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TRC Environmental Corporation

Final Report

Compliance Testing of a Landfill Flare at Browning-Ferris Gas Services, Inc.'s Facility in Halifax, Massachusetts

May 1996

RENEE A. VOYT
Permit Coordinator
Gas Services

June 13, 1996

Mr. Christopher Tilden
Regional Engineer
Commonwealth of Massachusetts
Department of Environmental Protection
Southeast Regional Office
20 Riverside Drive
Lakeville, Massachusetts 02347

Re: *Emissions Test Results*
Halifax Landfill Enclosed Flare
Source Number 220

Dear Mr. Tilden:

Enclosed are two copies of the Final Report entitled "Compliance Testing of a Landfill Flare at Browning-Ferris Gas Services, Inc.'s Facility in Halifax, Massachusetts" dated May 1996 for your review. TRC Environmental Corporation performed the tests on April 19 and 22, 1996 in accordance with the original protocol (4S93029) and the revisions to the protocol outlined in my February 21, 1996 letter. Additionally, a sample of landfill gas was analyzed for speciated volatile organic compounds (VOC) as requested by Mr. P.C. Mehta of your staff.

Emissions Summary

The test results demonstrate that emissions of particulate matter, carbon monoxide, hydrogen sulfide, and nitrogen oxides are well below the permitted limits. Additionally, hydrogen chloride (HCl) emissions were measured to be less than one ton per year from the flare. There are no emission limits for HCl, but emissions were measured as requested by the Massachusetts DEP.

VOC emissions during the first 1-hour test run at 1550°F, however, were measured above the permit limit. BFGSI does not believe this run is representative of normal flare operation because the flare had shut down during

the previous evening and likely did not reach a steady operating state prior to the first test. Please allow use of only the second two VOC emissions tests to demonstrate compliance with the permit limits.

VOC Destruction Efficiency

The permit currently requires VOC destruction efficiency of 98 percent. The average VOC destruction efficiency during test runs 2 and 3 was calculated to be 93 percent. However, as stated above, emissions were measured below the permit limits and within the requirements of the recently promulgated New Source Performance Standards (NSPS) for municipal solid waste landfills. NSPS requires that enclosed landfill gas flares reduce non methane organic compound (NMOC) emissions by 98 percent reduction efficiency or to 20 ppmv as hexane. The flare at the Halifax Landfill meets the requirement for emissions reductions to 20 ppmv as hexane. BFGSI proposes to modify the permit for the Halifax Landfill to incorporate the 20 ppm NMOC NSPS requirement rather than the 98 percent NMOC reduction requirement for the enclosed landfill gas flare.

As written in the above referenced February 21, 1996 letter, the flare at Halifax will continue to operate within the temperature conditions tested. The emissions were tested at operating temperatures of 1550°F and 1950°F. If you have any questions regarding the enclosed emissions test report, please call me at (713) 870-7446.

Sincerely,

Renee A. Voyt

RAV:sjc
Enclosure

xc: P.C. Mehta, Massachusetts DEP (w/o enclosure)
Dan Barrett, BFGSI Halifax
File: Halifax/B

bxc: Casey Chambers, John Zink

BFI Halifax Outlet Flow - Determined by Carbon Balance Equation per John Zink Company

Run No.	Inlet Flowrate scf/min	Inlet CO ppm	Inlet CO2 ppm	Inlet CH4 ppm	Inlet TGNMO ppm	Outlet CO ppm	Outlet CO2 ppm	Outlet CH4 ppm	Outlet TGNMO ppm	Outlet Flowrate scf/min
1	1,570	14	409,200	505,000	3,700	10	74,600	8.4	82	19,370
2	1,570	13	407,400	514,000	3,700	21	72,400	0.0	19	20,133
3	1,570	12	405,700	512,000	3,900	13	78,400	0.0	20	18,519

John Zink Company Outlet Flow Carbon Balance Equation:

$$VO = VI \times \frac{(HC + CO + CO2)\ \text{Inlet}}{(HC + CO + CO2 - 300)\ \text{Outlet}}$$

Where:

VO = Volume of outlet, standard condition, dry
VI = Volume of inlet as measured, standard conditions, dry
HC = Concentration of all hydrocarbons reported AS METHANE equivalent in ppm
CO = Concentration of CO in ppm
CO2 = Concentration of CO2 in ppm
300 = Approximate background concentration in ppm of CO2 in the inlet air

TRC Environmental Corporation

Boott Mills South, Foot of John Street
Lowell, Massachusetts 01852
Telephone 508-970-5600
Facsimile 508-453-1995

May 31, 1996

Browning-Ferris Gas Services, Inc.
757 N. Eldridge at Memorial Drive
Houston, TX 77079

Attention: Ms. Renee Voyt
Permit Coordinator

Subject: Final Report for Compliance Testing of BFGSI's Landfill Flare
Located in Halifax, Massachusetts
(TRC Reference No. 20272)

Dear Ms. Voyt:

In accordance with the reporting requirements of the subject program, enclosed herewith are four (4) copies of a Final Report entitled, "**Final Report - Compliance Testing of a Landfill Flare at Browning-Ferris Gas Services, Inc.'s Facility in Halifax, Massachusetts**", dated May 1996.

If you should have any questions regarding this final report, please do not hesitate to call me at (508) 656-3547.

Sincerely,

TRC ENVIRONMENTAL CORPORATION

Michael P. O'Brien
Project Manager
Air Measurements Department

Enclosures

TRC Environmental Corporation

TRC Project No. 20272

May 1996

FINAL REPORT

Compliance Testing of a Landfill Flare at Browning-Ferris Gas Services, Inc.'s Facility in Halifax, Massachusetts

Prepared for

Browning-Ferris Gas Services, Inc.
757 N. Eldridge at Memorial Drive
Houston, Texas 77079

Prepared by

TRC ENVIRONMENTAL CORPORATION
Boott Mills South
Foot of John Street
Lowell, Massachusetts 01852
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SECTION 1
INTRODUCTION

1.1 OVERVIEW

Browning-Ferris Industries, Inc. (BFI) operates a John Zink Company Enclosed Ground Flare at the Halifax Landfill. The waste encapsulated within the landfill decomposes and creates a gas, which primarily consists of methane, carbon dioxide, and trace gases. In an effort to control the air pollution, the landfill gas is directed to and combusted in the enclosed flare system.

Pursuant to the air quality permit issued by the Massachusetts Department of Environmental Protection, an emissions test program was undertaken on the enclosed flare system to demonstrate permit compliance conditions.

TRC Environmental Corporation (TRC) of Lowell, Massachusetts was retained by Browning-Ferris Gas Services, Inc. (BFGSI) to provide sampling and analytical support. The BFGSI Compliance Test Program documents the performance of the enclosed flare system when incinerating the landfill gas. The operation of the system was demonstrated at two operating conditions:

- 1550°F
- 1950°F

Sampling and analysis procedures described in this document were conducted using procedures deemed acceptable by the Massachusetts Department of Environmental Protection (MADEP) and the U.S. EPA. TRC was responsible for the collection and analysis of all flue gas samples.

1.2 SCOPE OF WORK

The test program involved conducting a series of test runs at the inlet and outlet of the enclosed

flare for each condition using EPA Reference Methods. Each inlet test determined the emission rate of oxygen, carbon monoxide, carbon dioxide, methane, non-methane organics, hydrogen sulfide and Btu content. Each outlet test determined the percent Destruction Efficiency for volatile organic carbons (%) and hydrogen sulfide (%), and effluent concentrations for nitrogen oxides, carbon monoxide, sulfur dioxide, methane, total non-methane organics, hydrogen sulfide, HCl, particulate matter, oxygen, and carbon dioxide. Velocity and moisture emissions were also determined during each run.

1.3 REPORT SUMMARY

This report presents a summary of the test procedures and analytical results of the testing conducted on the BFI landfill flare by TRC. Sample analyses were conducted by Chester LabNet of Tigard, Oregon, Performance Analytical Inc. of Canoga Park, California and TRC Environmental Corporation of Lowell, Massachusetts.

Section 2 of this report presents a summary and discussion of the results. Section 3 contains a brief description of the sampling locations. Section 4 contains descriptions of the sampling methodologies that were utilized in the test program and Section 5 presents the analytical methodologies. Section 6 is a presentation of program QA/QC results. Included in the appendices are copies of all sampling and analytical data sheets, CEM and calibration sheets, and facility process data.

SECTION 2

SUMMARY AND DISCUSSION OF RESULTS

This section presents a summary of the emissions testing conducted on BFI's Halifax Landfill Flare System. The flue gas field sampling data sheets are located in Appendix A. Field reduced data sheets can be found in Appendix B. Flue gas analytical data sheets can be found in Appendix C. CEM and calibration data sheets can be found in Appendix D. Equipment calibrations and calibration gas certification sheets can be found in Appendix E. Facility process data can be found in Appendix F.

2.1 OPERATIONAL PARAMETERS

Operational data on the BFI landfill flare system was recorded by a Honeywell Inc. dual channel circular chart recorder. The data generated presented inlet landfill gas flow rate, in standard cubic feet (scfm), and exit flue gas temperature in degree fahrenheit. This can be found in Appendix F.

2.2 COMPLIANCE TEST PARAMETERS

TRC used the following sampling trains to collect flare gas samples from the landfill flare system:

- EPA Method 0050 train to collect HCl and particulate emissions;
- EPA Method 18 to measure hydrogen sulfide and total reduced sulfur content;
- EPA Method 25C to measure methane, total gaseous non-methane organics, oxygen, carbon dioxide, carbon monoxide, Btu content; and
- Transportable Continuous Emissions Monitoring System (TCEMS) to measure CO, NO_x, SO_2, O_2, and CO_2.

The compliance test program consisted of running three test runs at approximately 1550°F and three test runs at approximately 1950°F. TRC conducted emissions testing for HCl/Particulate

Matter at the 1550°F temperature only. The pollutant parameters of NO_x, CO, and SO_2 were measured at the 1950°F temperature only.

On April 22, 1996, TRC waited one hour before starting Run No. 1 at the 1550°F temperature. This was to allow the flare system to stabilize. Based on the results of the testing, it shows that Run No. 1 was not consistent with Run No. 2 and Run No. 3 in regards to the effluent pollutant gas concentrations. This difference may have been the result of additional stabilization time being required on the flare system.

2.3 HYDROGEN CHLORIDE (HCl)

Three 72-minute test runs were conducted isokinetically at the outlet stack of the flare system, using an EPA Method 0050 train for the collection of HCl and particulate emissions. Testing was conducted at the operating temperature of 1550°F. Emission concentrations for HCl are presented in concentration parts per million (ppm), pounds per hour (lbs/hr) and pounds per million Btu (lbs/10^6Btu). Table 2-1 presents the results of the HCl tests.

2.4 PARTICULATE MATTER (PM)

Particulate matter was determined using an EPA Method 0050 train for the collection of HCl and PM emissions. Three 72-minute test runs were conducted isokinetically at the outlet stack of the flare system. Testing was conducted at the operating temperature of 1550°F. Emission concentrations for PM are presented in grains per dry standard cubic feed (gr/dscf), grains/dscf corrected to 7% oxygen (gr/dscf @ 7% O_2), pounds per hour (lbs/hr), and pounds per million Btu (lbs/10^6Btu). Table 2-2 presents the results of the PM tests.

2.5 TOTAL NON-METHANE ORGANICS AS METHANE AND HEXANE

The determination of total non-methane organics as methane and as hexane at the inlet and outlet to the flare system followed EPA Method 25C. Three test runs were conducted at the inlet and

TABLE 2-1. BFGSI - HALIFAX, MA
HYDROGEN CHLORIDE EMISSION SUMMARY @ 1550°F

Parameter	*Units*	04/22/96 *Run 1*	04/22/96 *Run 2*	04/22/96 *Run 3*	*AVERAGE Runs 1-3*	*AVERAGE Runs 2-3*
Sampling Location		**Outlet Stack**	**Outlet Stack**	**Outlet Stack**		
Start Time		11:50	14:30	17:25		
Stop Time		13:29	16:20	18:49		
Net Sampling Time	minutes	72	72	72	72	
Sample Volume	dscf	54.953	45.137	51.592	50.561	
Stack Gas Flow Rate	dscf/hr	1,401,540	1,185,960	1,286,400	1,291,300	
Stack Gas Temperature	°F	1507	1521	1510	1,513	
Stack Gas Moisture	%	8.6	7.8	8.6	8.3	
O_2 Concentration at Stack, % dry	%	12.94	13.48	12.68	13.03	
CO_2 Concentration at Stack, % dry	%	7.46	7.24	7.84	7.51	
HCl Catch	mg	3.37	2.77	2.96	3.03	2.87
HCl Concentration	mg/dscf	0.06	0.06	0.06	0.06	0.06
HCl Concentration	mg/m3	2.17	2.17	2.03	2.12	2.10
HCl Concentration	ppm	1.43	1.43	1.34	1.40	1.38
HCl Emission Rate	lbs/MMBtu	0.003	0.004	0.003	0.003	0.003
HCl Emission Rate	**lbs/hr**	**0.189**	**0.160**	**0.163**	**0.171**	**0.162**

TAB2-1.WK4

TABLE 2-2. BFGSI - HALIFAX, MA
PARTICULATE MATTER EMISSION SUMMARY @ 1550°F

Parameter	*Units*	04/22/96 *Run 1*	04/22/96 *Run 2*	04/22/96 *Run 3*	*AVERAGE Runs 1-3*	*AVERAGE Runs 2-3*
Sampling Location		**Outlet Stack**	**Outlet Stack**	**Outlet Stack**		
Start Time		11:50	14:30	17:25		
Stop Time		13:29	16:20	18:49		
Net Sampling Time	minutes	72	72	72	72	
Sample Volume	dscf	54.953	45.137	51.592	50.561	
Stack Gas Flow Rate	dscf/hr	1,401,540	1,185,960	1,286,400	1,291,300	
Stack Gas Temperature	°F	1507	1521	1510	1513	
Stack Gas Moisture	%	8.6	7.8	8.6	8.3	
O_2 ***Concentration at Stack, % dry***	%	12.94	13.48	12.68	13.03	
CO_2 ***Concentration at Stack, % dry***	%	7.46	7.24	7.84	7.51	
Particulate Catch	mg	5.60	4.80	4.00	4.80	4.40
Grain Loading	gr/dscf	0.0016	0.0016	0.0012	0.0015	0.0014
Grain Loading	gr/acf	0.0004	0.0004	0.0003	0.0004	0.0003
Grain Loading, gr/dscf @ 7% O2	gr/dscf	0.0027	0.0031	0.0020	0.0026	0.0025
Particulate Emission Rate	lbs/MMBtu	0.0056	0.0063	0.0041	0.0053	0.0052
Particulate Emission Rate	**lbs/hr**	**0.31**	**0.55**	**0.22**	**0.36**	**0.38**

TAB2-2.WK4

outlet locations for one test condition, 1550°F. These results are presented in Tables 2-3 through 2-4. The destruction and removal efficiency for Total VOCs is also presented in these tables.

2.6 HYDROGEN SULFIDE COMPOUNDS

EPA Method 18 was used to determine emission rates (lbs/hr) for H_2S at the flare inlet and outlet. Three test runs were conducted at the inlet and outlet locations for one test condition, 1550°F. These results are presented in Table 2-5. The destruction and removal efficiency for H_2S is also presented in this table.

2.7 CONTINUOUS EMISSIONS MONITORING FOR O_2, CO_2, SO_2, NO_x, AND CO

The continuous emissions monitoring system (TCEM) measured the effluent concentration from the flare system for the following pollutants; sulfur dioxide (SO_2), oxides of nitrogen (NO_x), carbon monoxide (CO), and the dilutants oxygen O_2 and carbon dioxide (CO_2). Testing was conducted during the two operating conditions of 1550°F and 1950°F. Table 2-6 presents the TCEM data for Runs 1 through 3 at 1550°F and Table 2-7 presents TCEM data for Runs 1 through 3 at 1950°F.

TABLE 2-3. BFGSI - HALIFAX, MA
VOC (as Methane) EMISSION SUMMARY @ 1550°F

Parameter	*Units*	*Inlet Run 1*	*Inlet Run 2*	*Inlet Run 3*	*AVERAGE Runs 1-3*	*AVERAGE Runs 2-3*
Sampling Location		Duct	Duct	Duct		
Date		04/22/96	04/22/96	04/22/96		
Stack Gas Flow Rate *	scf/hr	94,200	94,200	94,200		
TGNMO (as methane)	ppm	3700	3700	3900	2825	2533
Total VOC Emission Rate	lbs/hr	14.47	14.47	15.26	14.73	14.86
Total VOC Emission Rate	tons/yr	63.39	63.39	66.82	64.54	65.11

* - data taken from BFI Inlet Velocity Meter

Parameter	*Units*	*Outlet Run 1*	*Outlet Run 2*	*Outlet Run 3*	*AVERAGE Runs 1-3*	*AVERAGE Runs 2-3*
Sampling Location		Stack	Stack	Stack		
Date		04/22/96	04/22/96	04/22/96		
O2 Concentration	% dry	12.94	13.48	12.68		
Stack Gas Flow Rate *	dscf/hr	1,401,540	1,185,960	1,286,400		
TGNMO (as methane)	ppm	82.00	19.00	20.00	40.33	19.50
Total VOC Emission Rate	lbs/hr	4.77	0.94	1.07	2.26	1.00
Total VOC Emission Rate	tons/yr	20.90	4.10	4.68	9.89	4.39
Total VOC Emission Rate	lbs/MMBtu	0.0852	0.0211	0.0200	0.0421	0.0206

* - data taken from HCl/PM train sampling parameters

DESTRUCTION AND REMOVAL EFFICIENCY	**67.03%**	**93.53%**	**93.00%**	**84.52%**	**93.27%**

TAB2-3.WK4

TABLE 2-4. BFGSI - HALIFAX, MA
VOC (as Hexane) EMISSION SUMMARY @ 1550°F

Parameter	*Units*	*Inlet Run 1*	*Inlet Run 2*	*Inlet Run 3*	*AVERAGE Runs 1-3*	*AVERAGE Runs 2-3*
Sampling Location		Duct	Duct	Duct		
Date		04/22/96	04/22/96	04/22/96		
Stack Gas Flow Rate *	scf/hr	94,200	94,200	94,200		
TGNMO (as hexane)	ppm	617	617	650	628	633
Total VOC Emission Rate	lbs/hr	12.99	12.99	13.70	13.23	13.34
Total VOC Emission Rate	tons/yr	56.91	56.91	59.99	57.93	58.45

* - data taken from BFI Inlet Velocity Meter

Parameter	*Units*	*Outlet Run 1*	*Outlet Run 2*	*Outlet Run 3*	*AVERAGE Runs 1-3*	*AVERAGE Runs 2-3*
Sampling Location		Stack	Stack	Stack		
Date		04/22/96	04/22/96	04/22/96		
O2 Concentration	% dry	12.94	13.48	12.68		
Stack Gas Flow Rate *	dscf/hr	1,401,540	1,185,960	1,286,400		
TGNMO (as hexane)	ppm	13.67	3.17	3.33	6.72	3.25
TGNMO (as hexane) at 3% O2	ppm	30.73	7.64	7.26	15.21	7.45
Total VOC Emission Rate	lbs/hr	4.28	0.84	0.96	2.03	0.90
Total VOC Emission Rate	tons/yr	18.77	3.68	4.20	8.88	3.94
Total VOC Emission Rate	lbs/MMBtu	0.0764	0.0189	0.0180	0.0378	0.0185

* - data taken from moisture train sampling parameters

DESTRUCTION AND REMOVAL EFFICIENCY	**67.03%**	**93.53%**	**93.00%**	**84.52%**	**93.27%**

Proposed VOC Limits: Outlet concentration of 20 ppmvd at 3% O2 and 98% DRE

TAB2-4WK4

TABLE 2-5. BFGSI - HALIFAX, MA
HYDROGEN SULFIDE EMISSION SUMMARY @ 1550°F

Parameter	*Units*	*Inlet Run 1*	*Inlet Run 2*	*Inlet Run 3*	*AVERAGE*
Sampling Location		Duct	Duct	Duct	
Date		04/22/96	04/22/96	04/22/96	
Stack Gas Flow Rate *	scf/hr	94,200	94,200	94,200	
Hydrogen Sulfide	ppm	21.10	22.20	21.80	21.70
H2S Emission Rate	lbs/hr	0.1857	0.1954	0.1919	0.1910
H2S Emission Rate	tons/yr	0.8134	0.8558	0.8404	0.8365

* - data taken from BFI Inlet Velocity Meter

Parameter	*Units*	*Outlet Run 1*	*Outlet Run 2*	*Outlet Run 3*	*AVERAGE*
Sampling Location		Stack	Stack	Stack	
Date		04/22/96	04/22/96	04/22/96	
O2 Concentration	% dry	12.94	13.48	12.68	
Stack Gas Flow Rate *	dscf/hr	1,401,540	1,185,960	1,286,400	
Hydrogen Sulfide	ppm	0.000	0.000	0.000	0.000
H2S Emission Rate	lbs/hr	0.0000	0.0000	0.0000	0.0000
H2S Emission Rate	tons/yr	0.0000	0.0000	0.0000	0.0000
H2S Emission Rate	lbs/MMBtu	0.000000	0.000000	0.000000	0.000000

* - data taken from HCl/PM train sampling parameters

DESTRUCTION AND REMOVAL EFFICIENCY	**100.00%**	**100.00%**	**100.00%**	**100.00%**

TAB2-5WK4

TABLE 2-6. BFGSI - HALIFAX, MA

CEM EMISSIONS SUMMARY @ 1550°F

DATE	RUN #	TIME	TEST CONDITION (°F)	FLOW RATE (dscfm)	O2 (%)	CO2 (%)	NOx (ppm)	CO (ppm)	SO2 (ppm)
04/22/96	1	12:22 - 13:30	1550	23,359	12.94	7.46	11	10	0.48
04/22/96	2	14:30 - 15:30	1550	19,766	13.48	7.24	11	21	0.41
04/22/96	3	17:25 - 18:25	1550	21,440	12.68	7.84	11	13	0.00
			AVERAGE	21,522	13.03	7.51	11	15	0.30

	EMISSION RATE								
RUN #	NOx (lbs/hr)	NOx (tons/yr)	NOx (lbs/MMBtu)	CO (lbs/hr)	CO (tons/yr)	CO (lbs/MMBtu)	SO2 (lbs/hr)	SO2 (tons/yr)	SO2 (lbs/MMBtu)
1	1.84	8.06	0.033	1.02	4.46	0.018	0.11	0.49	0.002
2	1.56	6.82	0.035	1.81	7.93	0.041	0.08	0.35	0.002
3	1.69	7.40	0.032	1.22	5.32	0.023	0.00	0.00	0.000
AVERAGE	1.70	7.43	0.033	1.35	5.90	0.027	0.06	0.28	0.001

TAB2-6.WK4

TABLE 2-7. BFGSI - HALIFAX, MA

CEM EMISSIONS SUMMARY @ 1950°F

DATE	RUN #	TIME	TEST CONDITION (°F)	FLOW RATE (dscfm)	O2 (%)	CO2 (%)	NOx (ppm)	CO (ppm)	SO2 (ppm)
04/19/96	1	11:50 - 12:50	1950	12,184	9.78	10.02	25	0	1.29
04/19/96	2	13:25 - 14:25	1950	14,521	10.18	9.64	24	0	0.00
04/19/96	3	15:10 - 16:10	1950	14,753	10.19	9.80	24	0	1.97
			AVERAGE	13,819	10.05	9.82	24	0	1.09

	EMISSION RATE								
RUN #	NOx (lbs/hr)	NOx (tons/yr)	NOx (lbs/MMBtu)[1]	CO (lbs/hr)	CO (tons/yr)	CO (lbs/MMBtu)[1]	SO2 (lbs/hr)	SO2 (tons/yr)	SO2 (lbs/MMBtu)[1]
1	2.18	9.56	0.053	0.00	0.00	0.000	0.16	0.69	0.004
2	2.50	10.93	0.053	0.00	0.00	0.000	0.00	0.00	0.000
3	2.54	11.11	0.053	0.00	0.00	0.000	0.29	1.27	0.006
AVERAGE	2.40	10.53	0.053	0.00	0.00	0.000	0.15	0.65	0.003

[1] = 9501 dscf/MMBtu - F-Factor Average from 1550° Test condition Used

SECTION 3
PROCESS DESCRIPTION

3.1 INTRODUCTION

The landfill gas collection system consists of gas extraction wells which are spaced across the surface of the landfill. The wells are interconnected by a subsurface manifold system which traverses the landfill. Each landfill gas extraction well is outfitted with a valve allowing the flow of gas to be individually controlled. In addition, each well is equipped with a sampling port enabling the well to be monitored for methane content, temperature, vacuum, and flow rate.

The landfill gas collection system is equipped with two Lamson Corporation, Model No. 854-GB centrifugal blowers, each capable of handling 5120.9 acfm of landfill gas at a static pressure of 18 inches of water. The two blowers were installed in parallel, with one operating as the systems' primary blower, and the other acting as standby. Prior to the blowers, the landfill gas will pass through a condensate knockout vessel. After passing through the blowers, the landfill gas will proceed through a flame arrestor to the enclosed flare system.

The enclosed flare system is a John Zink Company enclosed flare having an energy input rating of 120.08 10^6Btu per hour when burning landfill gas at a maximum rate of 5120.9 acfm. The flare has an effective chamber length of 31.04 feet from top of the flame assembly to thermocouple resulting in an effective chamber volume of 2258.5 cubic feet. The flare will provide a minimum residence time of 0.50 seconds at the 1600°F, 1750°F, and 1800°F operating temperature ranges, as measured from top of the flame assembly to the thermocouple. The flare is capable of operating in a manual or automatic mode. Propane gas is utilized to fire the flare pilot light during start up.

Emissions from the flare are exhausted through a carbon steel stack which is 40.0 feet above ground level and has an inside exit diameter of 9.6 feet, providing a stack gas exit velocity of 62.44 feet per second at 1400°F. Figure 3-1 presents a schematic of the landfill flare system.

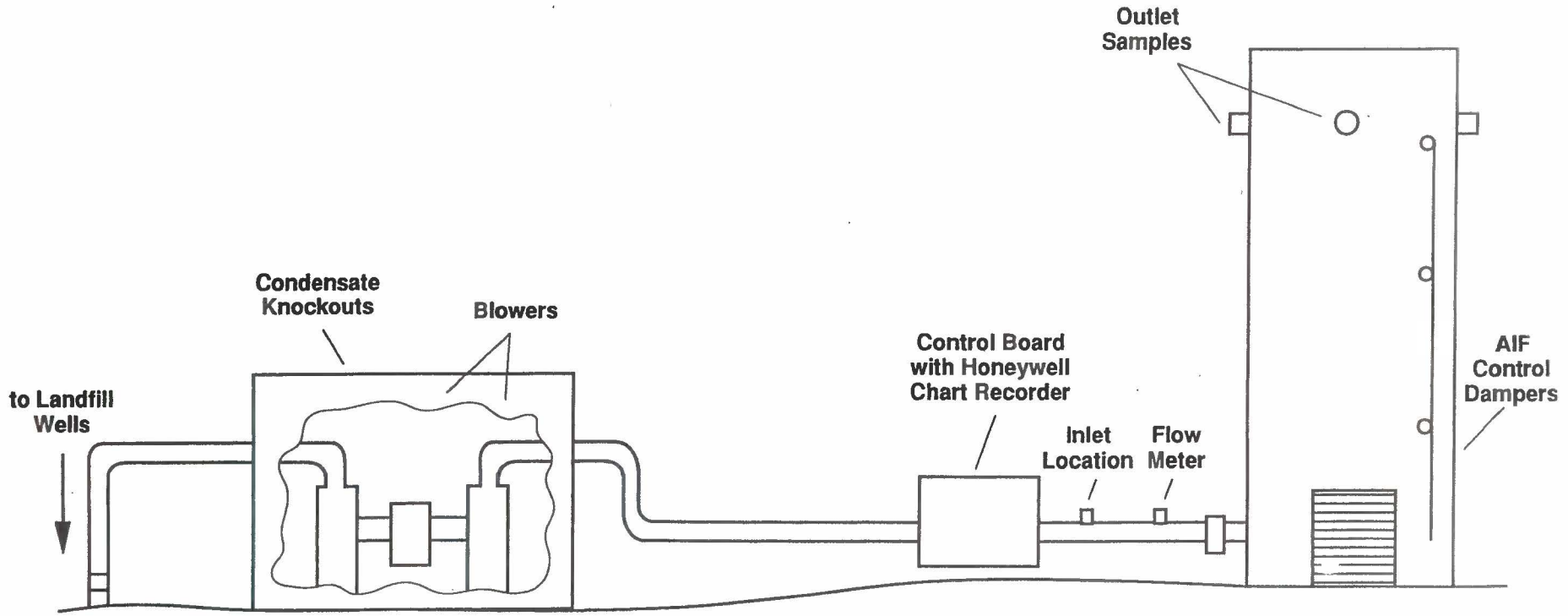


Figure 3-1. BFGSI Enclosed Flare System.

3.2 OPERATING CONDITIONS

The enclosed flare system was tested at two operating temperatures, 1550°F and 1950°F. It was agreed upon, and with the approval of the MADEP, that the emission rates for HCl and particulate be determined at the operating temperature of 1550°F. Only the emission rates for SO_2, NO_x, and CO were determined at the operating temperature of 1950°F.

The inlet flowrate and outlet stack temperature were recorded at the control board using a Honeywell Truline circular strip chart. The strip chart measures inlet flow in scf/min and outlet temperature in degree fahrenheit.

3.3 SAMPLING LOCATIONS

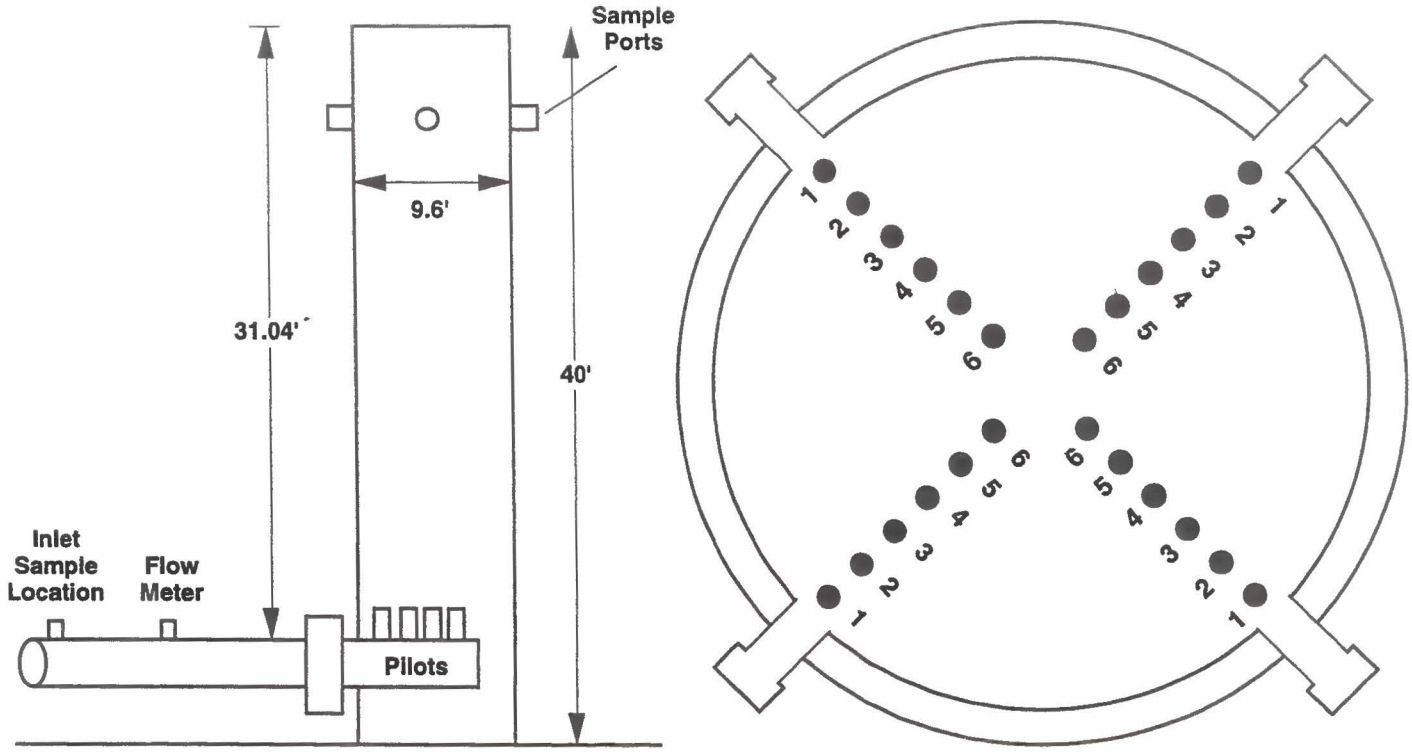
3.3.1 Inlet Sampling Location

The landfill flare has an inlet duct diameter of 12 inches. At this location integrated flue gas samples were collected. Access into the duct work was through a one-inch opening.

Samples were collected for the following:

- Methane and total non methane organics
- Total reduced sulfur and hydrogen sulfide
- O_2, CO_2, CO
- Btu value
- Inlet landfill gas flow rate.

The inlet sampling location is illustrated in Figure 3-2.



Point	Percent of Stack Diameter	Distance from Wall (in.)
1	2.1	2.39
2	6.7	7.64
3	11.8	13.45
4	17.7	20.18
5	25.0	28.50
6	35.6	40.58

Figure 3-2. Stack Sampling Location and Traverse Points.

3.3.2 Outlet Sampling Location

The flare system has an exhaust stack of approximately 40 feet in height. The stack diameter is 9.6 feet. Sampling ports are located approximately 33.69 feet above grade. Four sampling ports accessed for the collection and quantification of the target parameters are located 90° to each other.

Samples were collected for the following:

- HCl and particulate
- Total reduced sulfur and hydrogen sulfide
- Methane and non methane organics
- O_2, CO_2, SO_2, NO_x and CO
- Velocity and % moisture.

The outlet sampling location and traverse points are illustrated in Figure 3-2.

SECTION 4
SAMPLING PROCEDURES

4.1 OVERVIEW

This section describes the procedures TRC followed during the field sampling program on April 19 and 22, 1996. Throughout the program TRC followed EPA Reference Methods 40 CFR Part 60 Appendix A and/or Massachusetts approved sampling protocols. Any deviations from the specified test methods were approved by the MADEP observer and documented in this final report.

The remainder of this section is divided into several subsections: Field Program Description, Presampling Activities and Onsite Sampling Activities.

4.2 FIELD PROGRAM DESCRIPTION

The field sampling was conducted by TRC over the course of four consecutive days. On the first day equipment was set up and preliminary measurements made. On each subsequent test day, flue gas samples were collected for the parameters listed below.

- April 19 - 1950°F sampling condition

  outlet location

  CEM testing for O_2, CO_2, SO_2, NO_x and CO
  Velocity and % percent moisture

  inlet location

  Velocity

- April 22 - 1550°F sampling condition

  outlet location

  CEM testing for O_2, CO_2, SO_2, NO_x, and CO
  Methane and non methane organics
  Hydrogen Chloride
  Particulate Matter
  Hydrogen sulfide and total reduced sulfur
  Velocity and percent moisture

  inlet location

  Methane and non methane organics
  Hydrogen sulfide and total reduced sulfur
  O_2, CO_2, and CO
  Btu value
  Velocity

The test methods utilized in accordance with 40 CFR Part 60 Appendix A are as follows:

- Method 1 and 2 - Velocity Profile
- Method 3A - O_2 and CO_2 determination
- Method 4 - Percent Moisture
- Method 6C - SO_2 determination
- Method 7E - NO_x determination
- Method 10 - CO determination
- Method 18 - Total Reduced Sulfur and Hydrogen Sulfide determination
- Method 25C - Oxygen, Carbon Dioxide, Carbon Monoxide, Methane, Non-Methane Organics, and Btu content determination
- Method 0050 - HCl/Particulate determination

TRC utilized a four person test team to complete the above test methods.

4.3 PRESAMPLING ACTIVITIES

Presampling activities include equipment calibration, precleaning of the sample train glassware, and other miscellaneous tasks. Each of these activities are described or referenced in the following subsections. Other presampling activities included team meetings, equipment packing, and finalization of all details leading up to the coordinated initiation of the sampling program.

4.3.1 Equipment Calibration

TRC follows an orderly program of positive actions to prevent the failure of equipment or instruments during use. This preventative maintenance and careful calibration helps to ensure accurate measurements from field and laboratory instruments.

Once the equipment has gone through the cleaning and repair process it is then calibrated. All equipment that is scheduled for field use is cleaned and checked prior to calibration. Once the equipment has been calibrated, it is packed and stored to ensure the integrity of the equipment. An adequate supply of spare parts is taken in the field to minimize downtime from equipment failure.

