97	90	2.5
6	15.0	651.12	.50	1.63	1.45	6	325	250	250	38	97	90	2.5
7	17.5	652.99	.48	1.56	3.20	6	324	250	250	39	98	91	2.5
8	20	654.64	.48	1.56	4.95	6	326	250	250	41	99	91	2.5
9	22.5	656.37	.49	1.59	6.71	6	329	250	250	42	99	91	2.5
10	25	658.08	.50	1.62	8.50	6	329	250	250	42	99	91	2.5
11	27.5	659.61	.49	1.59	0.26	6	329	250	250	44	100	91	2.5
12	30	661.98	.46	1.49	1.98	6	326	250	250	45	100	91	2.5
B 1	32.5	663.24	.28	0.91	3.32	4	329	250	250	45	96	91	2.5
2	35	664.61	.38	1.11	4.79	4	323	250	250	45	97	91	2.5
3	37.5	666.17	.43	1.40	6.45	5	324	250	250	45	97	91	2.5
4	40	667.83	.45	1.47	8.14	5	324	250	250	45	98	91	2.5
5	42.5	669.39	.46	1.50	9.86	5	324	250	250	45	98	91	2.5
6	45	671.00	.47	1.53	1.59	5	325	250	250	46	99	92	2.5
7	47.5	672.59	.46	1.51	3.31	5	322	250	250	46	99	91	2.5
8	50	674.34	.45	1.47	5.01	5	322	250	250	47	99	92	2.5
9	52.5	676.00	.45	1.47	6.71	6	324	250	250	48	99	92	2.5
10	55	677.80	.42	1.37	8.35	6	324	250	250	48	100	92	2.5
11	57.5	679.50	.41	1.34	9.98	6	323	250	250	48	100	92	2.5
12	60	681.58	.40	1.31	1.58	6	325	250	250	48	100	92	2.5
	(1848)												
	θ = 60	Vm = 40.87		ΔH=							AVG.=		

AIR 7A

EPA METHOD 3/4/5 FIELD DATA

PROJECT NAME MCP / MARSHALL METHOD 1-5

SOURCE N.G. BOILER DATE 12-21-94 TEST 2 RUN 3

SAMPLE TRAIN LEAK CHECK:

PRETEST: (≤0.02 CFM AT 15 IN. Hg (vac) ☒ POSTTEST: 0 CFM AT 15 IN. Hg (vac) ☒

PARTICULATE CATCH DATA:

NO.S OF FILTERS USED: 1

CONDENSATE DATA:

ITEM	WEIGHT (g)		
	FINAL	TARE	DIFFERENCE
IMPINGER NO. 1	771	599	172
IMPINGER NO. 2			
IMPINGER NO. 3			
CONDENSER			
DESICCANT	1279	1271	8
TOTAL			180

☐ AMBIENT AIR 20.9% O_2 (V/V)

INTEGRATED GAS SAMPLING DATA:

BAG PUMP NO. BP-2 BOX NO. 1 BAG NO. 3

BAG MATERIAL: TEDCAR SIZE: 4'x4'

PRETEST LEAK CHECK: 0 cc/MIN AT 15 IN. Hg

TIME START: 1743 (HRS) TIME END: 1848 (HRS)

SAMPLING RATE: 400 cc/MIN OPERATOR: RW

S/N OF O_2 ANALYZER USED TO MONITOR TRAIN OUTLET: 133728

PITOT NO. PTB-6 Cp .840

BAR. PRESS. 29.25 IN Hg H2O 17 %

NOZZLE NO. NSL-2 NOZZLE DIA .276 IN.

EPA METHOD 2 FIELD DATA

PROJECT NAME MCP / MARSHALL
SOURCE NAT. GAS BOILER
TEST 3 RUN 1 DATE 12/21/94
STACK DIA. 59 IN.
DRY BULB _____ °F WET BULB _____ °F
MANOMETER: ✓ REG. ___ EXP. ___ ELEC.
BAROMETRIC PRESSURE 29.75 IN Hg
STATIC PRESSURE -0.54 IN WC
OPERATORS DAS
PITOT NO. PTB-6 Cp .840
FLOW INTO PAPER ___ /FLOW OUT OF PAPER ___

SCHEMATIC OF CROSS-SECTION

TRAVERSE POINT NO.	FRACTION OF DIAMETER	DISTANCE FROM STACK WALL (IN.)	DISTANCE FROM END OF PORT (IN.)	VELOCITY PRESSURE (IN WC)	TEMPERATURE OF GAS (°F)	CYCLONIC FLOW (Resultant Angle)
		Port Length:	4.5 In.	Time Start:	Hrs.	
A - 1		2.60	7.10			
2		8.61	13.11			
3		17.46	21.96			
4		41.54	46.04			
5		50.39	54.89			
6		56.40	60.90			
B - 1						
2						
3						
4						
5						
6						
	[CEM	PROBE]				
1	0.17	10.03	14.53			
2	0.50	29.50	34.00			
3	0.83	48.97	53.47			
Temp. Meas. Tool & S/N:				Time End:	Hrs.	

1M-10 2of4

EPA METHOD 5 FIELD DATA

PROJECT NAME MCP/MARSHALL OPERATORS D.SMITH/B.WOLFF METER BOX NO. 2 ΔH@ 1.90 IN WC

SOURCE NAT. GAS BOILER STACK DATE 12-21-94 TEST 3 RUN 1 GASMETER COEFF. 0.9984

TRAVERSE POINT NO.	SAMPLING TIME (MIN.)	SAMPLE VOL. (cf)	VELOCITY HEAD (IN WC)	ORIFICE METER (IN WC)	DES. VOL. (cf)	VAC IN Hg	TEMPERATURE (° F)						OXYGEN
							STACK	PROBE	OVEN	IMPG.	GAS/IN	GAS/OUT	(% v/v)
	(1947)	(680.84)											
A - 1	4.63	685.19	0.36	2.0	N/A	6	323	250	250	40	86	83	2.5
2	5.18	688.93	0.45	2.0		6	321	250	250	41	86	82	2.5
3	5.40	692.83	0.49	2.0		6	321	250	250	43	88	82	2.5
4	5.46	696.78	0.50	2.0		6	321	250	250	45	89	82	2.5
5	5.46	700.73	0.50	2.0		6	320	251	250	46	90	82	2.5
6	5.24	704.52	0.46	2.0		6	323	251	250	48	91	83	2.5
B - 1	3.86	707.31	0.25	2.0		6	323	250	250	47	92	84	2.5
2	4.50	710.56	0.34	2.0		7	321	250	249	48	92	84	2.5
3	5.29	714.38	0.47	2.0		7	323	250	249	50	93	84	2.5
4	4.88	717.91	0.40	2.0		7	317	250	249	51	93	85	2.5
5	5.06	721.57	0.43	2.0		7	322	250	250	52	93	85	2.5
6	4.94	725.21	0.41	2.0	↓	7	322	250	250	54	93	85	2.5
	(2052)												
	θ = 59.9	Vm = 43.37		ΔH = 2.0							AVG.=		

EPA METHOD 3/4/5 FIELD DATA

PROJECT NAME MCP / MARSHALL METHOD ~~5~~ 201A

SOURCE NAT. GAS BOILER STACK DATE 12-21-94 TEST 3 RUN 1

SAMPLE TRAIN LEAK CHECK:

PRETEST: (≤0.02 CFM AT 15 IN. Hg (vac) ☒ POSTTEST: (0 CFM AT 15 IN. Hg (vac) ☒

PARTICULATE CATCH DATA:

NO.S OF FILTERS USED: 1

CONDENSATE DATA:

ITEM	WEIGHT (g)		
	FINAL	TARE	DIFFERENCE
IMPINGER NO. 1	759	599	160
IMPINGER NO. 2			
IMPINGER NO. 3			
CONDENSER			
DESICCANT	1294	1283	11
TOTAL			171

☐ AMBIENT AIR 20.9% O_2 (V/V)

INTEGRATED GAS SAMPLING DATA:

BAG PUMP NO. BP-2 BOX NO. 2 BAG NO. 1

BAG MATERIAL: TEDLAR SIZE: 44L

PRETEST LEAK CHECK: 0 cc/MIN AT 15 IN. Hg

TIME START: _____ (HRS) TIME END: _____ (HRS)

SAMPLING RATE: 400 cc/MIN OPERATOR: DAS

S/N OF O_2 ANALYZER USED TO MONITOR TRAIN OUTLET: 138778

PITOT NO. PTB-6 Cp .840

BAR. PRESS. 29.75 IN Hg H2O 17 %

NOZZLE NO. NS1-9 NOZZLE DIA. .276 IN.

PM-10 ~1A

EPA METHOD 5 FIELD DATA

PROJECT NAME MCP/MARSHALL OPERATORS D. SMITH / B. WOLFF METER BOX NO. 2 ΔH@ 1.90 IN WC

SOURCE NAT. GAS BOILER STACK DATE 12-21-94 TEST 3 RUN 2 GASMETER COEFF. 0.9984

TRAVERSE POINT NO.	SAMPLING TIME (MIN.)	SAMPLE VOL. (cf)	VELOCITY HEAD (IN WC)	ORIFICE METER (IN WC)	DES. VOL. (cf)	VAC IN Hg	TEMPERATURE (°F)						OXYGEN
							STACK	PROBE	OVEN	IMPG.	GAS/IN	GAS/OUT	(% v/v)
	(2120)	(725.35)											
A - 1	4.63	728.69	0.36	2.0	N/A	6	320	249	250	48	86	87	2.6
2	5.40	732.59	0.49	2.0		6	321	250	250	49	89	85	2.6
3	5.12	736.28	0.44	2.0		6	320	250	251	52	93	85	2.8
4	5.29	740.10	0.47	2.0		6	321	250	251	54	94	85	2.7
5	5.24	743.88	0.46	2.0		6	322	251	251	55	95	85	2.6
6	4.94	747.44	0.41	2.0		6	323	251	250	57	95	86	2.5
B - 1	4.23	750.49	0.30	2.0		6	323	250	250	57	94	85	2.5
2	4.88	754.01	0.40	2.0		6	322	250	250	56	94	85	2.5
3	5.06	757.66	0.43	2.0		6	321	250	249	56	94	85	2.5
4	5.12	761.35	0.44	2.0		7	320	250	249	56	94	85	2.5
5	5.00	764.96	0.42	2.0		7	322	250	250	57	94	85	2.5
6	4.94	768.63	0.41	2.0		7	320	250	250	57	93	85	2.5
	(2225)												
	θ = 59.9	Vm = 43.28		ΔH = 2.0							AVG. =		

EPA METHOD 3/4/5 FIELD DATA

PROJECT NAME MCP / MARSHALL METHOD 201A

SOURCE NAT. GAS BOILER STACK DATE 12-21-94 TEST 3 RUN 2

SAMPLE TRAIN LEAK CHECK:

PRETEST: (≤0.02 CFM AT 15 IN. Hg (vac) ☒ POSTTEST: 0 CFM AT 15 IN. Hg (vac) ☒

PARTICULATE CATCH DATA:

NO.S OF FILTERS USED: 1

CONDENSATE DATA:

ITEM	WEIGHT (g)		
	FINAL	TARE	DIFFERENCE
IMPINGER NO. 1	758	597	161
IMPINGER NO. 2			
IMPINGER NO. 3			
CONDENSER			
DESICCANT	1392	1279	13
TOTAL			194

☐ AMBIENT AIR 20.9% O_2 (V/V)

INTEGRATED GAS SAMPLING DATA:

BAG PUMP NO. BP-2 BOX NO. 2 BAG NO. 2

BAG MATERIAL: TEDLAR SIZE: 44L

PRETEST LEAK CHECK: 0 cc/MIN AT 15 IN. Hg

TIME START: 2120 (HRS) TIME END: 2225 (HRS)

SAMPLING RATE: 400 cc/MIN OPERATOR: DAS

S/N OF O_2 ANALYZER USED TO MONITOR TRAIN OUTLET: 133778

PITOT NO. PTB-6 Cp .840

BAR. PRESS. 29.75 IN Hg H2O 17 %

NOZZLE NO. NS1-9 NOZZLE DIA. .276 IN.

EPA METHOD 5 FIELD DATA

PROJECT NAME MCP/MARSHALL OPERATORS D. SMITH / B. WOLFF METER BOX NO. 2 ΔH@ 1.90 IN WC

SOURCE NAT. GAS BOILER STACK DATE 12-21-94 TEST 3 RUN 3 GASMETER COEFF. 0.9984

TRAVERSE POINT NO.	SAMPLING TIME (MIN.)	SAMPLE VOL. (cf)	VELOCITY HEAD (IN WC)	ORIFICE METER (IN WC)	DES. VOL. (cf)	VAC IN Hg	TEMPERATURE (°F) STACK	PROBE	OVEN	IMPG.	GAS/IN	GAS/OUT	OXYGEN (% v/v)
	(2248)	(768.80)											
A- 1	4.63	772.25	0.36	2.0	N/A	6	322	250	250	40	84	82	2.5
2	5.67	776.47	0.54	2.0		6	322	250	250	41	86	82	2.5
3	5.62	780.65	0.53	2.0		6	323	250	251	42	88	81	2.5
4	5.46	784.71	0.50	2.0		6	321	250	251	43	89	81	2.5
5	5.35	788.69	0.48	2.0		7	318	249	251	42	89	82	2.5
6	5.24	792.59	0.46	2.0		7	323	250	250	42	89	82	2.5
B- 1	4.50	795.94	0.34	2.0		7	322	250	250	42	90	82	2.5
2	5.06	799.71	0.43	2.0		7	323	251	250	42	91	82	2.5
3	5.18	803.57	0.45	2.0		7	324	250	250	43	91	82	2.5
4	5.18	807.43	0.45	2.0		7	322	250	250	43	91	82	2.5
5	5.12	811.24	0.44	2.0		7	322	251	249	43	91	82	2.5
6	4.88	815.97	0.40	2.0		7	322	250	249	43	91	82	2.5
	(2352)												
	θ = 61.9	Vm = 44.67		ΔH = 2.0							AVG. =		

EPA METHOD 3/4/5 FIELD DATA

PROJECT NAME MCP/MARSHALL METHOD 5 201 A

SOURCE NAT. GAS BOILER STACK DATE 12-21-94 TEST 3 RUN 3

SAMPLE TRAIN LEAK CHECK:

PRETEST: (≤0.02 CFM AT 15 IN. Hg (vac) ☒ POSTTEST: 0.00 CFM AT 15 IN. Hg (vac) ☒

PARTICULATE CATCH DATA:

NO.S OF FILTERS USED: 1

CONDENSATE DATA:

ITEM	WEIGHT (g)		
	FINAL	TARE	DIFFERENCE
IMPINGER NO. 1	776	600	176
IMPINGER NO. 2			
IMPINGER NO. 3			
CONDENSER			
DESICCANT	1286	1277	9
TOTAL			185

☐ AMBIENT AIR 20.9% O_2 (V/V)

INTEGRATED GAS SAMPLING DATA:

BAG PUMP NO. BP-2 BOX NO. 2 BAG NO. 3

BAG MATERIAL: TEDLAR SIZE: 44L

PRETEST LEAK CHECK: 0 cc/MIN AT 15 IN. Hg

TIME START: 2248 (HRS) TIME END: 2352 (HRS)

SAMPLING RATE: 400 cc/MIN OPERATOR: DAS

S/N OF O_2 ANALYZER USED TO MONITOR TRAIN OUTLET: 133778

PITOT NO. PTB- Cp .840

BAR. PRESS. 29.75 IN Hg H2O 17 %

NOZZLE NO. NS1-8 NOZZLE DIA .276 IN.

