ECOLOGY AUDITS, INC.
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(214) 350-7893
Subsidiary of Core Laboratories, Inc.

STACK EMISSIONS SURVEY
FOR
U.S. GYPSUM, PERLITE MILL
DRYER STACK
GRANTS, NEW MEXICO

AUGUST 1979

Reference 7

FILE NUMBER EA 7922-17

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STACK EMISSIONS SURVEY
U.S. GYPSUM PERLITE MILL
DRYER STACK
GRANTS, NEW MEXICO
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INTRODUCTION

Ecology Audits, Inc., Albuquerque, New Mexico, conducted a stack emissions survey of the U.S. Gypsum Perlite Mill located in downtown Grants, New Mexico on U.S. 66, on 15-16 August 1979. The purpose of these tests was to determine the concentrations of particulate matter being emitted to the atmosphere via the Dryer Stack.

The sampling followed the procedures set forth in the Appendix to the Code of Federal Regulations, Title 40, Chapter I, Part 60.

Company Address:

Box 216
Grants, New Mexico 87020
Phone: (505)287-4211

Plant Superintendent:
Mr. Russ Stokes

Personnel Conducting Tests:

John C. Bokich - Division Manager
Steve Meyers - Environmental Field Technician
Jim Bednarz - Environmental Field Technician

EID Personnel Observing Tests:

Jimmy Romero - Environmental Scientist II
Mario Romero - Environmental Technician II

SUMMARY OF RESULTS

Dryer Stack

The emissions of particulate matter from the stack were equal to 34.5 pounds per hour based on averaging the three tests.

SUMMARY OF RESULTS

Run Number	1	2	3
Stack Flow Rate - ACFM	15176	16236	15650
Stack Flow Rate - DSCFM*	8275	9238	8866
% Water Vapor - % Vol.	14.5	12.9	12.4
% CO_2 - % Vol.	1.4	1.2	1.6
% O_2 - % Vol.	19.6	19.6	18.6
% Excess Air @ Sampling Point	---	---	---
Particulates			
Probe, Cyclone & Filter Catch			
grains/dscf*	0.5150	0.4340	0.4295
grains/cf @ Stack Conditions	0.2799	0.2461	0.2425
lbs/hr	36.5	34.4	32.6

*29.92 "Hg, 68°F

DISCUSSION OF RESULTS

The test for particulates appeared to be valid representations of the actual emissions during the testing. The indicative parameters calculated from the field data were in close agreement. The moisture percentages for the three tests were within 9.3 percent of the mean value.

The measured flow rates (Qs) for the tests were within 5.9 percent of the mean value. The rates of sampling for the three tests were within the specified limits of the isokinetic rate, the greatest deviation being 4.2 percent.

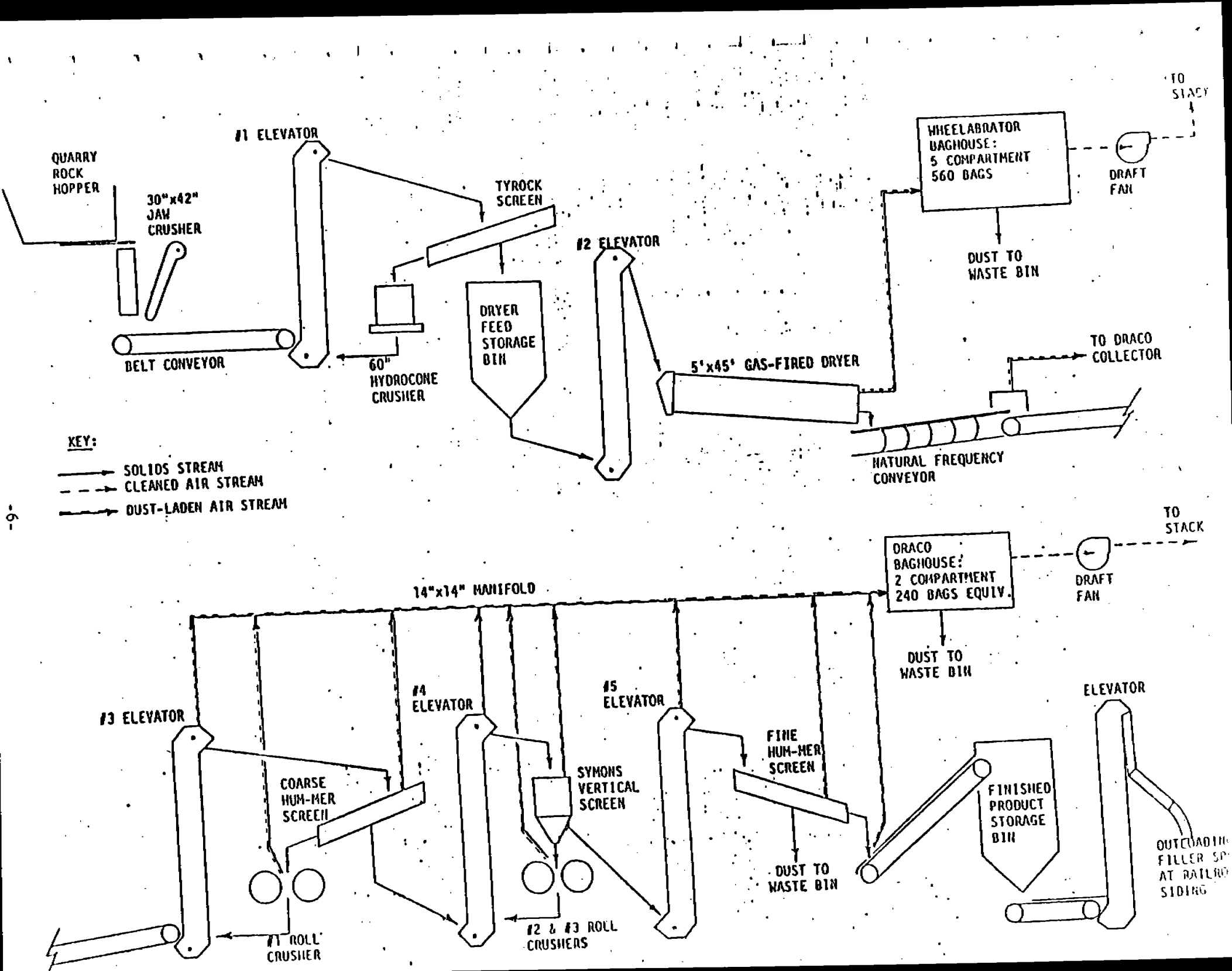
The calculated emissions (pounds per hour) showed a range of -5.5 percent to +5.8 percent variation from the mean value.