Inspection and calibration of the equipment is a crucial step in ensuring the successful completion of the field effort. All equipment is inspected for proper operation and durability prior to calibration. Calibration of the following equipment was conducted in accordance with the procedures outlined in EPA documents entitled "*Quality Assurance Handbook for Air Pollution Measurement Systems; Volume III - Stationary Source Specific Methods*" (EPA-600/4-77-027b) and 40 CFR Part 60 Appendix A. All calibrations were performed prior to test program.

- Probe Nozzles (QA Handbook, Vol III, Section 3.4.2, pp. 19) - average three ID measurements of nozzle; difference between high and low ≤ 0.1 mm. Recalibrate, reshape and sharpen when nozzle becomes nicked, dented, or corroded.

- Pitot tubes (QA Handbook, Vol III, Section 3.1.2, pp. 1-13) - measured for appropriate spacing and dimensions or calibrated in a wind tunnel. Rejection criteria given on the calibration sheet. Post-test check - inspect for damage.

- Thermocouples (QA Handbook, Vol III, Section 3.4.2, pp. 12-18) - verified against a mercury-in-glass thermometer at three points including the anticipated measurement range. Acceptance limits - impinger ± 2°F; DGM ± 5.4°F; stack ± 1.5 percent of stack temperature.

- Dry gas meters (EPA 40 CFR Part 60, Method 5, Section 5.3) - calibrated against a wet test meter. Acceptance criteria - pretest $Y_i = Y = \pm 0.02$; post test $Y = \pm 0.05\ Y_i$.

- Analytical balances (QA Handbook, Vol III, Section 3.4.2, pp. 19) - Acceptance criteria - calibrate with Standard Class-S weights within ± 0.5 g of stated value. Rejection criteria: Have manufacturer recalibrate or adjust.

4.3.2 Glassware Preparation

Sample train glassware and sample containers required specialized precleaning to avoid contamination of the sample from the collection container or devices. The sample train glassware necessary for the Method 0050 hydrogen chloride/particulate sampling was precleaned using an alconox soap and water wash. Deionized water was used for rinsing followed by air drying. The glassware was then sealed with parafilm.

Note that all amber sample bottle caps used were fitted with Teflon® liners which are cleaned in the same manner as the bottles themselves.

4.3.3 Sample Media Preparation

All reagents were checked in accordance with TRC's existing QC Program to minimize the probability of using contaminated solvents. This includes the use of spectro-grade solvents from the same lot and the collection and analysis of the appropriate blanks.

4.3.4 Continuous Emissions Monitoring

TRC conducted continuous emissions monitoring at the outlet stack for oxygen (EPA Method 3A), carbon dioxide (EPA Method 3A), sulfur dioxide (EPA Method 6C), oxides of nitrogen (EPA Method 7E), and carbon monoxide (EPA Method 10) during all test conditions. TRC followed procedures outlined in the EPA Publication 340/1-83-016 regarding setup and operation of its Transportable Continuous Emissions Monitoring System (TCEMS).

The TCEMS consists of three subsystems: sample acquisition/conditioning, sample analysis, and a data acquisition system. Sample acquisition/conditioning is designed to deliver a representative sample of the stack gas stream to the sample analysis subsystem.

In each case, accurate interpretation of analyzer response required the systematic calibration of the instrument against gases of known concentrations.

The data acquisition subsystem consists of a Yokogawa digital data logger designed to receive and log instrument signals (raw voltages) at user defined intervals. The resulting values are instantaneously accessible (updated every 15 seconds). Once the system was set up, the TCEM was connected to a power source and brought online. Sample line and signal wires are strung between the sampling and TCEM locations, and the probe was placed in the duct at the sampling port.

Prior to insertion of the probe into the stack, the sample/acquisition system was leak checked by the following procedure:

a. plug probe;
b. observe that flow in rotameter reaches zero Lpm;
c. observe vacuum; and
d. confirm that sample vacuum during sampling does not exceed vacuum attained during leak check.

The initial phase of instrumental analysis methods requires calibration of all involved monitors. At the beginning of each day, direct instrument calibrations for zero and upscale gases were performed prior to initiation of testing by direct calibration gas injection. Following these direct calibrations, system calibrations were performed both prior to and following each run using zero and one upscale gas concentration. This was accomplished by directing calibration gas through the sample line and conditioning system to assess system bias. Following completion of the required runs, final system calibrations were performed. These procedures allow for determination of initial and final system bias, as well as system drift. The calibration gas values and instrument range settings used on the landfill flare system are listed below:

Analyzer	Range	Conc.	High	Mid	Low	Zero
NO_x	0 - 300	ppm	225	180	NA	air
CO	0 - 300	ppm	278	120.0	62.0	air
SO_2	0 - 150	ppm	123	84.6	NA	air
CO_2	0 - 20	%	19.8	10.1	5.05	air
O_2	0 - 25	%	22.3	10.2	5.05	nitrogen

Calibration gases used were EPA Protocol 1, traceable to the National Bureau of Standards Reference Materials. The measurement system performance specifications in 40 CFR 60 Appendix A Methods 3A, 6C, and 7E are listed below and was the performance criteria for this program.

	Performance Criteria			
Procedure	NO_x M7E	SO_2 M6C	CO M10	O_2/CO_2 M3A
Zero Drift, % of range	$< \pm 3$	$< \pm 3$	$< \pm 3$	$< \pm 3$
Calibration Drift, % of range	$< \pm 3$	$< \pm 3$	$< \pm 3$	$< \pm 3$
Response time, seconds	≤ 60	≤ 60	≤ 90	≤ 60

Procedure	Performance Criteria			
	NO_x M7E	SO_2 M6C	CO M10	O_2/CO_2 M3A
Interference Response, % of range	< ± 2	< ± 2	1,000:1 CO_2	< ± 2
NO_2 to NO Converter, % efficiency	> 98	NA	NA	NA
Calibration Error, % of cal gas	< ± 2	< ± 2	< ± 2	< ± 2

4.3.5 NO_2 to NO Conversion Efficiency

Before mobilizing for the field portion of this program, the NO_2 to NO converter was checked in the following manner. A mid-level NO gas was introduced into a 30 liter tedlar bag and diluted one-to-one (1:1) with air. The bag was then hooked up to the sampling system and drawn through the system for 30 minutes. The highest peak response remained for the entire thirty minutes. A decrease was less than 2 percent of the highest peak value.

4.4 ONSITE SAMPLING ACTIVITIES

Onsite sampling activities included the emissions testing of the inlet duct and outlet stack, and collection of operational data.

4.4.1 Velocity Measurements/Cyclonic Flow

For the determination of velocity at the inlet to the flare, TRC used BFI's volume meter utilizing EPA Reference Method 2B (40 CFR 60 Appendix A). This methods refers to Method 2A which requires the installation of a volume meter, and the measurement of organic carbon, CO and CO_2 concentrations. For the determination of volumetric measurements BFI has a volume meter installed in the inlet duct. This meter was calibrated prior to the start of the test program.

Velocity traverses were conducted at the outlet sampling location with an S-type pitot assembly in

accordance with EPA Reference Methods 1 and 2. An S-type pitot tube with an attached inclined manometer was used to measure the exhaust velocities. An attached Type-K thermocouple with remote digital display was used to determine the flue gas temperature. During the preliminary and compliance test programs, velocity measurements were conducted during each test run. The required number of velocity measurements points for each sampling location was determined following EPA Method 1.

A cyclonic flow check was conducted at the outlet stack prior to sampling in accordance with Section 2.4 of EPA Method 1. This procedure is referred to as the nulling technique. An S-type pitot tube connected to an inclined manometer was used in this method. The pitot tube was positioned at each traverse point so that the face openings of the pitot tube are perpendicular to the stack cross-sectional plane. This position is called the "0° reference". The velocity pressure (ΔP) measurement was noted. If the ΔP reading is zero, the cyclonic angle was recorded as 0°. If the ΔP reading is not zero, the pitot tube was rotated clockwise or counter clockwise until the ΔP reading became zero. This angle was then measured with a leveled protractor and reported to the nearest degree. After this null technique was applied at each traverse point, the average of the cyclonic angles was calculated. The average was less than 20°.

4.4.2 Hydrogen Chloride/Particulate Matter

The Hydrogen Chloride/Particulate Matter train was operated as described in "*Measurement of HCl and Cl_2 (Method 0050)*" (EPA Methods Manual for Compliance with the BIF Regulations, EPA/530-SW-91-010, December 1990). The Method 0050 train was used to measure and determine the emission rate of Hydrogen Chloride and Particulate Matter from the outlet stack location only.

This sampling train used a air-cooled, quartz-lined probe, with a quartz button-hook nozzle due to the high temperature of the outlet stack. A thermocouple and S-type pitot tube were attached to the probe for the measurement of gas temperature and velocity. The sample gas passes through the probe assembly to a heated quartz fiber filter. The filter holder was maintained at 248°F ±

25°F throughout each test period. Downstream of the heated filter, the gas passed through a series of four ice-cooled impingers kept below 68°F to enable condensation of entrained moisture. The first two impingers each contained 100 mL of 0.1N H_2SO_4. The third and fourth impingers each contained 100 mL of 0.1N NaOH. The fifth impinger contained a preweighed amount of silica gel. The impingers were followed by a Nutech Model 2010 dry gas meter, pump, and calibrated orifice meter.

TRC conducted three Method 0050 runs at the 1550° test condition. Each test run had a sample duration of 72 minutes to ensure the collection of at least 45 cubic feet of sample gas.

Sampling was conducted while traversing the Method 0050 train across two diameters which satisfied the criteria for minimum number of sampling points. At each test point within the stack, all necessary train parameters were measured.

Sampling was isokinetic (± 10 percent) with readings of flue gas parameters recorded at every sampling point during the traverse. In the event where steady operation was not maintained, or there were atypical fluctuations in monitored gas parameters (O_2, CO_2), the testing was stopped until these conditions were stabilized. Steady operation of the unit was the responsibility of BFI personnel. A TRC team member was in contact with BFI and to relay any process related difficulties to the sampling crew.

Leak checks of the entire Method 0050 sampling train were performed before and after each sampling run. All leak checks and leakage rates are documented on the relevant field test data sheet. The acceptance criteria for the Method 0050 train is a leak rate of ≤ 0.02 cfm at the highest vacuum obtained during the run.

Following the completion of each test run, the Method 0050 train was transported to TRC's sample recovery lab. The sample recovery sequence was as follows:

- Removed the sampling train to the recovery area.

- Noted the condition of the train (i.e., filter condition, impinger contents color, silica gel color, etc.).

- Disassembled the filter housing and transferred the filter to its original petri dish. Sealed the container with Teflon® tape and labeled it with the appropriate sample information.

- The front half of the train, nozzle, probe, and front-half filter housing, were brush-rinsed with acetone into an amber glass container with a Teflon®-lined cap. The rinse procedure was performed three times after which the container was sealed and labeled.

- The contents of the first two impingers were measured for volume and transferred to a glass amber container with a Teflon®-lined cap. The impingers, right angle, and U-tubes were rinsed three times with distilled deionized water into the sample container. The container was then sealed and labeled.

- The contents of the third and fourth impingers were measured for volume and transferred to a glass amber container with a Teflon®-lined cap. The impingers, right angle, and U-tubes were rinsed three times with distilled deionized water into the sample container. The container was then sealed and labeled.

- The silica gel was returned to its original container and weighed to obtain a final weight.

- All containers were checked to ensure proper sealing, proper labeling, and that all liquid levels were marked. All samples were then logged onto the chain-of-custody record.

The Method 0050 train resulted in the following samples:

- Filter
- Front-Half Acetone Rinse
- 0.1N H_2SO_4 Impinger Catch
- 0.1N NaOH Impinger Catch

The 0.1N H_2SO_4 impinger catches (impingers 1, 2, and 3) were used to determine hydrogen chloride and moisture.

4.4.3 Methane and Non-Methane Organics

Inlet and outlet flue gas samples were collected for methane and non-methane organics utilizing EPA Method 25C, "*Determination of Nonmethane Organic Compounds (NMOC) in MSW*

Landfill Gases". TRC collected samples from the inlet and outlet by drawing the flue gas through a sampling train comprised of components that regulate the rate and duration of sampling into a pre-evacuated SUMMA passivated canister. Samples were collected over a 1-hour time frame using a pressurized canister. After the flue gas sample was collected, the canister valve was closed.

These SUMMA canisters were shipped via Federal Express overnight delivery to the laboratory and analyzed by gas chromatograph/flame ionization detector (GC/FID) according to EPA Method 25C.

4.4.4 Oxygen, Carbon Dioxide, Carbon Monoxide

Inlet flue gas samples were collected for oxygen, nitrogen, and carbon dioxide utilizing EPA Method 25C, "*Determination of Nonmethane Organic Compounds (NMOC) in MSW Landfill Gases*". TRC collected samples from the inlet by drawing the flue gas through a sampling train comprised of components that regulate the rate and duration of sampling into a pre-evacuated SUMMA passivated canister. Samples were collected over a 1-hour time frame using a pressurized canister. After the flue gas sample was collected, the canister valve was closed.

These SUMMA canisters were shipped via Federal Express overnight delivery to the laboratory and analyzed by gas chromatograph/thermal conductivity detector (GC/TCD) according to EPA Method 25C.

4.4.5 Hydrogen Sulfide and Total Reduced Sulfur (TRS)

Inlet and outlet flue gas samples were collected for Hydrogen Sulfide and Total Reduced Sulfur (TRS) utilizing EPA Method 18, "*Measurement of Gaseous Organic Compound Emissions by Gas Chromatography*". TRC collected an integrated air sample using the bag-in-drum technique. In this procedure, a Tedlar bag was placed inside a rigid container. The bag was then evacuated

and attached to a ¼-inch Teflon[R] sample line which was attached to a stainless steel probe. The sample line was then purged with flue gas and then the rigid container placed under a slight vacuum. To equalize the pressure in the container, flue gas was drawn through the sample line into the Tedlar bag. Sampling was conducted at an approximate rate of 0.35 liters per minute (LPM) for 60 minutes to yield a total sample volume of about 21 liters. These Tedlar bag samples were shipped via Federal Express overnight delivery to the laboratory and analyzed by gas chromatography/flame photometric detection (GC/FPD).

4.4.6 Continuous Emissions Monitoring for O_2, CO_2, SO_2, NO_x, and CO

TRC conducted continuous emissions monitoring at the outlet location for oxygen (EPA Method 3A), carbon dioxide (EPA Method 3A), sulfur dioxide (EPA Method 6C), oxides of nitrogen (EPA Method 7E), and carbon monoxide (EPA Method 10) during all test runs. Measurements were performed continuously for a minimum of four hours of operation concurrently with the Method 0050 tests. Single point sampling was conducted.

The sampling train started with an inconel sampling probe and heated filter box. The sample stream was then drawn through 100 feet of heated (248°F ± 25°F) Teflon[R] sample line and a sample conditioner to remove the moisture from the gas stream. The sample was then drawn through Teflon[R] tubing by a leak-free Teflon[R] double diaphragm pump to a stainless-steel sample manifold with an atmospheric by-pass rotometer. The O_2, CO_2, SO_2, NO_x, and CO analyzers withdrew samples from this manifold.

All CEM data was recorded as averages by a Yokogawa digital data logger designed to receive and log instrument signals. The results were expressed in ppm and lbs/hr for SO_2, NO_x, and CO; and in percent for O_2 and CO_2.

SECTION 5
ANALYTICAL PROCEDURES

This section delineates the analytical procedures used to analyze samples during the BFGSI Halifax Landfill Test Program. The analysis and quality control protocols for each parameter are summarized below in Sections 5.1 through 5.2.

TRC's analytical subcontractors on this program, Performance Analytical, Inc. (PAI) and Chester LabNet (LAB), were responsible for sample analysis and analytical data reporting. Each were responsible for conducting the analyses in accordance with the analytical methods specified in this section.

5.1 ORGANIC ANALYSIS

5.1.1 Methane and Non-Methane Organics

Methane and Non-Methane organic samples were collected using EPA Method 25C. TRC collected an integrated flue gas sample using a SUMMA canister as previously mentioned in Section 4.4.3. These SUMMA canisters were shipped via Federal Express overnight delivery to Performance Analytical, Inc. The SUMMA canisters were analyzed by GC/FID according to EPA Method 25C.

5.2 INORGANIC ANALYSIS

5.2.1 Hydrogen Chloride

The Hydrogen Chloride/Particulate Matter train was operated as described in "*Measurement of HCl and Cl_2*" (EPA Methods Manual for Compliance with the BIF Regulations, EPA/530-SW-91-010, December 1990). The Method 0050 train was used to measure and determine the emission rate of Hydrogen Chloride. Laboratory analyses was conducted by Chester LabNet.

Gaseous and particulate pollutants were withdrawn from an emission source and collected on a filter, and in absorbing solutions. The quartz-fiber filter collected particulate matter. Acidic absorbing solutions collected gaseous HCl. In the acidified water absorbing solution, the HCl gas is solubilized.

Chloride analysis of stack gas impinger samples will be performed for HCl determination via ion chromatography (IC) using Draft Method 9057 (equivalent to EPA Method 300.0).

5.2.2 Particulate Matter

Particulate sampling was accomplished by following the procedures in EPA Method 5. The sampling of particulate was done with the use of the EPA Method 0050 sampling train. Particulate analysis was conducted by TRC Environmental Corporation.

All filters for the test program were quartz fiber filters. The filters were desiccated to a constant weight, then placed in petri dishes and sealed with Teflon^{R} tape. An identification label was initially placed on the petri dish. The beakers used for the dry down of the acetone rinse were cleaned and dried. The beakers were desiccated to a constant weight. Weights were obtained using a Mettler AE200 analytical balance. Accuracy for the balances was checked by using Class "S" standard weights.

The front-half acetone rinse was dried down in a tared beaker and then desiccated and weighed to a constant weight. The filter was desiccated and weighed to a constant weight. The sum of the net weights for the probe wash and filter catch were used to calculate the concentration of particulate matter in gr/dscf. The emission rate in lbs/hr is also calculated.

5.2.3 Hydrogen Sulfide and Total Reduced Sulfur (TRS)

Hydrogen sulfide and total reduced sulfur compounds samples were collected using EPA Method 18, "*Measurement of Gaseous Organic Compound Emissions by Gas Chromatography*". TRC

collected an integrated air sample using the bag-in-drum technique as previously mentioned in Section 4.4.5. These Tedlar bag samples were shipped via Federal Express overnight delivery to Performance Analytical, Inc. The Tedlar bag samples were analyzed by gas chromatography/flame photometric detection (GC/FPD) using a direct injection technique.

The analysis was performed on a Hewlett-Packard 5890 gas chromatograph. A subambient GC temperature program was utilized for the analysis.

5.3 DRE CALCULATION

In calculating DREs, the following significant figure rules will apply:

- DREs were calculated using two significant figures for the penetration (i.e., DRE are reported to two places to the right of the decimal (e.g., 99.96 percent) if greater than 99.9 percent DRE is demonstrated).
- DREs were not rounded off to demonstrate a final nine unless that final nine is the second digit to the right of the decimal (e.g., a DRE of 99.987 was not rounded to 99.99).
- The equation used to determine DRE is as follows:

$$DRE = \frac{(W_{in} - W_{out})}{W_{in}} \times 100\%$$

W_{in} = mass feed rate of one compound in the flue gas stream feeding the enclosed flare.

W_{out} = mass emission rate of the same compound present in exhaust emissions prior to release to the atmosphere.

5.4 POUNDS PER MILLION BRITISH THERMAL UNITS CALCULATION

Emission rates are calculated in units of pollutant mass per quantity of heat input (lbs/10^6Btu) and in order to compute emission rates in terms of pounds per hour (lbs/hr). Lbs/10^6Btu was

calculated using the pollutant and diluent concentrations and the fuel-specific F-factor based upon the fuel combustion characteristics. The measured concentrations of NO_x, CO, and SO_2 in units of parts per million (ppm) was first converted to mass per unit volume (lbs/scf) for these calculations. The conversion factors for ppm SO_2, ppm NO_x, and ppm CO to SO_2, NO_x, and CO lbs/scf, as stated in Methods 19 and 20 are:

SO_2 lbs/scf = ppm SO_2 (meas) x 1.660×10^{-7}

NO_x lbs/scf = ppm NO_x (meas) x 1.194×10^{-7}

CO lbs/scf = ppm CO (meas) x 0.727×10^{-7}

Next, the SO_2, NO_x, and CO lbs/scf were converted to a mass emission rate in terms of pounds per million Btu (lbs/10^6Btu) as follows:

$$E = \text{lbs/scf} \times F_d \times \frac{20.9}{20.9\% - O_{2\,\text{measured}}}$$

where:

E = Mass emission rate of SO_2, NO_x, and CO in terms of lbs/10^6Btu

F_d = Ratio of the volume of dry effluent gas to the gross caloric value of the as-fired fuel (from Btu value analysis)

5.5 POUNDS PER HOUR CALCULATION

Emission rates in terms of pounds per hour (lbs/hr) were calculated using the pollutant emission rate in terms of parts per million (ppm), outlet stack flowrate, dscfm (Qs), molecular weight of the pollutant (MW), 60 minutes/hour, divided by 385.3×10^6 dscf/lb-mole @ 68°F (20°C).

$$\text{lbs/hr} = \frac{\text{ppm} \times Qs \times MW \times 60}{385.3 \times 10^6}$$

SECTION 6
QUALITY ASSURANCE

6.1 OVERVIEW

TRC Environmental Corporation management is fully committed to an effective Quality Assurance/Quality Control Program whose objective is the delivery of a quality product. For much of TRC's work, that product is data resulting from field measurements, sampling and analysis activities, engineering assessments, and the analysis of gathered data for planning purposes. The Quality Assurance Program works to provide complete, precise, accurate, representative data in a timely manner for each project, considering both the project's needs and budget constraints. The Corporate QA Director coordinates and directs the overall quality program with strong management support.

TRC's QA Program conforms with EPA recommendations and is directed by the Corporate QA Director, a full-time professional who reports directly to the Company President. This give the QA Director the necessary authority and independence to find and correct any existing quality problems. Division QC Coordinators are responsible for the QC Program within each technical division; they report both to their Division Manager and the Corporate QA Director.

This section highlights the specific QA/QC procedures to be followed on this Test Program. The QA Director has reviewed and approved this Final Report and will attend project review meetings, as needed, to ensure that appropriate QA/QC procedures will be followed.

6.2 FIELD QUALITY CONTROL SUMMARY

6.2.1 Calibration Gases

All calibration gases used to conduct instrument calibrations were prepared in accordance with EPA Protocol 1, and are traceable to National Bureau of Standards Reference Materials.

6.2.2 Instrument Calibrations

All instrument calibrations met the performance criteria defined in 40 CFR 60 Appendix A, Methods 3A, 6C, 7E, and 10.

6.2.3 Calibration Procedures

Calibration of the field sampling equipment was performed prior to the field sampling effort. Copies of the calibration sheets are submitted in the final report. Calibrations were performed as described in the EPA publications "*Quality Assurance Handbook for Air Pollution Measurement Systems; Volume III - Stationary Source Specific Methods*" (EPA-600/4-77-027b) and EPA 40 CFR Part 60 Appendix A. Equipment to be calibrated included the sample metering system, nozzles, thermocouples, and pitot tubes. Copies of the equipment calibration forms can be found in Appendix E.

6.2.4 Equipment Leak Checks

Prior to sampling, each sampling train was leak checked according to the procedures outlined in EPA Reference Method 5. During the course of a test run, a leak checks were conducted before and after every test.

6.2.5 Cyclonic Flow Check

The presence of cyclonic flow within the outlet stack was checked during preliminary traverses prior to sampling, in accordance with Section 2.4 of EPA Method 1 as described in the July 1, 1988 edition of the Federal Register.

6.2.6 Method Blanks

One Method blank for the Method 0050 for HCl and particulate was taken during the field

sampling program. This was to ensure sample quality and integrity.

6.3 SAMPLE CHAIN OF CUSTODY

The chain-of-custody of the samples was initiated and maintained as follows:

- Each sample collected was labeled, sealed, and the liquid level marked on appropriate samples container.
- The samples were then recorded on the sample chain-of-custody form.
- Custody of the samples were retained by TRC until shipment by Federal Express. Upon receipt of the samples at the analytical laboratory, custody was reestablished by the labs' internal custody procedures.

6.4 DATA REDUCTION, VALIDATION, AND REPORTING

Specific QC measures were used to ensure the generation of reliable data from sampling and analysis activities. Proper collection and organization of accurate information followed by clear and concise reporting of the data is a primary goal on all projects.

6.4.1 Field Data Reduction

Appendix A and B of this Final Report presents the field sampling data. The data collected was reviewed in the field by the Field Team Leader.

6.4.2 Laboratory Analysis Data Reduction

Analytical results were reduced to concentration units specified by the analytical procedures, using the equation provided in the analytical procedures. If units are not specified, data from the analysis of gas samples will be reported as $\mu g/m^3$. This latter was calculated by dividing the total weight of the substance detected by the volume of gas sampled.

6.4.3 Data Validation

TRC supervisory and QC personnel used validation methods and criteria appropriate to the type of data and the purpose of the measurement. Records of all data was maintained, including that judged to be an "outlying" or spurious value. The persons validating the data have sufficient knowledge of the technical work to identify questionable values.

Field sampling data was validated by the Field Team Leader and/or the Field QC Coordinator based on their review of the adherence to an approved sampling protocol and written sample collection procedure.

Analytical data was validated by the subcontractor laboratory QC or supervisory personnel using criteria outlined below. TRC utilized results from field and laboratory method blanks, replicate samples and internal QC samples to further validate analytical results. Furthermore, TRC QC personnel has reviewed all subcontractor laboratory raw analytical data to verify calculated results presented.

The following criteria was used to evaluate the field sampling data:

- Use of approved test procedures;
- Proper operation of the process being testing;
- Use of properly operating and calibrated equipment;
- Leak checks conducted before and after tests;
- Use of reagents conforming to QC specified criteria;
- Proper chain-of-custody maintained.

The criteria listed below was used to evaluate the analytical data:

- Use of approved analytical procedures;
- Use of properly operating and calibrated instrumentation;

- Acceptable results from analyses of QC samples (i.e., the reported values should fall within the 95 percent confidence interval for these samples).

6.4.4 Data Reporting

All data was reported in standard units depending on the measurement and the ultimate use of the data. The bulk of the data is computer processed and reported as follows:

- Exhaust Gas Streams
  - Gas Properties:
    a. Moisture, dscf and percent by volume
    b. Flow rate, dscfm and acfm
    c. Pressure, mm of Hg
    d. Temperature, °F
  - Particulate:
    a. gr/dscf
    b. gr/acf
    c. lbs/10^6Btu
    d. lbs/hr
  - Hydrogen Chloride
    a. mg
    b. ppm
    c. lbs/10^6Btu
    d. lbs/hr
  - Hydrogen Sulfide
    a. ppm
    b. lbs/10^6Btu
    c. lbs/hr
    d. tons/yr
  - Gas Pollutants/Diluents
    a. O_2, percent
    b. CO_2, percent
    c. CO, ppmvd, lbs/10^6Btu, lbs/hr, and tons/yr
    d. NO_x, ppmvd, lbs/10^6Btu, lbs/hr, and tons/yr
    e. SO_2, ppmvd, lbs/10^6Btu, lbs/hr, and tons/yr
    f. VOC, ppm, lbs/10^6Btu, lbs/hr, and tons/yr

6.5 EXCEPTIONS

Prior to and during Run No. 1 on April 22, 1996, the outlet CO concentration exceeded the carbon monoxide instrument calibration range. The occurance and time frame the range was exceeded was minimal. TRC notified the MADEP and with their approval, made note of the CO exceedance on the CEM chart recorder and continued testing. As the flare system further stabilized, the CO also stabilized. During Runs No. 2 and 3 there were no exceedances of the calibrated range.

APPENDIX A

FIELD SAMPLING DATA SHEETS

Traverse Point Location for Circular and Rectangular Ducts

Project No.: _____

Client: BFI Halifax

Date: _____

Sampling Location: Outlet Stack

Internal Stack Diameter: 114"

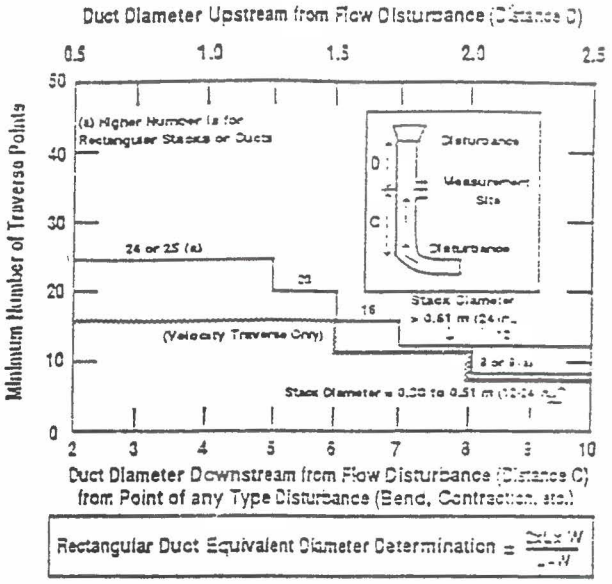
Nipple Length: NA

Total Stack Diameter: 114"

Nearest Upstream Disturbance (C): _____

Nearest Downstream Disturbance (D): _____

Calculator: TRC



Rectangular Duct Equivalent Diameter Determination = $\frac{2LW}{L+W}$

Traverse Point Number	1 Fraction of Stack ID ($\frac{1}{100}$)	2 Stack ID	3 Traverse Point (1 x 2=Point)	4 Nipple Length	5 Traverse Point Inside of Far Wall to Outside of Port Nipple (3 + 4 = Point)
1	.021	114	2.4		
2	.067	114	7.6		
3	.113	114	12.9		
4	.177	114	20.2		
5	.250	114	28.5		
6	.356	114	40.6		
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					

Location of Traverse Points in Circular Stacks

	4	6	8	10	12	14	16	18	20	22	24
1	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2	2.9
2	85.4	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
3		70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
4		89.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
5		95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.8	13.2
6			85.4	77.4	64.4	36.6	28.3	22.6	20.4	18.0	16.1
7			96.8	85.4	76.0	63.4	37.5	29.6	25.0	21.8	19.4
8				91.8	82.8	73.1	62.5	38.2	30.6	26.2	23.0
9				97.4	88.2	79.9	71.7	61.8	38.8	31.8	27.2
10					93.8	85.4	78.0	70.4	61.2	38.0	32.3
11					97.9	90.1	83.1	76.4	69.4	60.7	39.8
12						94.3	87.5	81.2	75.0	68.8	60.2
13						98.2	91.5	85.4	79.6	73.3	67.7
14							95.1	89.1	83.5	78.2	72.3
15							98.4	92.5	87.1	82.0	77.0
16								95.5	90.3	85.4	80.6
17								98.6	93.2	88.4	83.9
18									96.1	91.0	86.8
19									98.7	94.0	89.5
20										96.8	92.1
21										98.8	94.5
22											96.8
23											98.9
24											

Location of Traverse Points in Rectangular Stacks

	2	3	4	5	6	7	8	9	10	11	12
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4			87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5				90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6					91.7	78.6	68.8	61.1	55.0	50.0	45.8
7						92.9	81.3	72.2	65.0	59.1	54.2
8							93.8	83.3	75.0	68.2	62.5
9								94.4	85.0	77.3	70.8
10									95.0	86.4	79.2
11										95.5	87.5
12											95.8

TRC

Stack Geometry & Gas Velocity Data

Project No. _____

Client BFI

Plant Halifax, MA

Operator B. Kelly

Meter Box No. 813B

Source Landfill Flare

Sample Location Outlet Stack

Run No. 1 Cond. 1950

Static, In. H_2O -0.08

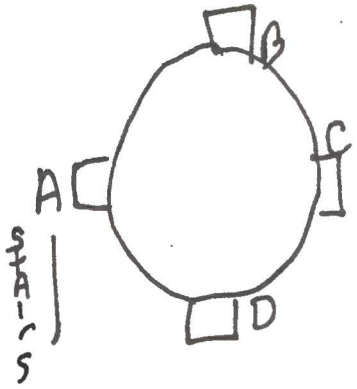
Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
11:50	1A	1850	0.01	
	2A	1845	0.00	
	3A	1865	0.00	
	4A	1874	0.01	
	5A	1874	0.015	
	6A	1873	0.015	
	1B	1799	0.01	
	2B	1825	0.01	
	3B	1800	0.01	
	4B	1797	0.015	
	5B	1806	0.02	
	6B	1826	0.02	

Sketch of Sampling Location

Stack Diameter 9'6"

Diameters Upstream _____

Diameters Downstream _____



Wet Bulb _____

Dry Bulb _____

%M _____

TRC

Stack Geometry & Gas Velocity Data

Project No. _____ Source Landfill Flare

Client BFI Sample Location Outlet Stack

Plant Halifax, MA Run No. 1 1950.

Operator B. Kelly Static, In. H_2O _____

Meter Box No. 8138

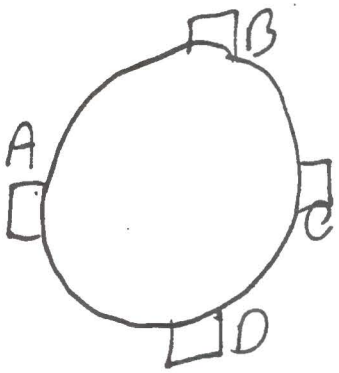
Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
	1C	1776	0.00	
	2C	1780	0.00	
	3C	1800	0.01	
	4C	1821	0.01	
	5C	1850	0.01	
	6C	1868	0.02	
	1D	1790	0.005	
	2D	1705	0.01	
	3D	1810	0.02	
	4D	1840	0.02	
	5D	1876	0.02	
	6D	1880	0.025	

Sketch of Sampling Location

Stack Diameter 9'6"

Diameters Upstream _____

Diameters Downstream _____



Wet Bulb _____

Dry Bulb _____

%M _____

TRC

Stack Geometry & Gas Velocity Data

Project No. _____

Client BCI

Plant Halifax, MA

Operator B. Kelly

Meter Box No. 813S

Source Landfill Flare

Sample Location Outlet Stack

Run No. 2 1950

Static, in. H_2O _____

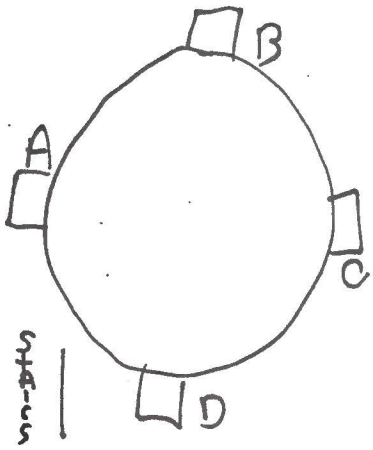
Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading in. H_2O	Cyclonic Flow Null Angle
12:48	1A	1828	0.025	0
	2DA	1810	0.025	5
	3DA	1796	0.020	0
	4DA	1793	0.015	5
	5DA	1789	0.010	0
	6DA	1775	0.010	0
	1B	1789	0.010	
	2B	1840	0.010	
	3B	1871	0.020	
	4B	1865	0.020	
	5B	1855	0.025	
	6B	1835	0.030	

Sketch of Sampling Location

Stack Diameter 9'6"

Diameters Upstream _____

Diameters Downstream _____



Wet Bulb _____

Dry Bulb _____

%M _____

AF-017

TRC

Stack Geometry & Gas Velocity Data

Project No. _____

Client BFI

Plant Halifax, MA

Operator B. Hollis

Meter Box No. 8138

Source Landfill flare

Sample Location outlet stack

Run No. 2 1950.