APPENDIX B

LABORATORY & QUALITY ASSURANCE DATA

Enthalpy Analytical Narrative Summary

Company:	NOVA
Contact:	Don Scheele
Phone:	612/448-9393
Fax:	612/448-9572
Analyst	BGP

Client #:	M4M-019
Enthalpy #:	1294-08
PO #	7717
Parameters	MeOH, EtOH, Acety., EA
# Samples	I/O One Scrubber

Custody

Samples were delivered by Federal Express on 12/27/94. Samples were cold upon receipt. Prior to and during analysis they were kept under lock with access only to authorized personnel of Enthalpy Analytical, Inc.

Separation

The ethyl acetate samples were separated using a 60M × .53 mm DB5 capillary column. The methanol, ethanol, and acetaldehyde samples were separated using a 60M × .53 mm RTX-Volatiles and a HPINNO Wax 60m 0.32 capillary columns in series. All compounds separated well and were easily identified.

The samples were analyzed using a 5890 Hewlett Packard Series II gas chromatograph with a flame ionization detector.

The following table shows approximate retention times for each analyte.

Analyte	Retention Time
Methanol	8.5
Ethanol	9.3
Acetaldehyde	8.0
Ethyl acetate	3.0

Due to the range of concentrations, several calibration curves were used. All curves are located in the back of the report and are referenced in the "Cal. Curve" section of the Results page.

Labeling

OK

Reproducibility

All standards were within 10% of their tag value.

Quality of Data

OK

Reporting Notes

The symbols MDL and LOQ represent the Minimum Detection Limit and the Limit of Quantification. The values that are between the MDL and the LOQ are represented by a tilde (~).

Company:	Nova Environmental Services, Inc.	Client #:	M4M-019
Analyst:	BGP	Enthalpy #:	1294-08
Parameters:	Ethyl acetate	PO #:	7717
# Samples:	18	Date:	01/18/95

Sample Identification	Catch Weight (ug)
	Ethyl acetate
T2-R1-I-CT Impinger	= 182
Scrubber #1-I -1 Aa Ab FH	1,337
Scrubber #1-I -1 Ab BH	< 5.69
Run Total	= 1,518
T2-R2-I-CT Impinger	< 50.0
Scrubber #1-I -2 Aa Ab FH	509
Scrubber #1-I -2 Ab BH	< 5.69
Run Total	509
T2-R3-I-CT Impinger	= 206
Scrubber #1-I -3 Aa Ab FH	< 5.69
Scrubber #1-I -3 Ab BH	< 5.69
Run Total	= 206
T2-R1-O-CT Impinger	= 159
Scrubber #1-O -1 Aa Ab FH	43.7
Scrubber #1-O -1 Ab BH	< 5.69
Run Total	= 203
T2-R2-O-CT Impinger	< 50.0
Scrubber #1-O -2 Aa Ab FH	< 5.69
Scrubber #1-O -2 Ab BH	< 5.69
Run Total	< 50.0
T2-R3-O-CT Impinger	< 50.0
Scrubber #1-O -3 Aa Ab FH	< 5.69
Scrubber #1-O -3 Ab BH	< 5.69
Run Total	< 50.0

Company:	Nova Environmental Services, Inc.	Client #:	M4M-019
Analyst:	BGP	Enthalpy #:	1294-08
Parameters:	Acetaldehyde, MeOH, EtOH	PO #:	7717
# Samples:	18	Date:	01/16/95

Sample Id	Catch Weight (ug)		
	Acetaldehyde	Methanol	Ethanol
T2-R1-O-SG Impinger	311	< 50.0	711
Scrubber #1-O -1 Aa Ab FH	~ 24.8	< 6.84	< 3.42
Scrubber #1-O -1 Ab BH	< 6.43	< 6.84	< 3.42
Run Total	**~ 335**	**< 50.0**	**711**
T2-R2-O-SG Impinger	349	< 50.0	~ 290
Scrubber #1-O -2 Aa Ab FH	< 6.43	< 6.84	< 3.42
Scrubber #1-O -2 Ab BH	< 6.43	< 6.84	< 3.42
Run Total	**349**	**< 50.0**	**~ 290**
T2-R3-O-SG Impinger	274	< 50.0	< 50.0
Scrubber #1-O -3 Aa Ab FH	~ 22.6	< 6.84	< 3.42
Scrubber #1-O -3 Ab BH	< 6.43	< 6.84	< 3.42
Run Total	**~ 296**	**< 50.0**	**< 50.0**
T2-R1-I-SG Impinger	< 50.0	< 50.0	9,650
Scrubber #1-I -1 Aa Ab FH	347	< 6.84	1,374
Scrubber #1-I -1 Ab BH	< 6.43	< 6.84	< 3.42
Run Total	**347**	**< 50.0**	**11,023**
T2-R2-I-SG Impinger	1,929	< 50.0	513,411
Scrubber #1-I -2 Aa Ab FH	1,163	< 6.84	5,012
Scrubber #1-I -2 Ab BH	< 6.43	< 6.84	< 3.42
Run Total	**3,092**	**< 50.0**	**518,423**
T2-R3-I-SG Impinger	~ 126	< 50.0	8,077
Scrubber #1-I -3 Aa Ab FH	36.9	< 6.84	< 3.42
Scrubber #1-I -3 Ab BH	< 6.43	< 6.84	< 3.42
Run Total	**~ 163**	**< 50.0**	**8,077**

MDL:	1.0	ppm
LOQ:	5.0	ppm
Collection Eff.	77.8	(%)

Company:	Nova Environmental Services, Inc.	Client #:	M4M-019
Analyst:	BGP	Enthalpy #:	1294 08
Parameters:	Acetaldehyde	PO #:	7717
# Samples:	18	Date:	01/16/95

Reviewed: BGP
Date: 1/16/95

Sample Identification	Retention Time (min.) Inj. # 1	Retention Time (min.) Inj. # 2	Percent Difference	Concentration Inj. # 1	Concentration Inj. # 2	% Difference of Mean	Average Conc.	Cal. Curve	Volume (mL)	Dilution Ratio	Collect Eff.	Catch Weight (ug)
T2-R1-O-SG Impinger	8.028	8.035	0.09	5.93	6.49	4.51	6.21	1	50.0	1.0	100	311
Scrubber #1-O -1 Aa Ab FH	8.009	8.031	0.27	~ 4.05	~ 3.65	> 5 %	~ 3.85	1	5.0	1.0	77.8	~ 24.8
Scrubber #1-O -1 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	77.8	< 6.43
												~ 335
T2-R2-O-SG Impinger	8.036	8.036	0.00	6.85	7.09	1.71	6.97	1	50.0	1.0	100	349
Scrubber #1-O -2 Aa Ab FH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	77.8	< 6.43
Scrubber #1-O -2 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	77.8	< 6.43
												349
T2-R3-O-SG Impinger	8.037	8.037	0.00	5.72	5.24	4.41	5.48	1	50.0	1.0	100	274
Scrubber #1-O -3 Aa Ab FH	8.025	8.009	0.20	~ 3.01	~ 4.02	> 5 %	~ 3.51	1	5.0	1.0	77.8	~ 22.6
Scrubber #1-O -3 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	77.8	< 6.43
												~ 296
T2-R1-I-SG Impinger	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	50.0	1.0	100	< 50.0
Scrubber #1-I -1 Aa Ab FH	8.015	8.014	0.01	53.55	54.41	0.80	53.98	1	5.0	1.0	77.8	347
Scrubber #1-I -1 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	77.8	< 6.43
												347
T2-R2-I-SG Impinger	8.035	8.035	0.00	39.22	37.96	1.62	38.59	1	50.0	1.0	100	1,929
Scrubber #1-I -2 Aa Ab FH	8.015	8.012	0.04	177.24	184.62	2.04	180.93	1	5.0	1.0	77.8	1,163
Scrubber #1-I -2 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	77.8	< 6.43
												3,092
T2-R3-I-SG Impinger	8.032	8.029	0.04	~ 2.12	~ 2.92	> 5 %	~ 2.52	1	50.0	1.0	100	~ 126
Scrubber #1-I -3 Aa Ab FH	8.014	8.016	0.02	5.82	5.67	1.36	5.74	1	5.0	1.0	77.8	36.9
Scrubber #1-I -3 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	77.8	< 6.43
												~ 163

MDL:	1.0	ppm
LOQ:	5.0	ppm
Collection Eff.	73.1	(%)

Company:	Nova Environmental Services, Inc.	Client #:	M4M 019
Analyst:	BGP	Enthalpy #:	1294 08
Parameters:	Methanol	PO #:	7717
# Samples:	18	Date:	01/16/95

Reviewed: BGP
Date: 1/18/95

Sample Identification	Retention Time (min.) Inj. # 1	Inj. # 2	Percent Difference	Concentration Inj. # 1	Inj. # 2	% Difference of Mean	Average Conc.	Cal. Curve	Volume (mL)	Dilution Ratio	Collect Eff.	Catch Weight (ug)
T2-R1-O-SG Impinger	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	50.0	1.0	100	< 50.0
Scrubber #1-O -1 Aa Ab FH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	73.1	< 6.84
Scrubber #1-O -1 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	73.1	< 6.84
												< 50.0
T2-R2-O-SG Impinger	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	50.0	1.0	100	< 50.0
Scrubber #1-O -2 Aa Ab FH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	73.1	< 6.84
Scrubber #1-O -2 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	73.1	< 6.84
												< 50.0
T2-R3-O-SG Impinger	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	50.0	1.0	100	< 50.0
Scrubber #1-O -3 Aa Ab FH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	73.1	< 6.84
Scrubber #1-O -3 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	73.1	< 6.84
												< 50.0
T2-R1-I-SG Impinger	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	50.0	1.0	100	< 50.0
Scrubber #1-I -1 Aa Ab FH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	73.1	< 6.84
Scrubber #1-I -1 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	73.1	< 6.84
												< 50.0
T2-R2-I-SG Impinger	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	50.0	1.0	100	< 50.0
Scrubber #1-I -2 Aa Ab FH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	73.1	< 6.84
Scrubber #1-I -2 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	73.1	< 6.84
												< 50.0
T2-R3-I-SG Impinger	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	50.0	1.0	100	< 50.0
Scrubber #1-I -3 Aa Ab FH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	73.1	< 6.84
Scrubber #1-I -3 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	73.1	< 6.84
												< 50.0

MDL:	1.0	ppm
LOQ:	5.0	ppm
Collection Eff.	146	(%)

Company:	Nova Environmental Services, Inc.	Client #:	M4M 019
Analyst:	BGP	Enthalpy #:	1294-08
Parameters:	Ethanol	PO #:	7717
# Samples:	18	Date:	01/16/95

Reviewed: BGP
Date: 1/18/95

Sample Identification	Retention Time (min.) Inj. # 1	Inj. # 2	Percent Difference	Concentration Inj. # 1	Inj. # 2	% Difference of Mean	Average Conc.	Cal. Curve	Volume (mL)	Dilution Ratio	Collect Eff.	Catch Weight (ug)
T2-R1-O-SG Impinger	9.251	9.251	0.00	14.09	14.37	0.99	14.23	1	50.0	1.0	100	711
Scrubber #1-O -1 Aa Ab FH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	146	< 3.42
Scrubber #1-O -1 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	146	< 3.42
												711
T2-R2-O-SG Impinger	9.25	9.252	0.02	6.85	~ 4.75	> 5 %	~ 5.80	1	50.0	1.0	100	~ 290
Scrubber #1-O -2 Aa Ab FH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	146	< 3.42
Scrubber #1-O -2 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	146	< 3.42
												~ 290 ✓
T2-R3-O-SG Impinger	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	50.0	1.0	100	< 50.0
Scrubber #1-O -3 Aa Ab FH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	146	< 3.42
Scrubber #1-O -3 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	146	< 3.42
												< 50.0
T2-R1-I-SG Impinger	9.245	9.245	0.00	188.28	197.70	2.44	192.99	1	50.0	1.0	100	9,650
Scrubber #1-I -1 Aa Ab FH	9.232	9.233	0.01	394.25	408.09	1.73	401.17	1	5.0	1.0	146	1,374
Scrubber #1-I -1 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	146	< 3.42
												11,023
T2-R2-I-SG Impinger	9.242	9.241	0.01	10224.33	10312.09	0.43	10268.21	2	50.0	1.0	100	513,411
Scrubber #1-I -2 Aa Ab FH	9.231	9.232	0.01	1407.63	1519.65	3.83	1463.64	2	5.0	1.0	146	5,012
Scrubber #1-I -2 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	146	< 3.42
												518,423
T2-R3-I-SG Impinger	9.242	9.242	0.00	155.83	167.25	3.54	161.54	1	50.0	1.0	100	8,077
Scrubber #1-I -3 Aa Ab FH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	146	< 3.42
Scrubber #1-I -3 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	146	< 3.42
												8,077

MDL:	1.0	ppm
LOQ:	5.0	ppm
Collection Eff.	87.9	(%)

Company:	Nova Environmental Services, Inc.	Client #:	M4M-019
Analyst:	BGP	Enthalpy #:	1294-08
Parameters:	Ethyl acetate	PO #:	7737
# Samples:	18	Date:	01/18/95

Reviewed: BGP
Date: 1/18/95

Sample Identification	Retention Time (min.) Inj. # 1	Inj. # 2	Percent Difference	Concentration Inj. # 1	Inj. # 2	% Difference of Mean	Average Conc.	Cal. Curve	Volume (mL)	Dilution Ratio	Collect Eff.	Catch Weight (ug)
T2-R1-I-CT Impinger	2.987	2.99	0.10	~ 3.71	~ 3.56	2.01	~ 3.64	1	50.0	1.0	100	~ 181.8
Scrubber #1-I -1 Aa Ab FH	3.008	3.007	0.03	117.77	117.19	0.25	117.48	1	10.0	1.0	87.9	1,337
Scrubber #1-I -1 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	87.9	< 5.69
												~ 1,518
T2-R2-I-CT Impinger	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	50.0	1.0	100	< 50.00
Scrubber #1-I -2 Aa Ab FH	2.998	3.008	0.33	87.74	91.16	1.92	89.45	1	5.0	1.0	87.9	509
Scrubber #1-I -2 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	87.9	< 5.69
												509
T2-R3-I-CT Impinger	2.987	2.989	0.07	~ 4.24	~ 4.00	2.83	~ 4.12	1	50.0	1.0	100	~ 206.0
Scrubber #1-I -3 Aa Ab FH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	87.9	< 5.69
Scrubber #1-I -3 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	87.9	< 5.69
												~ 206
T2-R1-O-CT Impinger	2.963	2.978	0.51	~ 3.14	~ 3.24	1.57	~ 3.19	1	50.0	1.0	100	~ 159.3
Scrubber #1-O -1 Aa Ab FH	2.988	3.01	0.74	5.30	5.67	3.37	5.49	1	7.0	1.0	87.9	43.7
Scrubber #1-O -1 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	87.9	< 5.69
												~ 203
T2-R2-O-CT Impinger	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	50.0	1.0	100	< 50.00
Scrubber #1-O -2 Aa Ab FH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	87.9	< 5.69
Scrubber #1-O -2 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	87.9	< 5.69
												< 50.0
T2-R3-O-CT Impinger	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	50.0	1.0	100	< 50.00
Scrubber #1-O -3 Aa Ab FH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	87.9	< 5.69
Scrubber #1-O -3 Ab BH	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	87.9	< 5.69
												< 50.0

ENTHALPY analytical, inc.