DESCRIPTION OF PROCESS OEPRATION

Quarry rock is reduced to 3-inch mesh by a jaw crusher. Crushed rock is then lifted by elevator to a tyrock screen which sits on top of a storage bin. Rock less than 3/4-inch is sifted into the storage bin. Larger material is routed through a hydrocone crusher then back to the tyrock screen.

Surface moisture is removed by a gas-fired rotary-dryer. Exhaust gases from the dryer maintain a temperature of 175°-200°F at the stack exit. Hot rock leaving the dryer is allowed to cool on a 20-foot long natural frequency conveyor. The rock is then lifted by elevator and dropped through two coarse hum-mer screens. Larger material passes over the screens into the #1 roll crusher, then is routed back to the two coarse hum-mer screens.

Material now enters the symons vertical screens. Oversize material is sent through the #2 and #3 roll crusher, then sent back to the symons vertical screens. The material is then sent by elevator to the fine hum-mer screen. The finished product is placed in a storage bin where it remains until shipment by rail.


QUARRY ROCK HOPPER
30"x42" JAW CRUSHER
BELT CONVEYOR
#1 ELEVATOR
TYROCK SCREEN
60" HYDROCONE CRUSHER
DRYER FEED STORAGE BIN
#2 ELEVATOR
5'x45' GAS-FIRED DRYER
WHEELABRATOR BAGHOUSE: 5 COMPARTMENT 560 BAGS
DRAFT FAN
TO STACK
DUST TO WASTE BIN
TO DRACO COLLECTOR
NATURAL FREQUENCY CONVEYOR
KEY:
SOLIDS STREAM
CLEANED AIR STREAM
DUST-LADEN AIR STREAM
14"x14" MANIFOLD
DRACO BAGHOUSE: 2 COMPARTMENT 240 BAGS EQUIV.
DRAFT FAN
TO STACK
DUST TO WASTE BIN
#3 ELEVATOR
#4 ELEVATOR
#5 ELEVATOR
COARSE HUM-MER SCREEN
SYMONS VERTICAL SCREEN
FINE HUM-MER SCREEN
DUST TO WASTE BIN
FINISHED PRODUCT STORAGE BIN
ELEVATOR
#1 ROLL CRUSHER
#2 & #3 ROLL CRUSHERS

DESCRIPTION OF SAMPLING LOCATION

The sampling location on the Dryer Stack is approximately 30 feet above ground. The stack is circular and approximately 70 feet in height.

The sampling ports are located approximately 10 feet 6 inches above the stack inlet (3.94 stack diameters) and approximately 46 feet 00 inches upstream of the stack outlet (17.25 stack diameters).

SAMPLING AND ANALYTICAL PROCEDURES

The sampling followed the procedures set forth in the Appendix to the Code of Federal Regulations, Title 40, Chapter I, Part 60.

A preliminary velocity traverse was made at each of the two ports on the Dryer Stack in order to determine the uniformity and magnitude of the flow prior to testing. The 18 traverse points were sampled from each of the two ports for a total of 36 traverse points. Samples of two-minute duration were taken isokinetically at each of the 36 traverse points using an EPA-type, glass-lined probe.

On all tests, the sampling train was leak-checked at 15 inches of mercury vacuum before each test, and leak-checked after each test at the highest vacuum reading recorded during the test. This was done to predetermine the possibility of a diluted sample. Also before and after each test the pitot tube lines were checked for leaks under both a vacuum and pressure. The lines were also checked for clearance and the manometer zeroed before each test. Particulate emissions were calculated from gravimetric analysis using the "front-half" collections of the EPA-type sampling train.

DESCRIPTION OF TESTS

Personnel from Ecology Audits arrived at the plant at 1030 hours on Wednesday, 15 August 1979. The equipment was set up and preliminary data were taken. By 1630 hours the equipment had been secured for the night.

On Thursday, 16 August 1979, work began at 0800 hours. By 0848 the first test was underway. This test was completed at 1006 hours. The second test began at 1115 hours and was completed at 1231 hours. The third and final test began at 1340 hours and was completed at 1454 hours.

The equipment was moved off the stack and loaded into the mobil laboratory. The samples were recovered and taken to Core Laboratories in Albuquerque for further analysis and evaluation. Operations at the U.S. Gypsum Plant in Grants, New Mexico, were completed at 1630 hours on Thursday, 16 August 1979.

John C. Bokich
Manager
Albuquerque Division

APPENDICES

A. Location of Sampling Points.

B. Source Emissions Calculations

C. Calibration of Equipment

D. Field Testing Data

E. Chain of Custody

F. Particulate Analysis Data

G. Plant Operation Data

H. Resumes of Test Personnel

APPENDIX A

Location of Sampling Points

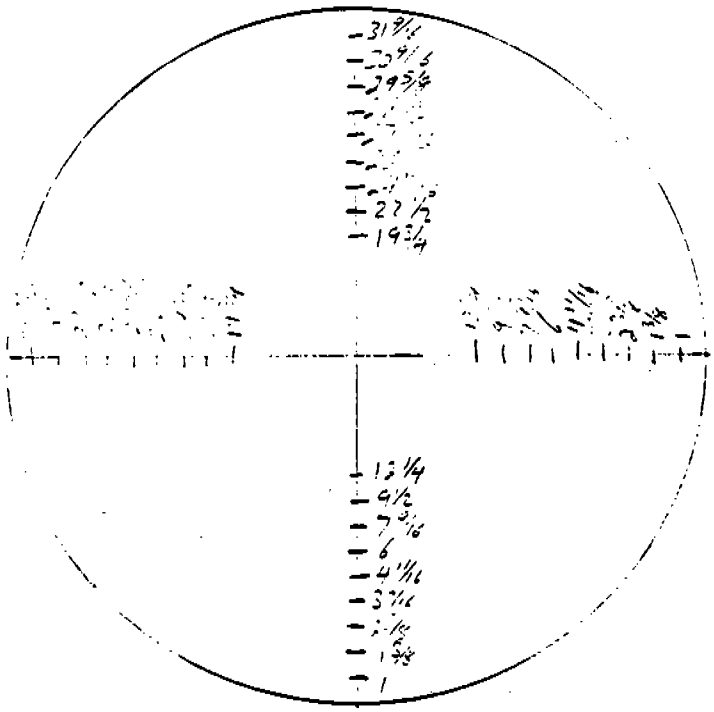
Dryer Stack

The sampling ports are located 126 inches (3.94 stack diameters) downstream from the inlet to the stack and 552 inches (17.25 stack diameters) upstream from the outlet of the stack. The locations of the sampling points were calculated as follows:

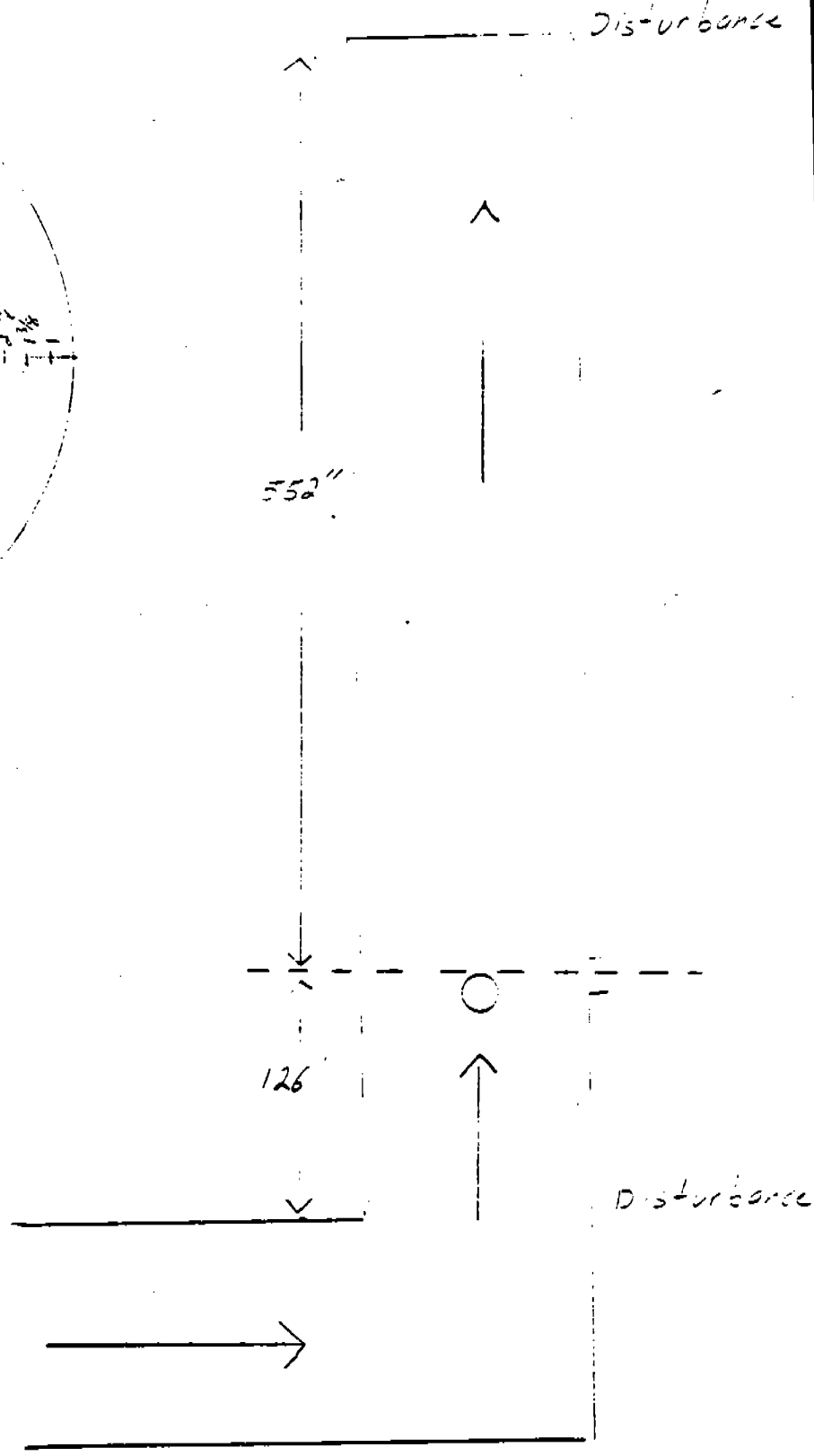
Inside Stack Diameter 32 inches

Port and Wall Thickness 2 1/4 inches

Point No.	Percent of Diameter From Wall	Distance From Wall (inches)
1	1.4	1
2	4.4	1 3/8
3	7.5	2 3/8
4	10.9	3 7/16
5	14.6	4 11/16
6	18.8	6
7	23.6	7 9/16
8	29.6	9 1/2
9	38.2	12 1/4
10	61.8	19 3/4
11	70.4	22 1/2
12	76.4	24 7/16
13	81.2	26
14	85.4	27 5/16
15	89.1	28 1/2
16	92.5	29 5/8
17	95.6	30 9/16
18	98.6	31 9/16



Distance From Wall
(Inches)



APPENDIX B

Source Emissions Calculations

STACK EMISSIONS SURVEY
U.S. GYPSUM PERLITE MILL
DRYER STACK
FILE NUMBER EA 7922-17

SOURCE EMISSIONS CALCULATIONS

Symbol	Description	Units	1	2	3
Run No.			1	2	3
Date			16 Aug 79	16 Aug 79	16 Aug 79
Begin			0848	1115	1340
End			1006	1231	1454
P_b	barometric pressure	"Hg Abs. (mm Hg)	23.05 (585)	23.06 (585)	23.05 (585)
P_m	orifice pressure drop	"H_2O (mm H_2O)	0.86 (21.8)	1.02 (25.8)	1.09 (27.6)
V_m	volume dry gas sampled @ meter conditions	$ft.^3$ (m^3)	46.097 (1.306)	49.991 (1.416)	52.129 (1.477)
T_m	avg. gas meter temp.	°F (°C)	56 (12.5)	66 (14.7)	70 (15.6)
$V_{m_{std}}$	volume dry gas sampled @ standard conditions*	dscf (dscm)	36.444 (1.032)	38.808 (1.099)	40.154 (1.137)
V_w	total H_2O collected, impingers & silica gel	ml	130.9	122.0	120.8
$V_{w_{gas}}$	volume water vapor collected @ standard conditions*	scf (scm)	6.1785 (0.1678)	5.7584 (0.1564)	5.7018 (0.1549)
%M	moisture in stack gas by volume	%	14.5	12.9	12.4

* 68°F, 29.92 "Hg (20°C, 760 mm Hg)