Static, In. H_2O _____

Sketch of Sampling Location

Stack Diameter _____

Diameters Upstream _____

Diameters Downstream _____

Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
	1B	1820	0.01	
	2B	1836	0.020	
	3B	1850	0.015	
	4B	1855	0.020	
	5B	1837	0.030	
	6B	1821	0.030	
	1D	1800	0.010	
	2D	1820	0.010	
	3D	1850	0.015	
	4D	1865	0.020	
	5D	1854	0.020	
13:07	6D	1848	0.030	

Wet Bulb _____

Dry Bulb _____

%M _____

TRC

Stack Geometry & Gas Velocity Data

Project No. _____

Client BFI

Plant Halifax

Operator B. Kelly

Meter Box No. S-138

Source Landfill Flare

Sample Location outlet stack

Run No. 3

Static, In. H_2O _____

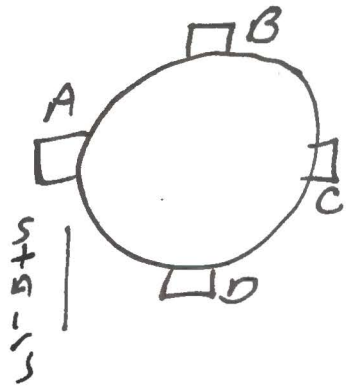
Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
14:36	1A	1830	0.015	
	2A	1815	0.015	
	3A	1880	0.010	
	4A	1877	0.010	
	5A6	1868	0.010	
	6A	1867	0.010	
	1B	1760	0.020	
	2B	1769	0.030	
	3B	1820	0.030	
	4B	1826	0.030	
	5B	1826	0.035	
	6B	1848	0.030	
	1C	1820	0.010	
	2C	1827	0.020	
	3C	1815	0.020	
	4C	1825	0.025	
	5C	1842	0.030	
	6C	1833	0.030	
	1D	1760	0.010	
	2D	1750	0.015	
	3D	1815	0.020	
	4D	1812	0.020	
	5D	1825	0.030	
14:55	6D	1836	0.030	

Sketch of Sampling Location

Stack Diameter 9'6"

Diameters Upstream _____

Diameters Downstream _____



Wet Bulb _____

Dry Bulb _____

%M _____

TRC

Stack Geometry & Gas Velocity Data

Project No. _____ Source Landfill Flare

Client BFI Sample Location outlet stack

Plant Halifax, MA Run No. 3 Kinial

Operator B Kelly Static, In. H_2O -.10

Meter Box No. 8138

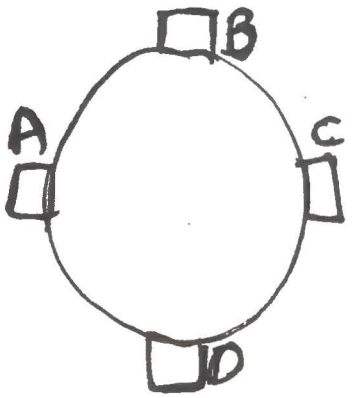
Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
1538	1A	1763	0.015	
	2A	1779	0.015	
	3A	1786	0.020	
	4A	1765	0.020	
	5A6	1817	0.020	
	6A	1819	0.030	
	1B	1705	0.015	0
	2B	1746	0.015	0
	3B	1820	0.020	0
	4B	1854	0.025	0
	5B	1885	0.030	0
	6B	1889	0.030	0
	1C	1770	0.010	0
	2C	1815	0.010	5
	3C	1817	0.015	0
	4C	1823	0.020	0
	5C	1837	0.020	0
	6C	1819	0.025	0
	1D			
	2D			
	3D			
	4D			
	5D			
	6D			

Sketch of Sampling Location

Stack Diameter 9'6"

Diameters Upstream _____

Diameters Downstream _____



HI Temp
Couldn't Perform flow rates

Wet Bulb _____

Dry Bulb _____

%M _____

F-017

Stack Geometry & Gas Velocity Data

Project No. _____

Client BFI

Plant Halifax, MA

Operator B. Kelly

Meter Box No. & 10" manometer

Source Inlet Duct

Sample Location Inlet Duct

Run No. 1

Static, In. H_2O +2.0

4/19/96

Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
1222	1	97	0.31	
	2	98	0.35	
	3	98	0.37	
	4	98	0.37	
	5	97	0.38	
	6	98	0.39	

Sketch of Sampling Location

Stack Diameter _____

Diameters Upstream _____

Diameters Downstream _____

Wet Bulb _____

Dry Bulb _____

%M _____

F-017

TRC

Stack Geometry & Gas Velocity Data

Project No. _____

Client BFI

Plant Hol, FAX, MA

Operator P. Kelly

Meter Box No. _____

Source Landfill Flare

Sample Location inlet

Run No. 2

Static, In. H_2O _____

4/19/96

Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
	1	98	0.340	
	2	|	0.350	
	3	|	0.380	
	4	|	0.375	
	5	|	0.360	
	6	|	0.350	

Sketch of Sampling Location

Stack Diameter _____

Diameters Upstream _____

Diameters Downstream _____

Wet Bulb _____

Dry Bulb _____

%M _____

TRC

Isokinetic Flue Gas Sampling Data Sheet

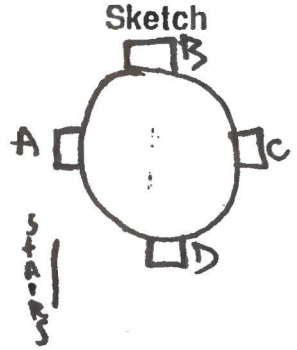
Page 1 of 2

Project No. 20272
Client BFI
Facility Halifax, MA
Source Landfill Flare
Sample Location Outlet Stack
Stack Diameter 114"
Date 4/19/96
Run No. Half-part 1 of M Run 1
Operator B. Kelly
Meter Box No. 8138
Meter Δ H@ 1.856
Y Factor 0.990.996

Very Important - Fill in All Blanks

Read and Record at the Start of Each Test Point

Sketch



Sheet 1 of 2.
Train Prepared By Bill Kissel
Pitot Number and Side
Pitot Tube CP 0.84
Filter No. / Thimble No. K-3+ N/A
Ambient Temp.°F 55°
Bar. Pressure., In. Hg 30.01
Assumed Moisture, % 6
Heater Box Setting, °F 250°
Nozzle # / Dia., In.
Probe Length / Material 7' Eff Air Cooled
Probe Heater Setting 250°

Point	Clock Time 24 - hr	Clock Time min	Dry Gas Meter, (ft^3)	Pitot In. H_2O Δ P	Orifice Δ H In. H_2O Desired	Orifice Δ H In. H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg Gauge	Temperatures °F °C Stack	Filter Box	Imp Temp	XAD Cond	Probe	Filter Outlet
1A	12:08	0	535.898	—	2.0	2.0	68	67	5	—	—	55	—	—	—
	12:13	5	539.511	—	2.0	2.0	68	67	5	—	—	56	—	—	—
	12:18	10	544.911	—	2.0	2.0	70	67	5	—	—	55	—	—	—
	12:23	15	547.211	—	2.0	2.0	70	67	5	—	—	54	—	—	—
	12:28	20	550.211		2.0	2.0	71	67	5	—	—	54	—	—	—
	12:33	25	554.211		2.0	2.0	71	67	5	—	—	54	—	—	—
↓	12:38	30	558.305										—	—	—

Train Leak Check:
Before Test: _____ CF _____ SEC _____ In. Hg
After Test: _____ CF _____ SEC _____ In. Hg

	I	F	Static Pressure			
Pitot Tube Leak Check	✓		Port			
ORSAT Train Leak Check			In. H_2O			
			In. Hg			

Comments: Leak Rate
Initial 0.005 @ 12 in
Final 0.001 @ 5 in

AF-061

Sampling Train Setup and Recovery Sheet

Project No. _____ Run No. 1

Client BFI Train Type/# HCl / Part Moisture

Facility Halifax Date 4/19/96

Source Flare Recovery Person CMI

Filter No. _____ _____ _____ VOID

Thimble No. (if applicable) _____ _____ _____ lost contents #1 Impinger

XAD Trap No. (if applicable) _____

Moisture

Impinger #	1	2	3	4
Reagent	H_2SO_4	H_2SO_4		NaOH
Final Volume (mLs)				
Initial Volume (mLs)	100	100	0	100
Net Collected (g)				

Impinger #	5			
Reagent	NaOH			
Final Volume (mLs)				
Initial Volume (mLs)	100			
Net Collected (g)				

Silica Gel	6			
Final Weight (g)				
Initial Weight (g)	302.8			
Net Collected (g)				

Total Moisture (Impingers and Silica Gel) (g) _____

TRC

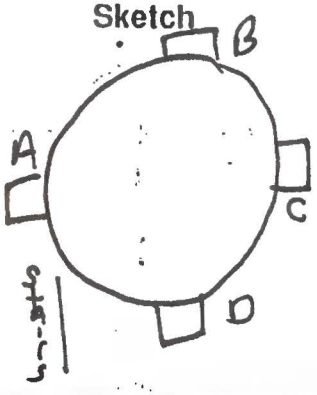
Isokinetic Flue Gas Sampling Data Sheet

Project No. _____
Client BFI
Facility Halifax, MA
Source Landfill Flare
Sample Location outlet Stack
Stack Diameter 9'6"
Date 4/19/96
Run No. Moister #2
Operator B. Kelly
Meter Box No. E438
Meter Δ H@ 1.856
Y Factor 0.996

Very Important - Fill in All Blanks

Read and Record at the Start of Each Test Point

Sketch



Sheet 1 of 1
Train Prepared By ED MacKinnon
Pitot Number and Side _____
Pitot Tube CP 0.84
Filter No. / Thimble No. N/A
Ambient Temp.°F 67°
Bar. Pressure., In. Hg _____
Assumed Moisture, % _____
Heater Box Setting, °F 250°
Nozzle # / Dia., In. NA
Probe Length / Material 7' Eff Air Cooled
Probe Heater Setting 250°

Point	Clock Time 24 - hr	Clock Time min	Dry Gas Meter, (ft^3)	Pitot In. H_2O Δ P	Orifice Δ H In. H_2O Desired	Orifice Δ H In. H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg Gauge	Temperatures °F °C Stack	Filter Box	Imp Temp	XAD Cond	Probe	Filter Outlet
1A	13:24	0	558.553	—	2.0	2.0	72	70	3	—	—	58	—	—	—
	13:29	5	562.117	—	2.0	2.0	73	70	3	—	—	55	—	—	—
	13:34	10	566.110	—	2.0	2.0	73	70	3	—	—	55	—	—	—
	13:39	15	569.911	—	2.0	2.0	73	70	3	—	—	54	—	—	—
	13:44	20	574.001	—	2.0	2.0	75	70	3	—	—	54	—	—	—
	13:49	25	577.771	—	2.0	2.0	74	70	3	—	—	53	—	—	—
	13:54	30	581.276	—	2.0	2.0				—	—		—	—	—

Train Leak Check:
Before Test: 0.001 CF 60 SEC 12 In. Hg
After Test: 0.001 CF 60 SEC 3 In. Hg

	I	F	Static Pressure
Pitot Tube Leak Check	✓		Port
ORSAT Train Leak Check			In. H_2O
			In. Hg

Comments:
Leak rate
initial 0.001 @ 11 in
Final

Sampling Train Setup and Recovery Sheet

Project No. _____ Run No. 2

Client BFI Train Type/# HCl/Part Moisture

Facility Halifax Date 4/19/96

Source Flare Recovery Person CM

Filter No. _____ _____ _____

Thimble No. (if applicable) _____ _____ _____

XAD Trap No. (if applicable) _____

Moisture

Impinger #				
Reagent				
Final Volume (mLs)				
Initial Volume (mLs)				
Net Collected (g)				

Impinger #	1	2	3	4
Reagent	H_2SO_4	H_2SO_4	NaOH	NaOH
Final Volume (mLs)	138	100	100	100
Initial Volume (mLs)	100	100	100	100
Net Collected (g)	38	0	0	0

Silica Gel	5			
Final Weight (g)	270.8			
Initial Weight (g)	264.7			
Net Collected (g)	6.1			

Total Moisture (Impingers and Silica Gel) (g) 44.1

TRC

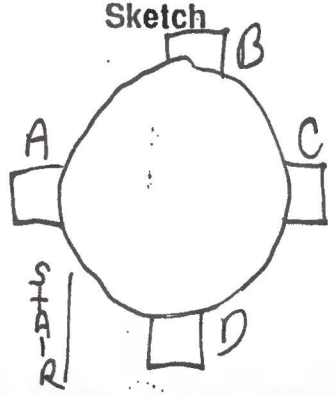
Isokinetic Flue Gas Sampling Data Sheet

Project No. _____
Client BFGSI
Facility Halifax Landfill
Source Landfill Flare
Sample Location Outlet
Stack Diameter 9'6"
Date 4/13/94
Run No. 3 Moisture
Operator B Kelly
Meter Box No. 013Y
Meter Δ H@ @ 1.856
Y Factor 0.996

Very Important - Fill in All Blanks

Read and Record at the Start of Each Test Point

Sketch



Sheet ____ of ____
Train Prepared By Ed Mackenzie
Pitot Number and Side _____
Pitot Tube CP 0.84
Filter No. / Thimble No. N/A
Ambient Temp.°F 67°
Bar. Pressure., In. Hg 30.01
Assumed Moisture, % 9%
Heater Box Setting, °F 250
Nozzle # / Dia., In. NA
Probe Length / Material 7' Eff Air Cooled
Probe Heater Setting 250

Point	Clock Time 24 - hr	Clock Time min	Dry Gas Meter, (ft^3)	Pitot In. H_2O ΔP	Orifice Δ H In. H_2O Desired	Orifice Δ H In. H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg Gauge	Temperatures °F °C Stack	Filter Box	Imp Temp	XAD Cond	Probe	Filter Outlet
1A	14:10	0	581.405	—	2.0	2.0	70	65	2	—	—	55	—	—	—
	14:15	5	585.115	—	2.0	2.0	71	69	2	—	—	56	—	—	—
	14:20	10	588.988	—	2.0	2.0	72	69	2	—	—	54	—	—	—
	14:25	15	592.511	—	2.0	2.0	72	69	2	—	—	53	—	—	—
	14:30	20	596.668	—	2.0	2.0	72	69	2	—	—	53	—	—	—
	14:35	25	600.211	—	2.0	2.0	72	69	2	—	—	53	—	—	—
	14:40	30	604.064	—	2.0	2.0	72	69	2	—	—	53	—	—	—

Comments:

Train Leak Check:
Before Test: 0.003 CF 60 SEC 10 In. Hg
After Test: 0.000 CF 60 SEC 5 In. Hg

	I	F	Static Pressure			
Pitot Tube Leak Check	✓		Port			
ORSAT Train Leak Check			In. H_2O			
			In. Hg			

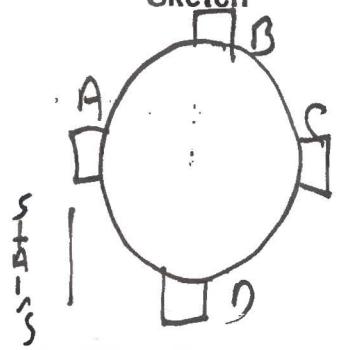
Isokinetic Flue Gas Sampling Data Sheet

Project No. _____
Client BFI
Facility Halifax, MA
Source Landfill Flare
Sample Location Outlet Stack
Stack Diameter 9'6"
Date 4/19/96
Run No. Run #3 Moisture
Operator B. Kelly
Meter Box No. 81X
Meter Δ H@ 1.95L
Y Factor 0.99L

Very Important - Fill in All Blanks

Read and Record at the Start of Each Test Point

Sketch



Sheet 1 of 1
Train Prepared By Ed MacGunnar
Pitot Number and Side NA
Pitot Tube CP 0.84
Filter No. / Thimble No. NA
Ambient Temp.°F 68°
Bar. Pressure, In. Hg 30.01
Assumed Moisture, % 9%
Heater Box Setting, °F 250
Nozzle # / Dia., In. NA
Probe Length / Material 7' EEE
Probe Heater Setting 250

Point	Clock Time 24 - hr	min	Dry Gas Meter, (ft^3)	Pitot In. H_2O ΔP	Orifice Δ H In. H_2O Desired	Orifice Δ H In. H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg Gauge	Temperatures °F °C Stack	Filter Box	Imp Temp	XAD Cond	Probe	Filter Outlet
IA	15:37	0	604.225	—	2.0	2.0	69	68	2	—	—	57	—	—	—
	15:42	5	608.211	—	2.0	2.0	69	67	2	—	—	55	—	—	—
	15:47	10	617.577	—	2.0	2.0	65	67	2	—	—	55	—	—	—
	15:52	15	615.887	—	2.0	2.0	69	66	2	—	—	54	—	—	—
	15:57	20	618.411	—	2.0	2.0	69	65	2	—	—	54	—	—	—
	16:02	25	622.311	—	2.0	2.0	69	66	2	—	—	53	—	—	—
	16:07	30	626.783	—						—	—		—	—	—
BK	16:07														

Train Leak Check:
Before Test: 0.003 CF 60 SEC 10 In. Hg
After Test: 0.000 CF 60 SEC 4 In. Hg

	I	F	Static Pressure
Pitot Tube Leak Check	✓	✓	Port
ORSAT Train Leak Check			In. H_2O
			In. Hg

Comments:
Sample train was run for 1-hr

AF 061

Field Moisture Determination

Client: BFI - Halifax

Project No.: _____

Location: Flare

Date: ~~4/18/96~~ 4/19/96

Run No.: ~~1~~ 3

Operator: _____

Data

Min	Clock Time	Gas Meter C.F. VM	TM In	TM Out	PM Orifice In. H_2O (+)	PM Vac. Gage In. Hg (-)
0						
5						
10						
15						
20						
25						
30						
Total/Avg						

Impingers

	1	2	3
Final mL	~~182~~	105	
Initial mL	100ml	100ml	0
Net mL	82	5	

Total moisture (Net mL + Net gm) = 92.2

Silica Gel

Container No. 1

Final gm 313.8

Initial gm ~~308.6~~ 308.6

Net gm 5.2

Calculations

(1) PB = _____ Meterbox No. _____

(2) VM Net = _____ Y = DGM Calibration Factor = _____

(3) TM Avg = _____ TM + 460 _____

(4) PM Avg = ± _____ Orifice In. H_2O x $\frac{1}{13.6}$ = ± _____ orifice In. Hg.

= - _____ Vacuum gage In. Hg (when meter is before pump)

(5) VMSTD = $\frac{528 \times VM\ (PB + PM)\ (Y)}{29.92 \times (TM + 460)}$ = _____

(6) VW = mL H_2O + gm Silica gel = _____

(7) VW Gas = VW x 0.04715 = _____

(8) %M = $\frac{100 \times VW\ Gas}{VMSTD + VW\ Gas}$ = $\frac{100 \times (\quad)}{(\quad) + (\quad)}$ = $\frac{(\quad)}{(\quad)}$ =

AF-252

TRC

Stack Geometry & Gas Velocity Data

Page __ of __

Project No. _____ Source Flare

Client BFI Halifax Sample Location Inlet Duct

Plant Halifax MA Run No. 1

Operator MO'Brien Static, In. H_2O _____

Meter Box No. _____ 4/22/96

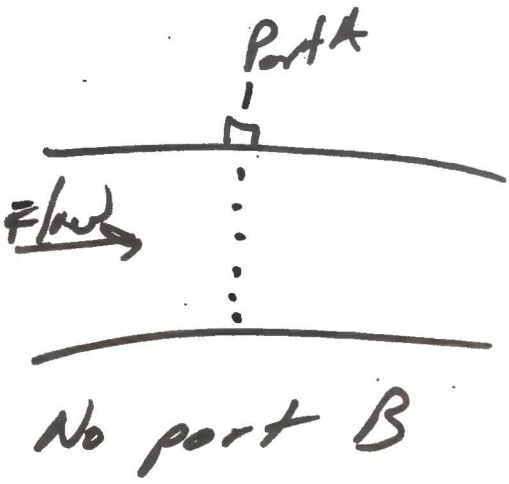
Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
0 A 1		101	.22	
2		102	.35	
3		102	.37	
4		102	.37	
5		102	.32	
1155 6		102	.34	

Sketch of Sampling Location

Stack Diameter 12"

Diameters Upstream 8

Diameters Downstream 2



No port B

Wet Bulb _____

Dry Bulb _____

%M _____

317

TRC

Stack Geometry & Gas Velocity Data

Page __ of __

Project No. _____

Client BFI Halifax/BFGSI

Plant B. Halifax MA

Operator B Kelly

Meter Box No. _____

Source Landfill

Sample Location Inlet

Run No. 2

Static, in. H_2C _____

4/22/96

Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading in. H_2O	Cyclonic Flow Null Angle
1713	1	86	0.24	
	2	89	0.32	
	3	100	0.35	
	4	100	0.35	
	5	100	0.35	
	6	100	0.37	

Sketch of Sampling Location

Stack Diameter _____

Diameters Upstream _____

Diameters Downstream _____

Wet Bulb _____

Dry Bulb _____

%M _____

TRC

Stack Geometry & Gas Velocity Data

Page __ of __

Project No. _____ Source Landfill 1

Client BFI/BFGSI Sample Location inlet

Plant BFI Halifax Run No. 3

Operator Mike O'Brien Static, In. H_2O _____

Meter Box No. _____

Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
		97	0.33	
		98	0.34	
		99	0.36	
		99	0.37	
		98	0.37	
		98	0.37	

Sketch of Sampling Location

Stack Diameter _____

Diameters Upstream _____

Diameters Downstream _____

Wet Bulb _____

Dry Bulb _____

%M _____

TRC

Isokinetic Flue Gas Sampling Data Sheet

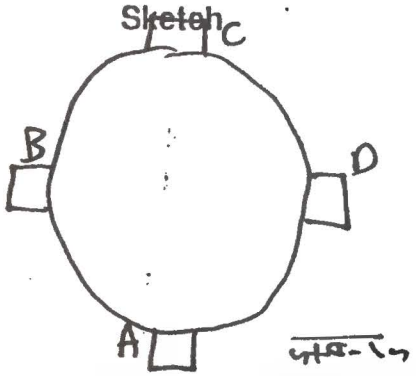
Page 1 of 2

Project No. _____
Client BFI
Facility Halifax, MA
Source Landfill Flare
Sample Location outlet stack
Stack Diameter 9'6"
Date 4/22/96
Run No. Cond 1500-HCl-1
Operator B. Kelly
Meter Box No. 813S
Meter Δ H@ 1.856
Y Factor 0.996

Very Important - Fill in All Blanks

Read and Record at the Start of Each Test Point

Sketch



Sheet 1 of 2
Train Prepared By B. Kelly
Pitot Number and Side N/A
Pitot Tube CP 0.84
Filter No. / Thimble No. _____
Ambient Temp.°F 72°F
Bar. Pressure., In. Hg 30.15
Assumed Moisture, % 9%
Heater Box Setting, °F 1500
Nozzle # / Dia., In. 0.658
Probe Length / Material 7' Eff Quartz
Probe Heater Setting 2500

Point	Clock Time 24-hr	Clock Time min	Dry Gas Meter, (ft³)	Pitot In. H₂O ΔP	Orifice Δ H (BK) In. H₂O Desired	Orifice Δ H (BK) In. H₂O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg Gauge	Temperatures °F °C Stack (BK)	Filter Box	Imp Temp	XAD Cond	Probe	Filter Outlet
1A	11:50	0	649.653	0.030	2.40	2.40	80	76	5	~~1483~~ 1520	250	58	—	242	—
2A	11:53	3	651.477	0.050	2.40	2.40	82	77	5	1545	251	58	—	247	—
3A	11:56	6	654.511	0.040	1.96	1.96	86	79	5	1495	252	57	—	249	—
4A	11:59	9	657.100	0.035	1.71	1.71	89	81	4	1510	255	57	—	249	—
5A	12:02	12	659.00	0.030	1.55	1.55	90	82	4	1400	249	55	—	248	—
6A	12:05	15	661.00	0.030	1.55	1.55	92	84	4	1405	250	55	—	247	—
Stop	12:08	18	663.043	stop run for port change											
1B	12:22	18	663.043	0.06	2.91	2.91	90	88	5	1523	253	56	—	248	

Train Leak Check:
Before Test: 0.004 CF 60 SEC 12 In. Hg
After Test: _____ CF 60 SEC _____ In. Hg

	I	F	Static Pressure			
Pitot Tube Leak Check	✓		Port			
ORSAT Train Leak Check			In. H₂O			
			In. Hg			

Comments:
0.659 Nozzle
0.658 Cal
0.658
Stop 12:08
Start 12:22

AF-061

Isokinetic Flue Gas Sampling Data Sheet

Project No. _____ Date 4/22/ Sheet 2 of 2

Client BFI Run No. Cond 1500 - HCl/Part - 1

Facility Halifax, MA Sample Location outlet stack

Source Landfill Flare Operator B. Kelly

Point	Clock Time 24-hr	Clock Time min	Dry Gas Meter, (ft^3)	Pitot in. H_2O ΔP	Orifice ΔH in. H_2O Desired	Orifice ΔH in. H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum in. Hg Gauge	Temperatures °F °C Stack	Filter Box	Imp Temp	XAD Cond	Probe	Filter Outlet
2B	12:25	21	666.211	0.06	2.89	2.89	92	89	5	1540	256	55	—	254	—
3B	12:28	24	668.425	0.06	2.89	2.89	97	91	5	1531	254	54	—	257	—
4B	12:31	27	671.511	0.05	2.40	2.40	91	89	5	1550	255	53	—	249	—
5B	12:34	30	673.811	0.04	1.94	1.94	92	89	5	1515	251	54	—	247	—
6B	12:37	33	676.431	0.035	1.79	1.79	92	89	3	1425	250	55	—	254	—
stop	12:40	36	678.615	stop run for port change											
1D	12:43	36	678.615	0.05	2.40	2.40	89	85	4	1545	254	56	—	251	—
2D	12:46	39	681.241	0.045	2.18	2.18	92	88	4	1521	256	57	—	249	—
3D	12:49	42	683.211	0.040	1.92	1.92	94	90	4	1550	255	58	—	248	—
4D	12:52	45	686.411	0.040	2.00	2.00	94	90	4	1465	255	57	—	246	—
5D	12:55	48	688.211	0.025	1.26	1.26	91	87	4	1438	256	56	—	249	—
6D	12:58	51	690.001	0.025	1.25	1.25	90	86	4	1460	257	55	—	253	—
stop	13:01	54	691.939	stop run for port change											
1C	13:11	54	691.939	0.05	2.40	2.40	88	87	5	1540	255	56	—	253	
2C	13:14	57	694.435	0.05	2.40	2.40	91	88	5	1550	250	55	—	256	
3C	13:17	60	697.211	0.045	2.16	2.16	93	88	5	1550	252	55	—	257	
4C	13:20	63	699.318	0.045	2.16	2.16	89	85	5	1547	255	53	—	258	
5C	13:23	66	702.311	0.035	1.70	1.70	90	87	5	1520	256	55	—	257	
6C	13:26	69	704.131	0.035	1.71	1.71	91	87	5	1500	254	55	—	258	
END	13:29	72	706.195												
		Total													

Meter Leak Check During Test:

	Meter Reading Stop	Meter Reading Start
____ CF ____ SEC ____ In. Hg	____	____
____ CF ____ SEC ____ In. Hg	____	____

Static Pressure

Port	____	____	____
In. H_2O	____	____	____
In. Hg	____	____	____

Comments:
Stop: 12:40
start: 12:43
stop: 13:01
start 1311

AF 060

Sampling Train Setup and Recovery Sheet

Project No. _____ Run No. 1

Client BFI Train Type/# HCl / Part.

Facility Halifax Date 4/22/96

Source Flare Recovery Person CDM

Filter No. K-31 _____ _____

Thimble No. (if applicable) _____ _____ _____

XAD Trap No. (if applicable) _____

Moisture

Impinger #	1	2	3	4
Reagent	H_2SO_4	H_2SO_4	NaOH	NaOH
Final Volume (mLs)	163	127	107	100
Initial Volume (mLs)	100	100	100	100
Net Collected (g)	63	27	7	0

Impinger #				
Reagent				
Final Volume (mLs)				
Initial Volume (mLs)				
Net Collected (g)				

Silica Gel	#1			
Final Weight (g)	305.9			
Initial Weight (g)	293.5			
Net Collected (g)	12.4			

Total Moisture (Impingers and Silica Gel) (g) 109.4

TRC

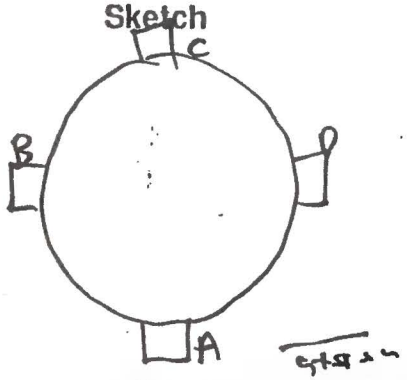
Isokinetic Flue Gas Sampling Data Sheet

Project No. _____
Client BFI
Facility Halifax, MA
Source Landfill Flare
Sample Location outlet stack
Stack Diameter 9'6"
Date 4/22/96
Run No. Cond 1500-Hcl/Part-2
Operator B. Kelly
Meter Box No. E18
Meter Δ H@ 1.856
Y Factor 0.996

Very Important - Fill in All Blanks

Read and Record at the Start of Each Test Point

Sketch



Sheet 1 of 2
Train Prepared By Ed MacKinnon
Pitot Number and Side _____
Pitot Tube CP 0.84
Filter No. / Thimble No. _____
Ambient Temp.°F 72
Bar. Pressure., In. Hg _____
Assumed Moisture, % 9%
Heater Box Setting, °F 250°
Nozzle # / Dia., In. .658
Probe Length / Material 7' Eff Quartz
Probe Heater Setting 250°

Point	Clock Time 24 - hr	Clock Time min	Dry Gas Meter, (ft^3)	Pitot In. H_2O Δ P	Orifice Δ H In. H_2O Desired	Orifice Δ H In. H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg Gauge	Temperatures °F °C Stack	Filter Box	Imp Temp	XAD Cond	Probe	Filter Outlet
1C	14:30	0	707.162	0.040	1.92	1.92	80	79	3	1540	258	59	—	241	—
2C	14:33	3	709.377	0.040	1.92	1.92	83	80	3	1545	255	59	—	246	—
3C	14:36	6	711.971	0.035	1.68	1.68	83	80	3	1550	251	58	—	245	
4C	14:39	9	713.556	0.035	1.68	1.68	85	80	3	1547	250	57	—	246	
5C	14:42	12	715.511	0.030	1.49	1.49	84	80	3	1470	249	57	—	245	
6C	14:45	15	717.981	0.025	1.29	1.29	85	80	3	1400	249	57	—	252	
Stop	14:48	18	719.678	Stop run for part change											
				BK											
1D	15:07	18	~~719.678~~ 719.843	0.040	1.94	1.94	84	80	3	1575	249	59	—	255	

Comments: Stop 1448
Start 1507

Train Leak Check:
Before Test: 0.003 CF 60 SEC 10 In. Hg
After Test: 0.007 CF ∞ SEC 5 In. Hg

	I	F	Static Pressure			
Pitot Tube Leak Check	✓		Port			
ORSAT Train Leak Check			In. H_2O			
			In. Hg			

AF 061

Isokinetic Flue Gas Sampling Data Sheet

Project No. _____ Date 4/22/96 Sheet 2 of 2

Client BFI Run No. Cond 1500 - Hcl/Port - 2

Facility Halifax, MA Sample Location Outlet stack Operator B. Kelly

Source Landfill Flare

Point	Clock Time 24-hr	Clock Time min	Dry Gas Meter, (ft^3)	Pitot In. H_2O ΔP	Orifice ΔH In. H_2O Desired	Orifice ΔH In. H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg Gauge	Temperatures °F °C Stack	Filter Box	Imp Temp	XAD Cond	Probe	Filter Outlet
2D	15:10	21	722.415	0.045	2.20	2.20	83	79	4	1550	255	59	—	248	—
3D	15:13	24	724.551	0.030	1.46	1.46	82	80	3	1520	254	58	—	249	—
4D	15:16	27	726.711	0.025	1.21	1.21	82	80	3	1520	255	59	—	247	—
5D	15:19	30	728.487	0.020	0.99	0.99	81	79	3	1485	253	58	—	252	—
6D	15:22	33	730.251	0.030	1.49	1.49	82	80	3	1483	250	57	—	249	—
Stop	15:25	36		stop run for port change											
1A	15:33	36	732.005	0.030	1.45	1.45	77	76	3	1580	255	58	—	252	—
2A	1536	39	734.005	0.030	1.45	1.45	78	77	3	1581	256	55	—	253	—
3A	15:39	42	736.127	0.020	0.97	0.97	79	76	3	1526	258	57	—	255	—
4A	15:42	45	737.788	0.020	0.98	0.98	79	76	3	1500	255	56	—	254	—
5A	15:45	48	739.377	0.020	1.03	1.03	80	76	3	1400	258	55	—	256	—
6A	15:48	51	740.841	0.020	1.03	1.03	80	76	3	1410	257	54	—	259	—
Stop	15:51	54	742.523	stop run for Port change											
1B	16:02	54	742.546	0.040	1.96	1.96	75	75	3	1550	255	55	—	258	—
2B	16:05	57	745.111	0.040	1.94	1.94	78	76	3	1575	250	56	—	253	—
3B	16:08	60	747.411	0.035	1.69	1.69	78	75	3	1583	252	57	—	255	—
4B	16:11	63	749.251	0.030	1.45	1.45	78	75	3	1584	251	59	—	248	—
5B	16:14	66	751.37	0.025	1.21	1.21	79	76	3	1524	255	58	—	249	—
6B	16:17	69	753.311	0.025	1.21	1.21	79	76	3	1520	256	57	—	246	—
END	16:20	72	754.884												
		Total													

Meter Leak Check During Test:

			Meter Reading Stop	Meter Reading Start
___ CF	___ SEC	___ In. Hg	___	___
___ CF	___ SEC	___ In. Hg	___	___

Pressure			
Port	___	___	___
In. H_2O	___	___	___
In. Hg	___	___	___

Comments:

Stop: 15:25
Start: 15:33
Stop: 1551
Start: 16:02

TRC

Sampling Train Setup and Recovery Sheet

Project No. _____ Run No. 2

Client BFI Train Type/# Part. / HCl

Facility Halifax Date 4/22/96

Source Flare Recovery Person CM

Filter No. ~~K-32~~ K-33 _____

Thimble No. (if applicable) _____ _____ _____

XAD Trap No. (if applicable) _____

Moisture

Impinger #	1	2	3	4
Reagent	H_2SO_4	H_2SO_4	NaOH	NaOH
Final Volume (mLs)	165	105	106	100
Initial Volume (mLs)	100	100	100	100
Net Collected (g)	65	5	0	0

Impinger #				
Reagent				
Final Volume (mLs)				
Initial Volume (mLs)				
Net Collected (g)				

Silica Gel	#2			
Final Weight (g)	325.8			
Initial Weight (g)	314.8			
Net Collected (g)	11.0			

Total Moisture (Impingers and Silica Gel) (g) 81.0

TRC

Isokinetic Flue Gas Sampling Data Sheet

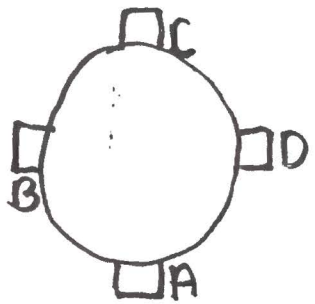
Page 1 of 2

Project No. _____
Client BFI
Facility Halifax, MA
Source Landfill Flare
Sample Location Outlet Stack
Stack Diameter 9'6"
Date 4/22/96
Run No. Cond 1500 - Hcl/Part - 3
Operator B. Kelly
Meter Box No. 8138
Meter Δ H@ 1.856
Y Factor 0.996

Very Important - Fill in All Blanks

Read and Record at the Start of Each Test Point

Sketch



Sheet 1 of 2
Train Prepared By ED MacKinnon
Pitot Number and Side Air Cooled
Pitot Tube CP 0.84
Filter No. / Thimble No. _____
Ambient Temp.°F 70°
Bar. Pressure., In. Hg 30.15
Assumed Moisture, % 9%
Heater Box Setting, °F 250°
Nozzle # / Dia., In. .658
Probe Length / Material 7' Eff Quartz
Probe Heater Setting 250°

Point	Clock Time 24 - hr	Clock Time min	Dry Gas Meter, (ft³)	Pitot In. H₂O Δ P	Orifice Δ H In. H₂O Desired	Orifice Δ H In. H₂O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg Gauge	Temperatures (°F) Stack	Filter Box	Imp Temp	XAD Cond	Probe	Filter Outlet
1B	1725	0	755.641	.04	1.90	1.90	72	72	3.0	1660	246	45		228	
2B	1728	3	758.200	.04	1.88	1.90	73	73	3.0	1580	247	46		233	
3B	17:31	6	760.260	0.04	1.88	1.88	75	73	3.0	1585	249	47		239	
4B	17:34	9	762.328	0.04	1.88	1.88	75	73	3.0	1587	251	48		247	
5B	17:37	12	764.535	0.035	1.65	1.65	76	73	3.0	1589	250	49		248	
6B	17:40	15	766.621	0.030	1.41	1.41	77	73	3.0	1575	252	49		245	
Stop	1743	18	768.485	Stop run for port change											
1A	1747	18	768.485	0.040	2.01	2.01	75	72	3.0	1456	251	49		246	

Comments: Stop 1743
Start 1747

Train Leak Check:
Before Test: .005 CF 60 SEC 12 In. Hg
After Test: 0.00 CF 60 SEC 6 In. Hg

	I	F	Static Pressure			
Pitot Tube Leak Check	✓	✓	Port			
ORSAT Train Leak Check			In. H₂O			
			In. Hg			