MDL:	1.0	ppm
LOQ:	5.0	ppm

Company:	Nova Environmental Services, Inc	Client #:	M4M 019
Analyst:	BGP	Enthalpy #:	1294 08
Parameters:	Acetaldehyde	PO #:	7717
# Samples:	8	Date:	01/16/95

Reviewed: BGP
Date: 1/16/95

Sample Identification	Retention Time (min.) Inj. # 1	Retention Time (min.) Inj. # 2	Percent Difference	Concentration Inj. # 1	Concentration Inj. # 2	% Difference of Mean	Average Conc.	Cal. Curve	Volume (mL)	Dilution Ratio	Collect Eff.	Catch Weight (ug)
T2-R1-O-SO Impinger SPK	8.037	8.036	0.01	~ 2.70	~ 2.81	1.96	~ 2.75	1	50.0	1.0	100	~ 137.7
Scrubber #1-O -1 Aa Ab FH SPK	8.01	8.011	0.01	86.67	86.11	0.33	86.39	1	5.0	1.0	100	432
Scrubber #1-O -1 Ab BH SPK	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	100	< 5.00
												~ 570

	Spike Amt.	Catch (ug)	Sample Vol. (L)	Recovery (%)
Spiked Train	591	~ 570	10.80	42.1
Un-spiked Train		330.0	11.10	
Spike Catch		248.5	NA	

Scrubber #1-O -2 Aa Ab FH SPK	8.011	8.012	0.01	122.40	117.22	2.16	119.81	1	5.0	1.0	100	599
Scrubber #1-O -2 Ab BH SPK	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	100	< 5.00
	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	100	< 5.00
												599

	Spike Amt.	Catch (ug)	Sample Vol. (L)	Recovery (%)
Spiked Train	591	599	10.80	43.9
Un-spiked Train		349.0	11.10	
Spike Catch		259.5	NA	

T2-R3-O-SO Impinger SPK	8.036	8.036	0.00	12.17	12.10	0.28	12.14	1	50.0	1.0	100	606.8
Scrubber #1-O -3 Aa Ab FH SPK	8.011	8.013	0.02	110.27	108.79	0.68	109.53	1	5.0	1.0	100	548
Scrubber #1-O -3 Ab BH SPK	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	100	< 5.00
												1,154

	Spike Amt.	Catch (ug)	Sample Vol. (L)	Recovery (%)
Spiked Train	591	1,154	10.80	147
Un-spiked Train		291.0	11.10	
Spike Catch		871.3	NA	

Average of Three: 77.8

ENTHALPY analytical, inc.

MDL:	1.0	ppm
LOQ:	5.0	ppm

Company:	Nova Environmental Services, Inc.	Client #:	M4M 019
Analyst:	BGP	Enthalpy #:	1294-08
Parameters:	Methanol	PO #:	7717
# Samples:	8	Date:	01/16/95

Reviewed: BGP
Date: 1/16/95

Sample Identification	Retention Time (min.) Inj. # 1	Inj. # 2	Percent Difference	Concentration Inj. # 1	Inj. # 2	% Difference of Mean	Average Conc.	Cal. Curve	Volume (mL)	Dilution Ratio	Collect Eff.	Catch Weight (ug)
T2-R1-O-SO Impinger SPK	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	50.0	1.0	100	< 50.00
Scrubber #1-O -1 Aa Ab FH SPK	8.448	8.448	0.00	88.21	83.35	2.83	85.78	1	5.0	1.0	100	429
Scrubber #1-O -1 Ab BH SPK	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	100	< 5.00
												429

	Spike Amt.	Catch (ug)	Sample Vol. (L)	Recovery (%)
Spiked Train	593	429	10.80	72.3
Un-spiked Train		0	11.10	
Spike Catch		428.9	NA	

Scrubber #1-O -2 Aa Ab FH SPK	8.449	8.449	0.00	93.21	87.10	3.39	90.15	1	5.0	1.0	100	451
Scrubber #1-O -2 Ab BH SPK	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	100	< 5.00
	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	100	< 5.00
												451

	Spike Amt.	Catch (ug)	Sample Vol. (L)	Recovery (%)
Spiked Train	593	451	10.80	76.0
Un-spiked Train		0	11.10	
Spike Catch		450.8	NA	

T2-R3-O-SO Impinger SPK	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	50.0	1.0	100	< 50.00
Scrubber #1-O -3 Aa Ab FH SPK	8.449	8.45	0.01	84.78	83.29	0.89	84.03	1	5.0	1.0	100	420
Scrubber #1-O -3 Ab BH SPK	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	100	< 5.00
												420

	Spike Amt.	Catch (ug)	Sample Vol. (L)	Recovery (%)
Spiked Train	593	420	10.80	70.9
Un-spiked Train		0	11.10	
Spike Catch		420.2	NA	

Average of Three: 73.1

ENTHALPY analytical, inc.

MDL:	1.0	ppm
LOQ:	5.0	ppm

Company:	Nova Environmental Services, Inc.	Client #:	MIM-019
Analyst:	DGP	Enthalpy #:	1294-08
Parameters:	Ethanol	PO #:	7717
# Samples:	8	Date:	01/16/95

Reviewed: BGP
Date: 1/18/95

Sample Identification	Retention Time (min.) Inj. # 1	Inj. # 2	Percent Difference	Concentration Inj. # 1	Inj. # 2	% Difference of Mean	Average Conc.	Cal. Curve	Volume (mL)	Dilution Ratio	Collect Eff.	Catch Weight (ug)
T2-R1-O-SO Impinger SPK	9.248	9.248	0.00	43.27	45.81	2.85	44.54	1	50.0	1.0	100	2,227
Scrubber #1-O -1 Aa Ab FII SPK	9.238	9.238	0.00	68.49	66.84	1.22	67.66	1	5.0	1.0	100	338
Scrubber #1-O -1 Ab BII SPK	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	100	< 5.00
												2,565

	Spike Amt.	Catch (ug)	Sample Vol. (L)	Recovery (%)
Spiked Train	589	2,565	10.80	318
Un-spiked Train		711	11.10	
Spike Catch		1,873	NA	

Scrubber #1-O -2 Aa Ab FII SPK	9.24	9.239	0.01	75.00	70.04	3.42	72.52	1	5.0	1.0	100	363
Scrubber #1-O -2 Ab BII SPK	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	100	< 5.00
	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	100	< 5.00
												363

	Spike Amt.	Catch (ug)	Sample Vol. (L)	Recovery (%)
Spiked Train	589	363	10.80	13.6
Un-spiked Train		290.1	11.10	
Spike Catch		80.4	NA	

T2-R3-O-SO Impinger SPK	9.245	9.247	0.02	5.98	6.01	0.26	5.99	1	50.0	1.0	100	300
Scrubber #1-O -3 Aa Ab FII SPK	9.24	9.241	0.01	65.86	65.59	0.21	65.72	1	5.0	1.0	100	329
Scrubber #1-O -3 Ab BII SPK	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	100	< 5.00
												628

	Spike Amt.	Catch (ug)	Sample Vol. (L)	Recovery (%)
Spiked Train	589	628	10.80	107
Un-spiked Train		0	11.10	
Spike Catch		628	NA	

Average of Three: 146

MDL:	1.0	ppm
LOQ:	5.0	ppm

Company:	Nova Environmental Services, Inc.	Client #:	M4M-019
Analyst:	BGP	Enthalpy #:	1294-08
Parameters:	Ethyl acetate	PO #:	7717
# Samples:	9	Date:	01/18/95

Reviewed: BGP
Date: 1/18/95

Sample Identification	Retention Time (min.) Inj. # 1	Inj. # 2	Percent Difference	Concentration Inj. # 1	Inj. # 2	% Difference of Mean	Average Conc.	Cal. Curve	Volume (mL)	Dilution Ratio	Collect Eff.	Catch Weight (ug)
T2-R1-O-CT Impinger Spike	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	50.0	1.0	100	< 50.00
Scrubber #1-O -1 Aq Ab PH Spk	2.96	2.959	0.03	235.71	242.40	1.40	239.05	1	5.0	1.0	100	1,195
Scrubber #1-O -1 Ab III Spk	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	100	< 5.00
												1,195

	Spike Amt.	Catch (ug)	Sample Vol. (l)	Recovery (%)
Spiked Train	676.5	1,195	10.68	151
Un-spiked Train		198	12.00	
Spike Catch		1,019	NA	

T2-R2-O-CT Impinger Spike	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	50.0	1.0	100	< 50.00
Scrubber #1-O -2 Aq Ab PH Spk	2.983	2.986	0.10	57.95	57.81	0.12	57.88	1	5.0	1.0	100	289
Scrubber #1-O -2 Ab III Spk	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	100	< 5.00
												289

	Spike Amt.	Catch (ug)	Sample Vol. (l)	Recovery (%)
Spiked Train	676.5	289	10.68	42.8
Un-spiked Train		0	12.00	
Spike Catch		289.4	NA	

T2-R3-O-CT Impinger Spike	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	50.0	1.0	100	< 50.00
Scrubber #1-O -3 Aq Ab PH Spk	2.982	2.995	0.44	90.73	99.52	4.62	95.12	1	5.0	1.0	100	476
Scrubber #1 O -3 Ab III Spk	NA	NA	NA	< 1.00	< 1.00	0.00	< 1.00	1	5.0	1.0	100	< 5.00
												476

	Spike Amt.	Catch (ug)	Sample Vol. (l)	Recovery (%)
Spiked Train	676.5	476	10.68	70.3
Un-spiked Train		0	12.00	
Spike Catch		475.6	NA	

Average of Three: 87.8

ENTHALPY analytical, inc.

Nova
Environmental Services, Inc.

CHAIN OF CUSTODY RECORD

Suite 170 O'Hare Atrium Office Plaza 2860 River Road Des Plaines, IL 60018
708/803-4510 FAX 708/803-0780

PROJ. NO. | PROJECT NAME: MARSHALL

LOCATION: MARSHALL MN

SAMPLERS: (Signature) PAUL LUNA
TOM WOLF

LAB NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	REMARKS
	12/2/11				SCRUBBER #1 - INLET SG - RUN 1	5	
					SCRUBBER #1 - INLET CH - RUN 1		
					SCRUBBER #1 - INLET SG - RUN 2		
					SCRUBBER #1 - INLET CH - RUN 2		
					SCRUBBER #1 - INLET CH - RUN 3		
					SCRUBBER #1 - INLET SG - RUN 3		
					SCRUBBER #1 - INLET SG - RUN #1 SPIKE		
					SCRUBBER #1 #1 - RUN #1 CH SPIKE		
					SCRUBBER #1 #1 RUN #1 SG SPIKE		
					SCRUBBER #1 #1 RUN #2 SG SPIKE		
					SCRUBBER #1 #1 RUN #2 CH SPIKE		
					SCRUBBER #1 #1 RUN #3 SG SPIKE		
					SCRUBBER #1 #1 RUN #3 CH SPIKE	V	

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
		PAUL PUNA			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
	12/2/11				
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)		Date / Time	

Remarks

2 - 500 gal

PROJECT MANAGER:

LABORATORY:

Distribution: White — Accompanies Shipment

Nova
Environmental Services, Inc.

CHAIN OF CUSTODY RECORD

Suite 170 O'Hare Atrium Office Plaza 2860 River Road Des Plaines, IL 60018
708/803-4510 FAX 708/803-0780

PROJ. NO. | PROJECT NAME: MCD - MARSHALL

LOCATION: MARSHALL MN

SAMPLERS: (Signature) [illegible]

LAB NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	REMARKS
	11/21	N/A			$T_1 - R_1 - I - SG$		
					$T_1 - R_1 - I - C_1$		
					$T_2 - R_2 - I - SG$		
					$T_2 - R_2 - I - C_1$		
					$T_2 - R_3 - I - SG$		
					$T_2 - R_3 - I - C_1$		
					$T_1 - R_1 - I - SG - SP$		
					$T_2 - R_1 - I - C_1 - SP$		
					$T_2 - R_2 - I - SG - SP$		
					$T_2 - R_2 - I - C_1 - SP$		
					$T_2 - R_3 - I - SG - SP$		
					$T_2 - R_3 - I - C_1 - SP$		

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
[signature]		Brian Pierce			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)		Date / Time	

Remarks

Vial $T_2 - R_1 - I - SP$ not labeled CT or SG

PROJECT MANAGER:

LABORATORY:

Distribution: White — Accompanies Shipment; Yellow — Laboratory File; Pink — Coordinator Field Files

Nova
Environmental Services, Inc.

Suite 170 O'Hare Atrium Office Plaza 2860 River Road Des Plaines, IL 60018
708/803-4510 FAX 708/803-0780

CHAIN OF CUSTODY RECORD

PROJ. NO.

PROJECT NAME MCP - MARSHALL

LOCATION: MCP MARSHALL MAIN

SAMPLERS: (Signature)

LAB NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	REMARKS
	8/21				T_2R_1-O-GC	1	
					T_2R_1-O-GC		
					T_2R_2-O-SC		
					T_2R_2-O-GC		
					T_2R_4-O-SC		
					T_2R_4-O-GC		
					T_2R_1-O-GC-SP		
					T_2R_1-O-GC-SP		
					T_2R_2-O-SC-SP		
					T_2R_2-O-GC-SP		
					T_2R_3-O-GC		
					T_2R_3-O-GC		

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)		Date / Time	

Remarks

T_2R_3-O-SG+CT included but not

T_2R_2-O-SG+CT

PROJECT MANAGER:

LABORATORY:

Distribution: White — Accompanies Shipment; Yellow — Laboratory File; Pink — Coordinator Field Files

Nova
Environmental Services, Inc.

Suite 170 O'Hare Atrium Office Plaza 2860 River Road Des Plaines, IL 60018
708/803-4510 FAX 708/803-0780

CHAIN OF CUSTODY RECORD

PROJ. NO.

PROJECT NAME: MCL2 MARSHALL

LOCATION: MARSHALL, MN

SAMPLERS: (Signature)

LAB NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	REMARKS
	12/2/96				SCRUBBER #1 RUN 1	2	
					SCRUBBER #1 RUN 1 C1 OUTLET	3	
					SCRUBBER #1 RUN 1 SC - OUTLET	4	
					SCRUBBER #1 RUN #2 - SC - OUTLET	3	
					SCRUBBER #1 RUN #3 - SC - OUTLET	3	
					SCRUBBER #1 RUN #3 - C1 - OUTLET	3	
					SCRUBBER #1 RUN 1 SC - STACK	2	
					SCRUBBER #1 RUN 1 C1 - STACK	2	
					SCRUBBER #1 RUN 2 SC - STACK	2	
					SCRUBBER #1 RUN 2 C1 - STACK	2	
					SCRUBBER #1 - RUN 3 SC - STACK	2	
					SCRUBBER #1 RUN 3 C1 - STACK	2	

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
	12/2/96				
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)		Date / Time	

Remarks

PROJECT MANAGER:

LABORATORY:

Distribution: White - Accompanies Shipment; Yell...