Source Emissions Calculations
U.S. Gypsum
Dryer Stack
File Number EA 7922-17

Symbol	Description	Units			
M_d	mol fraction of dry gas	---	0.8550	0.8708	0.8757
CO_2		%	1.4	1.2	1.6
O_2		%	19.6	19.6	18.6
N_2		%	79.0	79.2	79.8
%EA	excess air @ sampling point	%	---	---	---
MW_d	molecular weight of dry stack gas	lb/lb-mole (g/g-mole)	29.01 (29.01)	28.98 (28.98)	29.00 (29.00)
MW	molecular weight of stack gas	lb/lb-mole (g/g-mole)	27.41 (27.41)	27.56 (27.56)	27.63 (27.63)
ΔP_s	velocity head of stack gas	"H_2O (mm H_2O)	0.49 (12.4)	0.58 (14.7)	0.53 (13.4)
T_s	stack temperature	°F (°C)	179 (94.1)	164 (86.3)	170 (89.4)
P_s	stack pressure	"Hg Abs. (mm Hg)	-0.50	-0.50	-0.54
V_s	stack velocity @ stack conditions	fpm (m/sec)	2718 (13.81)	2908 (14.77)	2803 (14.24)
A_s	stack area	$in.^2$ (m^2)	804 (0.52)	804 (0.52)	804 (0.52)
Q_s	dry stack gas volume @ standard conditions*	DSCFM (dscm/hr)	8275 (14059)	9238 (15695)	8866 (15063)
Q_a	actual stack gas volume @ stack conditions	ACFM (m^3/hr)	15176 (25784)	16236 (27585)	15650 (26589)

* 68°F, 29.92 "Hg (20°C, 760 mm Hg)

Source Emissions Calculations
U.S Gypsum
Dryer Stack
File Number EA 7922-17

Symbol	Description	Units			
T_t	net time of test	min.	72	72	72
D_n	sampling nozzle diam.	in. (m)	0.249 (0.007)	0.249 (0.007)	0.249 (0.007)
%I	percent isokinetic	%	101.4	96.7	104.2
m_f	particulate - probe, cyclone and filter	mg	1218.77	1093.65	1119.96
m_t	particulate - total	mg	---	---	---
C_{an}	particulate - probe, cyclone and filter	gr/dscf* (g/dscm)	0.5150 (1.1793)	0.4340 (0.9938)	0.4295 (0.9836)
C_{ao}	particulate - total	gr/dscf* (g/dscm)	---	---	---
C_{at}	particulate - probe, cyclone and filter @ stack conditions	gr/cf (g/m^3)	0.2799 (0.6410)	0.2461 (0.5635)	0.2425 (0.5552)
C_{au}	particulate total @ stack conditions	gr/cf (g/m^3)	---	---	---
C_{aw}	particulate - probe, cyclone and filter	lbs/hr (kg/hr)	36.52 (16.57)	34.36 (15.59)	32.63 (14.80)
C_{ax}	particulate - total	lbs/hr (kg/hr)	---	---	---

* 68°F, 29.92 "Hg (20°C, 760 mm Hg)

APPENDIX C

Calibration of Equipment

Equipment	Calibration Factor	Date of Calibration
Pitot Tube #1	0.753	17 Apr 79
Probe Tip #I-3	0.249	14 Aug 79
Dry Gas Meter #7	1.005	11 Jul 79
Stack Unit Orifice #7		11 Jul 79

DATE 14 MAY 79

BY BUSHART

Pitot No.	ΔP Std.	ΔP	ΔP Range (±)	$Cp = \sqrt{\frac{(.99)^2 \times \Delta P\text{Std.}}{\Delta P}}$
3-1	.10	.57		.4146
	.20	.62		.5623
	.30	.68		.6576
	.40	.76		.7152
	.50	.84		.7635
	.60	.99		.7767
	.70	1.05		.8083
	.80	1.16		.8443
	.90	1.31		.8516
	1.00	1.50		.8453
	1.25	1.90		.8030
	1.50	2.20		.8175
	2.00	3.00		.8153
	2.50	3.66		.8125
	3.00	3.91		.8671
	~~4.00~~			
	~~5.00~~			

AVG = .7527

DRY GAS METER CALIBRATION
By a Wet Test Meter

Dry Gas Meter No.: 7 Average DGMCF: 1.005
Date of Calibration: 11 July 1979 Initials: RF
Date of Expiration: —

$$DGMCF = \frac{0.03531\,6\ (WTMD)\ (WTMCF)\ (Tm)}{(DGMD)\ (Ta)}$$

Wet Test Meter Calibration Factor (WTMCF): 1.001

Run Number	1	2	3	4	5	6
H - Orifice Pressure, "H_2O	0.5	0.5	0.6	0.6		
DGM Final, cf	651.862	662.677	673.795	684.831		
DGM Initial, cf	641.207	652.000	663.000	674.000		
DGM Difference, cf	10.655	10.677	10.795	10.831		
Wet Test Meter Diff., liter	300.570	301.735	304.035	304.512		
Ambient Temp. Initial, °F	74	76	76	76		
Ambient Temp. Final, °F	76	76	76	76		
*Ta - Mean Ambient Temp, °R	535	536	536	536		
DGM Temp. In Initial, °F	78	79	80	81		
DGM Temp. Out Initial, °F	78	79	80	82		
DGM Temp. In Final, °F	79	80	81	82		
DGM Temp. Out Final, °F	81	82	83	93		
Tm - Mean DGM Temp., °R	539	540	541	542		
DGMCF	1.0047	1.0065	1.0049	1.0050		

Average DGMCF: 1.005

Standard Deviation: 0.0008

*°R = ~~(°C + 273.15) 1.8~~

°F + 460

APPENDIX D

Field Testing Data

Job No. 96-17 Particulate

Job Name US Gypsum

Run No. 1

Location Dryer Stack

Date 16 Aug 1979

Operator Bokich, Meyers, Balnaz

Sample Box No. _____ Meter Box No. _____

Read and record at the start of each test point.

Ambient Temp °F 65

Assumed Moisture % 11%

Probe Length 3'