AF 061

Isokinetic Flue Gas Sampling Data Sheet

Project No. _____ Date 4/22/96 Sheet 2 of 2

Client BEI Run No. Cond1500-HCl/Part-3

Facility Halifax, MA Sample Location Outlet Stack Operator B. Kelly

Source Landfill Flare

Point	Clock Time 24-hr	Clock Time min	Dry Gas Meter, (ft^3)	Pitot In. H_2O ΔP	Orifice ΔH In. H_2O Desired	Orifice ΔH In. H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg Gauge	Temperatures °F °C Stack	Filter Box	Imp Temp	XAD Cond	Probe	Filter Outlet
2A	1750	21	770.488	0.040	2.01	2.01	76	72	3	1460	255	49	—	248	—
3A	1753	24	773.311	0.035	1.76	1.76	76	71	3	1464	251	50	—	250	—
4A	1756	27	775.211	0.030	1.49	1.49	76	71	3	1480	250	50	—	248	—
5A	1759	30	777.188	0.025	1.26	1.26	76	70	3	1454	249	50	—	251	—
6A	1802	33	779.688	0.025	1.26	1.26	75	70	3	1450	248	50	—	248	—
Stop	1805	36	780.958	Stop Run For Part Change											
1D	1809	36	780.958	0.040	2.01	2.01	70	69	3	1440	247	50	—	246	—
2D	1812	39	783.780	0.040	2.01	2.01	71	69	3	1448	249	51	—	253	—
3D	1815	42	785.598	0.035	1.71	1.71	71	68	3	1500	245	53	—	249	—
4D	1818	45	787.001	0.035	1.71	1.71	72	68	3	1510	249	53	—	246	—
5D	1821	48	789.311	0.030	1.47	1.47	70	68	3	1505	252	55	—	248	
6D	1824	51	791.511	0.025	1.23	1.23	70	69	3	1495	248	56	—	254	
Stop	1827	54	793.645												
1C	15:31	54	793.645	0.050	2.42	2.42	68	68	3	1530	247	55	—	250	
2C	18:34	57	796.001	0.040	1.94	1.94	69	67	3	1515	245	56	—	248	
3C	18:37	60	798.005	0.040	1.94	1.94	69	66	3	1520	249	57	—	249	
4C	18:40	63	800.411	0.035	1.72	1.72	68	66	3	1500	245	55	—	242	
5C	18:43	66	802.881	0.035	1.72	1.72	67	66	3	1495	251	54	—	245	
6C	18:46	69	804.477	0.035	1.72	1.72	67	66	3	1510	250	53	—	244	
End	18:49	72	807.115												
		Total													

Meter Leak Check During Test:

	Meter Reading Stop	Meter Reading Start
____ CF ____ SEC ____ In. Hg	____	____
____ CF ____ SEC ____ In. Hg	____	____

Static Pressure

Port	____	____	____
In. H_2O	____	____	____
In. Hg	____	____	____

Comments:

Stop 1805
Start 1809
stop 1827
Start

AF-060

Sampling Train Setup and Recovery Sheet

Project No. _____ Run No. 3

Client BFI Train Type/# Part I HCl

Facility Halifax Date 4/22/96

Source Flare Recovery Person CM

Filter No. K-34 _____ _____

Thimble No. (if applicable) _____ _____ _____

XAD Trap No. (if applicable) _____

Moisture

Impinger #	1	2	3	4
Reagent	H_2SO_4	H_2SO_4	NaOH	NaOH
Final Volume (mLs)	167	119	103	100
Initial Volume (mLs)	100	100	100	100
Net Collected (g)	67	19	3	0

Impinger #				
Reagent				
Final Volume (mLs)				
Initial Volume (mLs)				
Net Collected (g)				

Silica Gel				
Final Weight (g)	311.4			
Initial Weight (g)	297.6			
Net Collected (g)	13.8			

Total Moisture (Impingers and Silica Gel) (g) _____

TRC

APPENDIX B

FIELD REDUCED DATA

BFI Halifax - Outlet Stack
Sampling @ 1950°F Condition

Run No.	1	2	3	
Date	19-Apr-96	19-Apr-96	19-Apr-96	
Start Time	11:50	13:25	15:10	
Stop Time	12:50	14:25	16:10	AVERAGES
Barometric Pressure, in. Hg	30.01	30.01	30.01	30.01
Net Sampling Time, minutes	30.0	30.0	60.0	40.0
Volume Metered, cf	22.723	22.723	45.214	30.220
Avg. DGM Temp, F	72	72	70	71
AVG Delta H, in of H2O	2.00	2.00	2.00	2.00
AVG Delta H, in of Hg	0.1471	0.1471	0.1471	0.1471
DGM Calibration Factor	0.996	0.996	0.996	0.996
Volume of Gas Collected, dscf	22.654	22.654	45.194	30.168
Total Water Collected, mL	44.1	44.1	92.2	46.9
Volume of Water Vapor, scf	2.079	2.079	4.347	2.835
Moisture, %	8.4	8.4	8.8	8.5
Dry Mole Fraction, 100-%M	0.9159	0.9159	0.9123	0.9147
CO2 at Stack, % dry	10.02	9.64	9.80	9.82
O2 at Stack, % dry	9.78	10.18	10.19	10.05
CO + N2, % dry	80.20	80.18	80.01	80.13
Dry Molecular Weight, lb/lb mole	29.99	29.95	29.98	29.97
Wet Molecular Weight, lb/lb mole	28.99	28.95	28.92	28.95
Excess Air at Stack, %	85.8	92.7	93.2	90.6
Stack Area, sq. in.	10207.0	10207.0	10207.0	10207.0
Static Pressure, in. of H2O	-0.08	-0.08	-0.08	-0.08
Stack Pressure, in. of Hg	30.00	30.00	30.00	30.00
Avg. Stack Temp., F	1828	1826	1816	1823
Avg. Sqroot of Delta P	0.1160	0.1381	0.1405	0.1316
SDE Average	5.550	6.604	6.704	6.286
Pitot Coefficient	0.84	0.84	0.84	0.84
Stack Gas Velocity, afpm	811	966	981	919
Stack Flowrate, wet acfm	57,482	68,449	69,504	65,145
Stack Flowrate, dry scfm	12,184	14,521	14,753	13,819
EMISSIONS				
NOx, ppm	25	24	24	24
NOx, lbs/MMBtu	0.05	0.05	0.05	0.05
NOx, lbs/hr	2.18	2.50	2.54	2.40
CO, ppm	0	0	0	0
CO, lbs/MMBtu	0.00	0.00	0.00	0.00
CO, lbs/hr	0.00	0.00	0.00	0.00
SO2, ppm	1.29	0.00	1.97	1.09
SO2, lbs/MMBtu	0.00	0.00	0.01	0.00
SO2, lbs/hr	0.16	0.00	0.29	0.15

1950R1-3.WK4

BFI Halifax - Inlet Duct
1950°F Condition

Run No.	1	2	3	
Date	19-Apr-96	19-Apr-96	19-Apr-96	
Start Time	11:50	13:25	16:10	
Stop Time	12:50	14:25	17:10	AVERAGES
Barometric Pressure, in. Hg	30.01	30.01	30.01	30.01
Net Sampling Time, minutes	0.0	0.0	0.0	0.0
Volume Metered, cf	0.000	0.000	0.000	0.000
Avg. DGM Temp, F				0
AVG Delta H, in of H2O				0.00
AVG Delta H, in of Hg	0.0000	0.0000	0.0000	0.0000
DGM Calibration Factor	1.000	1.000	1.000	1.000
Volume of Gas Collected, dscf	0.000	0.000	0.000	0.000
Total Water Collected, mL	0.0	0.0	0.0	46.9
Volume of Water Vapor, scf	0.000	0.000	0.000	0.000
Moisture, %	5.0	5.0	5.0	5.0
Dry Mole Fraction, 100-%M	0.9500	0.9500	0.9500	0.9500
CO2 at Stack, % dry	40.77	40.77	40.77	40.77
O2 at Stack, % dry	1.11	1.11	1.11	1.11
CO + N2, % dry	58.12	58.12	58.12	58.12
Dry Molecular Weight, lb/lb mole	34.57	34.57	34.57	34.57
Wet Molecular Weight, lb/lb mole	33.74	33.74	33.74	33.74
Excess Air at Stack, %	7.8	7.8	7.8	7.8
Stack Area, sq. in. (12 in. ID)	113.1	113.1	113.1	113.1
Static Pressure, in. of H2O	2.00	2.00	2.00	2.00
Stack Pressure, in. of Hg	30.16	30.16	30.16	30.16
Avg. Stack Temp., F	102	98	98	99
Avg. Sqroot of Delta P	0.6010	0.5992	0.6000	0.6001
SDE Average	14.247	14.154	14.173	14.191
Pitot Coefficient	0.84	0.84	0.84	0.84
Stack Gas Velocity, afpm	1,925	1,912	1,915	1,917
Stack Flowrate, wet acfm	1,512	1,502	1,504	1,506
Stack Flowrate, wet scfm	1,431	1,432	1,434	1,432
Stack Flowrate, dry scfm	1,360	1,361	1,363	1,361

BFI Halifax - Outlet Stack
HCL/PM Sampling Train @ 1550°F Condition

Run No.	1	2	3	
Date	22-Apr-96	22-Apr-96	22-Apr-96	
Start Time	11:50	14:30	17:25	
Stop Time	13:29	16:20	18:49	AVERAGES
Nozzle Diameter, in.	0.658	0.658	0.658	
Barometric Pressure, in. Hg	30.15	30.15	30.15	30.15
Net Sampling Time, minutes	72.0	72.0	72.0	72.0
Volume Metered, cf	56.542	45.760	51.474	51.259
Avg. DGM Temp, F	88	79	71	79
AVG Delta H, in of H2O	2.08	1.49	1.75	1.77
AVG Delta H, in of Hg	0.1530	0.1092	0.1287	0.1303
DGM Calibration Factor	0.996	0.996	0.996	0.996
Volume of Gas Collected, dscf	54.953	45.137	51.592	50.561
Total Water Collected, mL	109.4	81.0	102.8	46.9
Volume of Water Vapor, scf	5.158	3.819	4.847	4.608
Moisture, %	8.6	7.8	8.6	8.3
Dry Mole Fraction, 100-%M	0.9142	0.9220	0.9141	0.9168
CO2 at Stack, % dry	7.46	7.24	7.84	7.51
O2 at Stack, % dry	12.94	13.48	12.68	13.03
CO + N2, % dry	79.60	79.28	79.48	79.45
Dry Molecular Weight, lb/lb mole	29.71	29.70	29.76	29.72
Wet Molecular Weight, lb/lb mole	28.71	28.79	28.75	28.75
Excess Air at Stack, %	160.3	180.9	152.7	164.6
Stack Area, sq. in.	10207.0	10207.0	10207.0	10207.0
Static Pressure, in. of H2O	-0.08	-0.08	-0.08	-0.08
Stack Pressure, in. of Hg	30.14	30.14	30.14	30.14
Avg. Stack Temp., F	1507	1521	1510	1513
Avg. Sqroot of Delta P	0.2052	0.1730	0.1886	0.1889
SDE Average	9.099	7.701	8.373	8.391
Pitot Coefficient	0.84	0.84	0.84	0.84
Stack Gas Velocity, afpm	1,333	1,127	1,226	1,228
Stack Flowrate, wet acfm	94,477	79,856	86,873	87,069
Stack Flowrate, dry scfm	23,359	19,766	21,440	21,522
Isokinetics, %	**98.1**	**95.2**	**100.3**	98
EMISSIONS				
NOx, ppm	11	11	11	11
NOx, lbs/MMBtu	0.03	0.03	0.03	0.03
NOx, lbs/hr	1.84	1.56	1.69	1.70
CO, ppm	10	21	13	15
CO, lbs/MMBtu	0.02	0.04	0.02	0.02
CO, lbs/hr	1.02	1.81	1.22	1.35
SO2, ppm	0.48	0.41	0.00	0.30
SO2, lbs/MMBtu	0.00	0.00	0.00	0.00
SO2, lbs/hr	0.11	0.08	0.00	0.06

1550R1-3.WK4

BFI Halifax - Inlet Duct
1550°F Condition

Run No.	1	2	3	
Date	22-Apr-96	22-Apr-96	22-Apr-96	
Start Time	11:50	14:30	17:25	
Stop Time	13:29	16:20	18:49	AVERAGES
Barometric Pressure, in. Hg	30.15	30.15	30.15	30.15
Net Sampling Time, minutes	0.0	0.0	0.0	0.0
Volume Metered, cf	0.000	0.000	0.000	0.000
Avg. DGM Temp, F				0
AVG Delta H, in of H2O				0.00
AVG Delta H, in of Hg	0.0000	0.0000	0.0000	0.0000
DGM Calibration Factor	1.000	1.000	1.000	1.000
Volume of Gas Collected, dscf	0.000	0.000	0.000	0.000
Total Water Collected, mL	0.0	0.0	0.0	46.9
Volume of Water Vapor, scf	0.000	0.000	0.000	0.000
Moisture, %	5.0	5.0	5.0	5.0
Dry Mole Fraction, 100-%M	0.9500	0.9500	0.9500	0.9500
CO2 at Stack, % dry	40.90	40.80	40.60	40.77
O2 at Stack, % dry	1.13	1.03	1.18	1.11
CO + N2, % dry	57.97	58.17	58.22	58.12
Dry Molecular Weight, lb/lb mole	34.59	34.57	34.54	34.57
Wet Molecular Weight, lb/lb mole	33.76	33.74	33.72	33.74
Excess Air at Stack, %	8.0	7.2	8.3	7.8
Stack Area, sq. in. (12 in. ID)	113.1	113.1	113.1	113.1
Static Pressure, in. of H2O	2.00	2.00	2.00	2.00
Stack Pressure, in. of Hg	30.30	30.30	30.30	30.30
Avg. Stack Temp., F	102	96	98	99
Avg. Sqroot of Delta P	0.5767	0.5731	0.6000	0.5833
SDE Average	13.672	13.512	14.173	13.786
Pitot Coefficient	0.84	0.84	0.84	0.84
Stack Gas Velocity, afpm	1,842	1,821	1,911	1,858
Stack Flowrate, wet acfm	1,447	1,430	1,501	1,459
Stack Flowrate, wet scfm	1,376	1,376	1,438	1,397
Stack Flowrate, dry scfm	1,308	1,307	1,366	1,327

APPENDIX C

FLUE GAS ANALYTICAL DATA

BTU F-FACTOR CONVERSION

Run No.	Specific Gravity @ 60°F	Density to 68°F	Density lb/cf	Btu/cf @ 60°F	Btu/cf to 68°F	Btu/lb	F-Factor dscf/MMBtu
Run 1	0.9877	0.0752	0.0743	511.6	503.8	6782	9524
Run 2	0.9821	0.0752	0.0739	522.8	514.9	6970	9493
Run 3	0.9822	0.0752	0.0739	520.3	512.4	6936	9485

Mole % H2	H2 lbs	H2 lbs %	Mole % C	C lbs	C lbs %	Mole % S2	S2 lbs	S2 lbs %	Mole % N2	N2 lbs	N2 lbs %	Mole % O2	O2 lbs	O2 lbs %	Total lbs	Total lbs %
51.40	0.52	7.11	23.30	2.80	38.39	0.00	0.00	0.00	3.87	0.54	7.44	21.42	3.43	47.06	7.2831	100.00
52.11	0.53	7.31	23.35	2.80	39.01	0.00	0.00	0.00	3.42	0.48	6.67	21.11	3.38	47.02	7.1837	100.00
51.99	0.52	7.28	23.29	2.79	38.81	0.00	0.00	0.00	3.56	0.50	6.92	21.15	3.38	46.99	7.2013	100.00

-DATA INPUT

Particulate Analysis

Project No. 20272 Date 4/22/96

Client BFI Source Landfill Flare

Plant Halifax Landfill Flare Analyst B. J

A. SAMPLE VOLUME

93 mL

B. WASH VOLUME

25 mL
____ mL
____ mL
____ mL
Total: 25 mL

C. BLANK CORRECTION

Sample: ____ mL x ____ g/mL = ____ g

Wash: ____ mL x ____ g/mL = ____ g

D. TARE WEIGHTS

	No.	Wt.
Container	B-1	105.9116 g
Filter		g
Thimble		g
Total		105.9116 g

E. GROSS WEIGHTS

RH/°F	Date/Time		RH/°F	Date/Time	
48%, 63°	5/9, Am	(1) 105.9160 g	/	/	(4) g
43%, 65°	5/9, Pm	(2) 105.9162 g	/	/	(5) g
/	/	(3) g	/	/	(6) g

Final Gross Weight 105.9162 g

Total Tare Weight 105.9116 g

Residue Weight 0.0046 g

Blank Weight 0.0000 g

F. NET WEIGHT Net Weight 0.0046 g = 4.6 mg

REMARKS: 1550° F HCL/Pm BFIH-FHALE-1

Run #1 Acetone Rinse

AF-198

TRC

Particulate Analysis

Project No. 20272 Date 4/22/96

Client BFI Source Landfill Flare

Plant Halifax Landfill Flare Analyst S J

A. SAMPLE VOLUME

_____ mL

B. WASH VOLUME

_____ mL
_____ mL
_____ mL
_____ mL
Total: _____ mL

C. BLANK CORRECTION

Sample: _____ mL x _____ g/mL = _____ g

Wash: _____ mL x _____ g/mL = _____ g

D. TARE WEIGHTS

	No.	Wt.
Container		g
Filter	K-31	0.3390 g
Thimble		g
Total		0.3390 g

E. GROSS WEIGHTS

RH/°F	Date/Time		RH/°F	Date/Time	
40%, 65°	5/8, Am	(1) 0.3401 g	/	/	(4) _____ g
44%, 66°	5/8, Pm	(2) 0.3400 g	/	/	(5) _____ g
/	/	(3) _____ g	/	/	(6) _____ g

Final Gross Weight 0.3400 g

Total Tare Weight 0.3390 g

Residue Weight 0.0010 g

Blank Weight 0.0000 g

F. NET WEIGHT Net Weight 0.0010 g = 1.0 mg

REMARKS: 1550° F HCL/PM BEIH-PF-1
Run #1 Filter

AF-198

TRC

Particulate Analysis

Project No. 20272 Date 4/22/96

Client BFI Source Landfill Flare

Plant Halifax Landfill Flare Analyst S. J

A. SAMPLE VOLUME

91 mL

B. WASH VOLUME

25 mL
____ mL
____ mL
____ mL
Total: 25 mL

C. BLANK CORRECTION

Sample: ____ mL x ____ g/mL = ____ g

Wash: ____ mL x ____ g/mL = ____ g

D. TARE WEIGHTS

	No.	Wt.
Container	B-2	118.3257 g
Filter		g
Thimble		g
Total		118.3257 g

E. GROSS WEIGHTS

RH/°F	Date/Time		RH/°F	Date/Time	
48%, 63°	5/9, AM	(1) 118.3297 g	/	/	(4) ____ g
43%, 65°	5/9, PM	(2) 118.3299 g	/	/	(5) ____ g
/	/	(3) ____ g	/	/	(6) ____ g

Final Gross Weight 118.3299 g

Total Tare Weight 118.3257 g

Residue Weight 0.0042 g

Blank Weight 0.0000 g

F. NET WEIGHT Net Weight 0.0042 g = 4.2 mg

REMARKS: 1550° F HCL/PM BFIH-FHARE-2
Rv-#2 Acetone Rinse

AF-198

TRC

Particulate Analysis

Project No. 20272 Date 4/22/96

Client BFI Source Landfill Flare

Plant Halifax Landfill Flare Analyst S. J

A. SAMPLE VOLUME

_____ mL

B. WASH VOLUME

_____ mL
_____ mL
_____ mL
_____ mL
Total: _____ mL

C. BLANK CORRECTION

Sample: _____ mL x _____ g/mL = _____ g

Wash: _____ mL x _____ g/mL = _____ g

D. TARE WEIGHTS

	No.	Wt.
Container		g
Filter	K-33	0.3371 g
Thimble		g
Total		0.3371 g

E. GROSS WEIGHTS

RH/°F	Date/Time			RH/°F	Date/Time		
40%, 65°	5/8, Am	(1)	0.3376 g	/	/	(4)	g
44%, 66°	5/8, Pm	(2)	0.3377 g	/	/	(5)	g
/	/	(3)	g	/	/	(6)	g

Final Gross Weight 0.3377 g

Total Tare Weight 0.3371 g

Residue Weight 0.0006 g

Blank Weight 0.0000 g

F. NET WEIGHT Net Weight 0.0006 g = 0.6 mg

REMARKS: 1550°F HCL/PM BFIH-PF-2 Run #2 Filter

AF-196

TRC

Particulate Analysis

Project No. 20272 Date 4/22/96

Client BFI Source Landfill Flare

Plant Hollifield Landfill Flare Analyst S.

A. SAMPLE VOLUME

75 mL

B. WASH VOLUME

25 mL
____ mL
____ mL
____ mL
Total: 25 mL

C. BLANK CORRECTION

Sample: ____ mL x ____ g/mL = ____ g

Wash: ____ mL x ____ g/mL = ____ g

D. TARE WEIGHTS

	No.	Wt.
Container	B-3	104.9275 g
Filter		g
Thimble		g
Total		104.9275 g

E. GROSS WEIGHTS

RH/°F	Date/Time			RH/°F	Date/Time		
43%, 65°	5/9, Pm	(1)	104.9303 g	/	/	(4)	g
46%, 61°	5/13, Am	(2)	104.9306 g	/	/	(5)	g
/	/	(3)	g	/	/	(6)	g

Final Gross Weight 104.9303 g

Total Tare Weight 104.9275 g

Residue Weight 0.0028 g

Blank Weight 0.0000 g

F. NET WEIGHT Net Weight 0.0028 g = 2.8 mg

REMARKS: 1550° F HCL/Pm BFIH-FHACE-3
Run #3 Acetone Rinse

AF-198

TRC

Particulate Analysis

Project No. 20272 Date 4/22/96

Client BFI Source Landfill Flare

Plant Halifax Landfill Flare Analyst S. J

A. SAMPLE VOLUME

_____ mL

B. WASH VOLUME

_____ mL
_____ mL
_____ mL
_____ mL
Total: _____ mL

C. BLANK CORRECTION

Sample: _____ mL x _____ g/mL = _____ g

Wash: _____ mL x _____ g/mL = _____ g

D. TARE WEIGHTS

	No.	Wt.
Container		_____ g
Filter	K-34	0.3380 g
Thimble		_____ g
Total		0.3380 g

E. GROSS WEIGHTS

RH/°F	Date/Time		RH/°F	Date/Time	
40%, 65°	5/8, Am	(1) 0.3394 g	___/___	___/___	(4) _____ g
44%, 66°	5/8, Pm	(2) 0.3392 g	___/___	___/___	(5) _____ g
___/___	___/___	(3) _____ g	___/___	___/___	(6) _____ g

Final Gross Weight 0.3392 g

Total Tare Weight 0.3380 g

Residue Weight 0.0012 g

Blank Weight 0.0000 g

F. NET WEIGHT Net Weight 0.0012 g = 1.2 mg

REMARKS: 1550°F HCL/PM BFIH-PF-2
Run #3 Filters

AF-198

TRC

Particulate Analysis

Project No. 20272 Date 4/22/96

Client BFI Source Landfill Flare

Plant Halifax Landfill Flare Analyst S. J

A. SAMPLE VOLUME

117 mL

B. WASH VOLUME

25 mL
____ mL
____ mL
____ mL
Total: 25 mL

C. BLANK CORRECTION

Sample: ____ mL x ____ g/mL = ____ g

Wash: ____ mL x ____ g/mL = ____ g

D. TARE WEIGHTS

	No.	Wt.
Container	B-4	113.2827 g
Filter		g
Thimble		g
Total		113.2827 g

E. GROSS WEIGHTS

RH/°F	Date/Time			RH/°F	Date/Time		
/	/	(1)	113.2830 g	/	/	(4)	g
/	/	(2)	113.2826 g	/	/	(5)	g
/	/	(3)	g	/	/	(6)	g

Final Gross Weight 113.2826 g

Total Tare Weight 113.2827 g

Residue Weight g

Blank Weight -0.0001 g

F. NET WEIGHT Net Weight -0.0001 g = -0.1 mg

REMARKS: 1550° F HCL/PM BFIH-Blank-ACE Blank Acetone Rinse

AF-198

TRC

Particulate Analysis

Project No. 20272 Date 4/22/96

Client BFI Source Landfill Flare

Plant Halifax Landfill Flare Analyst [signature]

A. SAMPLE VOLUME

_____ mL

B. WASH VOLUME

_____ mL
_____ mL
_____ mL
_____ mL
Total: _____ mL

C. BLANK CORRECTION

Sample: _____ mL x _____ g/mL = _____ g

Wash: _____ mL x _____ g/mL = _____ g

D. TARE WEIGHTS

	No.	Wt.
Container		_____ g
Filter	K-35	0.3389 g
Thimble		_____ g
Total		0.3389 g

E. GROSS WEIGHTS

RH/°F	Date/Time			RH/°F	Date/Time		
44%/66°	5/8 / PM	(1)	0.3391 g	/	/	(4)	_____ g
48%/63°	5/9 / AM	(2)	0.3388 g	/	/	(5)	_____ g
/	/	(3)	_____ g	/	/	(6)	_____ g

Final Gross Weight 0.3388 g

Total Tare Weight 0.3389 g

Residue Weight _____ g

Blank Weight -0.0001 g

F. NET WEIGHT Net Weight -0.0001 g = -0.1 mg

REMARKS: 1550° F HCL/PM BFIH - Blank - Filter Filter Blank

AF-196

TRC

CHAIN OF CUSTODY RECORD

Project Name: BFI Halifax
Project No.: 20272
Sampling Date(s): 4/22/96
Laboratory: TRC Lowell
Laboratory P.O. #:
Shipping Airbill No.:
Shipping Date(s): ~~HOLD~~ N/A
Shipper's Name: N/A

Sample Code	Sampled Date	Container Size	Container G/P	MATRIX: Aqueous	Organic Solvent	Ash/Soil/Sediment	Acidic	Basic	Other	Source Description	ANALYSIS: Trace Metals*	Mercury	Hexavalent Chromium	HCl	Cl2	Particulate Matter	PCDD/PCDF	Semi-Volatile Organics	Volatile Organics	Physical Parameters*	Comments
BFIH-FHACE-1	4/22		G	X											X						
BFIH-FHACE-2	4/22		G	X											X						
BFIH-FHACE-3	4/22		G	X											X						
PM Filters in desicator																					
Run 1			P					X							X						
Run 2			P					X							X						
Run 3			P					X							X						

Relinquished by:	Date/Time: 4/23/96	Relinquished by:	Date/Time:
Received by:	Date/Time: 5/8/96	Received by:	Date/Time:

REMARKS (*):

№ 00584

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TRC Environmental Corporation

TRC - LOWELL
BFI HALIFAX
JOB # T004
REPORT # 96-064

SUBMITTED BY:
CHESTER LABNET - PORTLAND
12242 S.W. GARDEN PLACE
TIGARD, OR 97223
☎(503)624-2183/FAX (503)624-2653

CHESTER LabNet

Portland
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Case Narrative

Date: May 2, 1996

General Information

Client:	TRC - Lowell
Sample Description:	EPA Method 26 Impinger Solutions
Sample Numbers:	96M288 - 96M290
Job Number:	T004
Report Number:	96-064

Analysis

Analytes:	HCl
Analytical Protocols:	EPA Method 26
Analytical Notes:	Analysis was performed with no problems encountered.
QA/QC Review:	All of the data have been reviewed by the analysts performing the analyses and the quality assurance officer. All of the quality control and sample-specific information in this package is complete and meets or exceeds the minimum requirements for acceptability.
Comments:	If you have any questions or concerns regarding this analysis, please feel free to contact the project manager.

5/2/96
QA Officer — Date
Charles Lytle

Paul Duda 5/2/96
Project Manager — Date
Paul Duda

Client Name: TRC - Lowell
Project Number: T004

Lab ID: 96-M288
Client ID: BF1H-HCl-1
Site: BFI Halifax
Sample Date: 4/22/96
Sample Volume: 435.0 ml

Analyte	Results			
HCl	7.74	µg/ml	3370	µg

Lab ID: 96-M289
Client ID: BF1H-HCl-2
Site: BFI Halifax
Sample Date: 4/22/96
Sample Volume: 395.0 ml

Analyte	Results			
HCl	7.02	µg/ml	2770	µg

Lab ID: 96-M290
Client ID: BF1H-HCl-3
Site: BFI Halifax
Sample Date: 4/22/96
Sample Volume: 420.0 ml

Analyte	Results			
HCl	7.05	µg/ml	2960	µg

QA/QC REPORT: BLANK ANALYSIS

Client: TRC-LOWELL
Analytical Technique: METHOD 26
Sample Description: IMPINGER SOLUTIONS
Chester Analysis Range: 96M 288 - 290
Date: 5/1/96

Sample ID	ANALYTES							
	Cl mg/L							
PREP BLANK	<MDL							
Average Blank	<MDL							
MDL	0.1							

Note:
MDL = Method Detection Limit
OC = Organic Carbon; EC = Elemental Carbon; TC = Total Carbon

All samples will be blank subtracted based on the average blank values listed above

QA/QC REPORT: CONTINUING CALIBRATION DATA

Client: TRC-LOWELL
Analytical Technique: METHOD 26
Sample Description: IMPINGER SOLUTIONS
Chester Analysis Range: 96M 288 - 290
Date: 5/1/96

Sample ID	Analyte	Std.Conc. mg/L	Meas'd Conc. mg/L	Recovery %
ICV	Cl	10.0	9.5	95.3
CCV	Cl	10.0	9.5	94.8

Note:
Concentrations are not blank corrected.
% Recovery = (measured conc./standard conc.)*100

QA/QC Limits:
Continuing Calibration = +/- 10%

QA/QC REPORT: LABORATORY DUPLICATE ANALYSIS

Client: TRC-LOWELL
Analytical Technique: METHOD 26
Sample Description: IMPINGER SOLUTIONS
Chester Analysis Range: 96M 288 - 290
Date: 5/1/96

Sample ID	Analyte	MDL mg/L	Sample Conc. mg/L	Duplicate Conc. mg/L	RPD %
96M 288	Cl	0.1	7.498	7.556	0.77

Note:

RPD = Relative Percent Difference between samples,
= ((sple1-sple2)/[(sple1+sple2)/2])*100
N/C = RPD Not Calculated since sample and/or duplicate was <MDL
= Concentrations are < 5 times MDL

QA/QC Limits:
Duplicate RPD = +/- 20% when sample value(s) are above 5 times the MDL

QA/QC REPORT: MATRIX SPIKE ANALYSIS

Client: TRC-LOWELL
Analytical Technique: METHOD 26
Sample Description: IMPINGER SOLUTIONS
Chester Analysis Range: 96M 288 - 290
Date: 5/1/96

Sample ID	Analyte	Spiked Sple Result mg/L	Sample result mg/L	Spike Added mg/L	Recovery %
96M 288	Cl	16.79	6.7482	10	97.00

Note:
Concentrations are blank corrected.
% Recovery = [(spiked sple - sple)/spike added]*100
* = 'Sample Result' has been adjusted for volume due to addition of the post-digestion spike.

QA/QC Limits: Spike Recoveries = 75% < spike recovery < 125%

CHAIN OF CUSTODY RECORD

Project Name: BFI Hal Eax
Project No.: 20272
Sampling Date(s): 4/22/96
Laboratory: Chester Labs
Laboratory P.O. #:
Shipping Airbill No.:
Shipping Date(s): 4/24/96
Shipper's Name: MO'Brien

Sample Code	Sampled Date	Container Size	Container G/P	MATRIX: Aqueous	Organic Solvent	Ash/Soil/Sediment	Acidic	Basic	Other	Source Description	ANALYSIS: Trace Metals*	Mercury	Hexavalent Chromium	HCl	Cl2	Particulate Matter	PCDD/PCDF	Semi-Volatile Organics	Volatile Organics	Physical Parameters*	Comments
BFIH-HCl-1		500ml	G			X							X								96M288
BFIH-HCl-2		500ml	G			X							X								M289
BFIH-HCl-3		500ml	G			X							X								M290

Relinquished by:	Date/Time: 4/24/96	Relinquished by:	Date/Time:
Received by:	Date/Time: 4/26/96 9:30	Received by:	Date/Time:

REMARKS (*):

PO# 028668 HRW

№ 00583

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TRC Environmental Corporation

5/2/96 SH VOLUMES — TRC LOWELL

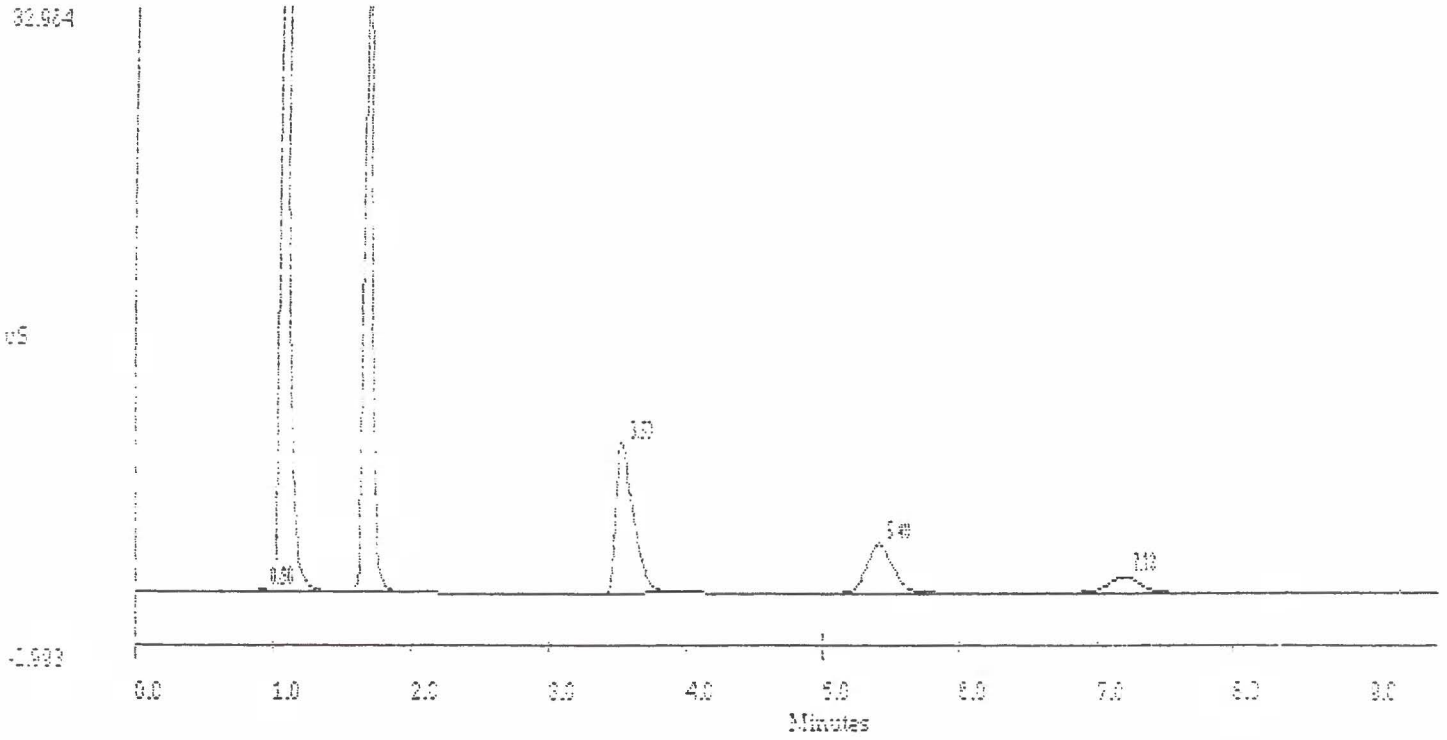
SAMPLE	VOLUME
96M288	435
289	395
290	420

Sample Name: CDV MID Date: Wed May 01 16:05:55 1996
Data File : C:\DX\DATA\050IAN01.D24
Method : C:\DX\METHOD\AN_AUTO.mat
ACQ Address: 1 System : 1 Inject#: 24 Detector: CDM-1

********** EXTERNAL STANDARD REPORT **********

Start Time : 0.00 minutes Stop time = 9.50 minutes
Number of Data Points = 2850 One Data Point per 0.2 seconds
Area Reject = 100
Amount Injected = 1 Dilution factor = 1

PEAK NUM	RET TIME	PEAK NAME	CONC. in ppm	AREA	HEIGHT	BL	REF PEAK	% DELTA RET TIME
1	0.90		7.826e+002	7.826e+002	193	1		
2	1.07	F	9.931e+000	2.350e+005	55952	1	1	0.00%
3	1.67	CL	9.527e+000	1.591e+005	36927	1	2	0.00%
4	3.53	NO3	9.390e+000	7.270e+004	8514	1	5	0.00%
5	5.40	PO4	1.009e+001	3.746e+004	2728	1	1	-6.76%
6	7.18	SO4	1.837e+000	1.612e+004	947	1	1	-1.41%