Nova
Environmental Services, Inc.

CLIENT NO: M1444
PROJECT NO: M4M-020
LOG-IN NO: 11914

EPA METHOD 5
GRAVIMETRIC ANALYSIS LABORATORY DATA

Plant: MGP - Marshall | Test No.: T3 | Run No.: R1
Source: N.G. Boiler | Analyzed by: MJW / RCM
Job No.: M4M-020 | Date: 12-22-94 | Solvent: Acetone
Date Submitted: 12-22-94 | Transport Leakage: X No ___ Yes ___ ml

Filter Blank:
Filter No.: 00957
Final Wt. = 0.4869 g
Tare Wt. = 0.4869 g
Wt. Gain = 0.0000 g

Acetone Blank:
140 ml (Sample)
Final Wt. = 106.1096 g
Tare Wt. = 106.1090 g
Wt. Gain = 0.0006 g/100 ml

Water Blank:
100 ml (Sample)
Final Wt. = ___ g
Tare Wt. = ___ g
Wt. Gain = ___ g/100 ml

Blank Correction Calculations:
Filter = (Wt. Gain) = 0.0000 g
Acetone = 56 ml x 0.0006 g/140 ml = 0.0002 g
Water = NA ml x NA g/100 ml = NA g

Filter: Pre

Filter No. 00990
Final Wt. = 0.4916 g
Tare Wt. = 0.4935 g
Wt. Gain = -0.0019 g
Less Blank = 0.0000 g
Corrected Gain = -0.0019 g

Probe and Front Half Wash: Pre

Volume Of Solvent: 56 ml
Final Wt. = 108.6012 g
Tare Wt. = 108.5927 g
Wt. Gain = 0.0085 g
Less Blank = 0.0002 g
Corrected Gain = 0.0083 g

Probe and Front Half Wash: Post

Volume Of Solvent: ___ ml
Final Wt. = ___ g
Tare Wt. = ___ g
Wt. Gain = ___ g
Less Blank = ___ g
Corrected Gain = ___ g

Impinger Water and Backhalf Wash:

Organic Extraction:
Final Wt. = ___ g
--Tare Wt. = ___ g
Wt. Gain = ___ g
Less Blank = ___ g
Corrected Gain = ___ g

Organic Extraction:
Final Wt. = ___ g
--Tare Wt. = ___ g
Wt. Gain = ___ g
Less Blank = ___ g
Corrected Gain = ___ g

Total Particulate:

	Pre	Post
Filter	-0.0019 g	
Front-Half Wash	0.0083 g	
Front-Half Wash	NA g	
Extraction	NA g	
Water Solubles	NA g	
Total Particulate	0.0064 g	

PM10 Particulate

	Post
Filter	-0.0019 g
Front-Half Wash	NA g
Extraction	NA g
Water Solubles	NA g
Total PM10 Particulate	NA g

Front-Half includes sampling train components up to and including the filter.
Back-Half is from the filter, up to and including the third impinger.

--Tare weight here is of evaporating dish or beaker.

Nova Environmental Services Inc.

CLIENT NO: M1444
PROJECT NO: M4M-020
LOG-IN NO: 11914

EPA METHOD 5
GRAVIMETRIC ANALYSIS LABORATORY DATA

Plant: MCP - Marshall
Source: N.G. Boiler
Job No.: M4M-020
Date Submitted: 12-22-94

Test No.: T3 Run No.: R2
Analyzed by: MJW / RCM
Date: 12-22-94 Solvent: Acetone
Transport Leakage: X No ___ Yes ___ ml

Filter Blank:

Filter No.: 00957
Final Wt. = 0.4869 g
Tare Wt. = 0.4869 g
Wt. Gain = 0.0000 g

Acetone Blank:

140 ml (Sample)
Final Wt. = 106.1096 g
Tare Wt. = 106.1090 g
Wt. Gain = 0.0006 g/100 ml

Water Blank:

100 ml (Sample)
Final Wt. = ___ g
Tare Wt. = ___ g
Wt. Gain = ___ g/100 ml

Blank Correction Calculations:

Filter = (Wt. Gain) = 0.0000 g
Acetone = 57 ml x 0.0006 g/140 ml = 0.0002 g
Water = NA ml x NA g/100 ml = NA g

Filter:

Filter No.: 00989
Final Wt. = 0.4851 g
Tare Wt. = 0.4871 g
Wt. Gain = -0.0020 g
Less Blank = 0.0000 g
Corrected Gain = -0.0020 g

Pre Probe and Front Half Wash:

Volume Of Solvent: 57 ml
Final Wt. = 103.9109 g
Tare Wt. = 103.9035 g
Wt. Gain = 0.0074 g
Less Blank = 0.0002 g
Corrected Gain = 0.0072 g

Post Probe and Front Half Wash:

Volume Of Solvent: ___ ml
Final Wt. = ___ g
Tare Wt. = ___ g
Wt. Gain = ___ g
Less Blank = ___ g
Corrected Gain = ___ g

Impinger Water and Backhalf Wash:

Organic Extraction:

Final Wt. = ___ g
--Tare Wt. = ___ g
Wt. Gain = ___ g
Less Blank = ___ g
Corrected Gain = ___ g

Organic Extraction:

Final Wt. = ___ g
--Tare Wt. = ___ g
Wt. Gain = ___ g
Less Blank = ___ g
Corrected Gain = ___ g

PM10 Particulate

Total Particulate:

Filter	-0.0020 g
Pre Front-Half Wash	0.0072 g
Post Front-Half Wash	NA g
Extraction	NA g
Water Solubles	NA g
Total Particulate	0.0052 g

Filter	-0.0020 g
Post Front-Half Wash	NA g
Extraction	NA g
Water Solubles	NA g
Total PM10 Particulate	NA g

Front-Half includes sampling train components up to and including the filter.
Back-Half is from the filter, up to and including the third impinger.

--Tare weight here is of evaporating dish or beaker.

Nova
Environmental Services Inc.

CLIENT NO: M1444
PROJECT NO: M4M-020
LOG-IN NO: 11914

EPA METHOD 5
GRAVIMETRIC ANALYSIS LABORATORY DATA

Plant: MCP - Marshall | Test No.: T3 | Run No.: R3
Source: N.G. Boiler | Analyzed by: MJW / RCM
Job No.: M4M-020 | Date: 12-22-94 | Solvent: Acetone
Date Submitted: 12-22-94 | Transport Leakage: X No ___ Yes ___ ml

Filter Blank:
Filter No.: 00957
Final Wt. = 0.4869 g
Tare Wt. = 0.4869 g
Wt. Gain = 0.0000 g

Acetone Blank:
140 ml (Sample)
Final Wt. = 106.1096 g
Tare Wt. = 106.1090 g
Wt. Gain = 0.0006 g/100 ml

Water Blank:
100 ml (Sample)
Final Wt. = ___ g
Tare Wt. = ___ g
Wt. Gain = ___ g/100 ml

Blank Correction Calculations:
Filter = (Wt. Gain) = 0.0000 g
Acetone = 52 ml x 0.0006 g/140 ml = 0.0002 g
Water = NA ml x NA g/100 ml = NA g

Filter: Pre
Filter No. 00992
Final Wt. = 0.4827 g
Tare Wt. = 0.4869 g
Wt. Gain = -0.0042 g
Less Blank = 0.0000 g
Corrected Gain = -0.0042 g

Probe and Front Half Wash: Pre
Volume Of Solvent: 52 ml
Final Wt. = 102.0881 g
Tare Wt. = 102.0793 g
Wt. Gain = 0.0088 g
Less Blank = 0.0002 g
Corrected Gain = 0.0086 g

Probe and Front Half Wash: Post
Volume Of Solvent: ___ ml
Final Wt. = ___ g
Tare Wt. = ___ g
Wt. Gain = ___ g
Less Blank = ___ g
Corrected Gain = ___ g

Impinger Water and Backhalf Wash:

Organic Extraction:
Final Wt. = ___ g
--Tare Wt. = ___ g
Wt. Gain = ___ g
Less Blank = ___ g
Corrected Gain = ___ g

Organic Extraction:
Final Wt. = ___ g
--Tare Wt. = ___ g
Wt. Gain = ___ g
Less Blank = ___ g
Corrected Gain = ___ g

PM10 Particulate

Total Particulate:

	Filter	-0.0042	g
Pre	Front-Half Wash	0.0088	g
Post	Front-Half Wash	NA	g
	Extraction	NA	g
	Water Solubles	NA	g
	Total Particulate	0.0044	g

	Filter	-0.0042	g
Post	Front-Half Wash	NA	g
	Extraction	NA	g
	Water Solubles	NA	g
	Total PM10 Particulate	NA	g

Front-Half includes sampling train components up to and including the filter.
Back-Half is from the filter, up to and including the third impinger.

--Tare weight here is of evaporating dish or beaker.

Nova Environmental Services Inc.

CLIENT NO: M1444
PROJECT NO: M4M-020
LOG-IN NO: 11914

EPA METHOD 5
GRAVIMETRIC ANALYSIS LABORATORY DATA

Plant: MCP - Marshall | Test No.: T4 | Run No.: R3
Source: N.G. Boiler | Analyzed by: MJW / RCM
Job No.: M4M-020 | Date: 12-22-94 | Solvent: Acetone
Date Submitted: 12-22-94 | Transport Leakage: X No ___ Yes ___ ml

Filter Blank:
Filter No.: 00957
Final Wt. = 0.4869 g
Tare Wt. = 0.4869 g
Wt. Gain = 0.0000 g

Acetone Blank:
140 ml (Sample)
Final Wt. = 106.1096 g
Tare Wt. = 106.1090 g
Wt. Gain = 0.0006 g/100 ml

Water Blank:
100 ml (Sample)
Final Wt. = ___ g
Tare Wt. = ___ g
Wt. Gain = ___ g/100 ml

Blank Correction Calculations:
Filter = (Wt. Gain) = 0.0000 g
Acetone = 39 ml x 0.0006 g/140 ml = 0.0002 g
Water = NA ml x NA g/100 ml = NA g

Filter: (Pre)
Filter No. 00993
Final Wt. = 0.4895 g
Tare Wt. = 0.4913 g
Wt. Gain = -0.0018 g
Less Blank = 0.0000 g
Corrected Gain = 0.0018 g

Probe and Front Half Wash: (Pre)
Volume Of Solvent: 39 ml
Final Wt. = 105.3526 g
Tare Wt. = 105.3519 g
Wt. Gain = 0.0007 g
Less Blank = 0.0002 g
Corrected Gain = 0.0005 g

Probe and Front Half Wash: (Post)
Volume Of Solvent: 65 ml
Final Wt. = 101.8599 g
Tare Wt. = 101.8572 g
Wt. Gain = 0.0027 g
Less Blank = 0.0003 g
Corrected Gain = 0.0024 g

Impinger Water and Backhalf Wash:

Organic Extraction:
Final Wt. = ___ g
--Tare Wt. = ___ g
Wt. Gain = ___ g
Less Blank = ___ g
Corrected Gain = ___ g

Organic Extraction:
Final Wt. = ___ g
--Tare Wt. = ___ g
Wt. Gain = ___ g
Less Blank = ___ g
Corrected Gain = ___ g

Total Particulate:

PM10 Particulate

	Filter	-0.0018 g	
Pre	Front-Half Wash	0.0005 g	
Post	Front-Half Wash	0.0024 g	
	Extraction	NA g	
	Water Solubles	NA g	
Total Particulate		0.0011 g	

Filter	-0.0018 g	
Post Front-Half Wash	0.0024 g	
Extraction	NA g	
Water Solubles	NA g	
Total PM10 Particulate		0.0006 g

Front-Half includes sampling train components up to and including the filter.
Back-Half is from the filter, up to and including the third impinger.

--Tare weight here is of evaporating dish or beaker.

Nova
Environmental Services, Inc.

CLIENT NO: M1444
PROJECT NO: M4M-020
LOG-IN NO: 11914

EPA METHOD 5
GRAVIMETRIC ANALYSIS LABORATORY DATA

Plant: M.C.P. - Marshall
Source: N.G. Boiler
Job No.: M4M-020
Date Submitted: 12-22-94

Test No.: T4
Analyzed by: MJW / RCM
Date: 12-22-94
Transport Leakage: X No ___ Yes ___ ml

Run No.: R1
Solvent: Acetone

Filter Blank:

Filter No.: 00957
Final Wt. = 0.4869 g
Tare Wt. = 0.4869 g
Wt. Gain = 0.0000 g

Acetone Blank:

140 ml (Sample)
Final Wt. = 106.1096 g
Tare Wt. = 106.1090 g
Wt. Gain = 0.0006 g/100 ml

Water Blank:

100 ml (Sample)
Final Wt. = ___ g
Tare Wt. = ___ g
Wt. Gain = ___ g/100 ml

Blank Correction Calculations:

Filter = (Wt. Gain) = 0.0000 g
Acetone = 38 ml x 0.0006 g/140 ml = 0.0002 g
Water = NA ml x NA g/100 ml = NA g

Filter:

Filter No. 00988
Final Wt. = 0.4859 g
Tare Wt. = 0.4866 g
Wt. Gain = -0.0007 g
Less Blank = 0.0000 g
Corrected Gain = -0.0007 g

Pre Probe and Front Half Wash:

Volume Of Solvent: 38 ml
Final Wt. = 102.2407 g
Tare Wt. = 102.2395 g
Wt. Gain = 0.0012 g
Less Blank = 0.0002 g
Corrected Gain = 0.0010 g

Post Probe and Front Half Wash:

Volume Of Solvent: 58 ml
Final Wt. = 105.4823 g
Tare Wt. = 105.4797 g
Wt. Gain = 0.0026 g
Less Blank = 0.0002 g
Corrected Gain = 0.0024 g

Impinger Water and Backhalf Wash:

Organic Extraction:

Final Wt. = ___ g
--Tare Wt. = ___ g
Wt. Gain = ___ g
Less Blank = ___ g
Corrected Gain = ___ g

Organic Extraction:

Final Wt. = ___ g
--Tare Wt. = ___ g
Wt. Gain = ___ g
Less Blank = ___ g
Corrected Gain = ___ g

PM10 Particulate

Total Particulate:

	Filter.....	-0.0007	g
Pre	Front-Half Wash.....	0.0010	g
Post	Front-Half Wash.....	0.0024	g
	Extraction.....	NA	g
	Water Solubles.....	NA	g
Total Particulate.....		0.0027	g

	Filter.....	-0.0007	g
Post	Front-Half Wash.....	0.0024	g
	Extraction.....	NA	g
	Water Solubles.....	NA	g
Total PM10 Particulate.....		0.0017	g

Front-Half includes sampling train components up to and including the filter.
Back-Half is from the filter, up to and including the third impinger.

--Tare weight here is of evaporating dish or beaker.

Nova
Environmental Services, Inc.