C Factor ✓ 1.6949 to reference

Initial Leak @ 15.0 "Hg = 0.000 cfm

Final Leak @ 4.2 "Hg = 0.012 cfm

Point	Clock Time	Dry Gas Meter, CF	ΔPs Pitot in. H_2O	Pm Orifice ΔH in. H_2O Desired	Pm Orifice ΔH in. H_2O Actual	Pump Vacuum In. Hg Gauge	Ts Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Tm Dry Gas Temp °F Inlet	Tm Dry Gas Temp °F Outlet	Ps Stack Press. In. H_2O
A-18	0848	909.000	0.75	1.30	1.30	4.0	184	247	248	48	51	52	-0.50
17	0850	910.62	0.65	1.10	1.10	3.8	185	257	257	43	51	53	-0.50
16	0852	912.12	0.66	1.10	1.10	3.8	185	260	262	42	51	53	-0.50
15	0854	913.57	0.70	1.20	1.20	3.9	183	249	265	42	51	54	-0.50
14	0856	915.08	0.70	1.20	1.20	4.0	183	235	264	42	51	54	-0.50
13	0858	916.58	0.75	1.30	1.30	4.1	181	232	260	43	51	55	-0.50
12	0900	918.14	0.70	1.20	1.20	4.1	184	231	261	46	52	55	-0.50
11	0902	919.72	0.70	1.20	1.20	4.1	182	241	256	48	52	55	-0.50
10	0904	921.22	0.65	1.10	1.10	4.0	182	251	253	51	52	56	-0.50
9	0906	922.90	0.60	1.00	1.00	3.5	182	258	253	57	52	56	-0.50
8	0908	924.10	0.58	0.98	0.98	3.5	184	259	252	59	53	57	-0.50
7	0910	925.44	0.52	0.90	0.90	3.2	184	258	256	61	53	57	-0.50
6	0912	926.74	0.51	0.89	0.89	3.2	185	260	254	65	53	57	-0.50
5	0914	928.03	0.55	0.94	0.94	3.2	183	263	255	67	53	57	-0.50
4	0916	929.35	0.51	0.84	0.84	3.2	183	264	254	71	54	58	-0.50
3	0918	930.65	0.50	0.88	0.88	3.2	182	263	254	73	54	58	-0.50
2	0920	931.94	0.45	0.79	0.79	3.0	181	263	259	74	54	58	-0.50
1	0922	933.20	0.42	0.73	0.73	2.9	179	262	263	71	54	58	-0.50

Pitot Tube Calibration Factor C_p 0.753

Volume Collected V_m 46.097 ft^3

Water Collected V_w _____ ml

Time of Test T_t 72 min.

Baro. Press., P_b 23.05 "Hg

Probe Tip Dia. D_n 0.249 in.

% CO_2 1.4 %CO 0.0

% O_2 19.6 % N_2 79.0

Pitot Tube No. 1

Probe Tip No. I-3

V_m = Dry Gas Meter Calibration Factor 1.045 X 46.868

[Dry Gas Meter Reading _____ ft^3 - (T_t _____ min X Leak Rate _____]

Run No. 1 — PARTICULATE FIELD DATA

Location Dryer Stack

Date 16 Aug 79

int	Clock Time	Dry Gas Meter, CF	A Ps Pitot in. H_2O	Pm Orifice ΔH in. H_2O Desired	Pm Orifice ΔH in. H_2O Actual	Pump Vacuum In. Hg Gauge	Ts Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Tm Dry Gas Temp °F Inlet	Tm Dry Gas Temp °F Outlet	Ps Stack Press. In. H_2O
ND	0924	934.360	/	/	/	/	/	/	/	/	/	/	/
18	0930	934.360	0.46	0.80	0.80	3.5	191	267	249	64	[illegible]	[illegible]	-0.50
17	0932	935.56	0.48	0.84	0.84	3.5	191	259	249	59	54	57	-0.50
16	0934	936.82	0.48	0.84	0.84	3.2	181	259	251	58	55	58	-0.50
15	0936	938.13	0.46	0.84	0.84	3.5	179	260	257	58	55	58	-0.50
14	0938	939.32	0.49	0.85	0.85	3.5	177	260	262	57	55	58	-0.50
13	0940	940.59	0.48	0.84	0.84	3.5	176	261	260	61	57	57	-0.50
12	0942	941.81	0.49	0.85	0.85	3.5	174	265	265	58	56	55	-0.50
11	0944	943.09	0.51	0.89	0.89	3.8	173	263	252	57	56	59	-0.50
10	0946	944.38	0.51	0.84	0.84	3.8	173	268	250	58	56	59	-0.50
9	0948	945.65	0.55	0.95	0.95	3.5	173	274	259	58	55	60	-0.50
8	0950	947.00	0.51	0.89	0.89	3.2	173	249	250	60	56	60	
7	0952	948.24	0.39	0.68	0.68	2.9	175	233	245	61	56	61	
6	0954	949.59	0.25	0.43	0.43	2.0	176	242	254	61	57	61	
5	0956	950.51	0.25	0.43	0.43	2.0	174	245	255	61	57	61	
4	0958	951.45	0.22	0.38	0.38	2.0	176	247	262	60	57	61	
3	1000	952.33	0.20	0.35	0.35	1.9	166	250	267	60	57	61	
2	1002	953.22	0.20	0.35	0.35	1.9	168	250	272	61	57	61	
1	1004	954.07	0.15	0.27	0.27	1.7	173	258	261	61	57	61	
ND	1006	954.868	/	/	/	/	/	/	/	/	/	/	/
ALL													

Job No. U. Gypsum — Particulate FIELD DATA

Job Name [illegible]

Run No. 2

Location Dryer Stack

Date 16 Aug '94

Operator Bokich, Meyers, Bedwarz

Sample Box No. 6 Meter Box No. 7

Read and record at the start of each test point.

Ambient Temp °F 70

Assumed Moisture % 4

Probe Length 3'

C Factor 1.6949 to reference

Initial Leak @ 15.0 "Hg = 0.000 cfm

Final Leak @ 7.0 "Hg = 0.000 cfm

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O (ΔPs)	Orifice ΔH in. H_2O (Pm) Desired	Orifice ΔH in. H_2O (Pm) Actual	Pump Vacuum In. Hg Gauge	Stack Temp °F (Ts)	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp °F (Tm) Inlet	Dry Gas Temp °F (Tm) Outlet	Stack Press. In. H_2O (Ps)
A-18	1115	956.080	0.65	1.10	1.10	4.0	171	237	270	57	62	62	-0.50
17	1117	957.50	0.60	1.00	1.00	3.9	175	225	264	51	62	63	
16	1119	958.94	0.77	1.35	1.35	4.3	173	229	260	49	62	63	
15	1121	960.49	0.77	1.35	1.35	4.3	172	230	261	48	62	64	
14	1123	962.13	0.80	1.40	1.40	4.5	172	230	257	46	62	64	
13	1125	963.77	0.78	1.35	1.35	4.3	172	235	255	47	62	65	
12	1127	965.39	0.78	1.35	1.35	4.3	172	248	261	51	62	66	
11	1129	967.39	0.62	1.10	1.10	4.2	172	246	259	53	62	66	
10	1131	968.53	0.56	0.97	0.97	4.0	172	251	260	56	62	66	
9	1133	969.91	0.51	0.90	0.90	3.9	170	250	265	60	63	67	
8	1135	971.22	0.53	0.92	0.92	4.0	170	252	267	63	63	67	
7	1137	972.56	0.54	0.93	0.93	4.0	168	256	267	64	63	67	
6	1139	973.88	0.62	1.10	1.10	4.4	167	258	268	65	64	67	
5	1141	975.36	0.63	1.10	1.10	4.4	166	259	272	68	64	67	
4	1143	976.89	0.65	1.10	1.10	4.4	165	261	272	67	64	68	
3	1145	978.27	0.61	1.05	1.05	4.3	165	263	271	67	64	68	
2	1147	979.71	0.59	1.00	1.00	4.1	165	267	270	65	64	68	
1	1149	981.05	0.51	0.90	0.90	3.9	164	261	268	68	64	68	

Pitot Tube Calibration Factor C_p 0.753

Volume Collected V_m _____ ft^3

Water Collected V_w _____ ml

Time of Test T_t 72 min.