Sample Name: CO2 Operator: [illegible]

Data File : C:\CHROMATOG\[illegible].D20

Method : C:\CHROMETH\[illegible].M

Run Date: [illegible] System: [illegible] Detector: CDM-1

********** EXTERNAL STANDARD REPORT **********

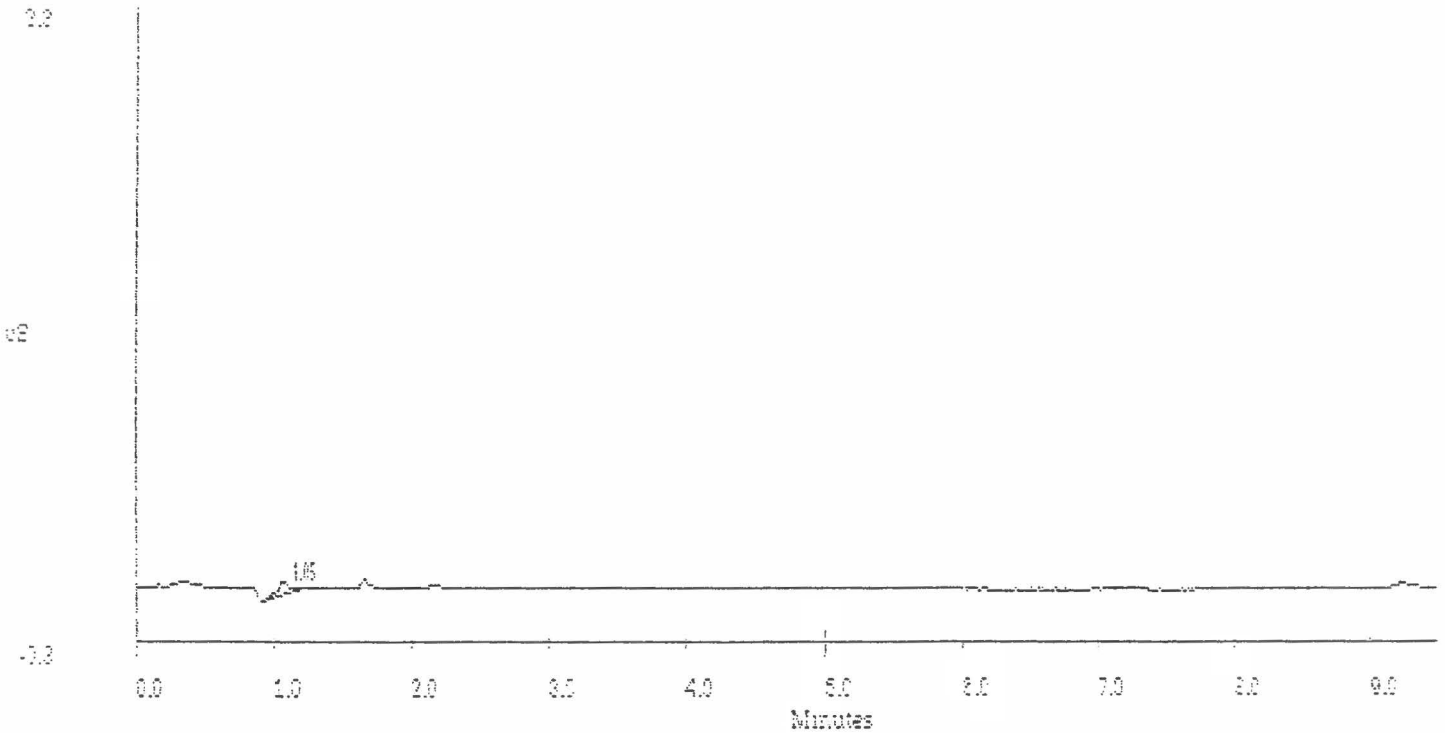
Start Time = 0.00 minutes Stop time = 9.50 minutes

Number of Data Points = 2850 One Data Point per 0.2 seconds

Area Reject = 100

Amount Injected = 1 Dilution factor = 1

PEAK NUM	RET TIME	PEAK NAME	CONC. in ppm	AREA	HEIGHT	MK	REF PEAK	% DELTA RET TIME
1	1.05	F	4.390e-002	4.861e+002	71	1	1	0.00%

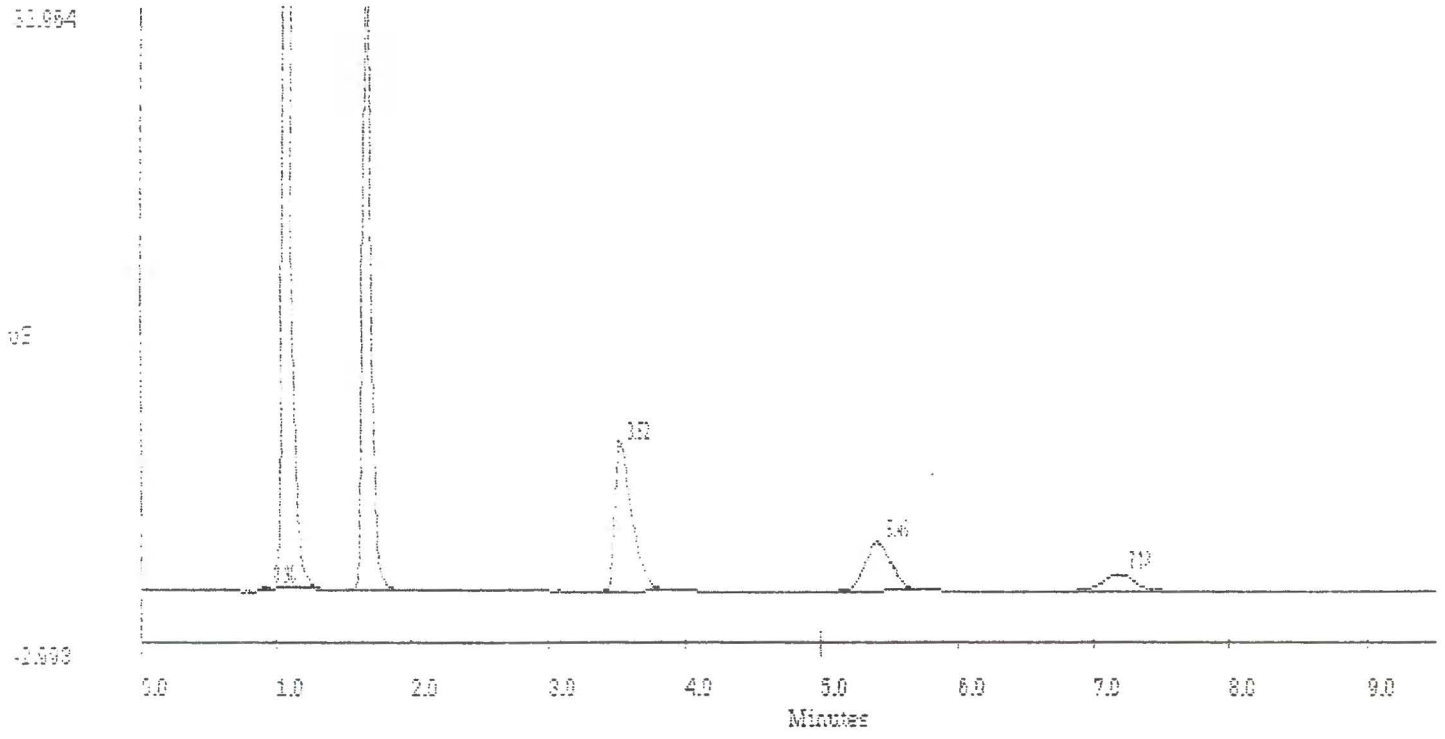


Sample Name: CCV FID Date: Wed May 01 19:45:48 1996
Data File : C:\DATA\050196\01.033
Method : C:\DATA\ET-OBVAN AUTO.mth
FID Address: 1 System # 1 Injector: 33 Detector: FID-1

********** EXTERNAL STANDARD REPORT **********

Start Time = 0.00 minutes Stop time = 9.50 minutes
Number of Data Points = 2850 One Data Point per 0.2 seconds
Area Reject = 100
Amount Injected = 1 Dilution factor = 1

PEAK NUM	RET TIME	PEAK NAME	CONC. in ppm	AREA	HEIGHT	BL	REF PEAK	% DELTA RET TIME
1	0.90		8.009e+002	8.009e+002	199	1		
2	1.07 F		9.097e+000	2.342e+005	56988	1	1	0.00%
3	1.67 CL		9.484e+000	1.583e+005	36547	1	2	0.00%
4	3.56 HCl		9.429e+000	7.301e+004	6305	1	3	0.00%
5	5.40 F04		1.002e+001	3.721e+004	2751	1	1	-6.76%
6	7.10 S04		1.844e+000	1.589e+004	931	1	1	-1.41%

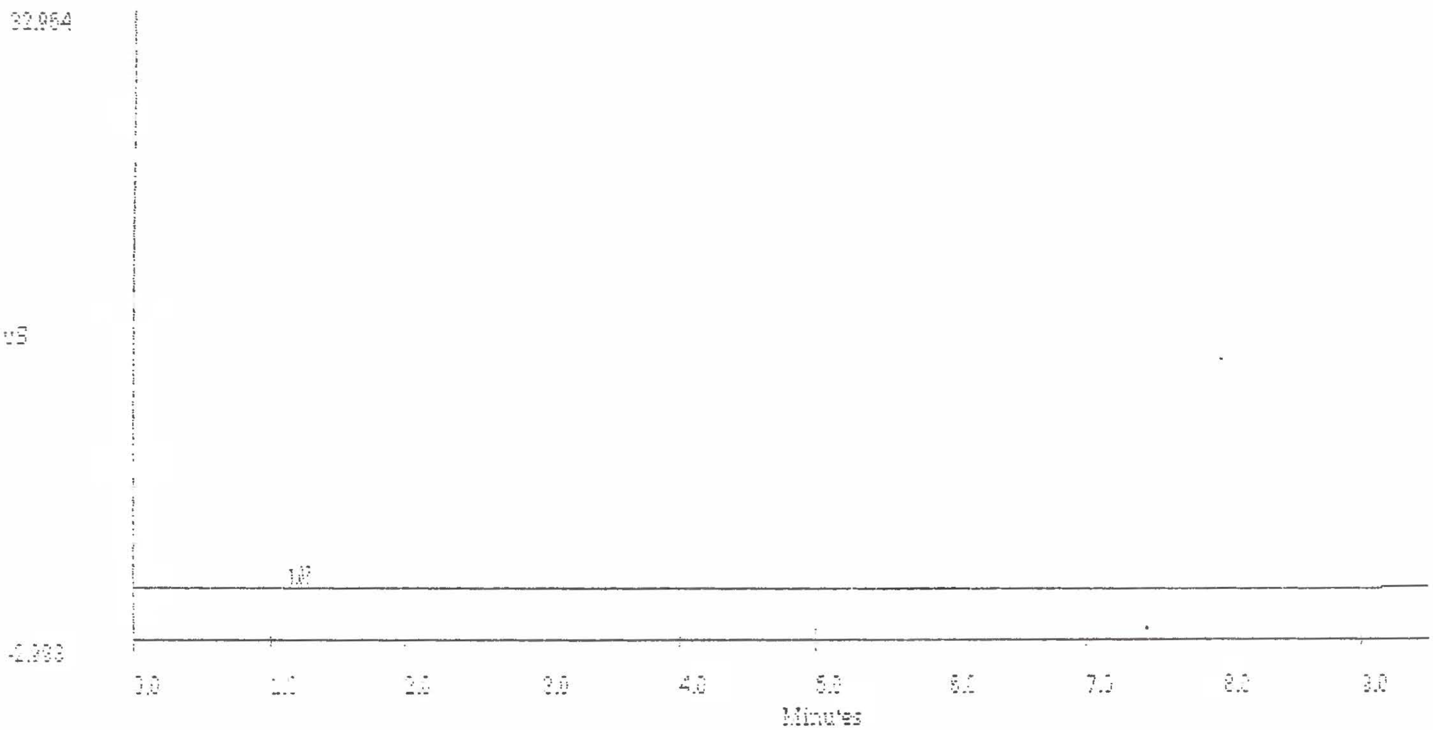


Sample Name: [illegible]   Date: Wed May [illegible] 19:37:55 199[illegible]
Data File : C:\DX\DATA\[illegible].D34
Method : C:\DX\METHOD\[illegible] AUTO.met
[illegible] Address: 1   System : 1   Inject#. 34   Detector: CDM-[illegible]

*********************** EXTERNAL STANDARD REPORT ****************************

Start Time = 0.00 minutes   Stop time = 9.50 minutes
Number of Data Points = 2850   One Data Point per 0.2 seconds
Area Reject = 100
Amount Injected = 1   Dilution factor = 1

PEAK NUM	RET TIME	PEAK NAME	CONC. in ppm	AREA	HEIGHT	BL	REF PEAK	% DELTA RET TIME
1	1.07 F		-6.407e-003	3.[illegible]e+002	68	1	1	0.00%

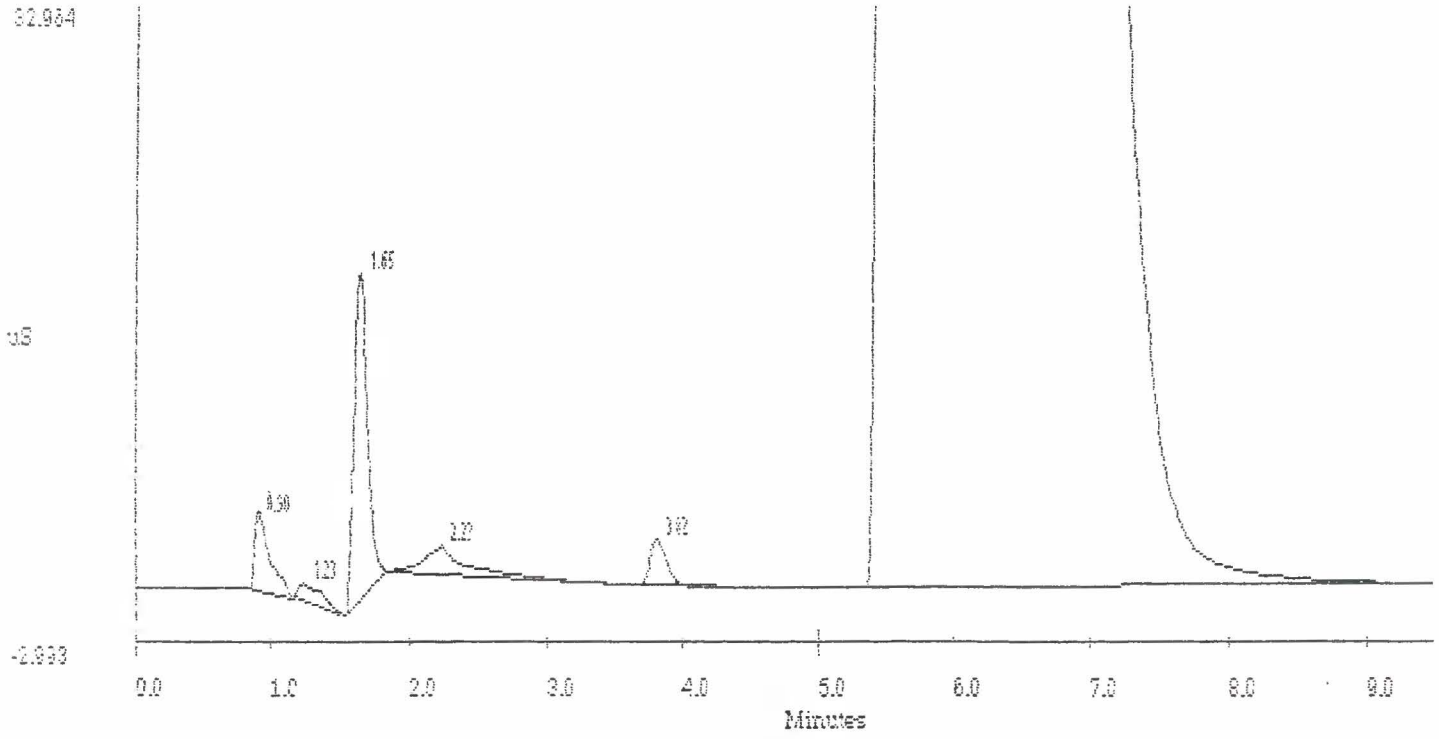


Sample Name: 24H 25F Date: Wed May 01 10:20:30 1996
Data File : C:\DX\DATA\050196\...D24
Method : C:\DX\METHODS\AK_AL10.met
ADC Address: 1 System: 1 Inject#: 26 Detector: CDM-1

********** EXTERNAL STANDARD REPORT **********

Start Time = 0.00 minutes Stop time = 9.50 minutes
Number of Data Points = 2850 One Data Point per 0.2 seconds
Area Reject = 100
Amount Injected = 1 Dilution factor = 1

PEAK NUM	RET TIME	PEAK NAME	CONC. in ppm	AREA	HEIGHT	BL	REF PEAK	% DELTA RET TIME
1	0.90		3.409e+004	3.409e+004	4205	1		
2	1.23		1.197e+004	1.197e+004	981	1		
3	1.65	BL	7.428e+000	1.239e+005	18405	1	2	0.00%
4	2.23		3.388e+004	3.388e+004	1564	1		
5	3.82	N03	2.885e+000	2.046e+004	2567	1	5	0.00%
6	5.55	P04	7.944e+003	3.009e+007	528657	1	1	-5.67%

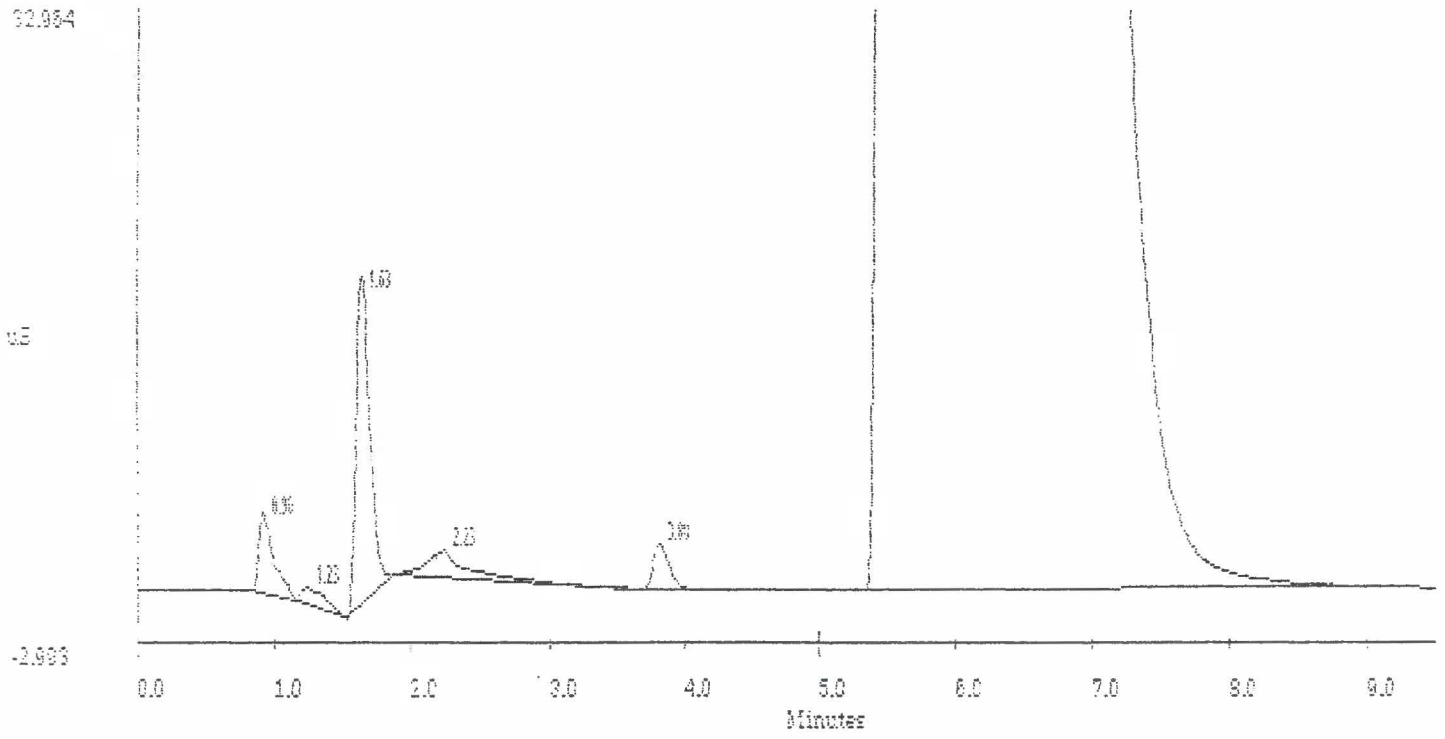


Sample Name: 96M 203 DUP Date: Wed May 01 18:39:40 1996
Data File: C:\DX\DATA\050ANO1.D97
Method: C:\DX\METHODS\NH_4LTO.MET
ASI Autosmpl: 1 System: 1 Inject#: 27 Detector: CONF

********** EXTERNAL STANDARD REPORT **********

Start Time = 0.00 minutes Stop time = 9.50 minutes
Number of Data Points = 2030 One Data Point per 0.2 seconds
Area Reject = 100
Amount Injected = 1 Dilution Factor = 1

PEAK #	RET TIME	PEAK NAME	CONC. in ppm	AREA	HEIGHT	BL	REF PEAK	% DELTA RET TIME
1	0.90		3.453e+004	3.453e+004	4236	1		
2	1.23		1.171e+004	1.171e+004	954	1		
3	1.63	CL	7.556e+000	1.249e+005	17657	1	2	0.00%
4	2.23		3.318e+004	3.318e+004	1593	1		
5	3.80	NO3	2.857e+000	2.024e+004	2452	1	5	0.00%
6	5.55	PO4	7.959e+003	3.014e+007	529357	1	1	-5.67%

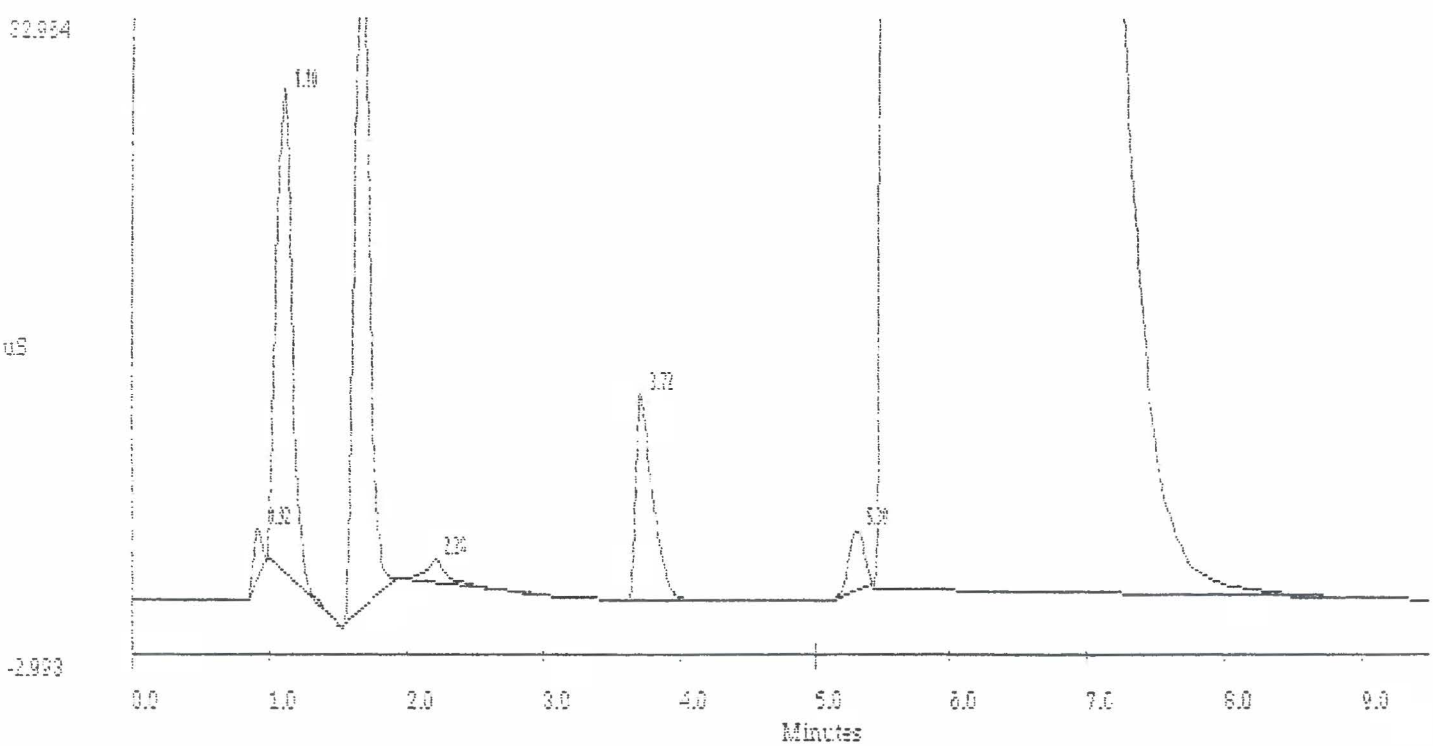


Sample Name: 96M 208 SPIKE   Date: Wed May 01 18:50:50 1996;
Data File : C:\DX\DATA\0501AN01.D??
Method   : C:\DX\METHOD\AN AUTO.MET
ACI Address: 1   System : 1   Inject#: 20   Detector: CDM-1

****************** EXTERNAL STANDARD REPORT ******************

Start Time = 0.00 minutes   Stop time = 9.50 minutes
Number of Data Points = 2850   One Data Point per 0.2 seconds
Area Reject = 100
Amount Injected = 1   Dilution factor = 1

PEAK NUM	RET TIME	PEAK NAME	CONC. in ppm	AREA	HEIGHT	BL	REF PEAK	% DELTA RET TIME
1	0.92		1.029e+004	1.029e+004	2674	1		
2	1.10	F	9.243e+000	2.188e+005	27116	1	1	0.00%
3	1.67	CL	1.679e+001	2.851e+005	36720	1	2	0.00%
4	2.20	NO2	1.708e+000	1.490e+004	1252	1	6	-5.17%
5	3.72	NO3	1.247e+001	9.742e+004	11626	1	5	0.00%
6	5.30		2.547e+004	2.547e+004	3277	1		
7	5.62	PO4	7.189e+003	2.723e+007	490457	1	1	-5.96%

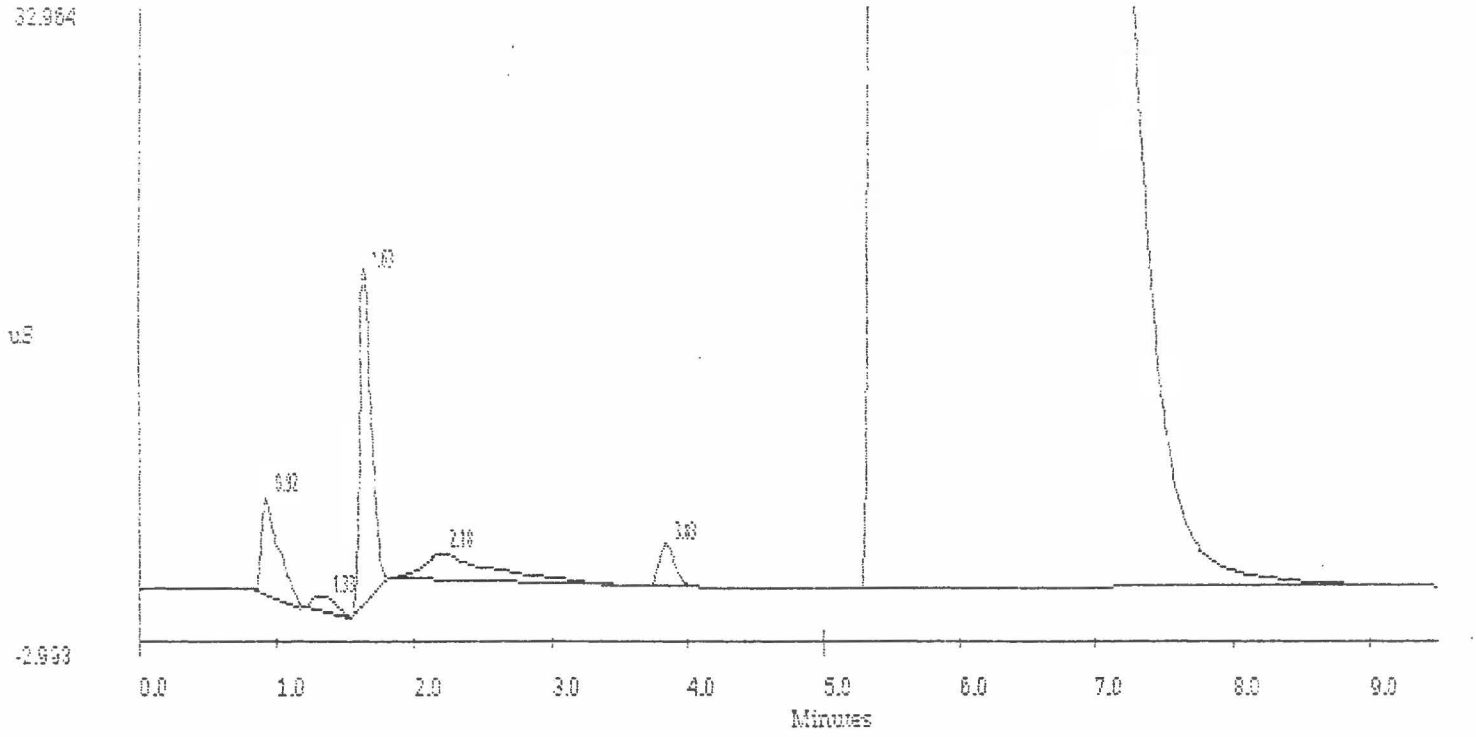


Sample Name: 95K 269 Date: Wed May 01 19:02:03 1996
Data File : C:\DX\DATA\050104ND1.D29
Method : C:\DX\METHOD\ASH AUTO.met
ACT Address: 1 System # : Inject#: 29 Detector: CON-1

EXTERNAL STANDARD REPORT

Start Time = 0.00 minutes Stop time = 9.50 minutes
Number of Data Points = 2550 One Data Point per 0.2 seconds
Area Reject = 100
Amount Injected = 1 Dilution factor = 1

PEAK NUM	RET TIME	PEAK NAME	CONC. in ppm	AREA	HEIGHT	BL	REF PEAK	% DELTA RET TIME
1	0.92		4.820e+004	4.820e+004	5556	1		
2	1.33		1.061e+004	1.061e+004	898	1		
3	1.63	CL	6.814e+000	1.121e+005	18663	1	2	0.00%
4	2.18		5.508e+004	5.503e+004	1493	1		
5	3.83		1.901e+004	1.901e+004	2395	1		
7	5.47		3.353e+007	3.353e+007	573834	1		



Sample Name: 96M 289 DUP Date: Wed May 01 19:13:16 1996

Data File: C:\EXTRACT\OXOLAN01.D30

Method: C:\OXMETHOD\AN_AUTO.met

ADC Address: 1 System # 1 Inject#: 30 Detector: CDM-1

********** EXTERNAL STANDARD REPORT **********

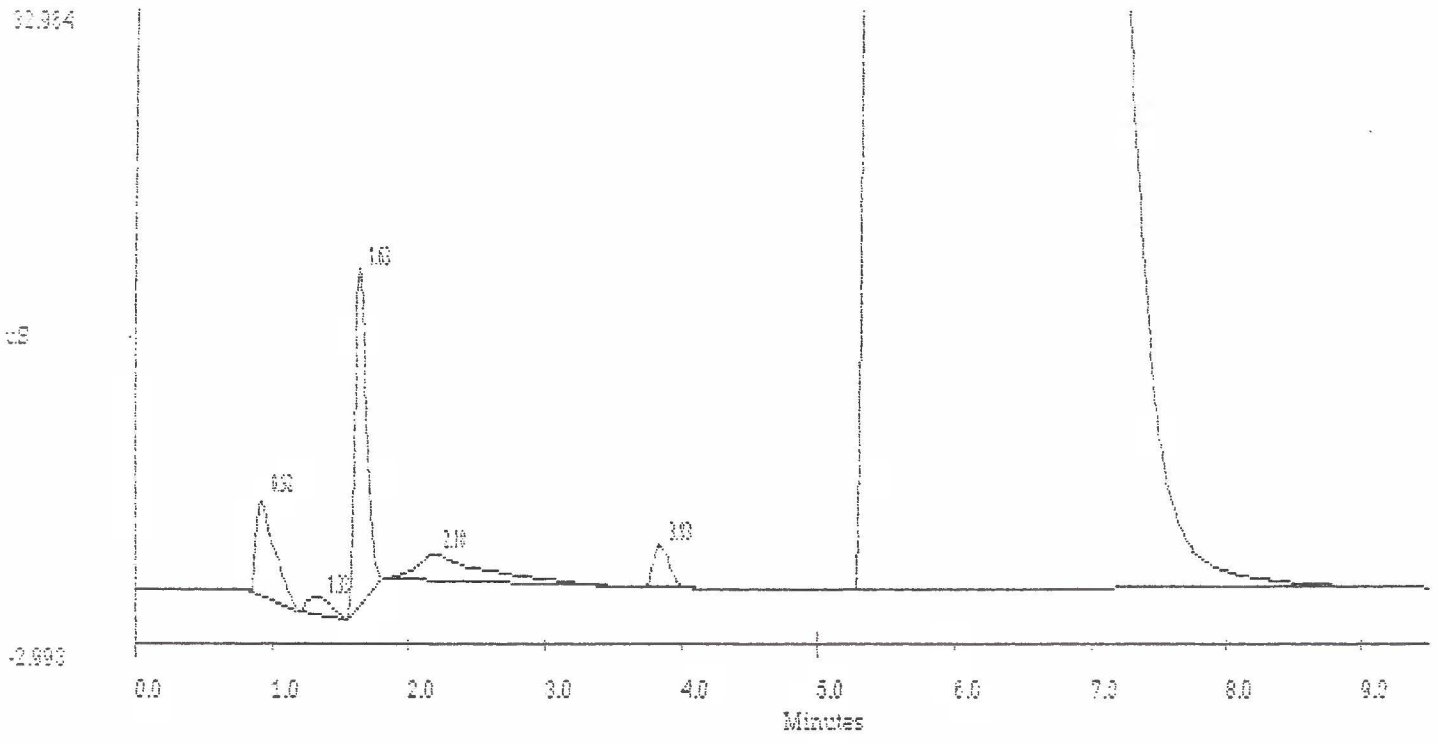
Start Time = 0.00 minutes Stop time = 9.50 minutes

Number of Data Points = 2850 One Data Point per 0.2 seconds

Area Reject = 100

Amount Injected = 1 Dilution factor = 1

PEAK NUM	RET TIME	PEAK NAME	CONC. in ppm	AREA	HEIGHT	BL	REF PEAK	% DELTA RET TIME
1	0.92		4.833e+004	4.833e+004	5573	1		
2	1.33		1.074e+004	1.074e+004	923	1		
3	1.65	OL	6.837e+000	1.125e+005	19015	1	2	0.00%
4	2.18		5.419e+004	5.419e+004	1512	1		
5	3.83		1.890e+004	1.890e+004	2406	1		
6	5.47		3.346e+007	3.346e+007	573746	1		