CLIENT NO: M1444
PROJECT NO: M4M-020
LOG-IN NO: 11914

EPA METHOD 5
GRAVIMETRIC ANALYSIS LABORATORY DATA

Plant: MCP - Marshall
Source: N.G. Boiler
Job No.: M4M-020
Date Submitted: 12-22-94

Test No.: T4
Analyzed by: MJW / RCM
Date: 12-22-94
Transport Leakage: X No ___ Yes ___ ml

Run No.: R3
Solvent: Acetone

Filter Blank:

Filter No.: 00957
Final Wt. = 0.4869 g
Tare Wt. = 0.4869 g
Wt. Gain = 0.0000 g

Acetone Blank:

140 ml (Sample)
Final Wt. = 106.1096 g
Tare Wt. = 106.1090 g
Wt. Gain = 0.0006 g/100 ml

Water Blank:

100 ml (Sample)
Final Wt. = ___ g
Tare Wt. = ___ g
Wt. Gain = ___ g/100 ml

Blank Correction Calculations:

Filter = (Wt. Gain) = 0.0000 g
Acetone = 40 ml x 0.0006 g/140 ml = 0.0002 g
Water = NA ml x NA g/100 ml = NA g

Filter:

Filter No. 00991
Final Wt. = 0.4875 g
Tare Wt. = 0.4894 g
Wt. Gain = -0.0019 g
Less Blank = 0.0000 g
Corrected Gain = -0.0019 g

Pre Probe and Front Half Wash:

Volume Of Solvent: 40 ml
Final Wt. = 108.4612 g
Tare Wt. = 108.4600 g
Wt. Gain = 0.0012 g
Less Blank = 0.0002 g
Corrected Gain = 0.0010 g

Post Probe and Front Half Wash:

Volume Of Solvent: 52 ml
Final Wt. = 101.9784 g
Tare Wt. = 101.9748 g
Wt. Gain = 0.0036 g
Less Blank = 0.0002 g
Corrected Gain = 0.0034 g

Impinger Water and Backhalf Wash:

Organic Extraction:

Final Wt. = ___ g
--Tare Wt. = ___ g
Wt. Gain = ___ g
Less Blank = ___ g
Corrected Gain = ___ g

Organic Extraction:

Final Wt. = ___ g
--Tare Wt. = ___ g
Wt. Gain = ___ g
Less Blank = ___ g
Corrected Gain = ___ g

PM10 Particulate

Total Particulate:

	Filter.....	-0.0019 g
Pre	Front-Half Wash.....	0.0010 g
Post	Front-Half Wash.....	0.0034 g
	Extraction.....	NA g
	Water Solubles.....	NA g
Total Particulate.....		0.0025 g

	Filter.....	-0.0019 g
Post	Front-Half Wash.....	0.0034 g
	Extraction.....	NA g
	Water Solubles.....	NA g
Total PM10 Particulate.....		0.0015 g

Front-Half includes sampling train components up to and including the filter.
Back-Half is from the filter, up to and including the third impinger.

--Tare weight here is of evaporating dish or beaker.

Nova Environmental Services, Inc.

Minneapolis Office ☑
1107 Hazeltine Blvd. Ste. 420
Chaska, MN 55318
(612) 448-9393
Fax # 612-448-9572

Chicago Office ☐
O'Hare Atrium Office Plaza, Ste 170
2860 River Road
Des Plaines, Il 60018
(312) 803-4510
Fax # 312-803-0780

Chain of Custody Record

Name of Project: MCP - MARSHALL

Project Number: M-1444 M4M-020

Project Manager: 11914

Laboratory:

Special Instructions:

Sample No.	Date	No. & Vol. of Containers	Sample Location	Requested Analysis: PM	PM-10					Sample Description / Remarks
1	12/2/94	1	N.C. BOILER							T3 R1 (FILTER)
2										T3 R2
3										T3 R3
4				X	X					T4 R1
5				X	X					T4 R2
6				X	X					T4 R3
7										T3 R1 - P.W.
8										T3 R2 - P.W.
9										T3 R3 - P.W.

Sampler (Signature)	Relinquished By	Affiliation	Date	Time	Received By	Affiliation	Date	Time
					Rachel M		12-22-94	3pm
Affiliation					6 filters			
					9 PW			
Date / Time								

Nova Environmental Services, Inc.

Minneapolis Office ☑
1107 Hazeltine Blvd. Ste. 420
Chaska, MN 55318
(612) 448-9393
Fax # 612-448-9572

Chain of Custody Record

Chicago Office ☐
O'Hare Atrium Office Plaza, Ste 170
2860 River Road
Des Plaines, Il 60018
(312) 803-4510
Fax # 312-803-0780

Name of Project: MCD – MARSHALL

Project Number: M-1444 M4M-020

Project Manager: 11914

Laboratory

Special Instructions

Sample No.	Date	No. & Vol. of Containers	Sample Location	Requested Analysis PM-10	Sample Description / Remarks
10	12/21/94	1	N.C. BOILER	✓	T4R1 – PRE
11				✓	T4R1 – POST
12				✓	T4R2 – PRE
13				✓	T4R2 – POST
14				✓	T4R3 – PRE
15				✓	T4R3 – POST

Sampler (Signature)	Relinquished By	Affiliation	Date	Time	Received By	Affiliation	Date	Time
Affiliation								
Date / Time								

UNIT 2

GRASEBY NUTECH

CALIBRATION SHEET

Customer : NOVA ENV. Serial : 80738
Date : 12-8-93 /S.S./FUJI/ORSAT/

CALCULATION DATA FOR RUN :	1	2	3
1. Barometric Pressure, P(B):	30.23	30.23	30.23
2. Orifice Setting, Delta H :	2.00	0.75	6.00
3. Finial Reading (Test) :	191.182	201.688	212.664
4. Initial Reading (Test) :	180.640	191.387	202.134
5. Volume, V(T) Cubic Feet :	10.542	10.301	10.530
6. Temp Initial T(T(I)) F :	68	67	67
7. Temp Finial T(T(F)) F :	68	67	67
8. Finial Reading (Box) :	251.777	262.359	273.318
9. Initial Reading (Box) :	241.200	252.000	262.804
10. Volume, V(B) Cubic Feet :	10.577	10.359	10.514
11. Temp Initial T(B(I)) F :	70	70	71
12. Temp Final T(B(F)) F :	71	71	76
13. Elapsed Time, Minutes :	14.0	22.0	8.0
Delta H(a) :	1.9438	1.8780	1.8905
Gamma :	0.9966	0.9992	0.9993

$\overline{\Delta H} = 1.90$
$Y = 0.9984$

Calibration Performed By : Alexander L. Fontenot

GRASEBY NUTECH
4022 STIRRUP CREEK DRIVE, SUITE 325, DURHAM, NC 27703-9000, USA
TEL: 919 544 8535 FAX: 919 544 3770

S-TYPE PITOT TUBE INSPECTION SHEET

PITOT NUMBER: PTB-6

DATE OF INSPECTION: 11-25-94

TECHNICIAN: DAS

PITOT TUBE DIMENSIONS:

External tubing diameter (D_t)	✓	IN.	(.1875≥.375)
Base to Side A opening plane (P_A)	✓	IN.	(A=B)
Base to Side B opening plane (P_B)	✓	IN.	($1.05D_t \geq 1.50D_t$)
Side A to Side B opening plane (P)	✓	IN.	($P_A + P_B$)

ALIGNMENT:

$a_1 \leq 10°$	0	degrees	
$a_2 \leq 10°$	0	degrees	
$B_1 \leq 5°$	0	degrees	
$B_2 \leq 5°$	0	degrees	
$Z \leq .125"$	0.1	IN.	
$W \leq .03125"$	0	IN.	

DISTANCE FROM PITOT TO PROBE COMPONENTS:

Pitot to 0.500" nozzle	0.750	IN.	≥ .750
Pitot to probe sheath	3.00	IN.	≥ 3.00
Pitot to thermocouple (parallel to probe)	0.750	IN.	≥ .750
Pitot to thermocouple (perpendicular to probe)	2.00	IN.	≥ 2.00

TEMPERATURE MEASUREMENT DEVICE
CALIBRATION DATA

SIMULATOR #1
MAKE: OMEGA T/C CALIBRATOR
MODEL: CL-300-K
SN: 90121031
RANGE: 0 - 2100 F
T.C. TYPE: K
TECHNICIAN: D. SMITH

UNIT UNDER CALIBRATION
MODEL: SERIES 873
MAKE: WATLOW
SN: DP-002
RANGE: 0-1999 °F
T.C. TYPE K
DATE: 11-25-94

DESIRED TEMP	TEMPURATURE OF SIMULATOR	RESPONCE OF UNIT TESTED	DIFFERENCE	PERCENT DIFFERENCE
0	0	0.0	0.00	0.00 %
100	100	99.8	.20	0.20 %
200	200	200.3	.30	0.15 %
300	300	300.3	.30	0.10 %
400	400	400.8	.80	0.20 %
500	500	501.2	1.20	0.24 %
600	600	600.3	.30	0.05 %
700	700	700.2	.20	0.03 %
800	800	800.4	.40	0.05 %
900	900	900.0	.00	0.00 %
1000	1000	999.4	.60	0.06 %
1100	1100	1099.4	.60	0.05 %
1200	1200	1198.9	1.10	0.09 %
1300	1300	1300.2	.20	0.02 %
1400	1400	1398.7	1.30	0.09 %
1500	1500	1499.4	.60	0.04 %
1600	1600	1601.5	1.50	0.09 %
1700	1700	1700.7	.70	0.04 %
1800	1800	1800.1	.10	0.01 %
1900	1900	1900.0	.00	0.00 %
2000	2000	1999.0	1.00	0.05 %
2100	2100	NA	NA	— %
		AVERAGES:	.54	.07 %

PERCENT DIFFERENCE MUST BE < 1.5 %

APPENDIX C

CALCULATION EQUATIONS AND REPORT NOMENCLATURE

Nomenclature

A	=	Cross-sectional area of duct.
A_n	=	Cross-sectional area of nozzle
B_{ws}	=	Water vapor in gas stream, proportion by volume
C_a	=	Particulate Concentration, actual, wet basis - gr/acf
C_s	=	Particulate concentration at dry standard conditions - gr/dscf
%EA	=	Excess air, percent by volume
G_d	=	Specific gravity relative to air, dimensionless
I	=	Isokinetic variation, percent by volume
M_d	=	Molecular weight of flue gas, dry, lb/lb-mole
M_g	=	Mass flow of wet flue gas, lb/hr
M_n	=	Total particulate collected, grams
M_p	=	Particulate mass flow, lb/hr
M_s	=	Molecular weight of flue gas, wet, lb/lb-mole
P_b	=	Barometric pressure, uncompensated, inches of mercury
P_g	=	Static pressure of duct, inches of water
P_s	=	Absolute gas pressure of duct, inches of mercury
Q	=	Actual flue gas volumetric flow rate, acfm
Q_{sd}	=	Dry flue gas volumetric flow rate corrected to standard conditions, dscfm
T_m	=	Average dry gas meter temperature, °R
T_s	=	Average stack gas temperature, °R
ϕ	=	Total sampling time, minutes
V_{lc}	=	Total volume of liquid collected in impingers and desiccant, ml
V_m	=	Volume of gas sample measured by gas meter, cubic feet
V_{std}	=	Volume of gas sample corrected to standard conditions, dry standard cubic feet
V_w	=	Volume of water vapor in gas sample, corrected to standard conditions
V_s	=	Linear velocity of flue gas, feet per second
Y	=	Dry gas meter calibration factor
ΔH	=	Orifice meter differential pressure, inches of water
ΔP	=	Velocity pressure of flue gas, inches of water
p	=	Actual gas density, pounds per cubic feet

REPORT NOMENCLATURE

acfm	Actual cubic feet per minute
°C	Degrees Centigrade
C_1	Results reported as carbon
cc(ml)	Cubic centimeter (milliliter)
cfh	Cubic feet per hour
cu. ft.	Cubic feet
dscfm	Dry standard cubic feet per minute
°F	Degrees Fahrenheit
dia	Diameter
ft./sec.	Feet per second
gph	Gallons per hour
gpm	Gallons per minute
gr/acf	Grains per actual cubic foot
gr/dscf	Grains per dry standard cubic foot
gr/dscf @ 12% CO_2	Grains per dry standard cubic foot corrected to 12 percent carbon dioxide
gr/dscf @ 7% O_2	Grains per dry standard cubic foot corrected to 7 percent oxygen
g	Gram
hrs	Hours
in	Inches
in Hg	Inches of mercury
in H_2O	Inches of water
in WC	Inches of water column
Klb/hr	Thousand pounds per hour
lb	Pound
lb/dscf	Pounds per dry standard cubic foot
lb/hr	Pounds per hour
lb/MMBTU	Pounds per million British Thermal Units heat input
MW	Megawatt
mg	Milligram
mg/dscm	Milligrams per dry standard cubic meter
min	Minutes
ppm	Parts per million by volume
ppm w/w	Parts per million by weight
PSIA	Pounds per square inch - actual
PSIG	Pounds per square inch - gauge
°R	Degress Rankin
sec.	Seconds
sq. ft.	Square Feet
tph	Tons per hour
ug	Microgram
%v/v	percent by volume
%w/w	Percent by weight

Calculation Equations

EPA Method 2

$$V_s = 85.49\ C_p\ (\Delta p_{(avg)})^{1/2} \left[\frac{Ts}{P_s M_s} \right]^{1/2}$$

$$Q = 60\ V_s A$$

$$Q_{sd} = Q\ (1-B_{ws}) \left[\frac{528}{T_s} \right] \left[\frac{P_s}{29.92} \right]$$

$$M_g = \frac{4.995\ Q_{sd}\ G_d}{1-B_{ws}}$$

$$p = \frac{0.04585\ P_s M_s}{T_s}$$

Calculation Equations

EPA Method 3A

$$C_d = \frac{1}{n} \sum_{i=1}^{n} X$$

$$C_w = C_d * (1-B_{ws})$$

$$E_{o2} = C_d \text{ X DSCFM X } 0.049850$$

$$E_{co2} = \text{Cd X DSCFM X } 0.06856$$

WHERE:

X	=	O_2 or CO_2 Concentration, ppmw, one-minute integration values.
n	=	Number of one-minute integrations per run.
C_d	=	O_2 or CO_2 Concentration, ppmd
C_w	=	O_2 or CO_2 Concentration, ppmw
DSCFM	=	Volumetric Airflow, Dry Standard Cubic Feet Per Minute
E_{o2}	=	O_2 Emission Rate, lb/hr
E_{co2}	=	CO_2 Emission Rate, lb/hr
0.049850	=	Conversion from % (v/v) to lb/hr and minutes to hours for oxygen
0.06856	=	Conversion from % (v/v) to lb/hr and minutes to hours for carbon dioxide

Calculation Equations

EPA Method 5

$$V_{std} = 17.647\ V_m\ Y \left[\frac{P_b + \Delta H/13.6}{T_m} \right]$$

$$V_w = 0.047070\ V_{lc}$$

$$B_{ws} = \frac{V_w}{V_w + V_{std}}$$

$$C_s = 15.432 \left[\frac{M_n}{V_{std}} \right]$$

$$C_s = 272.22 \left[\frac{M_n\ P_s}{T_s\ V_w + V_{std}} \right]$$

$$M_p = 0.00857\ C_s\ Q_{sd}$$

$$I = 0.09450 \left[\frac{T_s\ V_m}{P_s\ V_s\ A_n\ \phi\ (1-B_{ws})} \right]$$

Calculation Equations

Volatile Organic Compound Calculations

$$C_{voc} = \frac{m_{voc}}{V_{std}}$$

$$C_{ppm} = \frac{C_{voc} \times 24.04}{MW_{voc}}$$

$$E_{voc} = (6.242 \times 10^{-8}) \times 60 \times C_{voc} \times DSCFM$$

Where:

C_{voc}	=	Volatile Organic Compound Concentration, mg/dscm
C_{ppm}	=	Volatile Organic Compound Concentration, PPM v/v
DSCFM	=	Volumetric Airflow, Dry Standard Cubic Feet Per Minute
E_{voc}	=	Volatile Organic Compound Emission Rate, LB/HR
m_{voc}	=	Mass of Volatile Organic Compound Collected, µg
MW_{voc}	=	Molecular Weight of Volatile Organic Compound
V_{std}	=	Standard Volume of Air Sample, liters
(6.242×10^{-8})	=	Conversion From mg/dscm To LB/CF
60	=	Conversion From Minutes to Hours

Calculation Equations

EPA Method 201A

$$V_{std} = 17.647\ V_m\ Y \left[\frac{P_b + \blacktriangle H/13.6}{T_m} \right]$$

$$V_w = 0.047070\ V_{lc}$$

$$B_{ws} = \frac{V_w}{V_w + V_{std}}$$

$$C_s = 15.432 \left[\frac{M_n}{V_{std}} \right]$$

$$C_s = 272.22 \left[\frac{M_n\ P_s}{T_s\ V_w + V_{std}} \right]$$

$$M_p = 0.00857\ C_s\ Q_{sd}$$

$$I = 0.09450 \left[\frac{T_s\ V_m}{P_s\ V_s\ A_n\ \phi\ (1-B_{ws})} \right]$$

Calculation Equations

EPA Method 201A Continued

$$D_{p50} = \sqrt{\frac{18\mu\, ¥\, \pi\, D_c^3}{4\, C\, p\, Q}}$$

Where:

D_{p50} = 50% effective cutoff diameter of particle, cm
μ = gas viscosity, poise = $63 + 0.40\ T\ 10^{-6}$
¥ = dimensionless inertial impaction parameter, 0.076
D_c = jet diameter, cm
C = Cunningham slip correction factor

$$= 1 + \frac{2L}{D_p}\left[1.257 + 0.40e^{-1.10\frac{D_p}{L}}\right] = 1 + \frac{2L}{D_p}(1.257)$$

P = particle density, 1 gm/cm^3 for aerodynamic diameters

Calculation Equations

EPA Method 201A Continued

Q = actual gas flow rate, cm^3/sec

L = mean free path length for gas molecules

$$L = \frac{\mu\,(82.057)\,T}{0.499\,P\,M\,\sqrt{\frac{8\,R\,T}{\pi\,M}}}$$

Where:

P = Pressure = 1 ATM

M = Molecular weight of gas = 28.9 for air

R = 8.31×10^7

μ = Gas viscosity = $63 + 0.40\,T\,10^{-6}$

T = Temperature in °K

To solve the equation for D_{p50}, you must first compute μ, then substitute μ into the equation for L, and then substitute L into the equation for C. Since C is dependent upon D_{p50}, several iterations are normally required to solve for the proper C to use in the equation for D_{p50}.

A sample calculation of the cutpoint at 70°F and a flow rate of 0.75 CFM follows:

1. $\mu = (63 + 0.40\,T) \times 10^{-6} = [63 + (0.4)\,(294)] \times 10^{-6}$

   $= 1.81 \times 10^{-4}$ poise

2. $$L = \frac{\mu\,(82.057)\,T}{0.499\,P\,M\,\sqrt{\frac{8RT}{\pi\,M}}}$$

Calculation Equations

EPA Method 201A Continued

3. $$C = \frac{2L}{D_{p50}} (1.257) = 1 + \frac{.164 \times 10^{-4}}{D_{p50}}$$

4. $$D_{p50} \sqrt{\frac{18 \mu \text{¥} \pi D_c^3}{4 C p Q}}$$

$$D_{p50} \sqrt{\frac{18 (1.81 \times 10^{-4}) (.076) (3.14) (1.23)^3}{(4) \quad 1 + \frac{.164 \times 10^{-4}}{D_{p50}} \quad (1) (354)}}$$

$$D_{p50} \sqrt{\frac{120 \times 10^{-8}}{1 + \frac{.164 \times 10^{-4}}{D_{p50}}}}$$

Substituting D_{p50} = 10 micrometers into the right hand side of the equation, we get:

$$D_{p50} = \sqrt{100.3 \times 10^{-8}} = 0.001 \text{ cm} = 10 \text{ micrometers}$$

APPENDIX D

PROCESS DATA

OPERATING DATA SUMMARY FOR PROCESS SOURCES

Company Name: MINNESOTA CORN PROCESSORS
Date of Performance Test: DECEMBER 20, 1994
Summary Prepared By: _____ (Signature)

A. Equipment & Operating Data

1. Process Equipment No./Ident. EMISSION POINT NOS. 7-17

2. Process Equipment Description SIX (6) FERMENTERS AND ONE (1) BEER WELL

3. Process equipment operating under normal operating conditions? YES
   If not, explain _____

1. Process rate during the test (specify units ; amount of raw material or finished product per hour, wet or dry basis)
   Run 1. 60.33 GPM Run 2. 60.43 GPM Run 3. 62.14 GPM

B. Instrument Data on Process Equipment

Include copy of production records or instrumentation which indicates rate of production or operation of the equipment, i.e. units per hour, lbs. per hour, pressure, air flow, etc.

C. Air Pollution Control Equipment

1. Type of control equipment WET SCRUBBER

2. Air pressure drop (range during test)
   Run 1. _____ Run 2. _____ Run 3. _____

3. Air flow (range during test)
   Run 1. 2479 ACFM Run 2. 2270 ACFM Run 3. 2190 ACFM

4. Was the control equipment operating normally? YES
   If not, explain _____

5. Data and procedures of last major maintenance/cleaning of control equipment
   TEST PORTS WERE INSTALLED.

NOTE: This form provides only a summary of the operating conditions during the performance test. Additional and more detailed records are required to meet the requirements of Minn. Rule pt. 7017.2035, subp. 3. The record of operating conditions must also be certified in accordance with Minn. Rule pt. 7017.2040, subp. 5. This form is to be submitted as part of the performance test report.

OPERATING DATA SUMMARY FOR COMBUSTION SOURCES

Company Name: MINNESOTA CORN PROCESSORS
Date of Performance Test: DECEMBER 21, 1994
Summary prepared by: _____ (Signature)

A. Fuel Input

1. Itemize all fuels and materials that are added to the combustion process during the test period. Attach ultimate/proximate analysis of the fuel.

TEST __	FUEL TYPE & ORIGIN (e.g. Eastern Coal)	RATE OF FUEL INPUT (list units)	MOISTURE CONTENT (as received)	HEAT CONTENT (e.g. BTU/LB, BTU/GAL) (as received)	HEAT INPUT (10^6 BTU/HR)
Run 1	NAT. GAS	*			
Run 2	NAT. GAS	*			
Run 3	NAT. GAS	*			

2. Are the above fuels substantially the same as those normally burned ? YES
   If not, explain _____

3. Are the above fuels normally burned in the proportions shown above ? YES
   If not, explain _____

4. Describe any changes anticipated for procurement of fuels within the next twelve (12) months.
   N/A

B. Equipment & Operating Data:

1. Furnace No. EMISSION POINT NO. 2
2. Furnace Manufacturer: ZURN
3. Type of Firing: LOW - NOX BURNER
4. Was the furnace operated under normal operating conditions? YES
   If not, explain _____
5. Specify normal soot blowing frequency: N/A
   a) source operating time blowing soot: _____ minutes/shift
   b) number of shifts per day _____

* SEE ATTACHED CHART RECORD FOR STEAM PRODUCTION.

6.. Specify soot blowing times during the test: start _____ end _____
_____ _____
_____ _____

When was the last time before the test that you blew soot:
(date & time) _____

7. Specify normal ash-pulling frequency:
   a) source operating time pulling ashes: _____ *minutes/shift*
   b) number of shifts per day _____

8. Specify ash pulling times during the test: start _____ end _____
_____ _____
_____ _____

When was the last time before the test that you pulled ashes:
(date & time) _____

9. Date and procedures of last maintenance/cleaning of the boiler (please attach records)
_____

C. Instrument Data

1. Include a copy of chart records during test for the combustion efficiency indices (CO, O_2, C combustibles, steam flow, air flow, etc.) Label as appropriate.

D. Air Pollution Control Equipment

1. Type of control equipment N/A

2. Air pressure drop (range during test)
   Run 1._____Run 2._____Run 3._____

3. Air flow (range during test)
   Run 1._____Run 2._____Run 3._____

4. Was the control equipment operating normally? _____
   If not, explain_____

5. Date and procedures of last maintenance/cleaning of control equipment._____
_____
_____

NOTE: This form provides only a summary of the operating conditions during the perfor test. Additional and more detailed records are required to meet the requirements of Minn. 7017.2035. The record of operating conditions must also be certified in accordance with Rule pt. 7017.2040, sub. 5. This form is to be submitted as part of the performance test re

Natural Gas Boiler Process Conditions

12/21/94

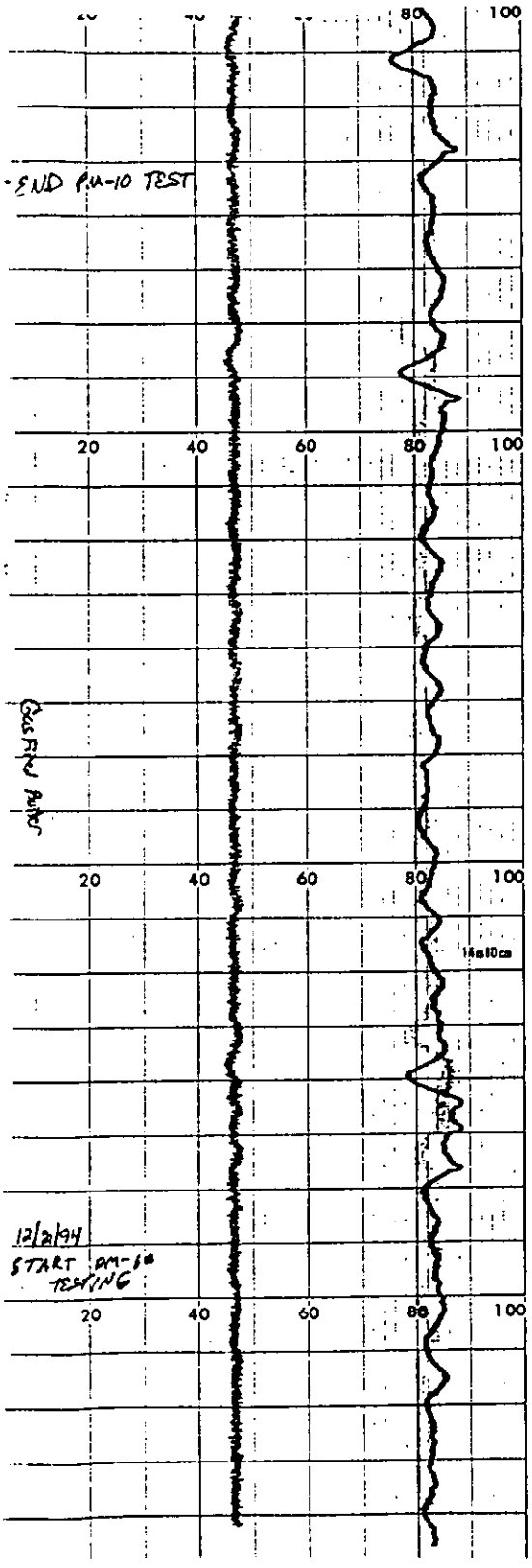
Time	Steam Production #/Hr
13:00	154,800
13:15	154,800
13:30	147,600
13:45	154,800
14:00	158,400
14:15	158,400
14:30	154,800
14:45	162,000
15:00	155,700
15:15	147,600
15:30	148,500
15:45	151,200
16:00	148,500
16:15	158,400
16:30	154,800
16:45	148,500
17:00	151,200
17:15	147,600
17:30	147,600
17:45	159,300
18:00	154,800
18:15	154,800
18:30	155,700
18:45	152,100
19:00	154,800
19:15	152,100
19:30	154,800
19:45	152,100
20:00	154,800
20:15	151,200
20:30	148,500
20:45	151,200
21:00	147,600
21:15	154,800
21:30	146,400
21:45	151,200
22:00	151,200
22:15	151,200
22:30	147,600
22:45	151,200
23:00	151,200
23:15	151,200
23:30	146,400
23:45	151,200
24:00	151,200

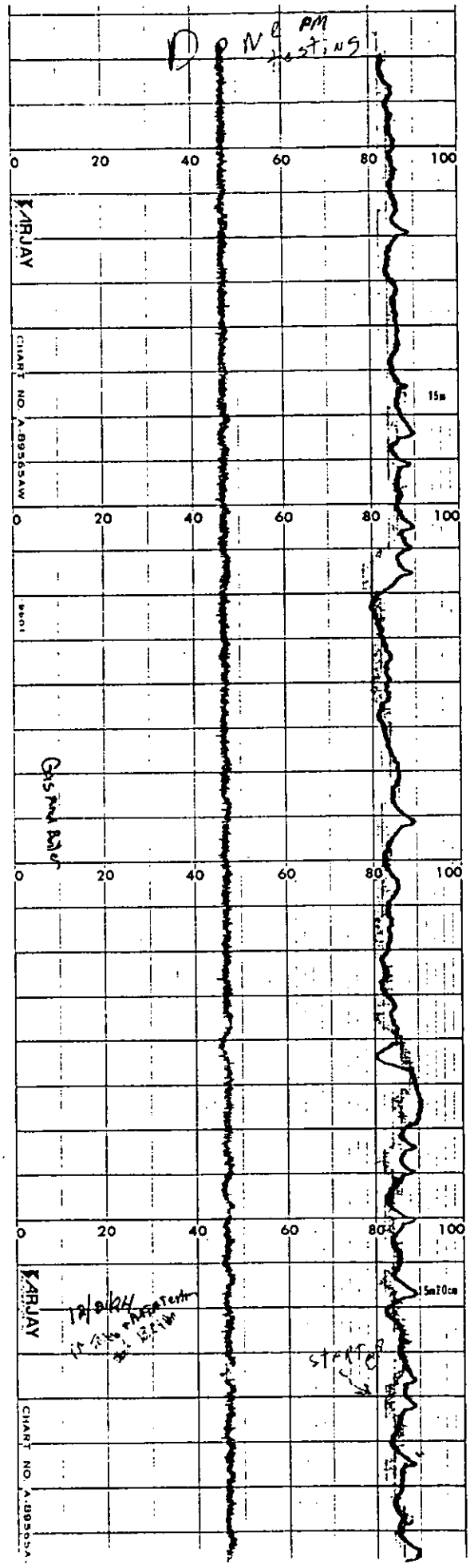
Test Start

PM10

Test end

ave 150,600 #/hr


END PM-10 TEST
0
20
40
60
80
100
Gas Fired Auto
12/2/94
START PM-10 TESTING


PM
0
20
40
60
80
100
EARJAY
CHART NO. A-8995SAW
15m
Gas Fired Boiler
12/8/94
started
CHART NO. A-8995SA

APPENDIX E

TEST PLAN

Nova
Environmental Services, Inc.