Baro. Press., P_b 23.06 "Hg

Probe Tip Dia. D_n 0.249 in.

% CO_2 1.2 %CO 0.0

% O_2 19.6 % N_2 79.2

Pitot Tube No. 1

Probe Tip No. I-3

V_m = Dry Gas Meter Calibration Factor 1.005 X

[Dry Gas Meter Reading _____ ft^3 - (T_t ____ min X Leak Rate ____

PARTICULATE FIELD DATA

Run No. 2

Location Dryer Stack

Date 16 Aug 79

int	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O	ΔPs / Pm: Orifice ΔH in. H_2O Desired	ΔPs / Pm: Orifice ΔH in. H_2O Actual	Pump Vacuum In. Hg Gauge	Ts: Stack Temp °F	Ts: Probe Temp °F	Ts: Oven Temp °F	Ts: Effluent Temp °F	Tm: Dry Gas Temp °F Inlet	Tm: Dry Gas Temp °F Outlet	Ps: Stack Press. In. H_2O
ND	1151	982.322	/	/	/	/	/	/	/	/	/	/	-0.50
5-18	1155	982.322	0.55	0.95	0.95	3.5	162	228	232	63	64	67	
17	1157	983.43	0.55	0.95	0.95	3.5	162	234	228	55	64	67	
16	1159	984.25	0.52	0.90	0.90	3.5	160	247	230	55	64	68	
15	1201	986.06	0.52	0.90	0.90	3.2	160	254	232	55	65	69	
14	1203	987.37	0.55	0.95	0.95	3.5	160	254	227	55	65	69	
13	1205	988.71	0.57	0.99	0.99	3.8	160	258	230	55	65	69	
12	1207	990.04	0.62	1.10	1.10	3.8	161	255	241	54	65	69	
11	1209	991.50	0.61	1.05	1.05	3.9	160	253	257	53	66	69	
10	1211	992.92	0.56	0.97	0.97	3.5	160	248	254	53	66	69	
9	1213	994.32	0.54	0.93	0.93	3.5	159	254	266	52	65	69	
8	1215	995.66	0.54	0.93	0.93	3.5	159	258	264	53	66	70	
7	1217	996.92	0.49	0.85	0.85	3.2	158	261	264	52	66	69	
6	1219	998.20	0.52	0.90	0.90	3.5	156	255	269	53	66	69	
5	1221	999.50	0.49	0.85	0.85	3.2	156	251	268	52	66	69	
4	1223	000.85	0.52	0.90	0.90	3.5	155	252	262	53	66	70	
3	1225	002.08	0.49	0.85	0.85	3.2	155	258	260	52	66	70	
2	1227	003.34	0.50	0.86	0.86	3.2	155	262	260	52	66	70	
1	1229	004.61	0.46	0.80	0.80		154	255	257	52	66	69	
END	1231	005.822	—	—	—	—	—	—	—	—	—	—	
ALL													

No. [illegible]

Job Name US Gypsum

Run No. 3

Location Dryer Stack

Read and record at the start of each test point.

Date 16 Aug 79

Operator Bokich, Myers, Bednarz

Sample Box No. 7 Meter Box No. 7

Ambient Temp °F 75

Assumed Moisture % 14

Probe Length 3'

C Factor _____ to reference

Initial Leak @ 15.5 "Hg = 0.004 cfm

Final Leak @ 7.0 "Hg = 0.000 cfm

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O (ΔPs)	Orifice ΔH in. H_2O (Pm) Desired	Orifice ΔH in. H_2O (Pm) Actual	Pump Vacuum In. Hg Gauge	Stack Temp °F (Ts)	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp °F (Tm) Inlet	Dry Gas Temp °F (Tm) Outlet	Stack Press. In. H_2O (Ps)
													-0.54
B-16	1340	7.668	0.47	0.82	0.82	2.5	181	257	249	62	67	68	
17	1342	8.83	0.49	0.85	0.85	2.5	180	249	252	54	67	68	
16	1344	010.12	0.49	0.85	0.85	2.5	178	246	254	52	67	68	
15	1346	011.34	0.55	0.95	0.95	3.0	177	246	260	51	67	68	
14	1348	012.70	0.55	0.95	0.95	2.9	177	243	258	50	67	68	
13	1350	014.05	0.57	0.98	0.98	3.0	177	244	262	52	67	69	
12	1352	015.39	0.59	1.00	1.00	3.0	177	244	265	53	67	69	
11	1354	016.77	0.57	0.98	0.98	3.0	174	246	265	54	67	70	
10	1356	018.14	0.55	0.95	0.95	3.0	177	250	270	55	68	70	
9	1358	019.46	0.53	0.91	0.91	2.9	175	249	269	58	68	70	
8	1400	020.79	0.55	0.95	0.95	3.0	175	242	271	58	68	70	
7	1402	022.15	0.50	0.87	0.87	2.9	173	252	257	59	68	70	
6	1404	023.44	0.52	0.90	0.90	2.9	172	258	255	54	68	70	
5	1406	024.75	0.50	0.87	0.87	2.9	171	256	262	59	68	70	
4	1408	026.07	0.52	0.90	0.90	2.9	171	256	268	60	68	71	
3	1410	027.38	0.53	0.91	0.91	2.9	169	255	259	61	68	71	
2	1412	028.69	0.55	0.95	0.95	3.0	167	253	254	62	68	71	
1	1414	030.06	0.60	1.05	1.05	3.1	165	248	249	61	69	72	

Pitot Tube Calibration Factor C_p 0.753

Volume Collected V_m 52.129 ft^3

Water Collected V_w _____ ml

Time of Test T_t 72 min.

Baro. Press, P_b 23.05 "Hg

Probe Tip Dia. D_n 0.249 in.