Sample Name: 25h 290 Date: Wed May 01 19:24:26 1996

Data File : C:\DATA\DATA050196\NO3.RST

Method : C:\DATA\METHOD\ANI_AUTO.met

ACT Address: 1 System : 1 Inject#: 31 Detector: UV-1

********** EXTERNAL STANDARD REPORT **********

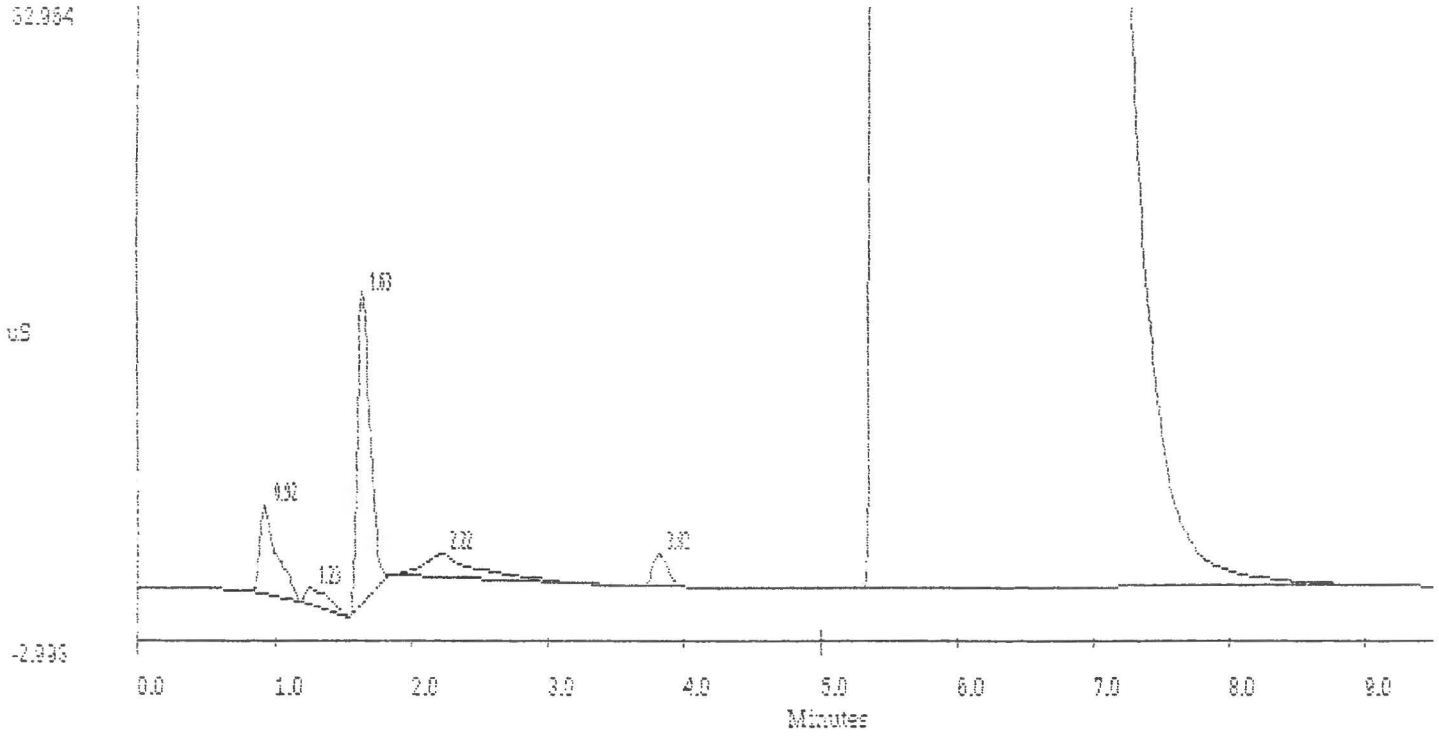
Start Time = 0.00 minutes Stop time = 9.50 minutes

Number of Data Points = 2850 One Data Point per 0.2 seconds

Area Reject = 100

Amount Injected = 1 Dilution factor = 1

PEAK NUM	RET TIME	PEAK NAME	CONC. in ppm	AREA	HEIGHT	BL	REF PEAK	% DELTA RET TIME
1	0.92		4.106e+004	4.186e+004	4979	1		
2	1.23		1.135e+004	1.135e+004	848	1		
3	1.63	CL	6.385e+000	1.133e+003	17250	1	2	0.00%
4	2.22		4.004e+004	4.004e+004	1390	1		
5	3.92	NO3	2.229e+000	1.520e+004	1849	1	5	0.00%
6	5.52	PO4	8.334e+003	3.156e+007	548956	1	1	-6.27%

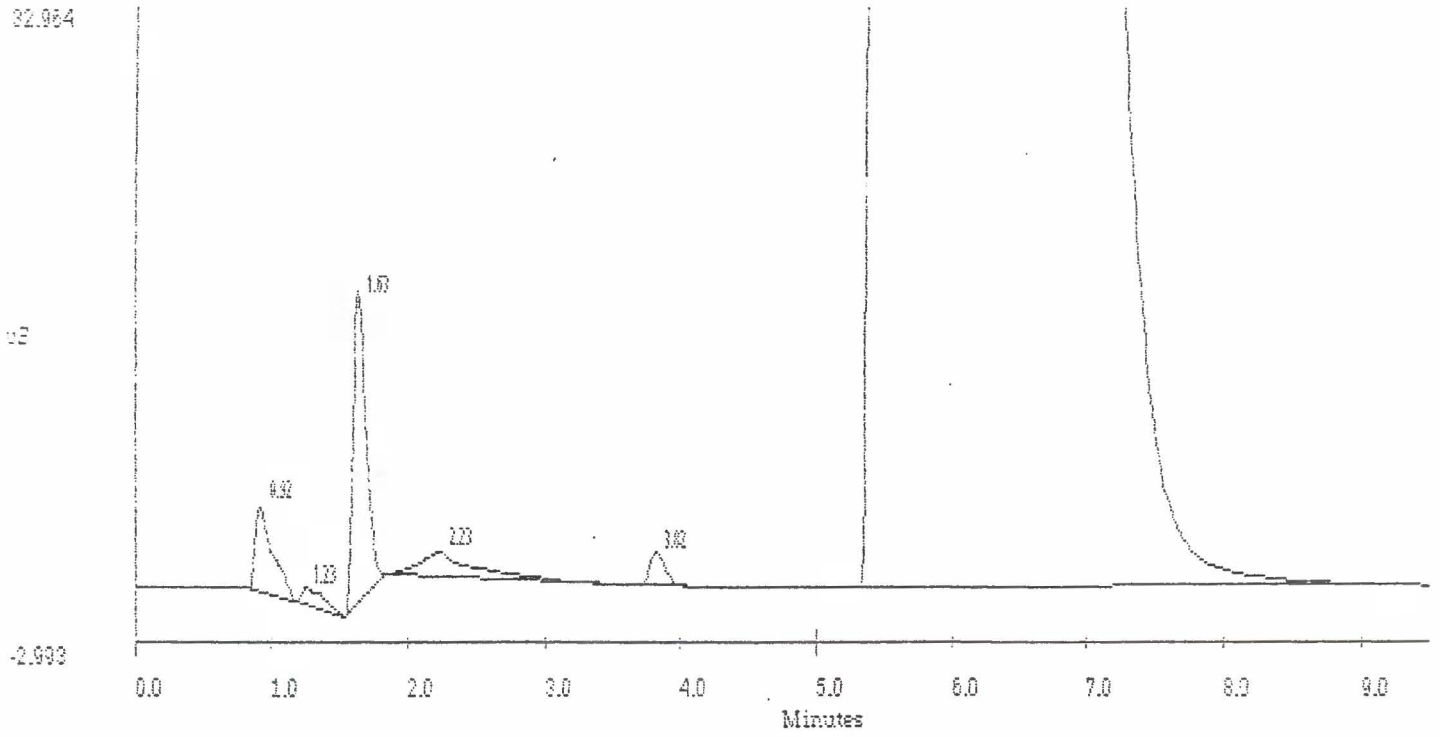


Sample Name: 96M 290 DUP Date: Wed May 01 17:35:38 1996
Data File : C:\DX\DATA\050196\01.D32
Method : C:\DX\METHOD\AN_AUTO.met
ACE Address: 1 System : 1 Inject#: 32 Detector: UV-1

********** EXTERNAL STANDARD REPORT **********

Start Time = 0.00 minutes Stop time = 9.50 minutes
Number of Data Points = 2850 One Data Point per 0.2 seconds
Area Reject = 100
Amount Injected = 1 Dilution factor = 1

PEAK #	RET TIME	PEAK NAME	CONC. in ppm	AREA	HEIGHT	ML	REF PEAK	% DELTA RET TIME
1	0.92		4.183e+004	4.163e+004	5020	1		
2	1.23		1.155e+004	1.155e+004	836	1		
3	1.63	CL	6.843e+000	1.126e+005	17334	1	2	0.00%
4	2.23		4.130e+004	4.130e+004	1414	1		
5	3.82	NO3	2.206e+000	1.501e+004	1844	1	5	0.00%
6	5.52	PO4	6.331e+003	3.155e+007	548356	1	1	-6.23%



Performance Analytical Inc.
Air Quality Laboratory

LABORATORY REPORT

Client:	TRC ENVIRONMENTAL CORPORATION	Date of Report:	05/06/96
Address:	Boott Mills South, Foot of John Street	Date Received:	04/23/96
	Lowell, MA 01852	PAI Project No:	P9600706
Contact:	Mr. Mike O'Brien	Purchase Order:	028667

Client Project ID: BFI Halifax #20272

Six (6) Tedlar Bag Samples labeled:

"BFIH-IN-1"	"BFIH-OUT-1"	"BFIH-IN-2"
"BFIH-OUT-2"	"BFIH-IN-3"	"BFIH-OUT-3"

The samples were received at the laboratory under chain of custody on April 23, 1996. The samples were received intact. The dates of analyses are indicated on the attached data sheets.

Sulfur Analysis

The samples were analyzed for twenty Sulfur compounds and total reduced Sulfur by gas chromatography/flame photometric detection (FPD). The analytical system used was comprised of a Hewlett Packard Model 5890 equipped with a flame photometric detector (FPD). A thick film (5 micron) crossbonded 100% Dimethyl polysiloxane megabore column (60 meter x 0.53mm RT_x-1, Restek Corporation, Bellefonte, PA) was used to achieve chromatographic separation.

The results of analyses are given on the attached data sheets.

Data Release Authorization:

Ku-Jih Chen
Principal Chemist

Reviewed and Approved:

Michael Tuday
Laboratory Director

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Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF ANALYSIS

Client : TRC Environmental Corporation

Client Sample ID : N/A
PAI Sample ID : PAI Method Blank

Test Code : GC/FPD Reduced Sulfur Analysis
Analyst : J. Dan Taliaferro
Instrument : HP5890A/FPD #4
Matrix : Tedlar Bag

Date Sampled : N/A
Date Received : N/A
Date Analyzed : 4/23/96
Volume(s) Analyzed : 10.0 (ml)

CAS #	COMPOUND	RESULT ug/m3	REPORTING LIMIT ug/m3	RESULT ppb	REPORTING LIMIT ppb
7783-06-4	Hydrogen Sulfide	ND	5.60	ND	4.00
463-58-1	Carbonyl Sulfide	ND	9.80	ND	4.00
74-93-1	Methyl Mercaptan	ND	7.90	ND	4.00
75-08-1	Ethyl Mercaptan	ND	10.0	ND	4.00
75-18-3	Dimethyl Sulfide	ND	10.0	ND	4.00
75-15-0	Carbon Disulfide	ND	6.20	ND	2.00
75-33-2	Isopropyl Mercaptan	ND	12.0	ND	4.00
75-66-1	tert-Butyl Mercaptan	ND	15.0	ND	4.00
107-03-9	n-Propyl Mercaptan	ND	12.0	ND	4.00
624-89-5	Ethyl Methyl Sulfide	ND	12.0	ND	4.00
110-02-1	Thiophene	ND	14.0	ND	4.00
513-44-0	Isobutyl Mercaptan	ND	15.0	ND	4.00
352-93-2	Diethyl Sulfide	ND	15.0	ND	4.00
109-79-5	n-Butyl Mercaptan	ND	15.0	ND	4.00
624-92-0	Dimethyl Disulfide	ND	7.70	ND	2.00
616-44-4	3-Methylthiophene	ND	16.0	ND	4.00
110-01-0	Tetrahydrothiophene	ND	14.0	ND	4.00
638-02-8	2,5-Dimethylthiophene	ND	18.0	ND	4.00
872-55-9	2-Ethylthiophene	ND	18.0	ND	4.00
110-81-6	Diethyl Disulfide	ND	10.0	ND	2.00
	Total Reduced Sulfur	ND	N/A	ND	N/A

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : SE

Date : 5/2/96

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Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF ANALYSIS

Client : TRC Environmental Corporation

Client Sample ID : BFIH-IN-1
PAI Sample ID : P9600706-001

Test Code : GC/FPD Reduced Sulfur Analysis
Analyst : J. Dan Taliaferro
Instrument : HP5890A/FPD #4
Matrix : Tedlar Bag

Date Sampled : 4/22/96
Date Received : 4/23/96
Date Analyzed : 4/23/96
Volume(s) Analyzed : 1.0 (ml)
0.050 (ml)

CAS #	COMPOUND	RESULT ug/m3	REPORTING LIMIT ug/m3	RESULT ppb	REPORTING LIMIT ppb
7783-06-4	Hydrogen Sulfide	29,400	56.0	21,100	40.0
463-58-1	Carbonyl Sulfide	340	98.0	138	40.0
74-93-1	Methyl Mercaptan	1,470	79.0	749	40.0
75-08-1	Ethyl Mercaptan	326	100	128	40.0
75-18-3	Dimethyl Sulfide	1,940	100	763	40.0
75-15-0	Carbon Disulfide	291	62.0	93.5	20.0
75-33-2	Isopropyl Mercaptan	410	120	132	40.0
75-66-1	tert-Butyl Mercaptan	ND	150	ND	40.0
107-03-9	n-Propyl Mercaptan	ND	120	ND	40.0
624-89-5	Ethyl Methyl Sulfide	ND	120	ND	40.0
110-02-1	Thiophene	410	140	119	40.0
513-44-0	Isobutyl Mercaptan	ND	150	ND	40.0
352-93-2	Diethyl Sulfide	ND	150	ND	40.0
109-79-5	n-Butyl Mercaptan	ND	150	ND	40.0
624-92-0	Dimethyl Disulfide	171	77.0	44.3	20.0
616-44-4	3-Methylthiophene	ND	160	ND	40.0
110-01-0	Tetrahydrothiophene	ND	140	ND	40.0
638-02-8	2,5-Dimethylthiophene	ND	180	ND	40.0
872-55-9	2-Ethylthiophene	ND	180	ND	40.0
110-81-6	Diethyl Disulfide	ND	100	ND	20.0
	Total Reduced Sulfur	34,800	N/A	23,300	N/A

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : [signature]

Date : 5/2/96

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Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF ANALYSIS

Client : TRC Environmental Corporation

Client Sample ID : BFIH-OUT-1
PAI Sample ID : P9600706-002

Test Code : GC/FPD Reduced Sulfur Analysis
Analyst : J. Dan Taliaferro
Instrument : HP5890A/FPD #4
Matrix : Tedlar Bag

Date Sampled : 4/22/96
Date Received : 4/23/96
Date Analyzed : 4/23/96
Volume(s) Analyzed : 10.0 (ml)

CAS #	COMPOUND	RESULT ug/m3	REPORTING LIMIT ug/m3	RESULT ppb	REPORTING LIMIT ppb
7783-06-4	Hydrogen Sulfide	ND	5.60	ND	4.00
463-58-1	Carbonyl Sulfide	ND	9.80	ND	4.00
74-93-1	Methyl Mercaptan	ND	7.90	ND	4.00
75-08-1	Ethyl Mercaptan	ND	10.0	ND	4.00
75-18-3	Dimethyl Sulfide	ND	10.0	ND	4.00
75-15-0	Carbon Disulfide	ND	6.20	ND	2.00
75-33-2	Isopropyl Mercaptan	ND	12.0	ND	4.00
75-66-1	tert-Butyl Mercaptan	ND	15.0	ND	4.00
107-03-9	n-Propyl Mercaptan	ND	12.0	ND	4.00
624-89-5	Ethyl Methyl Sulfide	ND	12.0	ND	4.00
110-02-1	Thiophene	ND	14.0	ND	4.00
513-44-0	Isobutyl Mercaptan	ND	15.0	ND	4.00
352-93-2	Diethyl Sulfide	ND	15.0	ND	4.00
109-79-5	n-Butyl Mercaptan	ND	15.0	ND	4.00
624-92-0	Dimethyl Disulfide	ND	7.70	ND	2.00
616-44-4	3-Methylthiophene	ND	16.0	ND	4.00
110-01-0	Tetrahydrothiophene	ND	14.0	ND	4.00
638-02-8	2,5-Dimethylthiophene	ND	18.0	ND	4.00
872-55-9	2-Ethylthiophene	ND	18.0	ND	4.00
110-81-6	Diethyl Disulfide	ND	10.0	ND	2.00
	Total Reduced Sulfur	ND	N/A	ND	N/A

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : (SG)

Date : 5/2/96

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Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF ANALYSIS

Client : TRC Environmental Corporation

Client Sample ID : BFIH-OUT-1
PAI Sample ID : P9600706-002 (Laboratory Duplicate)

Test Code : GC/FPD Reduced Sulfur Analysis
Analyst : J. Dan Taliaferro
Instrument : HP5890A/FPD #4
Matrix : Tedlar Bag

Date Sampled : 4/22/96
Date Received : 4/23/96
Date Analyzed : 4/23/96
Volume(s) Analyzed : 10.0 (ml)

CAS #	COMPOUND	RESULT ug/m3	REPORTING LIMIT ug/m3	RESULT ppb	REPORTING LIMIT ppb
7783-06-4	Hydrogen Sulfide	ND	5.60	ND	4.00
463-58-1	Carbonyl Sulfide	ND	9.80	ND	4.00
74-93-1	Methyl Mercaptan	ND	7.90	ND	4.00
75-08-1	Ethyl Mercaptan	ND	10.0	ND	4.00
75-18-3	Dimethyl Sulfide	ND	10.0	ND	4.00
75-15-0	Carbon Disulfide	ND	6.20	ND	2.00
75-33-2	Isopropyl Mercaptan	ND	12.0	ND	4.00
75-66-1	tert-Butyl Mercaptan	ND	15.0	ND	4.00
107-03-9	n-Propyl Mercaptan	ND	12.0	ND	4.00
624-89-5	Ethyl Methyl Sulfide	ND	12.0	ND	4.00
110-02-1	Thiophene	ND	14.0	ND	4.00
513-44-0	Isobutyl Mercaptan	ND	15.0	ND	4.00
352-93-2	Diethyl Sulfide	ND	15.0	ND	4.00
109-79-5	n-Butyl Mercaptan	ND	15.0	ND	4.00
624-92-0	Dimethyl Disulfide	ND	7.70	ND	2.00
616-44-4	3-Methylthiophene	ND	16.0	ND	4.00
110-01-0	Tetrahydrothiophene	ND	14.0	ND	4.00
638-02-8	2,5-Dimethylthiophene	ND	18.0	ND	4.00
872-55-9	2-Ethylthiophene	ND	18.0	ND	4.00
110-81-6	Diethyl Disulfide	ND	10.0	ND	2.00
	Total Reduced Sulfur	ND	N/A	ND	N/A

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : SB

Date : 5/2/96

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Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF ANALYSIS

Client : TRC Environmental Corporation

Client Sample ID : BFIH-IN-2
PAI Sample ID : P9600706-003

Test Code : GC/FPD Reduced Sulfur Analysis
Analyst : J. Dan Taliaferro
Instrument : HP5890A/FPD #4
Matrix : Tedlar Bag

Date Sampled : 4/22/96
Date Received : 4/23/96
Date Analyzed : 4/23/96
Volume(s) Analyzed : 1.0 (ml)
0.050 (ml)

CAS #	COMPOUND	RESULT ug/m3	REPORTING LIMIT ug/m3	RESULT ppb	REPORTING LIMIT ppb
7783-06-4	Hydrogen Sulfide	30,900	56.0	22,200	40.0
463-58-1	Carbonyl Sulfide	333	98.0	135	40.0
74-93-1	Methyl Mercaptan	1,500	79.0	765	40.0
75-08-1	Ethyl Mercaptan	320	100	126	40.0
75-18-3	Dimethyl Sulfide	2,020	100	794	40.0
75-15-0	Carbon Disulfide	275	62.0	88.3	20.0
75-33-2	Isopropyl Mercaptan	410	120	132	40.0
75-66-1	tert-Butyl Mercaptan	ND	150	ND	40.0
107-03-9	n-Propyl Mercaptan	ND	120	ND	40.0
624-89-5	Ethyl Methyl Sulfide	ND	120	ND	40.0
110-02-1	Thiophene	436	140	127	40.0
513-44-0	Isobutyl Mercaptan	ND	150	ND	40.0
352-93-2	Diethyl Sulfide	ND	150	ND	40.0
109-79-5	n-Butyl Mercaptan	ND	150	ND	40.0
624-92-0	Dimethyl Disulfide	173	77.0	44.8	20.0
616-44-4	3-Methylthiophene	ND	160	ND	40.0
110-01-0	Tetrahydrothiophene	ND	140	ND	40.0
638-02-8	2,5-Dimethylthiophene	ND	180	ND	40.0
872-55-9	2-Ethylthiophene	ND	180	ND	40.0
110-81-6	Diethyl Disulfide	ND	100	ND	20.0
	Total Reduced Sulfur	36,400	N/A	24,400	N/A

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : SB

Date : 5/2/96

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Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF ANALYSIS

Client : TRC Environmental Corporation

Client Sample ID : BFIH-OUT-2
PAI Sample ID : P9600706-004

Test Code : GC/FPD Reduced Sulfur Analysis
Analyst : J. Dan Taliaferro
Instrument : HP5890A/FPD #4
Matrix : Tedlar Bag

Date Sampled : 4/22/96
Date Received : 4/23/96
Date Analyzed : 4/23/96
Volume(s) Analyzed : 10.0 (ml)

CAS #	COMPOUND	RESULT ug/m3	REPORTING LIMIT ug/m3	RESULT ppb	REPORTING LIMIT ppb
7783-06-4	Hydrogen Sulfide	ND	5.60	ND	4.00
463-58-1	Carbonyl Sulfide	ND	9.80	ND	4.00
74-93-1	Methyl Mercaptan	ND	7.90	ND	4.00
75-08-1	Ethyl Mercaptan	ND	10.0	ND	4.00
75-18-3	Dimethyl Sulfide	ND	10.0	ND	4.00
75-15-0	Carbon Disulfide	ND	6.20	ND	2.00
75-33-2	Isopropyl Mercaptan	ND	12.0	ND	4.00
75-66-1	tert-Butyl Mercaptan	ND	15.0	ND	4.00
107-03-9	n-Propyl Mercaptan	ND	12.0	ND	4.00
624-89-5	Ethyl Methyl Sulfide	ND	12.0	ND	4.00
110-02-1	Thiophene	ND	14.0	ND	4.00
513-44-0	Isobutyl Mercaptan	ND	15.0	ND	4.00
352-93-2	Diethyl Sulfide	ND	15.0	ND	4.00
109-79-5	n-Butyl Mercaptan	ND	15.0	ND	4.00
624-92-0	Dimethyl Disulfide	ND	7.70	ND	2.00
616-44-4	3-Methylthiophene	ND	16.0	ND	4.00
110-01-0	Tetrahydrothiophene	ND	14.0	ND	4.00
638-02-8	2,5-Dimethylthiophene	ND	18.0	ND	4.00
872-55-9	2-Ethylthiophene	ND	18.0	ND	4.00
110-81-6	Diethyl Disulfide	ND	10.0	ND	2.00
	Total Reduced Sulfur	ND	N/A	ND	N/A

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : SB

Date : 5/2/96

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Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF ANALYSIS

Client : TRC Environmental Corporation

Client Sample ID : BFIH-IN-3
PAI Sample ID : P9600706-005

Test Code : GC/FPD Reduced Sulfur Analysis
Analyst : J. Dan Taliaferro
Instrument : HP5890A/FPD #4
Matrix : Tedlar Bag

Date Sampled : 4/22/96
Date Received : 4/23/96
Date Analyzed : 4/23/96
Volume(s) Analyzed : 1.0 (ml)
0.050 (ml)

CAS #	COMPOUND	RESULT ug/m3	REPORTING LIMIT ug/m3	RESULT ppb	REPORTING LIMIT ppb
7783-06-4	Hydrogen Sulfide	30,400	56.0	21,800	40.0
463-58-1	Carbonyl Sulfide	310	98.0	126	40.0
74-93-1	Methyl Mercaptan	1,460	79.0	745	40.0
75-08-1	Ethyl Mercaptan	329	100	129	40.0
75-18-3	Dimethyl Sulfide	1,960	100	774	40.0
75-15-0	Carbon Disulfide	272	62.0	87.4	20.0
75-33-2	Isopropyl Mercaptan	404	120	130	40.0
75-66-1	tert Butyl Mercaptan	ND	150	ND	40.0
107-03-9	n-Propyl Mercaptan	ND	120	ND	40.0
624-89-5	Ethyl Methyl Sulfide	ND	120	ND	40.0
110-02-1	Thiophene	433	140	126	40.0
513-44-0	Isobutyl Mercaptan	ND	150	ND	40.0
352-93-2	Diethyl Sulfide	ND	150	ND	40.0
109-79-5	n-Butyl Mercaptan	ND	150	ND	40.0
624-92-0	Dimethyl Disulfide	162	77.0	42.0	20.0
616-44-4	3-Methylthiophene	ND	160	ND	40.0
110-01-0	Tetrahydrothiophene	ND	140	ND	40.0
638-02-8	2,5-Dimethylthiophene	ND	180	ND	40.0
872-55-9	2-Ethylthiophene	ND	180	ND	40.0
110-81-6	Diethyl Disulfide	ND	100	ND	20.0
	Total Reduced Sulfur	35,700	N/A	24,000	N/A

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : SG

Date : 5/2/96

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Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF ANALYSIS

Client : TRC Environmental Corporation

Client Sample ID : BFIH-OUT-3
PAI Sample ID : P9600706-006

Test Code : GC/FPD Reduced Sulfur Analysis
Analyst : J. Dan Taliaferro
Instrument : HP5890A/FPD #4
Matrix : Tedlar Bag

Date Sampled : 4/22/96
Date Received : 4/23/96
Date Analyzed : 4/23/96
Volume(s) Analyzed : 10.0 (ml)

CAS #	COMPOUND	RESULT ug/m3	REPORTING LIMIT ug/m3	RESULT ppb	REPORTING LIMIT ppb
7783-06-4	Hydrogen Sulfide	ND	5.60	ND	4.00
463-58-1	Carbonyl Sulfide	ND	9.80	ND	4.00
74-93-1	Methyl Mercaptan	ND	7.90	ND	4.00
75-08-1	Ethyl Mercaptan	ND	10.0	ND	4.00
75-18-3	Dimethyl Sulfide	ND	10.0	ND	4.00
75-15-0	Carbon Disulfide	ND	6.20	ND	2.00
75-33-2	Isopropyl Mercaptan	ND	12.0	ND	4.00
75-66-1	tert-Butyl Mercaptan	ND	15.0	ND	4.00
107-03-9	n-Propyl Mercaptan	ND	12.0	ND	4.00
624-89-5	Ethyl Methyl Sulfide	ND	12.0	ND	4.00
110-02-1	Thiophene	ND	14.0	ND	4.00
513-44-0	Isobutyl Mercaptan	ND	15.0	ND	4.00
352-93-2	Diethyl Sulfide	ND	15.0	ND	4.00
109-79-5	n-Butyl Mercaptan	ND	15.0	ND	4.00
624-92-0	Dimethyl Disulfide	ND	7.70	ND	2.00
616-44-4	3-Methylthiophene	ND	16.0	ND	4.00
110-01-0	Tetrahydrothiophene	ND	14.0	ND	4.00
638-02-8	2,5-Dimethylthiophene	ND	18.0	ND	4.00
872-55-9	2-Ethylthiophene	ND	18.0	ND	4.00
110-81-6	Diethyl Disulfide	ND	10.0	ND	2.00
	Total Reduced Sulfur	ND	N/A	ND	N/A

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : SG

Date : 5/2/96

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Project Name: BFI - Halifax
Project No.: 20272
Sampling Date(s): 4/22/96
Laboratory: PAI
Laboratory P.O. #:
Shipping Airbill No.:
Shipping Date(s): 4/22/96
Shipper's Name: Mike O'Brien

P9600706

Sample Code	Sampled Date	Container Size	Container G/P	MATRIX: Aqueous	Organic Solvent	Ash/Soil/Sediment	Acidic	Basic	Other	Source Description	ANALYSIS: Trace Metals*	Mercury	Hexavalent Chromium	HCl	Cl2	Particulate Matter	PCDD/PCDF	Semi-Volatile Organics	Volatile Organics	Physical Parameters*	TRS + H2S	Comments
BFIH-IN-1	4/22/96		Tedlar						✓	Landfill Flare Inlet										✓		P9600706-001
BFI-Out-1									✓	" " outlet										✓		-002
BFI-IN-2									✓	" " Inlet										✓		-003
BFI-Out-2									✓	" " Outlet										✓		-004
BFI-IN-3									✓	" " Inlet										✓		-005
BFI-OUT-3	4/22/96								✓	" " outlet										✓		-006

Relinquished by: E. McKinnon	Date/Time: 4/22/96	Relinquished by:	Date/Time:
Received by: Richard Fox	Date/Time: 4/23/96 9:00 A.M.	Received by:	Date/Time:

REMARKS (*):

№ 09156

WHITE — LABORATORY YELLOW — OFFICE COPY PINK — FIELD COPY

TRC Environmental Corporati

Performance Analytical Inc.
Air Quality Laboratory

LABORATORY REPORT

Client:	TRC ENVIRONMENTAL CORPORATION	Date of Report:	05/06/96
Address:	Boott Mills South, Foot of John Street	Date Received:	04/24/96
	Lowell, MA 01852	PAI Project No:	P9600715
Contact:	Mr. Mike O'Brien	Purchase Order:	028667

Client Project ID: BFI Halifax #20272

Six (6) Stainless Steel Summa Canisters labeled:

"BFIH-IN-SUMMA-1"	"BFIH-OUT-SUMMA-1"	"BFIH-IN-SUMMA-2"
"BFIH-OUT-SUMMA-2"	"BFIH-IN-SUMMA-3"	"BFIH-OUT-SUMMA-3"

The samples were received at the laboratory under chain of custody on April 24, 1996. The samples were received intact. The dates of analyses are indicated on the attached data sheets.

Methane and Total Gaseous Non-Methane Organics Analysis

The samples were analyzed for Methane and total gaseous non-Methane organics according to EPA Method 25C. The analyses were performed by gas chromatography using flame ionization detection/total combustion analysis.

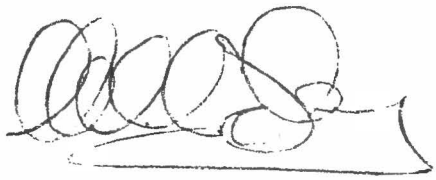
Methane, Oxygen and Carbon Dioxide Analysis

The samples were also analyzed for Methane, Oxygen and Carbon dioxide using a Hewlett Packard Model 5890 gas chromatograph equipped with a thermal conductivity detector (TCD).

Data Release Authorization:

Christopher Casteel
Manager of Technical Operations

Reviewed and Approved:



Michael Tuday
Laboratory Director

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Air Quality Laboratory

Volatile Organic Compound Analysis

The sample labeled "BFIH-IN-SUMMA-1" was also analyzed by combined gas chromatography/mass spectrometry (GC/MS) for volatile organic compounds. The analyses were performed according to the methodology outlined in EPA Method TO-14 from the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, EPA 600/4-84-041, U.S. Environmental Protection Agency, Research Triangle Park, NC, April, 1984 and May, 1988. The analyses were performed by gas chromatography/mass spectrometry, utilizing a direct cryogenic trapping technique. The analytical system used was comprised of a Hewlett Packard Model 5989 GC/MS/DS interfaced to an Entech 7000 whole air inlet system/cryogenic concentrator. A 100% Dimethylpolysiloxane capillary column (RT_x-1, Restek Corporation, Bellefonte, PA) was used to achieve chromatographic separation.

The results of analyses are given on the attached data sheets.

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Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF METHANE &

TOTAL GASEOUS NON-METHANE ORGANICS (TGNMO) ANALYSIS

Client: TRC Environmental Corporation

Client Project ID: #20272
PAI Project ID: P9600715

Test Code: EPA Method 25C
Instrument ID: HP 5890A/FID/TCA
Analyst: J. Dan Taliaferro
Matrix: Summa Canisters

Date Sampled: 4/22/96
Date Received: 4/24/96
Date Analyzed: 4/24/96
Volume(s) Analyzed: 0.50 (ml)

Client Sample ID	PAI Sample ID	D.F.	Concentration in ppm, v/v	
			Methane	Total Non-Methane Organics (as Methane)
BFIH-IN-SUMMA-1	P9600715-001	1.31	N/A	3,700
BFIH-OUT-SUMMA-1	P9600715-002	1.59	8.4	82
BFIH-IN-SUMMA-2	P9600715-003	1.40	N/A	3,700
BFIH-OUT-SUMMA-2	P9600715-004	1.23	ND < 0.50	19
BFIH-IN-SUMMA-3	P9600715-005	1.29	N/A	3,900
BFIH-OUT-SUMMA-3	P9600715-006	1.72	ND < 0.50	20
BFIH-OUT-SUMMA-3	Lab Duplicate	1.72	ND < 0.50	17
N/A (4/24/96)	Method Blank	1.00	ND < 0.50	ND < 1.0

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : JG

Date : 5/3/96

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Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF METHANE ANALYSIS

Client: TRC Environmental Corporation

Client Project ID: #20272
PAI Project ID: P9600715

Test Code: GC/TCD
Instrument ID: HP 5890A/TCD #1
Analyst: J. Dan Taliaferro
Matrix: Summa Canisters

Date Sampled: 4/22/96
Date Received: 4/24/96
Date Analyzed: 4/24/96
Volume(s) Analyzed: 1.00 (ml)
0.10 (ml)

Client Sample ID	PAI Sample ID	D.F.	Methane (%, v/v) Result	Reporting Limit
BFIH-IN-SUMMA-1	P9600715-001	1.31	50.3	0.200
BFIH-IN-SUMMA-2	P9600715-003	1.40	51.4	0.200
BFIH-IN-SUMMA-3	P9600715-005	1.29	51.2	0.200
N/A (4/24/96)	Method Blank	1.00	ND	0.0200

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : RG

Date : 5/3/96

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Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF FIXED GASES ANALYSIS

Client: TRC Environmental Corporation

Client Project ID: #20272
PAI Project ID: #P9600715

Test Code: GC/TCD
Instrument ID: HP 5890A/TCD #1
Analyst: J. Dan Taliaferro
Matrix: Summa Canisters

Date Sampled: 4/22/96
Date Received: 4/24/96
Date Analyzed: 4/24/96
Volume(s) Analyzed: 1.00 (ml)
0.10 (ml)

Client Sample ID	PAI Sample ID	D.F.	Oxygen (%, v/v)	Carbon Dioxide (%, v/v)
BFIH-IN-SUMMA-1	P9600715-001	1.31	1.13	40.9
BFIH-IN-SUMMA-2	P9600715-003	1.40	1.03	40.8
BFIH-IN-SUMMA-3	P9600715-005	1.29	1.18	40.6
N/A (4/24/95)	Method Blank	1.00	ND < 0.0300	ND < 0.0200

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : RG

Date : 5/6/96

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Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF ANALYSIS

Client : TRC Environmental Corporation

Client Sample ID : N/A
PAI Sample ID : Method Blank

Test Code : GC/MS EPA TO-14
Analyst : Chris Casteel
Instrument : HP 5989A/Entech 7000
Matrix : Summa Canister

Date Sampled : N/A
Date Received : N/A
Date Analyzed : 4/30/96
Volume(s) Analyzed : 1.000 Liter(s)

Pi 1 = 0.0
Pf 1 = 0.0

D.F. = 1.00

CAS #	COMPOUND	RESULT (UG/M3)	REPORTING LIMIT (UG/M3)	RESULT (PPB)	REPORTING LIMIT (PPB)
74-87-3	Chloromethane	ND	1.0	ND	0.49
75-01-4	Vinyl Chloride	ND	1.0	ND	0.39
75-00-3	Chloroethane	ND	1.0	ND	0.38
74-83-9	Bromomethane	ND	1.0	ND	0.26
67-64-1	Acetone	ND	1.0	ND	0.42
75-69-4	Trichlorofluoromethane	ND	1.0	ND	0.18
75-35-4	1,1-Dichloroethene	ND	1.0	ND	0.25
75-09-2	Methylene chloride	ND	1.0	ND	0.29
75-15-0	Carbon Disulfide	ND	1.0	ND	0.32
76-13-1	Trichlorotrifluoroethane	ND	1.0	ND	0.13
156-60-5	trans-1,2-Dichloroethene	ND	1.0	ND	0.25
156-59-2	cis-1,2-Dichloroethene	ND	1.0	ND	0.25
75-34-3	1,1-Dichloroethane	ND	1.0	ND	0.25
1634-04-4	Methyl tert-Butyl Ether	ND	1.0	ND	0.28
108-05-4	Vinyl Acetate	ND	1.0	ND	0.28
78-93-3	2-Butanone	ND	1.0	ND	0.34
67-66-3	Chloroform	ND	1.0	ND	0.21
107-06-2	1,2-Dichloroethane	ND	1.0	ND	0.25
71-55-6	1,1,1-Trichloroethane	ND	1.0	ND	0.19
71-43-2	Benzene	ND	1.0	ND	0.31
56-23-5	Carbon Tetrachloride	ND	1.0	ND	0.16
78-87-5	1,2-Dichloropropane	ND	1.0	ND	0.22

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : RG

Date : 5/3/96

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Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF ANALYSIS