S.B. Cummings
President

J.E. Findley
Chief Executive Officer

December 14, 1994

Mr. Craig Averman
Compliance Determination Unit
Air Quality Division
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155-3898

RE: **MINNESOTA CORN PROCESSORS**
MARSHALL, MINNESOTA
REVISED STACK TEST PLAN
AIR EMISSION PERMIT NO. 1939-91-0T-2

Dear Craig:

On behalf of Minnesota Corn Processors (MCP), Nova Environmental Services, Inc. hereby submits this Stack Test Plan for compliance emission testing for the CO_2 Scrubber and Natural Gas fired Boiler at Marshall, Minnesota. The revised test plan includes particulate matter and visible emissions testing for the natural gas fired boiler.

Please call me at 448-9393 or Mr. Daniel Andersen at (402) 564-6353 if you have any questions regarding this plan.

Sincerely,

NOVA ENVIRONMENTAL SERVICES, INC.

Donald J. Scheele, P.E.
Air Quality Specialist

c. D. Andersen - MCP

Enclosure

Suite 400 Hazeltine Gates 1107 Hazeltine Boulevard Chaska, MN 55318
612/448-9393 FAX 448-9572

TEST PLAN FOR MISCELLANEOUS INDUSTRIAL SOURCES

Date test plan was written or revised: **Revised December 14, 1994**

Scheduled test date(s): **December 19 - 21, 1994**

PART I. GENERAL INFORMATION

1. Permittee: **Minnesota Corn Processors**
400 West Main Street, Suite 201
Marshall, MN 56258

2. Permittee contact person: **Mr. Daniel Andersen**
Title: **Environmental & Safety Manager**
Telephone No.: **(507) 532-9653**

3. Permit File No.: **1939**

4. Reason for testing: **Air Permit No. 1939-91-OT-2**
Compliance Demonstration for
CO_2 Scrubber & Natural Gas fired Boiler

5. Physical Description of emission points to be tested:

Fig. 1 - Inlet/Outlet Port Locations (CO_2 Scrubber)
Fig. 2 - Stack Port Location (Natural Gas fired Boiler)

6. Physical location of emission points to be tested:

Fig. 3 - Stack and Building Location

7. Testing Company Contact Person: **Donald Scheele**
Testing Company: **Nova Environmental Services, Inc.**
Telephone No.: **(612) 448-9393**

8. Date when the test plan was discussed and agreed upon with the permittee, or indicate if a pre-test meeting is needed:

(To be determined)

PART II. TESTING REQUIREMENTS

1. The following is a description of the Pollutant to be tested, and applicable emission limit, and the applicable rule or regulation for each emission limit:

Emission Point	Pollutant	Emission Limit	Applicable Rule	Method	Run Length
EP No. 2: Natural Gas fired Boiler	PM-10	0.0029 lb/MMBtu	40 CFR 52.21	EPA Methods 1, 2, 3, 4, & 201A	3, 1 Hour Runs
EP No. 2: Natural Gas fired Boiler	PM	0.0048 lb/MMBtu	40 CFR 52.21	EPA Methods 1, 2, 3, 4, & 5	3, 1 Hour Runs
EP No. 2: Natural Gas fired Boiler	Visible Emissions	20% Opacity	MN Rules Part 7005.0330, subpt. 2	EPA Method 9	1, 1-Hour Run
EP Nos.7-17: 12 Fermenters and Beer Well	Total Organic Compound(TOC)	Reduce emissions of TOC (less methane & ethane) by 98%	40 CFR Part 60, Subpt. RRR	EPA Method 1, 2A, 3B, 4, and 18	3, 1-Hour Runs at the CO_2 Scrubber Inlet/Outlet

Operating condition of sources tested:

1. Specify operating conditions at the time of the test for each source being tested. Specify if the source has to be tested under more than one combination of operating conditions.

   a) Process rates: **The emission units will be operated as close to 100% of capacity as possible during testing.**

   b) Physical parameters: **Not Applicable.**

   c) Chemical parameters: **The wet scrubber provides $\geq$98% removal efficiency of VOCs in the process air stream.**

2. If batch process, specify at what time within the batch should the test be conducted as a function of the emission rate profile.
   Not Applicable.

Operating Data to be Recorded during the Test:

1. Operating conditions of each source tested and its associated pollution control equipment will be documented in the test report. Documentation of operating conditions includes all parameters listed in Part III.

   Operating conditions of the process will be included in the test report using a completed Operating Data Summary for Process Sources form.

2. The following is a detailed description of the procedure for fuel sampling and analysis to be followed for the applicable emission unit.

   The boiler uses natural gas as fuel. Fuel sampling is not required.

PART III. OPERATING CONDITIONS

1. For each process unit to be tested the following will be specified:

EP#	Process Equipment Description	Process Rate/ Operating Conditions During Test	Control Equipment Description	Control Operating Parameter During Test
2	Natural Gas fired Boiler	Max. Heat Input 178.73 million Btu/Hr	Not Applicable	Not Applicable
7 -17	12 Fermenters & Beer Well	Max. Ethanol Production 70 gallons/min.	2 Wet Scrubbers in series	Scrubber water flowrate

2. Explanation of why the proposed test conditions are considered to be the worst case in accordance with part 7017.2025, subpart 2:

Emission Point No.	Rationale for Worst Case
2: Natural Gas fired Boiler	100% Capacity
7 - 17: 12 Fermenters & Beer Well	100% Capacity

3. For each process unit listed in section III.1. above, the following are the normal range of process or operating rates for each emission unit:

Emission Point No.	Normal Range of Process or Operating Rates
2: Natural Gas fired Boiler	95% of capacity
7 - 17: 12 Fermenters & Beer Well	60 gallons/min.

4. For each piece of process and control equipment listed in section III.1. above, the following are the descriptions of how air pollution control and process equipment will be monitored:

Emission Point No.	Description of How This Will Be Monitored During Testing
2: Natural Gas fired Boiler	Fuel monitoring instrumentation
7 - 17: 12 Fermenters & Beer Well	Process instrumentation

EP#	Air Pollution Control Description	Description of How This Will Be Monitored During Testing
2: Natural Gas fired Boiler	Not Applicable	Not Applicable
7 - 17: Fermenters & Beer Well	2 Wet Scrubbers in Series	The scrubber water flowrate will be continuously monitored during testing.

5. If emission point tested shares a stack, indicate the operating conditions of other emission units during testing.

Not Applicable

PART IV. TEST METHODS

1. Listed below in section 2., are the methods to be used for this test.

2. The following is a description of the number of test runs, length of test runs, and sampling rate of each pollutant.

Emission Point No.	Method	No. of Runs	Run Length
2: Natural Gas fired Boiler	1, 2, 3, 4, & 201A	3	1 Hour
2: Natural Gas fired Boiler	1, 2, 3, 4, & 5	3	1 Hour
2: Natural Gas fired Boiler	9	1	1 Hour
7 - 17: Fermenters & Beer Well	1, 2A, 3B, 4, & 18	3	1 Hour

A. EPA Method 1 for the location of sampling ports and points.

A check for cyclonic flow will be performed prior to the first run at the inlet and outlet of the control system. Documentation of the check for cyclonic flow will be provided in the test report.

B. EPA Method 2 or 2A for determination of stack velocity and volumetric flowrate.

Three determinations: one measurement concurrently with each test run.

C. EPA Method 3 or 3B for gas composition analysis.

Three Determinations: one integrated sample taken concurrently with each test run.

D. EPA Method 4 for the determination of moisture in flue gases.

Three Determinations: one measurement concurrently with each test run.

E. EPA Method 5 for the determination of particulate matter emissions:

Three Determinations: one measurement concurrently with each test run.

F. EPA Method 9 for the determination of visible emissions:

One Determination: one measurement at the outlet of the boiler stack outlet.

G. EPA Method 18 for the determination of Organic Compound Concentrations.

Three Determinations: one measurement concurrently with each test run for ethanol, methanol, ethyl acetate, and acetaldehyde. These pollutants were selected based on previous testing conducted at the Minnesota Corn Processors - Columbus plant for a similar system.

H. EPA Method 201A for the determination of particulate matter less than 10 microns:

Three Determinations: one measurement concurrently with each test run.

3. Reference to any compliance document, federal regulation, or Minnesota rule or statute requiring use of specific methods or procedures, shall be stated in this section.

Testing will be conducted in accordance with EPA Reference Methods in Title 40, Code of Federal Regulations, Part 60, Appendix A and applicable Minnesota Rules.

4. If any alternate or equipment methods are proposed, include a summary of the reasons for the proposal.

Not applicable.

5. For a non-reference test method, include a statement of the detection limit and degree of accuracy of that method at the expected emission rate and under the conditions of the performance test.

No non-reference test methods are proposed.

PART V. CEMS RELATIVE ACCURACY

Not Applicable.

PART VI. OTHER

1. Pollutant(s) to be tested are reported as one or more of the following:

   - **PM-10 Concentration - pounds per million BTU (lb/million BTU)**
   - **PM Concentration - lb/million BTU**
   - **TOC Concentration - parts per million by volume (wet basis)**
   - **TOC Reduction Efficiency - percent (%) less methane and ethane**
   - **TOC, PM, & PM-10 Mass Rate - pounds per hour (lbs/hour)**

2. List any special averaging times for emission limit if applicable:

   Not Applicable

3. Testing schedules.

12/19/94 - Monday	12/20/94 - Tuesday	12/21/94 - Wednesday
Travel to site. Equipment set-up.	Natural Gas fired Boiler Testing	CO2 Scrubber Testing.

4. Description and date of last maintenance work done before the test.

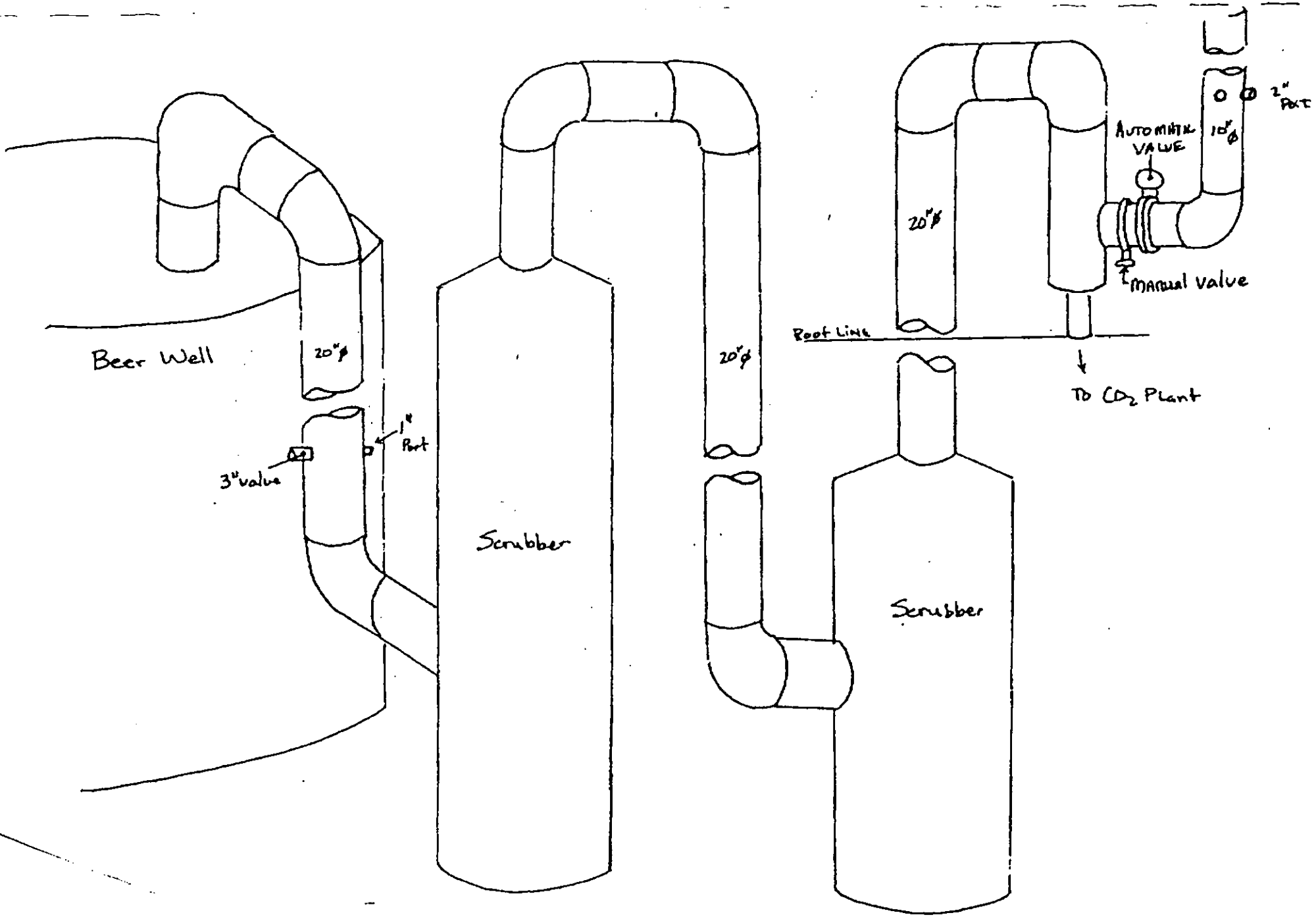
   Normal maintenance is performed on the two CO_2 scrubbers on a routine basis.

5. One complete test report will be submitted within 45 days after the date of the test to the MPCA, Air Quality Division, Compliance Determination Unit. The report will include a signed copy of the Certifications Required for Performance Test Reports form.

   The 45 day due date is February 4, 1995.