% CO_2 1.6 %CO 0.0

% O_2 18.6 % N_2 19.8

Pitot Tube No. 1

Probe Tip No. I-3

V_m = Dry Gas Meter Calibration Factor 1.005 X 51.870

[Dry Gas Meter Reading _____ ft^3 - (T_t _____ min X Leak Rate

Run No. 3

PARTICULATE FIELD DATA

Location Dryer Stack

Date 16 Aug 79

int	Clock Time	Dry Gas Meter, CF	Δ Ps Pitot in. H_2O	Pm Orifice ΔH in. H_2O Desired	Pm Orifice ΔH in. H_2O Actual	Pump Vacuum In. Hg Gauge	Ts Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Tm Dry Gas Temp °F Inlet	Tm Dry Gas Temp °F Outlet	Ps Stack Press. In. H_2O
													-0.59
ND	1416	031.433										71	
18	1418	031.433	0.82	1.40	1.40	3.9	169	240	147	62	69		
17	1420	032.90	0.85	1.50	1.50	4.0	169	231	247	58	68	71	
16	1422	034.60	0.89	1.50	1.50	4.0	168	247	251	57	69	72	
15	1424	036.32	0.90	1.55	1.55	4.1	168	248	256	56	69	72	
14	1426	038.01	0.90	1.55	1.55	4.1	169	246	254	55	69	72	
13	1428	039.72	0.87	1.50	1.50	4.1	169	249	254	55	69	72	
12	1430	041.45	0.82	1.40	1.40	4.0	169	251	258	54	69	73	
11	1432	043.17	0.78	1.35	1.35	4.0	169	246	263	53	69	73	
10	1434	044.76	0.75	1.30	1.35	3.9	168	247	262	53	70	73	
9	1436	046.38	0.68	1.20	1.20	3.8	169	245	263	51	69	73	
8	1438	047.97	0.68	1.20	1.20	3.5	162	246	263	51	70	73	
7	1440	049.57	0.68	1.20	1.20	3.5	168	248	260	51	70	73	
6	1442	051.07	0.65	1.10	1.10	3.5	169	253	263	50	69	73	
5	1444	052.61	0.63	1.10	1.10	3.2	170	255	262	49	70	73	
4	1446	054.11	0.63	1.10	1.10	3.2	170	257	263	50	70	73	
3	1448	055.61	0.59	1.00	1.00	3.0	169	262	261	50	70	73	
2	1450	057.00	0.51	0.89	0.89	2.9	128	267	260	50	70	73	-0.6
1	1452	058.32	0.46	0.80	0.80	2.8	173	270	258	50			
END	1454	059.538											
ALL													

APPENDIX E

Chain of Custody

ECOLOGY AUDITS, INC.

Chain of Custody

Job Number _____

Job Name U.S. Gypsum

Location Fort Dodge, Iowa

Unit Tested Dryer Stack

Date(s) Sampled 16 Aug 79

No. of Tests 3

Sample Containers

Description	No. of Containers	Remarks
Front Wash	2	Front wash
Back Wash	2	Save
Impinger No. 1		
Impinger No. 2		
Impinger No. 3		
Filter Container	2	Dessicate & save

Sample No. 1 Recovered by: JCR Jr Date: 16 Aug 79 Time: 1015 Location: On Site

Sample No. 2 Recovered by: JCR Jr Date: 16 Aug 79 Time: 1321 Location: On Site

Sample No. 3 Recovered by: JCR Jr Date: 16 Aug 79 Time: 1454 Location: On Site

Samples Received by: _____ for Transport Date: 16 Aug 79 Time: 1600

Samples Received at Lab by: _____ Date: 16 Aug 79 Time: 1530

Samples Analyzed by: _____ Date: 16 Aug 79 Time: _____

APPENDIX F

Particulate Analysis Data

JOE # 7922-17

U.S Gypsum Dryer Stock

25 ppm standard absorbance

Sample #		Absorbance	% U_3O_8	Notes
Dryer 1 Filter	Gross wt. .9909 Tare wt. .7769 Spl. wt. 0.2140			Tot mg 1212.7
Dryer 2 Filter	Gross wt. .9506 Tare wt. .7841 Spl. wt. 0.1665			1093.6
Dryer 3 Filter	Gross wt. .9896 Tare wt. .7852 Spl. wt. 0.2044			1119.9
Run 1 Frontwash	Gross wt. 153.7298 Tare wt. 152.7248 Spl. wt. 1.0050	565 ml	0.4 x .565 = - 0.226 + 1005.0 =	1004.7
Run 2 Frontwash	Gross wt. 155.0597 Tare wt. 155.9871 Spl. wt. 0.9274	637 ml	0.4 x .637 = - 0.2548 + 927.1	927.
Run 3 Frontwash	Gross wt. 150.1695 Tare wt. 149.2537 Spl. wt. 0.9158	606 ml	0.4 x .606 = - 0.2424 + 915.8	915
Acetone Blank	Gross wt. 156.6944 Tare wt. 156.6942 0.0002	500 ml. 100% recovery		

APPENDIX G

Plant Operation Data

Date	Daily Production	Hrs. of Operation	Averaged Hourly Producti
16 Aug 79	216 tons	8	27.0 tons

Daily Production records are kept by plant personnel, as well as hours of operation. Hourly production averages were determined by dividing daily production by hours of operation.

APPENDIX H

Resumes of Test Personnel

JOHN C. BOKICH, Manager, Albuquerque Division

Education

M.S. 1975, University of Texas at El Paso, El Paso, Texas, Ecology major. Course training in natural sciences, ecology, plant ecology, mathematical modelling of biological systems, numerical taxonomy, mammalogy, herpetology, biosystematics, and archeobiology.

B.S. 1973, University of Texas at El Paso, Biology major, Geology minor. Course training in plant ecology, genetics, plant taxonomy, animal ecology, anatomy, microbiology, evolutionary theory, vertibrate natural history, animal behavior, physical and historical geology, minerology, petrology, structural geology, oceanography, anthropology, and physical geography.

Graduate work continued in Ph.D. program at North Texas State University, Denton, Texas, 1975-1976. Emphasis in Ecology. Course training in population ecology, reproductive strategies of animals, comparative animal physiology, biometrics, population genetics, physiological ecology and biochemistry.

Professional Memberships

Texas Academy of Science

American Society of Mammologists

Southwestern Association of Naturalists

Air Pollution Control Association

Research Experience

Study of the taxonomic status of pocket gophers by computer analysis of morphological data. Determination of the causes influencing distributional changes of two species of pocket gophers. Study of the ecology and life history of pocket gophers including soil analysis, vegetative analysis, food habits, predation, population densities, and factors affecting distribution.

Study of naturally occurring population of white bass (Morone chrysops) in a north-central Texas reservoir. Study involving life history tactics, reproductive

effort, and bioenergetics of this species. Techniques employed for collecting fish included seining, gill nets, electroshocking, Fyke or hoop nets and angling. Information on cycling of lipid stores and seasonal calorific values for fish were determined. Techniques for lipid extraction and bomb calorimetry employed.

Technical Experience

Since joining Ecology Audits, Inc. during the fall of 1977, Mr. Bokich has been involved extensively in source sampling. He has participated in the sampling of over 200 sources since joining the staff. In the fall of 1978, Mr. Bokich opened a new branch office for Ecology Audits, Inc. in Albuquerque, New Mexico. His responsibilities include client contact and the supervision of all environmental and biological studies, as well as source sampling and ambient air programs.