Client : TRC Environmental Corporation

Client Sample ID : N/A
PAI Sample ID : Method Blank

Test Code : GC/MS EPA TO-14
Analyst : Chris Casteel
Instrument : HP 5989A/Entech 7000
Matrix : Summa Canister

Date Sampled : N/A
Date Received : N/A
Date Analyzed : 4/30/96
Volume(s) Analyzed : 1.000 Liter(s)

Pi 1 = 0.0
Pf 1 = 0.0

D.F. = 1.00

CAS #	COMPOUND	RESULT (UG/M3)	REPORTING LIMIT (UG/M3)	RESULT (PPB)	REPORTING LIMIT (PPB)
75-27-4	Bromodichloromethane	ND	1.0	ND	0.15
79-01-6	Trichloroethene	ND	1.0	ND	0.19
10061-01-5	cis-1,3-Dichloropropene	ND	1.0	ND	0.22
108-10-1	4-Methyl-2-pentanone	ND	1.0	ND	0.24
10061-02-6	trans-1,3-Dichloropropene	ND	1.0	ND	0.22
79-00-5	1,1,2-Trichloroethane	ND	1.0	ND	0.19
108-88-3	Toluene	ND	1.0	ND	0.27
124-48-1	Dibromochloromethane	ND	1.0	ND	0.12
591-78-6	2-Hexanone	ND	1.0	ND	0.24
106-93-4	1,2-Dibromoethane	ND	1.0	ND	0.13
127-18-4	Tetrachloroethene	ND	1.0	ND	0.15
108-90-7	Chlorobenzene	ND	1.0	ND	0.22
100-41-4	Ethylbenzene	ND	1.0	ND	0.23
75-25-2	Bromoform	ND	1.0	ND	0.10
100-42-5	Styrene	ND	1.0	ND	0.24
1330-20-7	m,p-Xylenes	ND	1.0	ND	0.23
95-47-6	o-Xylene	ND	1.0	ND	0.23
79-34-5	1,1,2,2-Tetrachloroethane	ND	1.0	ND	0.15
541-73-1	1,3-Dichlorobenzene	ND	1.0	ND	0.17
106-46-7	1,4-Dichlorobenzene	ND	1.0	ND	0.17
95-50-1	1,2-Dichlorobenzene	ND	1.0	ND	0.17

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : RG

Date : 5/3/96

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Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF ANALYSIS

Client : TRC Environmental Corporation

Client Sample ID : BFIH-IN-SUMMA-1
PAI Sample ID : P9600715-001

Test Code : GC/MS EPA TO-14
Analyst : Chris Casteel
Instrument : HP 5989A/Entech 7000
Matrix : Summa Canister

Date Sampled : 4/22/96
Date Received : 4/24/96
Date Analyzed : 4/30/96
Volume(s) Analyzed : 0.001 Liter(s)

Pi 1 = -1.2
Pf 1 = 3.0

D.F. = 1.31

CAS #	COMPOUND	RESULT (UG/M3)	REPORTING LIMIT (UG/M3)	RESULT (PPB)	REPORTING LIMIT (PPB)
74-87-3	Chloromethane	ND	1,000	ND	490
75-01-4	Vinyl Chloride	4,600	1,000	1,800	390
75-00-3	Chloroethane	1,500	1,000	560	380
74-83-9	Bromomethane	ND	1,000	ND	260
67-64-1	Acetone	15,000	1,000	6,400	420
75-69-4	Trichlorofluoromethane	2,300	1,000	410	180
75-35-4	1,1-Dichloroethene	ND	1,000	ND	250
75-09-2	Methylene chloride	4,400	1,000	1,300	290
75-15-0	Carbon Disulfide	ND	1,000	ND	320
76-13-1	Trichlorotrifluoroethane	ND	1,000	ND	130
156-60-5	trans-1,2-Dichloroethene	ND	1,000	ND	250
156-59-2	cis-1,2-Dichloroethene	3,400	1,000	850	250
75-34-3	1,1-Dichloroethane	2,800	1,000	700	250
1634-04-4	Methyl tert-Butyl Ether	ND	1,000	ND	280
108-05-4	Vinyl Acetate	ND	1,000	ND	280
78-93-3	2-Butanone	14,000	1,000	4,800	340
67-66-3	Chloroform	ND	1,000	ND	210
107-06-2	1,2-Dichloroethane	ND	1,000	ND	250
71-55-6	1,1,1-Trichloroethane	1,100	1,000	200	190
71-43-2	Benzene	6,800	1,000	2,100	310
56-23-5	Carbon Tetrachloride	ND	1,000	ND	160
78-87-5	1,2-Dichloropropane	ND	1,000	ND	220

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : RG

Date : 5/3/96

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Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF ANALYSIS

Client : TRC Environmental Corporation

Client Sample ID : BFIH-IN-SUMMA-1
PAI Sample ID : P9600715-001

Test Code : GC/MS EPA TO-14
Analyst : Chris Casteel
Instrument : HP 5989A/Entech 7000
Matrix : Summa Canister

Date Sampled : 4/22/96
Date Received : 4/24/96
Date Analyzed : 4/30/96
Volume(s) Analyzed : 0.001 Liter(s)

Pi 1 = -1.2
Pf 1 = 3.0

D.F. = 1.31

CAS #	COMPOUND	RESULT (UG/M3)	REPORTING LIMIT (UG/M3)	RESULT (PPB)	REPORTING LIMIT (PPB)
75-27-4	Bromodichloromethane	ND	1,000	ND	150
79-01-6	Trichloroethene	3,000	1,000	560	190
10061-01-5	cis-1,3-Dichloropropene	ND	1,000	ND	220
108-10-1	4-Methyl-2-pentanone	3,100	1,000	750	240
10061-02-6	trans-1,3-Dichloropropene	ND	1,000	ND	220
79-00-5	1,1,2-Trichloroethane	ND	1,000	ND	190
108-88-3	Toluene	95,000	1,000	25,000	270
124-48-1	Dibromochloromethane	ND	1,000	ND	120
591-78-6	2-Hexanone	ND	1,000	ND	240
106-93-4	1,2-Dibromoethane	ND	1,000	ND	130
127-18-4	Tetrachloroethene	4,300	1,000	640	150
108-90-7	Chlorobenzene	ND	1,000	ND	220
100-41-4	Ethylbenzene	38,000	1,000	8,700	230
75-25-2	Bromoform	ND	1,000	ND	98
100-42-5	Styrene	5,100	1,000	1,200	240
1330-20-7	m,p-Xylenes	50,000	1,000	11,000	230
95-47-6	o-Xylene	15,000	1,000	3,500	230
79-34-5	1,1,2,2-Tetrachloroethane	ND	1,000	ND	150
541-73-1	1,3-Dichlorobenzene	ND	1,000	ND	170
106-46-7	1,4-Dichlorobenzene	2,500	1,000	410	170
95-50-1	1,2-Dichlorobenzene	ND	1,000	ND	170

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : RG

Date : 5/3/96

Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF ANALYSIS

Client : TRC Environmental Corporation

Client Sample ID : BFIH-IN-SUMMA-1
PAI Sample ID : P9600715-001 Dup

Test Code : GC/MS EPA TO-14
Analyst : Chris Casteel
Instrument : HP 5989A/Entech 7000
Matrix : Summa Canister

Date Sampled : 4/22/96
Date Received : 4/24/96
Date Analyzed : 4/30/96
Volume(s) Analyzed : 0.001 Liter(s)

Pi 1 = -1.2
Pf 1 = 3.0
D.F. = 1.31

CAS #	COMPOUND	RESULT (UG/M3)	REPORTING LIMIT (UG/M3)	RESULT (PPB)	REPORTING LIMIT (PPB)
74-87-3	Chloromethane	ND	1,000	ND	490
75-01-4	Vinyl Chloride	4,500	1,000	1,800	390
75-00-3	Chloroethane	1,400	1,000	530	380
74-83-9	Bromomethane	ND	1,000	ND	260
67-64-1	Acetone	15,000	1,000	6,200	420
75-69-4	Trichlorofluoromethane	2,000	1,000	360	180
75-35-4	1,1-Dichloroethene	ND	1,000	ND	250
75-09-2	Methylene chloride	4,200	1,000	1,200	290
75-15-0	Carbon Disulfide	ND	1,000	ND	320
76-13-1	Trichlorotrifluoroethane	ND	1,000	ND	130
156-60-5	trans-1,2-Dichloroethene	ND	1,000	ND	250
156-59-2	cis-1,2-Dichloroethene	3,300	1,000	840	250
75-34-3	1,1-Dichloroethane	2,600	1,000	650	250
1634-04-4	Methyl tert-Butyl Ether	ND	1,000	ND	280
108-05-4	Vinyl Acetate	ND	1,000	ND	280
78-93-3	2-Butanone	13,000	1,000	4,400	340
67-66-3	Chloroform	ND	1,000	ND	210
107-06-2	1,2-Dichloroethane	ND	1,000	ND	250
71-55-6	1,1,1-Trichloroethane	1,100	1,000	200	190
71-43-2	Benzene	6,600	1,000	2,100	310
56-23-5	Carbon Tetrachloride	ND	1,000	ND	160
78-87-5	1,2-Dichloropropane	ND	1,000	ND	220

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : RG

Date : 5/3/96

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Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF ANALYSIS

Client : TRC Environmental Corporation

Client Sample ID : BFIH-IN-SUMMA-1
PAI Sample ID : P9600715-001 Dup

Test Code : GC/MS EPA TO-14
Analyst : Chris Casteel
Instrument : HP 5989A/Entech 7000
Matrix : Summa Canister

Date Sampled : 4/22/96
Date Received : 4/24/96
Date Analyzed : 4/30/96
Volume(s) Analyzed : 0.001 Liter(s)

Pi 1 = -1.2
Pf 1 = 3.0

D.F. = 1.31

CAS #	COMPOUND	RESULT (UG/M3)	REPORTING LIMIT (UG/M3)	RESULT (PPB)	REPORTING LIMIT (PPB)
75-27-4	Bromodichloromethane	ND	1,000	ND	150
79-01-6	Trichloroethene	2,700	1,000	510	190
10061-01-5	cis-1,3-Dichloropropene	ND	1,000	ND	220
108-10-1	4-Methyl-2-pentanone	2,900	1,000	700	240
10061-02-6	trans-1,3-Dichloropropene	ND	1,000	ND	220
79-00-5	1,1,2-Trichloroethane	ND	1,000	ND	190
108-88-3	Toluene	92,000	1,000	24,000	270
124-48-1	Dibromochloromethane	ND	1,000	ND	120
591-78-6	2-Hexanone	ND	1,000	ND	240
106-93-4	1,2-Dibromoethane	ND	1,000	ND	130
127-18-4	Tetrachloroethene	4,100	1,000	620	150
108-90-7	Chlorobenzene	ND	1,000	ND	220
100-41-4	Ethylbenzene	35,000	1,000	8,100	230
75-25-2	Bromoform	ND	1,000	ND	98
100-42-5	Styrene	4,600	1,000	1,100	240
1330-20-7	m,p-Xylenes	46,000	1,000	11,000	230
95-47-6	o-Xylene	14,000	1,000	3,300	230
79-34-5	1,1,2,2-Tetrachloroethane	ND	1,000	ND	150
541-73-1	1,3-Dichlorobenzene	ND	1,000	ND	170
106-46-7	1,4-Dichlorobenzene	2,400	1,000	400	170
95-50-1	1,2-Dichlorobenzene	ND	1,000	ND	170

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : RG

Date : 5/3/96

20954 Osborne Street, Canoga Park, CA 91304 • Phone 818 709-1139 • Fax 818 709-2915

Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF CARBON MONOXIDE ANALYSIS

Client: TRC Environmental Corporation

Client Project ID: #20272
PAI Project ID: #P9600715C

Test Code: EPA Method 25C
Instrument ID: HP 5890A/FID/TCA
Analyst: J. Dan Taliaferro
Matrix: Summa Canisters

Date Sampled: 4/22/96
Date Received: 4/24/96
Date Analyzed: 4/24/96
Volume(s) Analyzed: 0.50 (ml)

Client Sample ID	PAI Sample ID	D.F.	Carbon Monoxide Concentration in ppm, v/v	
			Result	Reporting Limit
BFIH-IN-SUMMA-1	P9600715C-001	1.31	14	1.0
BFIH-IN-SUMMA-2	P9600715C-003	1.40	13	1.0
BFIH-IN-SUMMA-3	P9600715C-005	1.29	12	1.0
N/A (4/24/96)	Method Blank	1.00	ND	1.0

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : RG

Date : 5/21/96

20954 Osborne Street, Canoga Park, CA 91304 • Phone 818 709-1139 • Fax 818 709-2915

HAI CHAIN OF CUSTODY ORI

Project Name: BFI Halifax
Project No.: 20272
Sampling Date(s): 4/22/96
Laboratory: PAL
Laboratory P.O. #:
Shipping Airbill No.:
Shipping Date(s): 4/23/96
Shipper's Name: M. O'Brien

P9600715

Sample Code	Sampled Date	Container Size	Container Type	MATRIX: Aqueous	Organic Solvent	Ash/Soil/Sediment	Acidic	Basic	Other	Source Description	ANALYSIS: Trace Metals*	Mercury	Hexavalent Chromium	HCl	Cl2	Particulate Matter	PCDD/PCDF	Semi-Volatile Organics	Volatile Organics	Physical Parameters*	10/14	Methane	Non-Methane	Comments
BFIH-IN-Summa-1	4/22		SS							P9600715-001									X	X		X		7
BFIH-OUT-Summa-1	4/22		SS							-002										X		X		191
BFIH-IN-Summa-2	4/22		SS							-003										X		X		133
BFIH-OUT-Summa-2	4/22		SS							-004										X		X		116
BFIH-IN-Summa-3	4/22		SS							-005										X		X		62
BFIH-OUT-Summa-3	4/22		SS							-006										X		X		183 822/881

Relinquished by:	Date/Time: 4/23/96 1325	Relinquished by:	Date/Time:
Received by:	Date/Time: 4/24/96 9:00 A.M.	Received by:	Date/Time:

REMARKS (*): Please analyze BFIH-IN-Summa-1 for TO14/Methane-Non Methane. All others, Methane-Non Methane only

№ 09149

WHITE — LABORATORY YELLOW — OFFICE COPY PINK — FIELD COPY

TRC Environmental Corporation

Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF BTU ANALYSIS

Client: TRC Environmental Corporation

Client Sample ID: BFIH-IN-SUMMA-1
PAI Sample ID: P9600715B-001

Test Code: ASTM D3588-91
Analyst: J. Dan Taliaferro
Matrix: Tedlar Bag & Summa Canister

Date Sampled: 4/22/96
Date Received: 4/24/96

Components	Volume %	Weight %
Hydrogen	< 0.01	< 0.01
Oxygen	1.13	1.27
Nitrogen	7.60	7.45
Carbon Monoxide	< 0.01	< 0.01
Methane	50.30	28.23
Carbon Dioxide	40.92	63.02
Hydrogen Sulfide	< 0.01	< 0.01
Ethane	< 0.01	< 0.01
Propane	< 0.01	< 0.01
Butanes	< 0.01	< 0.01
Pentanes	< 0.01	0.01
Hexanes	< 0.01	< 0.01
> Hexanes	0.03	< 0.01
TOTALS	99.98	99.98

Components	Mole %	Weight %
C	23.30	38.40
H	51.40	7.11
O	21.42	47.04
N	3.87	7.45
S	< 0.10	< 0.10

Specific Gravity (Air = 1)	0.9877
* Specific Volume, cu. ft./lb	13.27
* Gross Heating Value, BTU/cu. ft.	501.2
** Gross Heating Value, BTU/cu. ft.	511.6
** Gross Heating Value, BTU/lb.	6786.4
** Net Heating Value, BTU/cu. ft.	460.7
** Net Heating Value, BTU/lb	6111.2
* Net Heating Value, BTU/cu. ft.	451.3
Compressibility Factor "Z" (60 F, 14.696 psig)	0.9970

* = Water Saturated at 0.25636 psig
** = Dry Gas @ 60 F, 14.696 psig

Verified By: RG Date: 5/21/96

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Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF BTU ANALYSIS

Client: TRC Environmental Corporation

Client Sample ID: BFIH-IN-SUMMA-2
PAI Sample ID: P9600715B-003

Test Code: ASTM D3588-91
Analyst: J. Dan Taliaferro
Matrix: Tedlar Bag & Summa Canister

Date Sampled: 4/22/96
Date Received: 4/24/96

Components	Volume %	Weight %
Hydrogen	< 0.01	< 0.01
Oxygen	1.03	1.16
Nitrogen	6.77	6.68
Carbon Monoxide	< 0.01	< 0.01
Methane	51.41	29.02
Carbon Dioxide	40.74	63.11
Hydrogen Sulfide	< 0.01	< 0.01
Ethane	< 0.01	< 0.01
Propane	< 0.01	< 0.01
Butanes	< 0.01	< 0.01
Pentanes	< 0.01	0.01
Hexanes	< 0.01	0.01
> Hexanes	0.03	< 0.01
TOTALS	99.98	99.99

Components	Mole %	Weight %
C	23.35	39.02
H	52.11	7.31
O	21.11	47.00
N	3.42	6.67
S	< 0.10	< 0.10

Specific Gravity (Air = 1)	0.9821
* Specific Volume, cu. ft./lb	13.34
* Gross Heating Value, BTU/cu. ft.	512.1
** Gross Heating Value, BTU/cu. ft.	522.8
** Gross Heating Value, BTU/lb.	6975.0
** Net Heating Value, BTU/cu. ft.	470.8
** Net Heating Value, BTU/lb	6281.0
* Net Heating Value, BTU/cu. ft.	461.2
Compressibility Factor "Z" (60 F, 14.696 psig)	0.9970

* = Water Saturated at 0.25636 psig
** = Dry Gas @ 60 F, 14.696 psig

Verified By: RG Date: 5/21/96

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Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF BTU ANALYSIS

Client: TRC Environmental Corporation

Client Sample ID: BFIH-IN-SUMMA-3
PAI Sample ID: P9600715B-005

Test Code: ASTM D3588-91
Analyst: J. Dan Taliaferro
Matrix: Tedlar Bag & Summa Canister

Date Sampled: 4/22/96
Date Received: 4/24/96

Components	Volume %	Weight %
Hydrogen	< 0.01	< 0.01
Oxygen	1.18	1.33
Nitrogen	7.04	6.93
Carbon Monoxide	< 0.01	< 0.01
Methane	51.17	28.88
Carbon Dioxide	40.57	62.82
Hydrogen Sulfide	< 0.01	< 0.01
Ethane	< 0.01	< 0.01
Propane	< 0.01	< 0.01
Butanes	< 0.01	< 0.01
Pentanes	< 0.01	0.01
Hexanes	< 0.01	0.01
> Hexanes	0.03	< 0.01
TOTALS	99.99	99.98

Components	Mole %	Weight %
C	23.29	38.83
H	51.99	7.27
O	21.15	46.97
N	3.56	6.93
S	< 0.10	< 0.10

Specific Gravity (Air = 1)	0.9822
* Specific Volume, cu. ft./lb	13.34
* Gross Heating Value, BTU/cu. ft.	509.7
** Gross Heating Value, BTU/cu. ft.	520.3
** Gross Heating Value, BTU/lb.	6941.0
** Net Heating Value, BTU/cu. ft.	468.5
** Net Heating Value, BTU/lb	6250.3
* Net Heating Value, BTU/cu. ft.	459.0
Compressibility Factor "Z" (60 F, 14.696 psig)	0.9970

* = Water Saturated at 0.25636 psig
** = Dry Gas @ 60 F, 14.696 psig

Verified By: RG Date: 5/2/96

CHAIN OF CUSTODY RECORD

Project Name: BFI Halifax
Project No.: 20272
Sampling Date(s): 4/22/96
Laboratory: PACE
Laboratory P.O. #:
Shipping Airbill No.:
Shipping Date(s): 4/23/96
Shipper's Name: M. O'Brien

P9600715

Sample Code	Sampled Date	Container Size	Container BTP	MATRIX: Aqueous	Organic Solvent	Ash/Soil/Sediment	Acidic	Basic	Other	Source Description	ANALYSIS: Trace Metals*	Mercury	Hexavalent Chromium	HCl	Cl2	Particulate Matter	PCDD/PCDF	Saml. Volatile Organics	Volatile Organics	Physical Parameters*	TO14/Methane-Non Methane	Methane-Non Methane only	Comments
BFIH-IN-Summa-1	4/22		SS							P9600715-001									X		X		7
BFIH-OUT-Summa-1	4/22		SS							-002											X		191
BFIH-IN-Summa-2	4/22		SS							-003											X		133
BFIH-OUT-Summa-2	4/22		SS							-004											X		116
BFIH-IN-Summa-3	4/22		SS							-005											X		62
BFIH-OUT-Summa-3	4/22		SS							-006											X		183 827/881

Relinquished by: [signature]	Date/Time: 4/23/96 1325	Relinquished by:	Date/Time:
Received by: [signature]	Date/Time: 4/24/96 9:00 A.M.	Received by:	Date/Time:

REMARKS (*): Please analyze BFIH-IN-Summa-1 for TO14/Methane-Non Methane. All others, Methane-Non Methane only

№ 09149

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TRC Environmental Corporation

PERFORMANCE ID:818-709-1139 MAY 24'96 13:27 NO.012 P.06

APPENDIX D

CEM CALIBRATION AND DATA SHEETS

TRC Environmental Corporation
CEM Data Sheet

Firm	BFI
Location	Halifax, Ma
Tester	William Kissel
Test No.	1900°F - Run 1
Location	Flare Outlet
Date	April 19, 1996
TIME	1150-1250

Ambient Temp, deg. F	=	55	
MEL Temp, deg. F	=	66.4	
Bar. Pressure, in Hg	=	29.5	
Vacuum Gauge	=	5	
Pressure Gauge	=	2	

Calibration Gases				
	Mid Cal	High Cal	Tank ID Mid	Tank ID High
CO	120.0	278.0	ALM038611	ALM063760
O2	10.2	22.3	ALM026170	ALM027466
CO2	10.1	19.8	ALM026170	ALM027466
NOx	180.0	255.0	ALM043688	ALM009773
SO2	84.6	123.0	ALM021721	ALM063760

		(Rack) Analyzer Cal. Response	Initial Values: System Cal. Response	Initial Values: System Cal. Bias % of Span	Final Values: System Cal. Response	Final Values: System Cal. Bias % of Span	Drift % of Span	Analyzer Range & Units	Avg. Gas Conc.	Effluent Gas Conc.
CO	Zero	0	0	0.0	0	0.0	0.0	ppm	-	-
	Upscale	118	117	-0.3	119	0.3	0.7	300	0	0
O2	Zero	0.04	0.36	1.3	0.43	1.6	0.3	PERCENT	-	-
	Upscale	10.26	10.35	0.4	10.32	0.2	-0.1	25.0	9.93	9.78
CO2	Zero	0.07	0.07	0.0	0.04	-0.2	-0.2	PERCENT	-	-
	Upscale	10.02	9.86	-0.8	9.93	-0.5	0.4	20.0	9.82	10.02
NOx	Zero	0	0	0.0	0	0.0	0.0	ppm	-	-
	Upscale	181	172	-3.0	170	-3.7	-0.7	300	24	25
SO2	Zero	0.90	0.00	-0.6	1.80	0.6	1.2	ppm	-	-
	Upscale	84.90	79.40	-3.7	79.70	-3.5	0.2	150.0	2.10	1.29
			LIMITS	+/- 5%		+/- 5%	+/- 3%			

		Cal. Back Analyzer Response	Cal. Upstream Analyzer Response	Bias Check % of Span
CO	Zero	0.0	0.0	0.0
	Upscale	118.0	117.0	-0.3
NOx	Zero	0.0	0.0	0.0
	Upscale	181.0	172.0	-3.0
			LIMIT	+/- 5%

	ZERO Cal. Gas Analyzer Response	Analyzer Calib. Error	MID Cal. Gas Analyzer Response	Analyzer Calib. Error	HIGH Cal. Gas Analyzer Response	Analyzer Calib. Error
CO	0.0	0.00	118.0	-0.67	279.0	0.33
O2	0.04	0.16	10.26	0.24	22.44	0.56
CO2	0.07	0.35	10.02	-0.40	19.75	-0.25
NOx	0.00	0.00	181.00	0.33	255.00	0.00
SO2	0.9	0.60	84.90	0.20	124.6	1.07
	LIMIT	+/- 2%		+/- 2%		+/- 2%

40 CFR 60, Appendix A, Method 6C, subpart 4.1

TRC Environmental Corporation
CEM Data Sheet

Firm	BFI	Ambient Temp, deg. F =	55
Location	Halifax, Ma	MEL Temp, deg. F =	66.4
Tester	William Kissel	Bar. Pressure, in Hg =	29.5
Test No.	1900°F - Run 2	Vacuum Gauge =	5
Location	Flare Outlet	Pressure Gauge =	2
Date	April 19, 1996		
TIME	1325-1425		

	Calibration Gases			
	Mid Cal	High Cal	Tank ID Mid	Tank ID High
CO	120.0	278.0	ALM038611	ALM063760
O2	10.2	22.3	ALM026170	ALM027466
CO2	10.1	19.8	ALM026170	ALM027466
NOx	180.0	255.0	ALM043688	ALM009773
SO2	84.6	123.0	ALM021721	ALM063760

		(Rack) Analyzer Cal. Response	Initial Values: System Cal. Response	Initial Values: System Cal. Bias % of Span	Final Values: System Cal. Response	Final Values: System Cal. Bias % of Span	Drift % of Span	Analyzer Range & Units	Avg. Gas Conc.	Effluent Gas Conc.
CO	Zero	0	0	0.0	2	0.7	0.7	ppm	-	-
	Upscale	118	119	0.3	118	0.0	-0.3	300	0	-1
O2	Zero	0.04	0.43	1.6	0.46	1.7	0.1	PERCENT	-	-
	Upscale	10.26	10.32	0.2	10.17	-0.4	-0.6	25.0	9.71	9.64
CO2	Zero	0.07	0.04	-0.2	0.07	0.0	0.2	PERCENT	-	-
	Upscale	10.02	9.93	-0.5	9.88	-0.7	-0.3	20.0	9.98	10.18
NOx	Zero	0	0	0.0	0	0.0	0.0	ppm	-	-
	Upscale	181	170	-3.7	177	-1.3	2.3	300	23	24
SO2	Zero	0.90	1.80	0.6	0.90	0.0	-0.6	ppm	-	-
	Upscale	84.9	79.70	-3.5	78.90	-4.0	-0.5	150.0	1.13	-0.24
			LIMITS	+/- 5%		+/- 5%	+/- 3%			

		Cal. Back Analyzer Response	Cal. Upstream Analyzer Response	Bias Check % of Span
CO	Zero	0.0	0.0	0.0
	Upscale	118.0	117.0	-0.3
NOx	Zero	0.0	0.0	0.0
	Upscale	181.0	170.0	-3.7
			LIMIT	+/- 5%

	ZERO Cal. Gas Analyzer Response	Analyzer Calib. Error	MID Cal. Gas Analyzer Response	Analyzer Calib. Error	HIGH Cal. Gas Analyzer Response	Analyzer Calib. Error
CO	0.0	0.00	118.0	-0.67	279.0	0.33
O2	0.04	0.16	10.26	0.24	22.44	0.56
CO2	0.07	0.35	10.02	-0.40	19.75	-0.25
NOx	0.00	0.00	181.00	0.33	255.00	0.00
SO2	0.9	0.60	84.90	0.20	124.6	1.07
	LIMIT	+/- 2%		+/- 2%		+/- 2%

40 CFR 60, Appendix A, Method 6C, subpart 4.1

TRC Environmental Corporation
CEM Data Sheet

Firm	BFI	Ambient Temp, deg. F =	55
Location	Halifax, Ma	MEL Temp, deg. F =	66.4
Tester	William Kissel	Bar. Pressure, in Hg =	29.5
Test No.	1900°F - Run 3	Vacuum Gauge =	5
Location	Flare Outlet	Pressure Gauge =	2
Date	April 19, 1996		
TIME	1510-1610		

	Calibration Gases			
	Mid Cal	High Cal	Tank ID Mid	Tank ID High
CO	120.0	278.0	ALM038611	ALM063760
O2	10.2	22.3	ALM026170	ALM027466
CO2	10.1	19.8	ALM026170	ALM027466
NOx	180.0	255.0	ALM043688	ALM009773
SO2	84.6	123.0	ALM021721	ALM063760

		(Rack) Analyzer Cal. Response	Initial Values: System Cal. Response	Initial Values: System Cal. Bias % of Span	Final Values: System Cal. Response	Final Values: System Cal. Bias % of Span	Drift % of Span	Analyzer Range & Units	Avg. Gas Conc.	Effluent Gas Conc.
CO	Zero	0	2	0.7	1	0.3	-0.3	ppm	-	-
	Upscale	118	118	0.0	119	0.3	0.3	300	0	-2
O2	Zero	0.04	0.46	1.7	0.44	1.6	-0.1	PERCENT	-	-
	Upscale	10.26	10.17	-0.4	10.30	0.2	0.5	25.0	9.85	9.80
CO2	Zero	0.07	0.07	0.0	0.05	-0.1	-0.1	PERCENT	-	-
	Upscale	10.02	9.88	-0.7	9.88	-0.7	0.0	20.0	9.97	10.19
NOx	Zero	0	0	0.0	0	0.0	0.0	ppm	-	-
	Upscale	181	177	-1.3	177	-1.3	0.0	300	24	24
SO2	Zero	0.90	0.90	0.0	-0.10	-0.7	-0.7	ppm	-	-
	Upscale	84.90	78.90	-4.0	80.60	-2.9	1.1	150.0	2.25	1.97
			LIMITS	+/- 5%		+/- 5%	+/- 3%			

		Cal. Back Analyzer Response	Cal. Upstream Analyzer Response	Bias Check % of Span
CO	Zero	0.0	0.0	0.0
	Upscale	118.0	117.0	-0.3
NOx	Zero	0.0	0.0	0.0
	Upscale	181.0	177.0	-1.3
			LIMIT	+/- 5%

	ZERO Cal. Gas Analyzer Response	Analyzer Calib. Error	MID Cal. Gas Analyzer Response	Analyzer Calib. Error	HIGH Cal. Gas Analyzer Response	Analyzer Calib. Error
CO	0.0	0.00	118.0	-0.67	279.0	0.33
O2	0.04	0.16	10.26	0.24	22.44	0.56
CO2	0.07	0.35	10.02	-0.40	19.75	-0.25
NOx	0.00	0.00	181.00	0.33	255.00	0.00
SO2	0.9	0.60	84.90	0.20	124.6	1.07
LIMIT		+/- 2%		+/- 2%		+/- 2%

40 CFR 60, Appendix A, Method 6C, subpart 4.1

TRC Environmental Corporation
CEM Data Sheet

Firm	BFI	Ambient Temp, deg. F =	70
Location	Halifax, Ma	MEL Temp, deg. F =	72
Tester	William Kissel	Bar. Pressure, in Hg =	30.15
Test No.	1500°F - Run 1	Vacuum Gauge =	5
Location	Flare Outlet	Pressure Gauge =	2
Date	April 22, 1996		
TIME	1222-1330		

	Calibration Gases			
	Mid Cal	High Cal	Tank ID Mid	Tank ID High
CO	120.0	278.0	ALM038611	ALM063760
O2	10.2	22.3	ALM026170	ALM027466
CO2	10.1	19.8	ALM026170	ALM027466
NOx	180.0	255.0	ALM043688	ALM009773
SO2	84.6	123.0	ALM021721	ALM063760

		(Rack) Analyzer Cal. Response	Initial Values: System Cal. Response	Initial Values: System Cal. Bias % of Span	Final Values: System Cal. Response	Final Values: System Cal. Bias % of Span	Drift % of Span	Analyzer Range & Units	Avg. Gas Conc.	Effluent Gas Conc.
CO	Zero	0	4	1.3	2	0.7	-0.7	ppm	-	-
	Upscale	120	121	0.3	118	-0.7	-1.0	300	12	10
O2	Zero	0.04	0.23	0.8	0.28	1.0	0.2	PERCENT	-	-
	Upscale	10.30	10.26	-0.2	10.09	-0.8	-0.7	25.0	12.84	12.94
CO2	Zero	0.09	0.18	0.5	0.22	0.7	0.2	PERCENT	-	-
	Upscale	10.05	9.90	-0.8	9.84	-1.1	-0.3	20.0	7.34	7.46
NOx	Zero	0	0	0.0	0	0.0	0.0	ppm	-	-
	Upscale	182	173	-3.0	174	-2.7	0.3	300	10	11
SO2	Zero	-0.20	0.00	0.1	1.70	1.3	1.1	ppm	-	-
	Upscale	85.20	81.10	-2.7	85.70	0.3	3.1	150.0	1.32	0.48
	Zero									
	Upscale									
			LIMITS	+/- 5%		+/- 5%	+/- 3%			

		Cal. Back Analyzer Response	Cal. Upstream Analyzer Response	Bias Check % of Span
CO	Zero	0.0	4.0	1.3
	Upscale	120.0	121.0	0.3
NOx	Zero	0.0	0.0	0.0
	Upscale	182.0	173.0	-3.0
			LIMIT	+/- 5%

	ZERO Cal. Gas Analyzer Response	Analyzer Calib. Error	MID Cal. Gas Analyzer Response	Analyzer Calib. Error	HIGH Cal. Gas Analyzer Response	Analyzer Calib. Error
CO	0.0	0.00	120.0	0.00	281.0	1.00
O2	0.04	0.16	10.30	0.40	22.55	1.00
CO2	0.09	0.45	10.05	-0.25	19.76	-0.20
NOx	0.00	0.00	182.00	0.67	255.00	0.00
SO2	-0.2	-0.13	85.20	0.40	125.2	1.47
LIMIT		+/- 2%		+/- 2%		+/- 2%

40 CFR 60, Appendix A, Method 6C, subpart 4.1

TRC Environmental Corporation
CEM Data Sheet

Firm	BFI	Ambient Temp, deg. F =	70	
Location	Halifax, Ma	MEL Temp, deg. F =	72	
Tester	William Kissel	Bar. Pressure, in Hg =	30.15	
Test No.	1500°F - Run 2	Vacuum Gauge =	5	
Location	Flare Outlet	Pressure Gauge =	2	
Date	April 22, 1996			
TIME	1430-1530			

	Calibration Gases			
	Mid Cal	High Cal	Tank ID Mid	Tank ID High
CO	120.0	278.0	ALM038611	ALM063760
O2	10.2	22.3	ALM026170	ALM027466
CO2	10.1	19.8	ALM026170	ALM027466
NOx	180.0	255.0	ALM043688	ALM009773
SO2	84.6	123.0	ALM021721	ALM063760

		Initial Values		Final Values					
		(Rack) Analyzer Cal. Response	System Cal. Response	System Cal. Bias % of Span	System Cal. Response	System Cal. Bias % of Span	Drift % of Span	Analyzer Range & Units	Avg. Gas Conc.	Effluent Gas Conc.
CO	Zero	0	2	0.7	5	1.7	1.0	ppm	-	-
	Upscale	120	118	-0.7	121	0.3	1.0	300	24	21
O2	Zero	0.04	0.28	1.0	0.29	1.0	0.0	PERCENT	-	-
	Upscale	10.30	10.09	-0.8	10.14	-0.6	0.2	25.0	13.28	13.48
CO2	Zero	0.09	0.22	0.7	0.23	0.7	0.1	PERCENT	-	-
	Upscale	10.05	9.84	-1.1	9.81	-1.2	-0.1	20.0	7.11	7.24
NOx	Zero	0	0	0.0	0	0.0	0.0	ppm	-	-
	Upscale	182	174	-2.7	175	-2.3	0.3	300	11	11
SO2	Zero	-0.20	1.70	1.3	1.50	1.1	-0.1	ppm	-	-
	Upscale	85.20	85.70	0.3	84.70	-0.3	-0.7	150.0	2.01	0.41
			LIMITS	+/- 5%		+/- 5%	+/- 3%			

		Cal. Back Analyzer Response	Cal. Upstream Analyzer Response	Bias Check % of Span
CO	Zero	0.0	4.0	1.3
	Upscale	120.0	121.0	0.3
NOx	Zero	0.0	0.0	0.0
	Upscale	182.0	173.0	-3.0
			LIMIT	+/- 5%

	ZERO Cal. Gas Analyzer Response	Analyzer Calib. Error	MID Cal. Gas Analyzer Response	Analyzer Calib. Error	HIGH Cal. Gas Analyzer Response	Analyzer Calib. Error
CO	0.0	0.00	120.0	0.00	281.0	1.00
O2	0.04	0.16	10.30	0.40	22.55	1.00
CO2	0.09	0.45	10.05	-0.25	19.76	-0.20
NOx	0.00	0.00	182.00	0.67	255.00	0.00
SO2	-0.2	-0.13	85.20	0.40	125.2	1.47
	LIMIT	+/- 2%		+/- 2%		+/- 2%