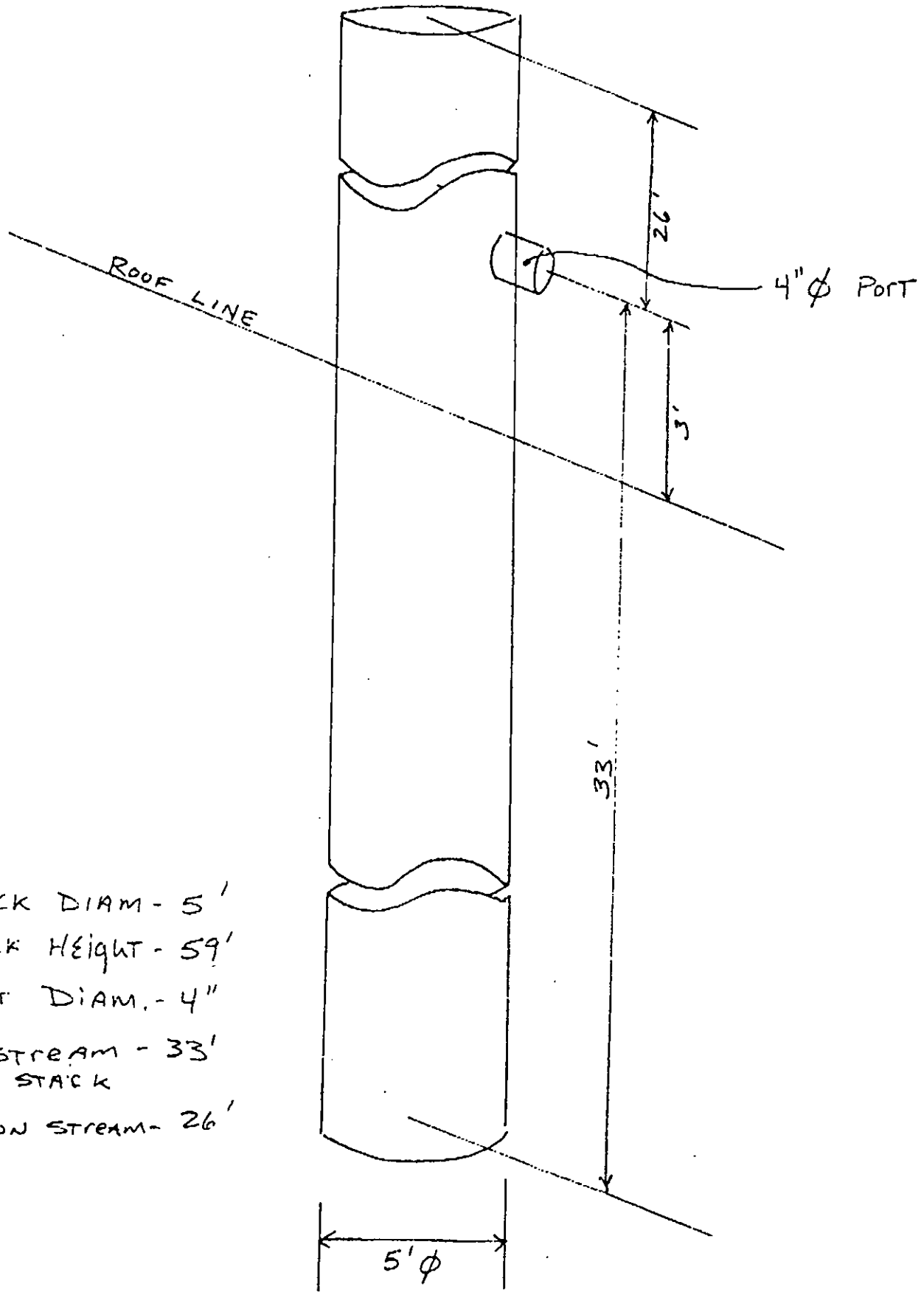
6. One microfiche copy of the test report will be submitted within 105 days after the date of the test to the MPCA, Air Quality Division, Compliance Determination Unit.

   The 105 day due date is April 5, 1995.

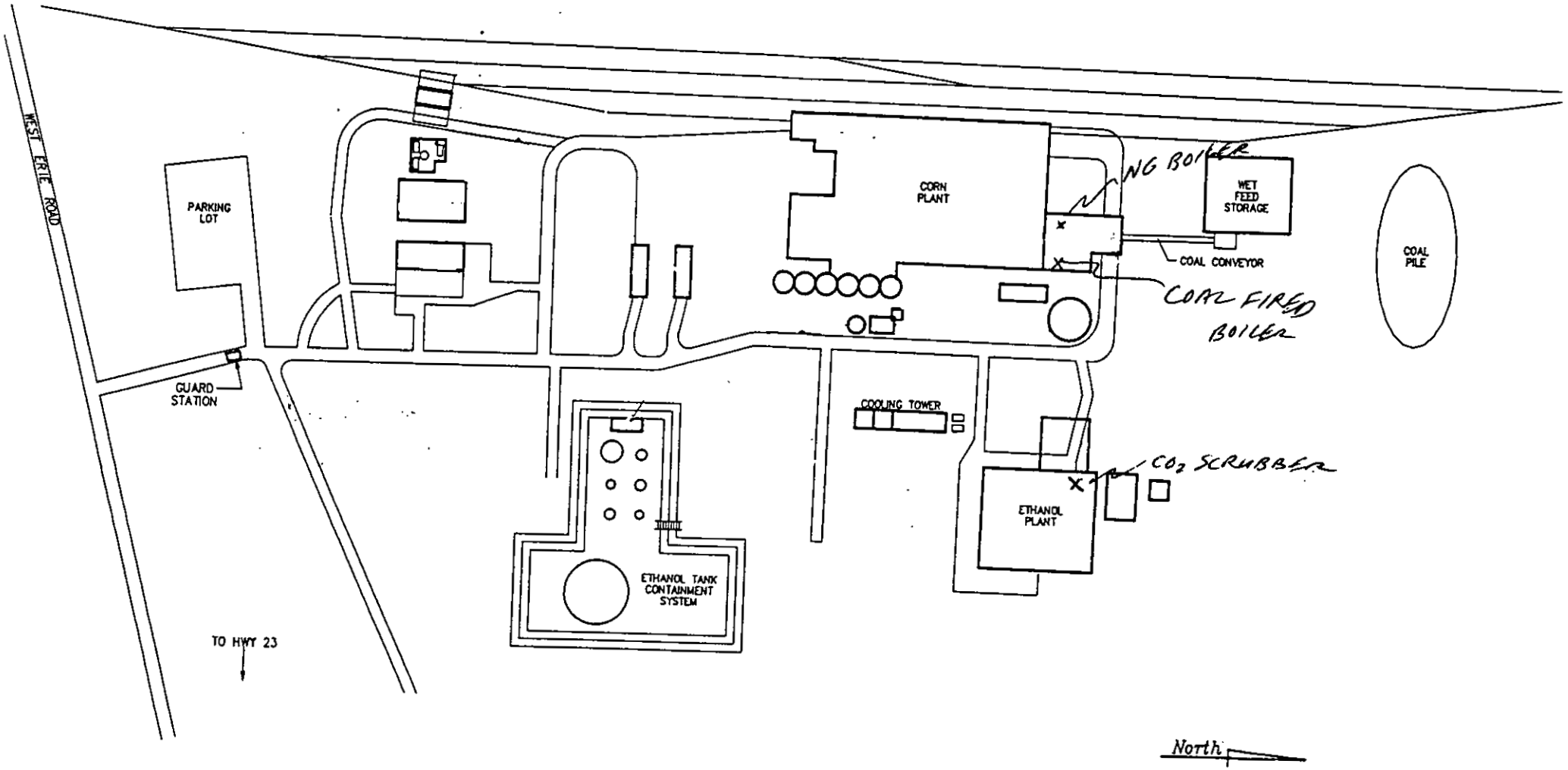


Not Drawn to Scale
12-9-94

GAS FIRED BOILER STACK
MARSHALL, MN.



STACK DIAM - 5'
STACK HEIGHT - 59'
PORT DIAM. - 4"
UPSTREAM - 33'
STACK
DOWN STREAM - 26'



SITE DIAGRAM
MINNESOTA CORN PROCESSORS

M1143/M93-098

Nova Environmental Services, Inc.

Minnesota Pollution Control Agency

January 5, 1995

RECEIVED
JAN 0 6 1995

Mr. Dan Andersen
Environmental & Safety Manager
Minnesota Corn Processors
400 West Main Street, Suite 201
Marshall, Minnesota 56258

RE: December 9, 1994, Test Plan Submittal for the December 19-21, 1994, Performance Test on the Natural Gas Boiler (Emission Point No. 2) and the Fermenters / Beer Well (Emission Point No. 7-17)

Dear Mr. Andersen:

This letter, which also grants a shortened notification period, and its enclosures conclude the pretest requirements for the Minnesota Corn Processors (Company) facility located in Marshall, Minnesota, as discussed during the telephone conference call between yourself, Don Scheele of Nova Environmental, Janelle Jacobson and myself of the Minnesota Pollution Control Agency (MPCA) of December 16, 1994.

The Air Quality Division (AQD) staff of the MPCA has reviewed the submittal, and has approved the test plan with the following provisions:

1. As discussed during the pretest conference call and pursuant to Special Condition 2.4.2.1 of Air Emission Permit No. 1939-91-OT-2, once compliance has been demonstrated, the Company will be limited to the steam and ethanol production rates achieved during the performance tests. The Company has been informed the facility must operate at worst case conditions as defined by Minn. Rules pt. 7017.2025, subp. 2. Worst case scenario for natural gas boiler (EP# 2) has been identified as highest achievable rate of steam production averaged over the 3 test periods. The natural gas boiler has a manufacturer's rated capacity of 150,000 lbs/hr of steam. Worst case scenario for the fermenters/beer well (EP# 7-17) has been identified to be maximum capacity of ethanol production. The Company indicated the maximum ethanol production to be approximately 62-63 gallons/minute. **The Company understands upon completion of the performance tests, the natural gas boiler may not be operated at a steam production rate greater than 82,000 lb/hr as achieved during the July 22, 1992, performance test.**

2. The Company will record the steam production and fuel usage at 15 minute intervals during the particulate matter and particulate matter as PM10 performance tests. The Company will record CO_2 production to ethanol, the water flow rate of the packed tower scrubbers, and the water flow rate of sieve tray column CO_2 scrubber during the EPA Method 18 performance test. The Company will also supply the amount of corn processed and all other related feed material used during processing for each of the above mentioned tests.

3. The Company/Testing firm will field verify the port locations for emission points 2 and 7-17 before performance testing will continue.

4. The Company indicated a change in the order of testing. As of the pretest meeting, the testing for the fermenters/beer well will be conducted on Tuesday, December 20, 1994, and the boiler will be conducted on Wednesday, December 21, 1994.

5. The Company indicated all gases produced by the fermenters/beer well will be vented through discharge stack. The CO_2 Plant will be cut off from receiving any of the gases from the fermenters/beer well during the performance testing.

These provisions are modifications to the test plan, and are to be incorporated into the proposed test.

Copies of the Operating Data Summary For Combustion Sources, Operating Data Summary For Process Sources, Certifications Required For Performance Test Reports, and Microfiche Submittal forms are enclosed. These forms will help you to comply with the submittal requirements of Minn. Rules pts. 7017.2035 and 7017.2040. **A copy of the test plan, including this letter, must be included as part of the performance test report.**

Please remember that it is not the Testing Consultant's responsibility to submit the test report or microfiche copy of the test report or to certify that the microfiche submitted is an exact copy of the original test report by the deadlines specified in the applicable compliance document (i.e. permit, stipulation agreement, administrative penalty order, etc.). The responsibility for these submittals lies solely with the Company.

If you have any questions regarding this letter or the enclosures, please contact me at (612)297-8301.

Sincerely,

Craig D. Averman
Performance Test Coordinator
Compliance Determination Unit
Compliance and Enforcement Section
Air Quality Division

CDA:jch

Enclosures

cc: Janelle Jacobson, MPCA Marshal Regional Office
Greg Sicms, AQD
AQD File No: 1939

APPENDIX F

TEST CERTIFICATION

CERTIFICATIONS REQUIRED FOR PERFORMANCE TEST REPORTS

NOTE: All performance test reports must contain a certification by the responsible parties that the test results have been reported accurately, that the field data is a true representation of the sampling procedures, and that the process data is a true indicator of the operating parameters of the emissions unit at the time of the performance test. (Ref. Minn. Rules pt. 7017.2040). Performance test results will not be accepted without certification of the report..

1. Certification of sampling procedures by the team leader of the personnel conducting the sampling procedures:

"I certify under penalty of law that the sampling procedures were performed in accordance with the approved test plan and that the data presented in this test report are, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below."

Signature: Dwayne A. Smith — Printed Name of Person Signing: DWAYNE A. SMITH
Title: AIR QUALITY SPECIALIST — Date: 1/31/95

2. Certification of analytical procedures by the person responsible for the laboratory analysis of field samples:

"I certify under penalty of law that the analytical procedures were performed in accordance with the requirements of the test methods and that the data presented for use in the test report were, to the best of my knowledge and belief, true, accurate, and
complete. All exceptions are listed and explained below."

Signature: Michael L. Willey — Printed Name of Person Signing: MICHAEL L. WILLEY
Title: LABORATORY TECHNICIAN — Date: 1/31/95

3. Certification of test report by the senior staff person at the testing company who is responsible for compiling and checking the test report:

"I certify under penalty of law that this test report and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the test information submitted. Based on my inquiry of the person or persons who performed sampling and analysis relating to the performance test, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below."

Signature: Paul C. Luna — Printed Name of Person Signing: PAUL C. LUNA
Title: AIR QUALITY SPECIALIST — Date: 1/31/95

4. Certification of test report by owner or operator of the emission facility:

"I certify under penalty of law that the information submitted in this test report accurately reflects the operating conditions at the emission facility during this performance test and describes the date and nature of all operational and maintenance activities that were performed on process and control equipment during the month prior to the performance test. Based on my inquiry of the person or persons who performed the operational and maintenance activities, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below."

Signature: _____ — Printed Name of Person Signing: _____
Title: _____ — Date: _____

TABLE 1

Minnesota Corn Processors
Marshall, Minnesota
Scrubber Inlet

Nova Environmental Services, Inc.
Project No. M4M-020

EPA Method 2 -- Determination of Stack Gas Velocity and Volumetric Flow Rate

Test No. 1	Run 1	Run 2	Run 3	Average
Date of Run	20-Dec-94	20-Dec-94	20-Dec-94	
Start Time	1210	1530	1730	
End Time	1230	1550	1750	
Stack Dimensions (in.)	22.0	22.0	22.0	
Cross Sectional Area (sq. ft)	2.6	2.6	2.6	
Pitot Tube Coefficient	0.840	0.840	0.840	0.840
Barometric Pressure (in. Hg)	29.80	29.80	29.80	29.80
Duct Static Pressure (in. H2O)	0.16	0.15	0.15	0.15
Avg. Effluent Gas Temp. (F)	66	63	65	65
Effluent Gas Moisture (% v/v)	6.39	6.37	7.33	6.70
Dry Molecular Weight (lb/lb-mole)	38.89	40.52	40.90	40.10
Wet Molecular Weight (lb/lb-mole)	37.56	39.09	39.22	38.62
Avg. Gas Velocity (ft/sec)	35.39	34.49	34.39	34.76
Volumetric Flow Rate				
Actual (acfm)	5,606	5,462	5,447	5,505
Standard (scfm)	5,608	5,496	5,459	5,508
Dry Standard (dscfm)	5,250	5,146	5,058	5,151

TABLE 2

MINNESOTA CORN PROCESSORS
MARSHALL, MINNESOTA
SCRUBBER INLET

Nova Environmental Services, Inc.
Project No. M4M-020

EPA Method 18 -- Determination of Volatile Organic Compound Emissions

Test No. 1	Run 1	Run 2	Run 3	Average
Date of Run	20-Dec-94	20-Dec-94	20-Dec-94	
Start Time	1343	1648	1845	
End Time	1443	1748	1945	
Duration (min)	60	60	60	
Stack Volumetric Flow Rate				
Actual (acfm)	5,606	5,462	5,447	5,505
Standard (scfm)	5,608	5,496	5,459	5,521
Dry Standard (dscfm)	5,250	5,146	5,058	5,151
Concentration (ppmw)				
ETHYL ACETATE	131	44	18	64
ACETALDHYDE	53	468	25	182
METHANOL	10	10	10	10
ETHANOL	1,595	75,020	1,169	25,928
Mass Rate (lb/hr)				
ETHYL ACETATE	10.849	3.565	1.433	5.282
ACETALDHYDE	2.168	18.930	0.991	7.363
METHANOL	0.312	0.306	0.304	0.308
ETHANOL	68.860	3173.872	49.116	1097.283
TOTAL	82.189	3196.673	51.844	1110.235

ND = NOT DETECTED