Worked as independent consultant for an archeological study by Oklahoma State University, identification of faunal remains from the site, 1976.

Laboratory instructor for first and second semesters of General Biology and General Ecology at the University of Texas at El Paso. He assisted in the development of a new freshman biology laboratory manual while performing graduate course work and research, 1973-1975.

Research assistant in study of Anuran dermal ectoparasites at the University of Texas at El Paso, 1974.

Curatorial assistant under Dr. Arthur H. Harris at the Museum of Arid Lands Biology, University of Texas at El Paso. Preparation, identification, classification of museum specimens (mammals, birds, herptiles and fish), 1973.

Laboratory instructor for Zoology and Botany at North Texas State University, 1975-1976.

Bokich

Papers Presented

Distributional changes of Pappogeomys castanops in El Paso County, Texas. 1975 Annual Meeting of the Texas Academy of Science, Huntsville, Texas.

Taxonomic status of some Southwestern pocket gophers. 1976 Annual Meeting of the Southwestern Association of Naturalists, Fort Hays, Kansas.

STEVEN W. MEYERS, Environmental Field Technician

Education

B.S. 1978, New Mexico State University, Las Cruces, New Mexico, degree in Fishery Science. Course training in botany, zoology, invertebrate zoology, parasitology, ecology, genetics, wildlife science, forestry, birds of the Southwest, forest and range mammals, ichthyology, fisheries science, wildlife ecology, wildlife law, advanced fishery science, aquatic entomology, limnology and independent research.

Professional Memberships

Student Chapter, American Fisheries Society

Parent Chapter, American Fisheries Society

Research Experience

Study of the Roundtailed Chub (Gila robustus grahami), in the Gila National Forest of New Mexico. Investigated age and growth of Roundtail Chubs from different areas of the Gila River drainage. Employed electroshocking and netting for collection of fish.

Study of Chubs (Gila sp.) in the Colorado River drainage. Looked at life history data, food habits, spawning, etc., of three species of Chubs including Gila robusta grahami.

Technical Experience

Since joining Ecology Audits, Inc. in January, 1979, Mr. Meyers has been involved extensively in source sampling and environmental and biological studies out of the Albuquerque branch office. He has participated in the sampling of over 25 sources.

Worked as a meteorologist in the U.S. Army between 1971 and 1974. He was stationed in Alaska and White Sands Missile Range, New Mexico.

JAMES C. BEDNARZ, Environmental Field Technician

Education

M.S. 1979, Iowa State University, Ames, Iowa, Wildlife Ecology major. Course training in wildlife habitat management, wildlife management, aquatic birds, waterfowl biology, pesticide ecology, vertebrate behavioral ecology, multivariate statistics, research statistical methods, plant ecology, and dendrology.

B.S. 1976, New Mexico State University, Las Cruces, New Mexico, degree in wildlife biology and Fishery Science. Course training in fishery sciences, limnology, game mammal management, game bird management, game mammal populations, wildlife ecology, mammalogy, ornithology, ichthyology, wildlife administration and law, range management, range communities, experimental statistics, human ecology, entomology, plant taxonomy, invertebrate zoology, parasitology, natural history of vertebrates, genetics, botany, and zoology.

Professional Memberships

Wildlife Society

American Ornithologists' Union

Wilson Ornithological Society

American Fisheries Society

Raptor Research Foundation

Research Experience

Study of the status and habitat utilization of the state endangered Red-shouldered Hawk in Iowa. Potential hawk habitat was identified with computer analyses of land use data. Work included field searches for nests, trapping and banding of hawks, radio telemetry, nesting study, food habits study, small mammal trapping, habitat and vegetation analysis, and multivariate statistical analysis.

Study of potential Peregrine Falcon habitat and eyries in northern New Mexico. Several unknown eyries were located. Productivity at active eyries was monitored. Data were collected on range conditions, recreational impacts, and harassment as they relate to prey densities at Peregrine Falcon eyries.

Study of the distribution, status, and ecology of the state endangered white-sided jackrabbit (Lepus callotis) in New Mexico.

Bednarz

A vehicle was designed for spotlight surveys and night live capture of hares. Work included coordinating capture and marking crews, making night observations, collecting specimens, and conducting habitat and vegetation analysis.

Study of the distribution, abundance, life history, and habitat requirements of the Pecos gambusia (Gambusia nobilis) in New Mexico. Work included sampling a variety of aquatic habitats, mark and recapture study, fecundity study, life history observation, and water quality and habitat analysis.

Study of the validity and the biological justification of aquatic ecosystem models. Model simulations with varied imput parameters were compared to the results of an extensive literature review of aquatic field studies.

Technical Experience

Mr. Bednarz's duties include source sampling and environmental and biological studies out of the Albuquerque branch office.

Employed as a laboratory instructor at Iowa State University, 1976-1978. Taught labs in Fishery Mgt., Icthyology, Wildl. Techniques, Mammalogy, Ornithology, Vert. Biol., Human Anat. / Physio., and Intro. Zoo. Cotaught a seminar course in nongame wildlife management.

Employed as a field assistant by Dr. James J. Dinsmore to assist in age related studies of nesting waterfowl and colonial birds, 1977. Work included surveys of wetlands to locate nesting birds, collecting nest site data, capture and banding of nestlings and young birds.

Awards

1978-1979 Ding Darling Scholarship, 1978 Hawk Mountain Research Award, Honorary student memberships in the American Ornithologist's Union and the Wilson Ornithological Society, 1976 ISU Premium Academic Excellence Award, and 1976 Sigma Xi second place award for undergraduate research at NMSU.

Publications

Bednarz, J. 1978. Red-tailed Hawk migration in western Iowa. Iowa Bird Life 48(4):141-142.

Bednarz, J. C. 1979. Ecology and status of the Pecos gambusia, Gambusia nobilis (Poeciliidae) in New Mexico. Southwestern Naturalist 24(2): In press.

Bednarz

Bednarz, J. 1979. Swainson's Hawk nest in Hardin County. Iowa Bird Life. In press.

Bednarz, J. C. 1979. I. Productivity, nest sites, and habitat of Red-shouldered and Red-tailed hawks in Iowa. II. Status, habitat utilization, and management of Red-shouldered Hawks in Iowa. Unpubl. M.S. Thesis, Iowa State University, Ames. 105 pp. In prep.

Papers Presented

Papers have been presented at the New Mexico Ornithological Society meeting, 1979; the national AOU meeting, 1978; the Western Wildlife Conclave, 1976; and an AFS sectional meeting, 1976.