40 CFR 60, Appendix A, Method 6C, subpart 4.1

TRC Environmental Corporation
CEM Data Sheet

Firm	BFI	Ambient Temp, deg. F =	70
Location	Halifax, Ma	MEL Temp, deg. F =	72
Tester	William Kissel	Bar. Pressure, in Hg =	30.15
Test No.	1500°F - Run 3	Vacuum Gauge =	5
Location	Flare Outlet	Pressure Gauge =	2
Date	April 22, 1996		
TIME	1725-1825		

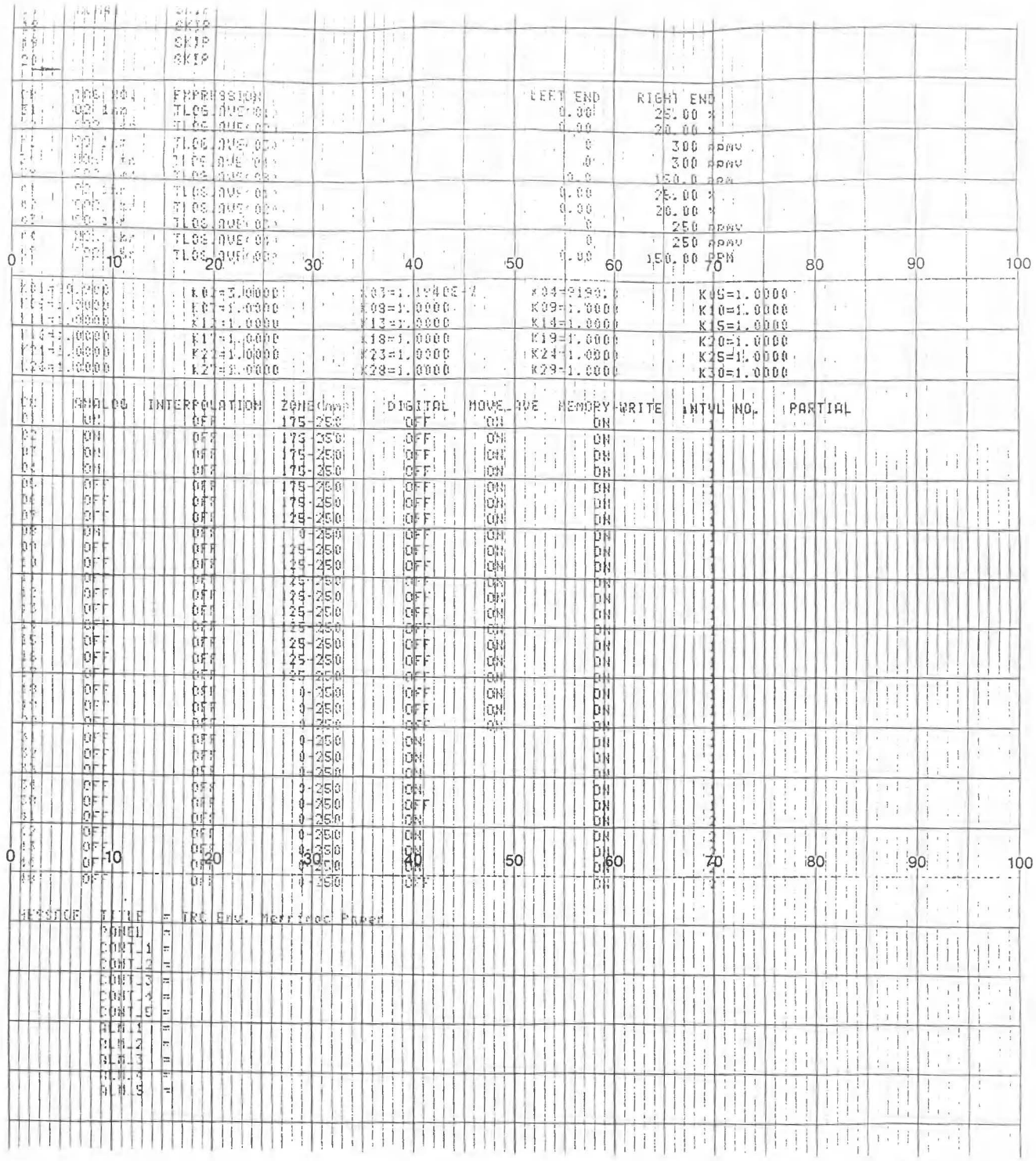
	Calibration Gases			
	Mid Cal	High Cal	Tank ID Mid	Tank ID High
CO	120.0	278.0	ALM038611	ALM063760
O2	10.2	22.3	ALM026170	ALM027466
CO2	10.1	19.8	ALM026170	ALM027466
NOx	180.0	255.0	ALM043688	ALM009773
SO2	84.6	123.0	ALM021721	ALM063760

		Initial Values		Final Values					
		(Rack) Analyzer Cal. Response	System Cal. Response	System Cal. Bias % of Span	System Cal. Response	System Cal. Bias % of Span	Drift % of Span	Analyzer Range & Units	Avg. Gas Conc.	Effluent Gas Conc.
CO	Zero	0	5	1.7	4	1.3	-0.3	ppm	-	-
	Upscale	120	121	0.3	121	0.3	0.0	300	17	13
O2	Zero	0.04	0.29	1.0	0.34	1.2	0.2	PERCENT	-	-
	Upscale	10.30	10.14	-0.6	10.13	-0.7	-0.0	25.0	12.52	12.68
CO2	Zero	0.09	0.23	0.7	0.29	1.0	0.3	PERCENT	-	-
	Upscale	10.05	9.81	-1.2	9.84	-1.1	0.1	20.0	7.68	7.84
NOx	Zero	0	0	0.0	0	0.0	0.0	ppm	-	-
	Upscale	182	175	-2.3	177	-1.7	0.7	300	11	11
SO2	Zero	-0.20	1.50	1.1	0.50	0.5	-0.7	ppm	-	-
	Upscale	85.20	84.70	-0.3	84.10	-0.7	-0.4	150.0	0.83	-0.17
			LIMITS	+/- 5%		+/- 5%	+/- 3%			

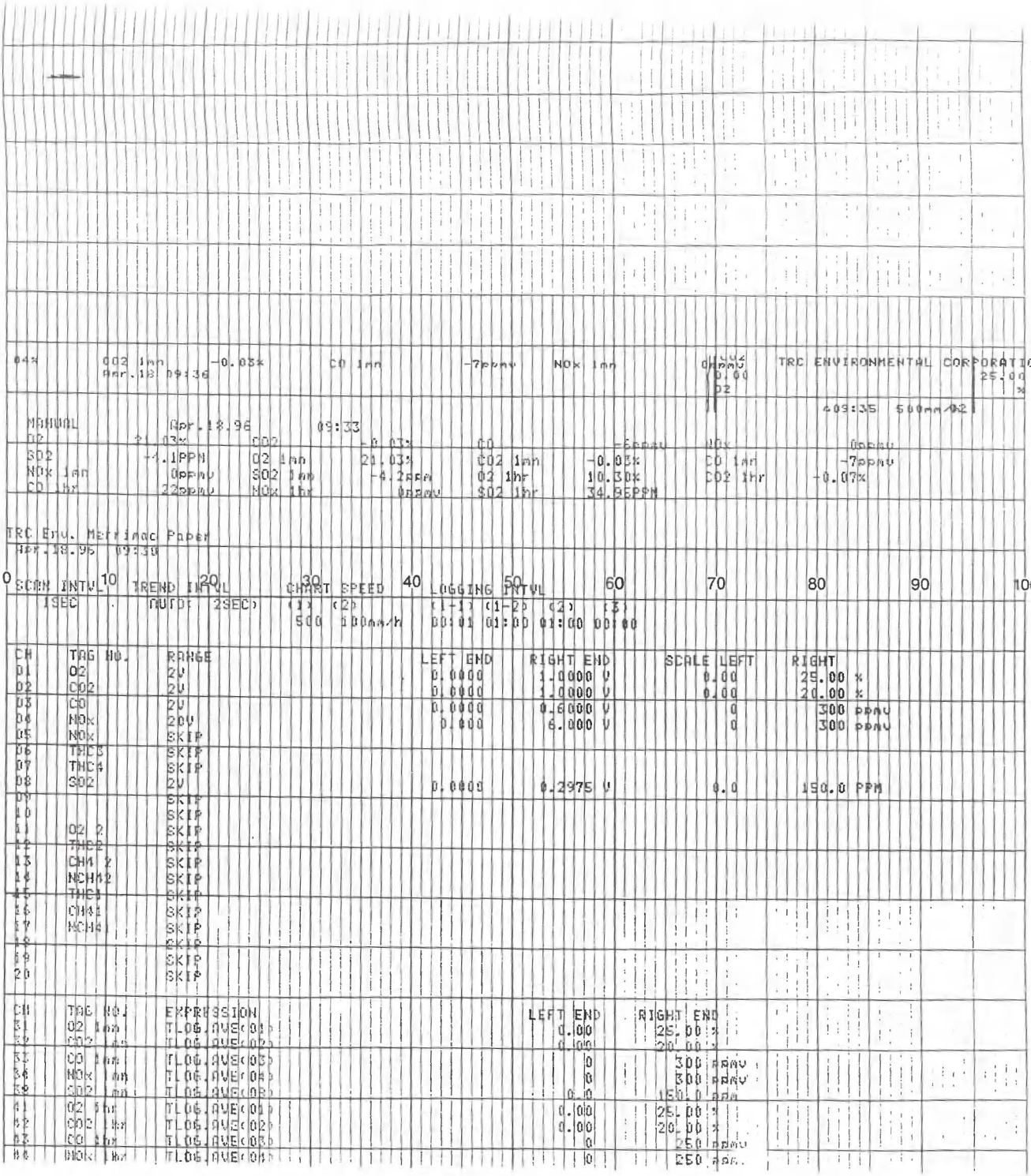
		Cal. Back Analyzer Response	Cal. Upstream Analyzer Response	Bias Check % of Span
CO	Zero	0.0	4.0	1.3
	Upscale	120.0	121.0	0.3
NOx	Zero	0.0	0.0	0.0
	Upscale	182.0	173.0	-3.0
			LIMIT	+/- 5%

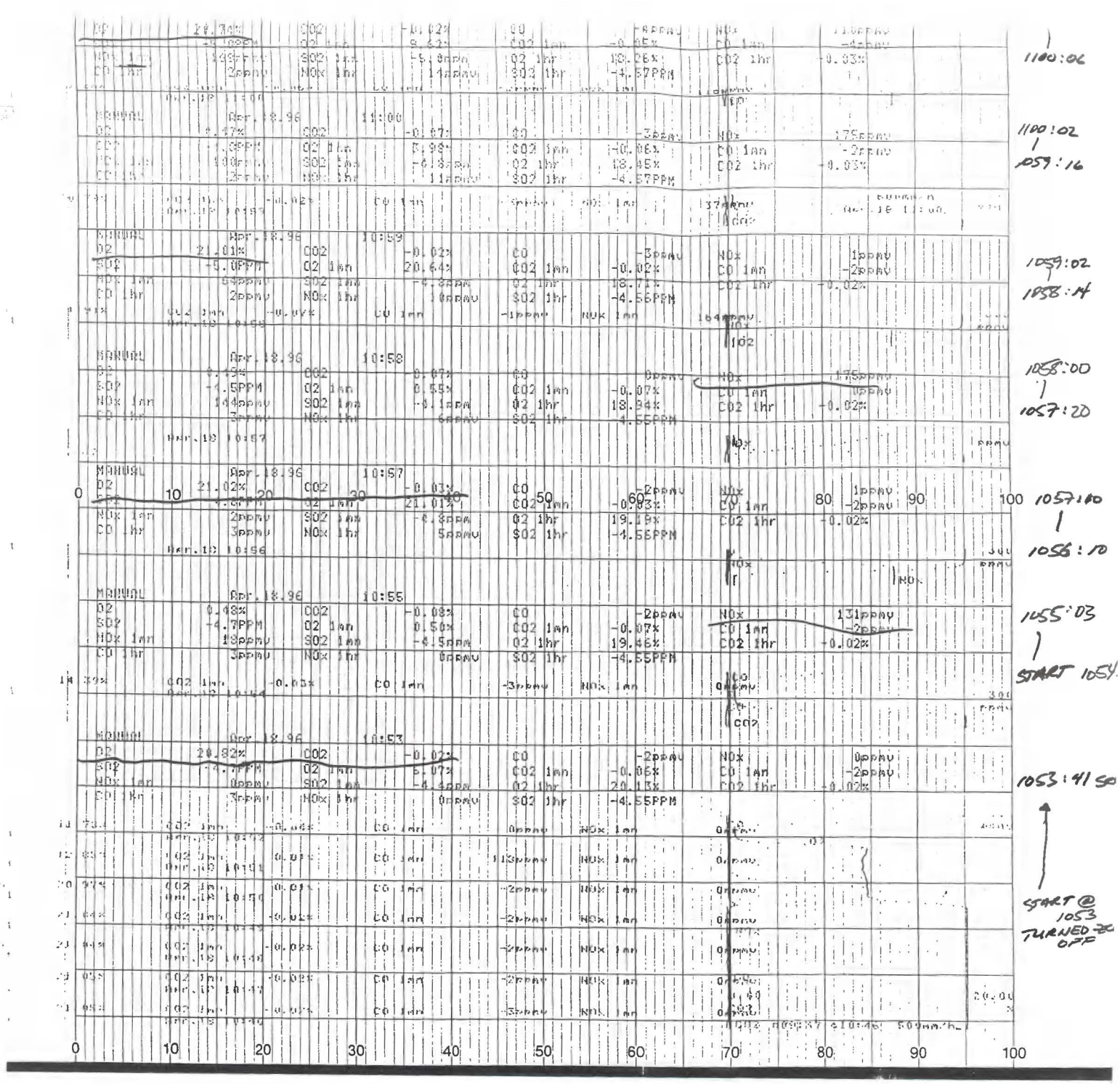
	ZERO Cal. Gas Analyzer Response	Analyzer Calib. Error	MID Cal. Gas Analyzer Response	Analyzer Calib. Error	HIGH Cal. Gas Analyzer Response	Analyzer Calib. Error
CO	0.0	0.00	120.0	0.00	281.0	1.00
O2	0.04	0.16	10.30	0.40	22.55	1.00
CO2	0.09	0.45	10.05	-0.25	19.76	-0.20
NOx	0.00	0.00	182.00	0.67	255.00	0.00
SO2	-0.2	-0.13	85.20	0.40	125.2	1.47
	LIMIT	+/- 2%		+/- 2%		+/- 2%

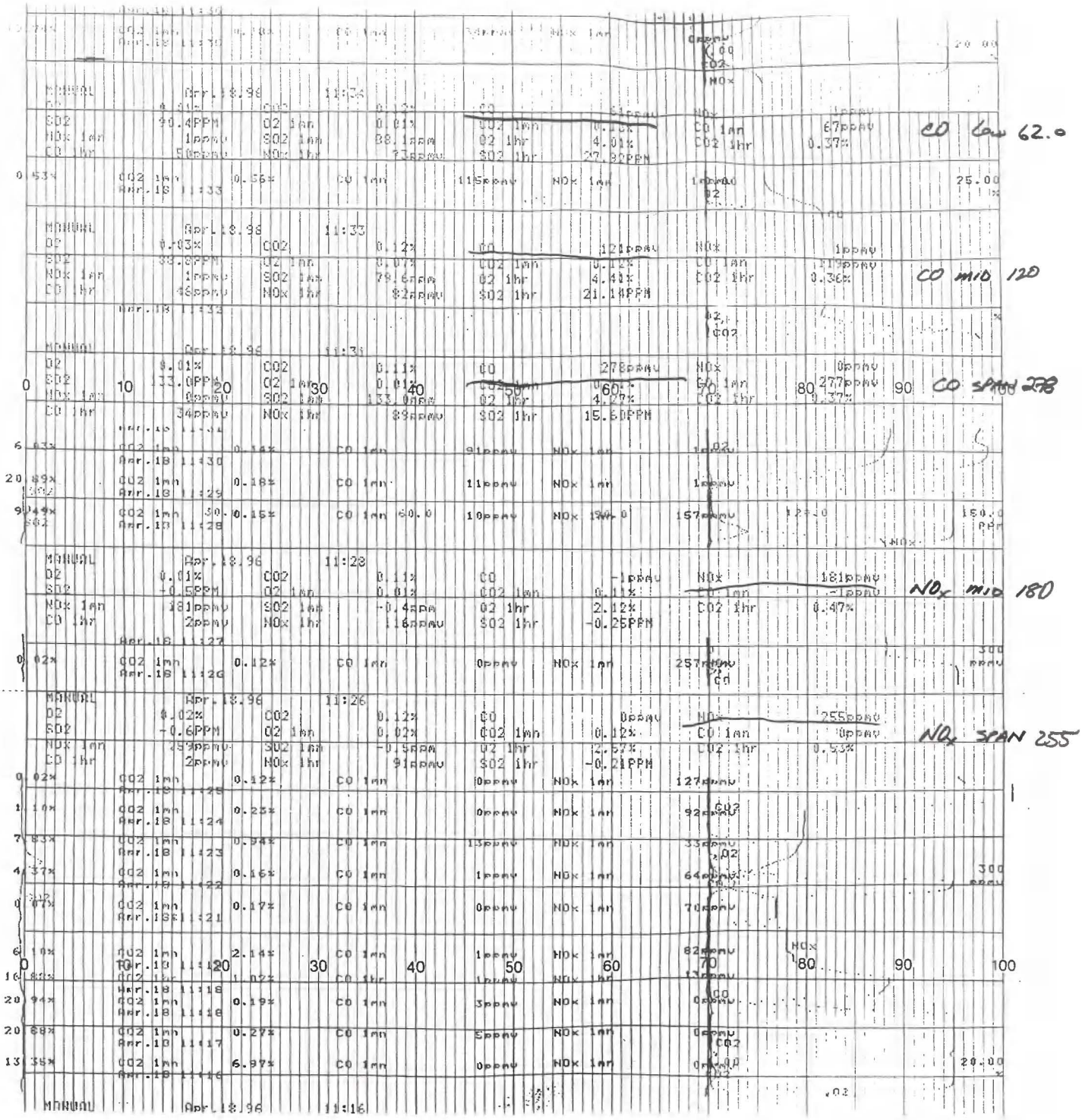
40 CFR 60, Appendix A, Method 6C, subpart 4.1

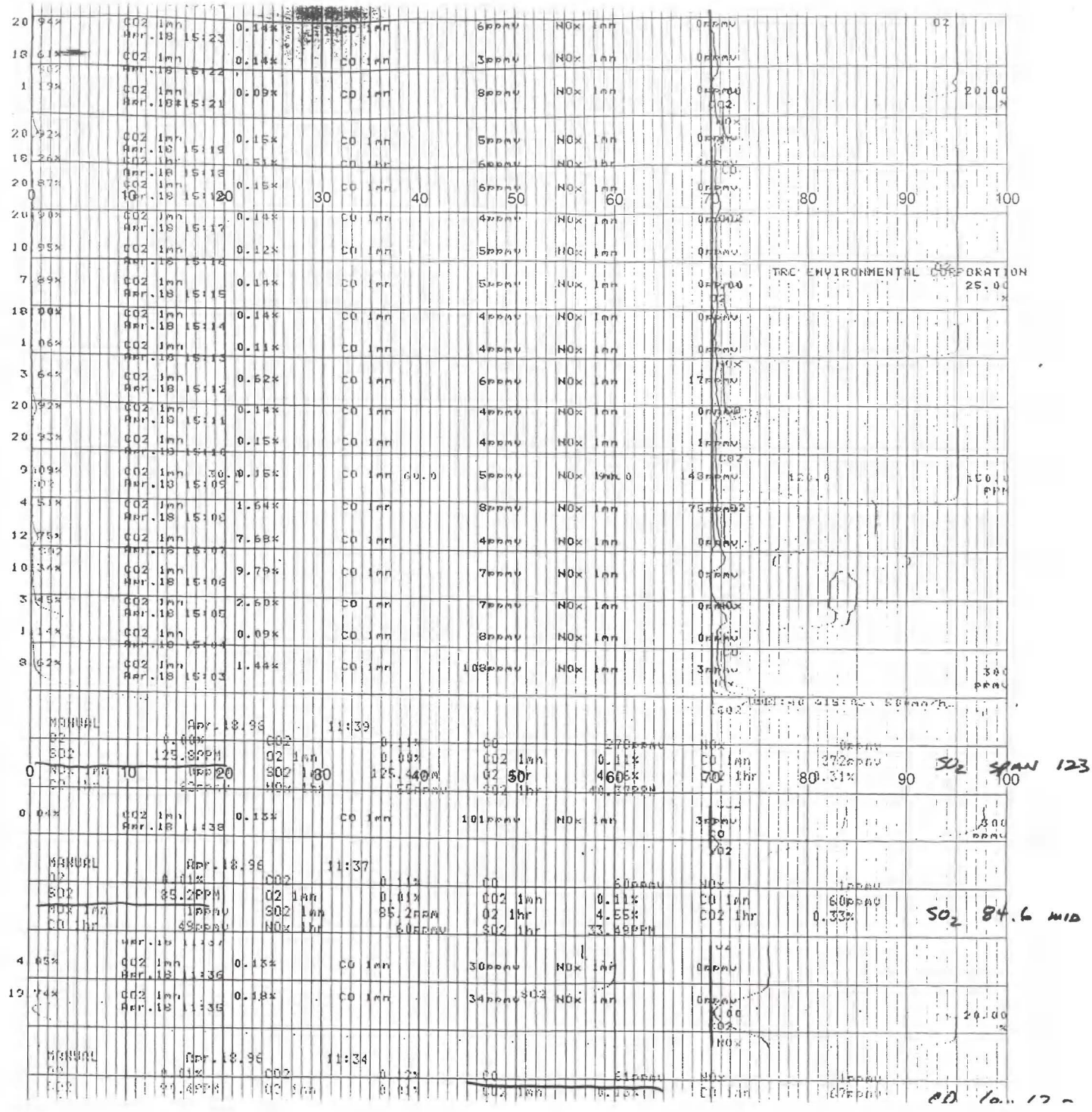

SKIP
SKIP
SKIP
EXPRESSION
TL05 AVE=05
TL06 AVE=06
TL07 AVE=07
TL08 AVE=08
LEFT END
RIGHT END
0.00
25.00 %
0.00
20.00 %
0
300 RPMV
0
300 RPMV
0.0
150.0 RPM
0.00
25.00 %
0.00
20.00 %
0
250 RPMV
0
250 RPMV
0.00
150.00 RPM
0
10
20
30
40
50
60
70
80
90
100
K01=3.0000
K03=1.1940E-7
K04=9190.0
K05=1.0000
K07=1.0000
K09=1.0000
K09=1.0000
K10=1.0000
K12=1.0000
K13=1.0000
K14=1.0000
K15=1.0000
K17=1.0000
K18=1.0000
K19=1.0000
K20=1.0000
K22=1.0000
K23=1.0000
K24=1.0000
K25=1.0000
K27=1.0000
K28=1.0000
K29=1.0000
K30=1.0000
CH
ANALOG
INTERPOLATION
ZONE(mm)
DIGITAL
MOVE_AVE
MEMORY_WRITE
INTVL NO.
PARTIAL
00 ON OFF 175-250 OFF ON ON 1
01 ON OFF 175-250 OFF ON ON 1
02 ON OFF 175-250 OFF ON ON 1
03 OFF OFF 175-250 OFF ON ON 1
04 OFF OFF 175-250 OFF ON ON 1
05 OFF OFF 175-250 OFF ON ON 1
06 ON OFF 0-250 OFF ON ON 1
07 OFF OFF 25-250 OFF ON ON 1
08 OFF OFF 25-250 OFF ON ON 1
09 OFF OFF 25-250 OFF ON ON 1
10 OFF OFF 25-250 OFF ON ON 1
11 OFF OFF 25-250 OFF ON ON 1
12 OFF OFF 25-250 OFF ON ON 1
13 OFF OFF 25-250 OFF ON ON 1
14 OFF OFF 25-250 OFF ON ON 1
15 OFF OFF 25-250 OFF ON ON 1
16 OFF OFF 25-250 OFF ON ON 1
17 OFF OFF 25-250 OFF ON ON 1
18 OFF OFF 0-250 OFF ON ON 1
19 OFF OFF 0-250 OFF ON ON 1
20 OFF OFF 0-250 OFF ON ON 1
21 OFF OFF 0-250 ON ON ON 1
22 OFF OFF 0-250 ON ON ON 1
23 OFF OFF 0-250 ON ON ON 1
24 OFF OFF 0-250 ON ON ON 1
25 OFF OFF 0-250 ON ON ON 1
26 OFF OFF 0-250 ON ON ON 1
27 OFF OFF 0-250 ON ON ON 1
28 OFF OFF 0-250 ON ON ON 1
29 OFF OFF 0-250 ON ON ON 1
30 OFF OFF 0-250 ON ON ON 1
31 OFF OFF 0-250 OFF ON ON 1
0
10
20
30
40
50
60
70
80
90
100
REFSPCF TITLE = TRC Env. Merritec Paper
PANEL
CONT_1
CONT_2
CONT_3
CONT_4
CONT_5
ALM_1
ALM_2
ALM_3
ALM_4
ALM_5

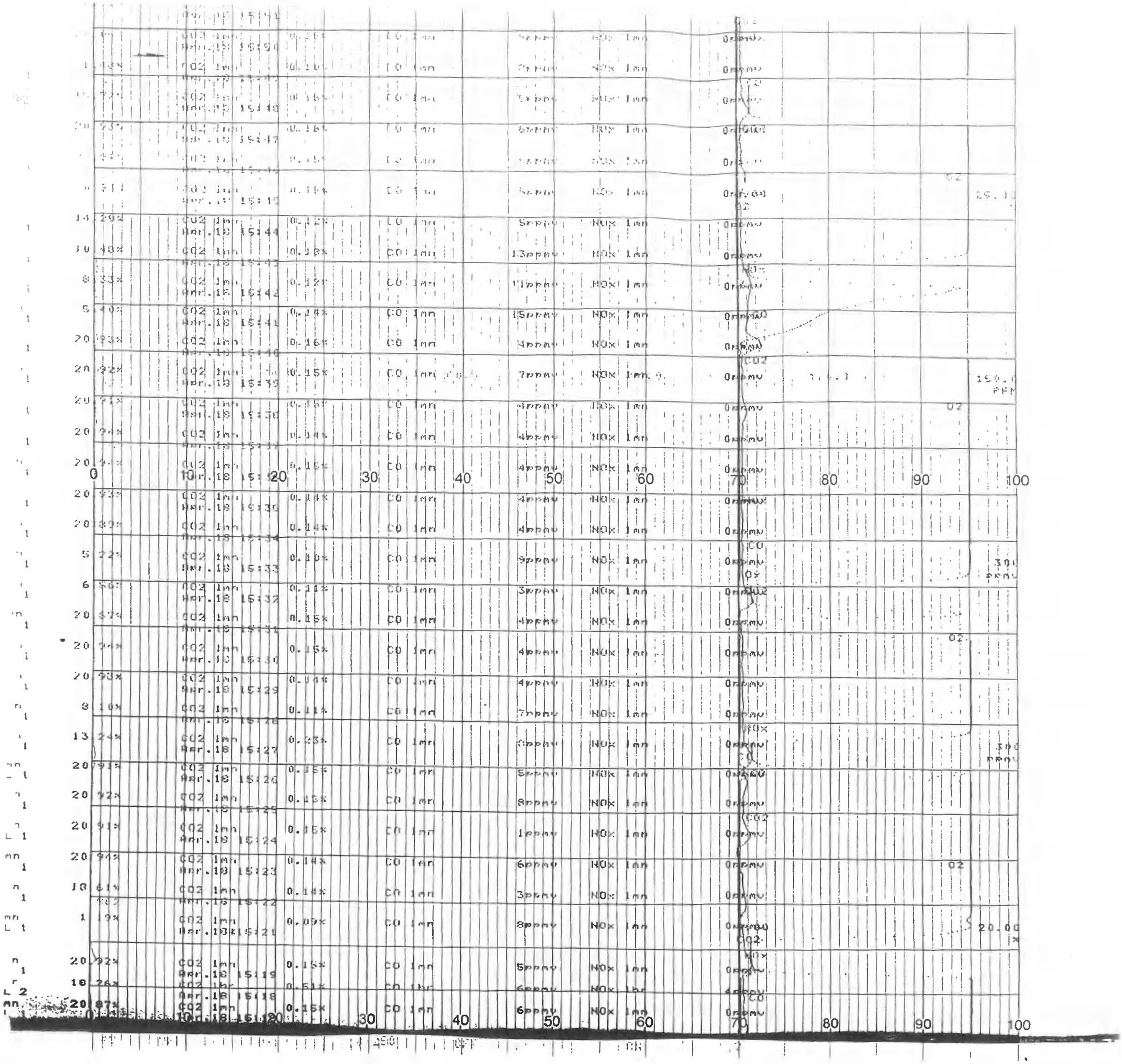
Response Time Check 4/18/96

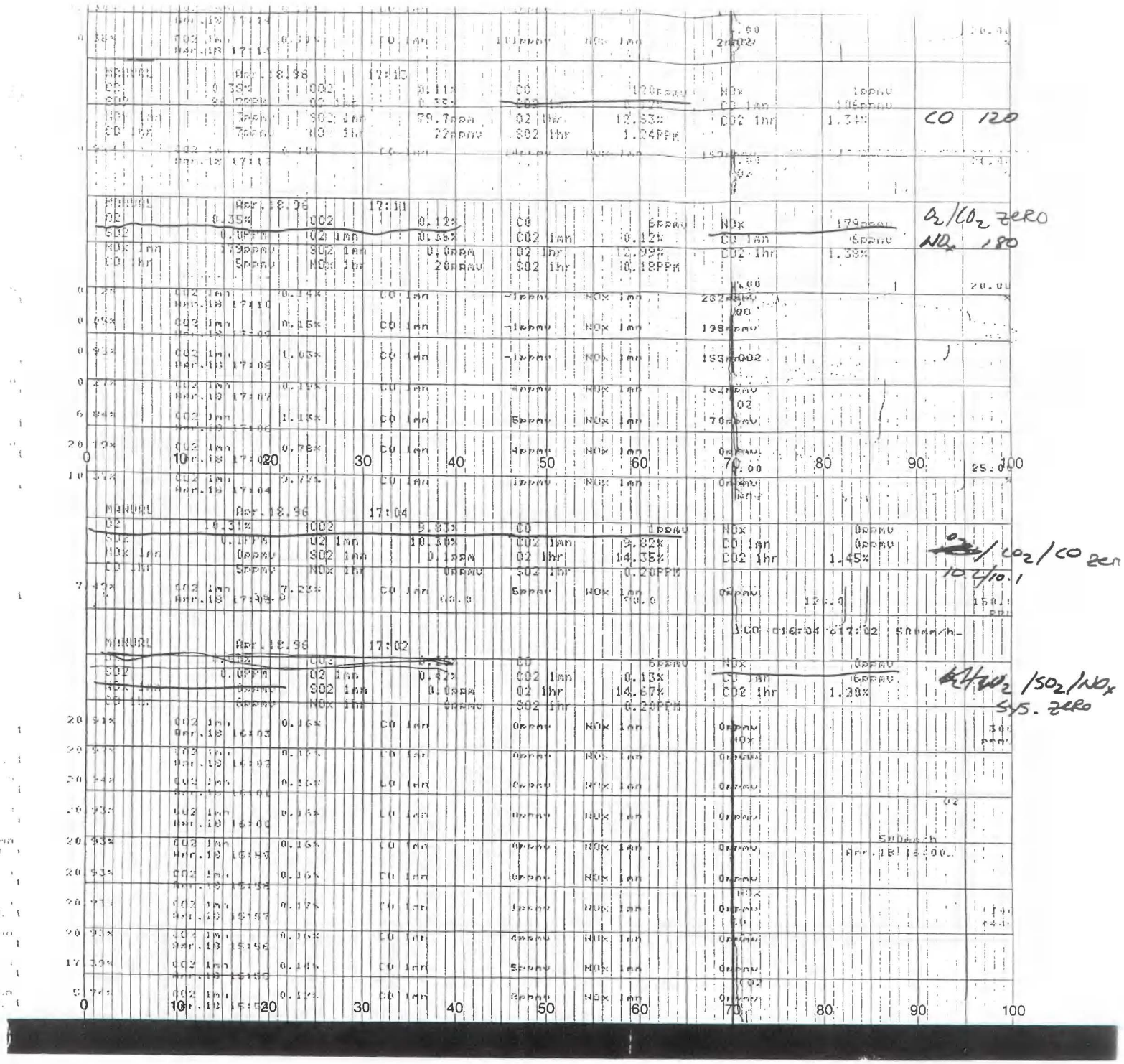


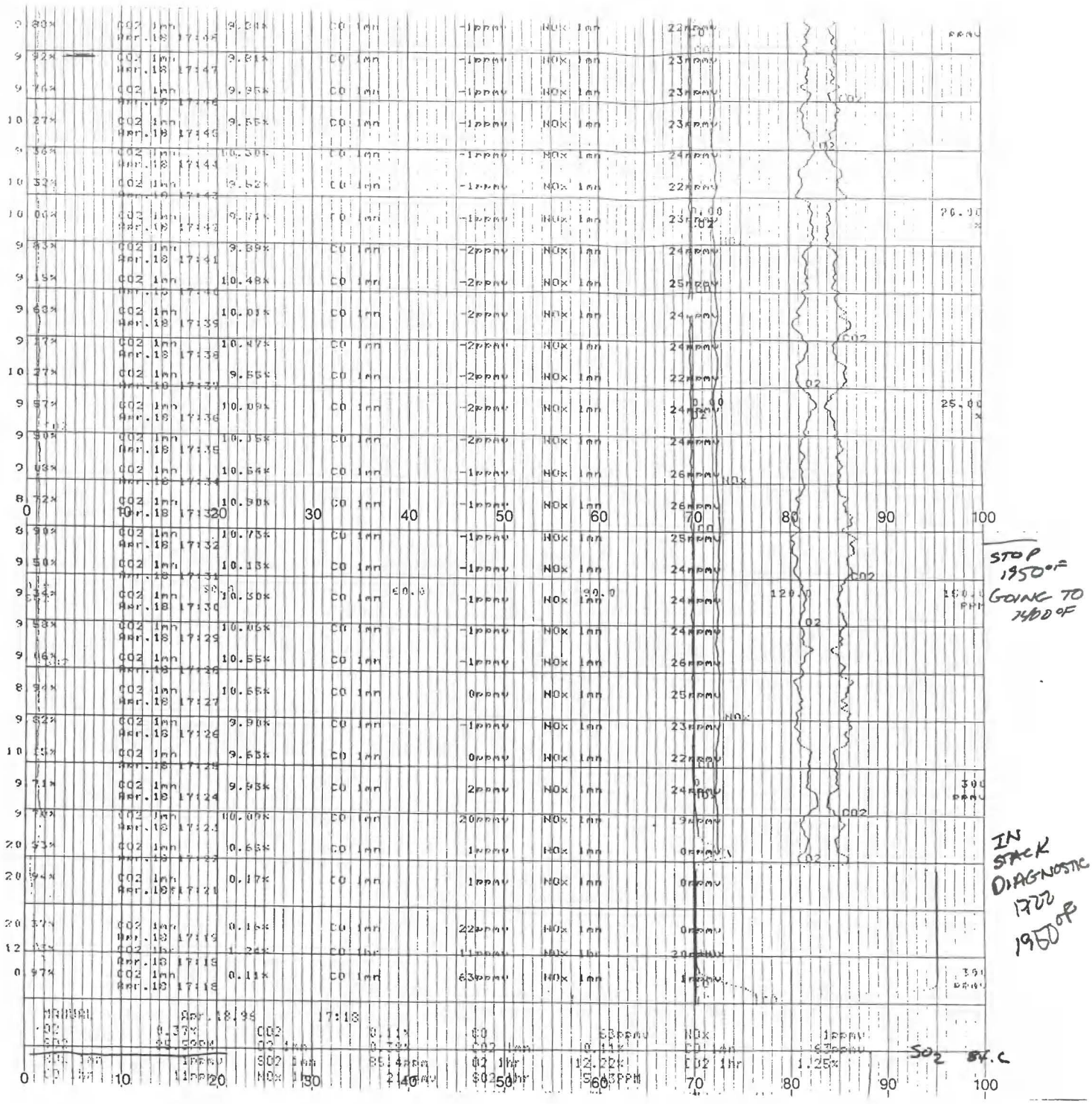

MANUAL
Apr.18.96
10:59
10:58
10:57
10:56
10:55
10:53
O2
SO2
NOx 1mn
CO 1hr
CO2
CO
NOx
0 10 20 30 40 50 60 70 80 90 100
1100:02
1059:16
1059:02
1058:14
1058:00
1057:20
1057:00
1056:10
1055:03
START 1054
1053:41 SO
START @ 1053 TURNED OFF

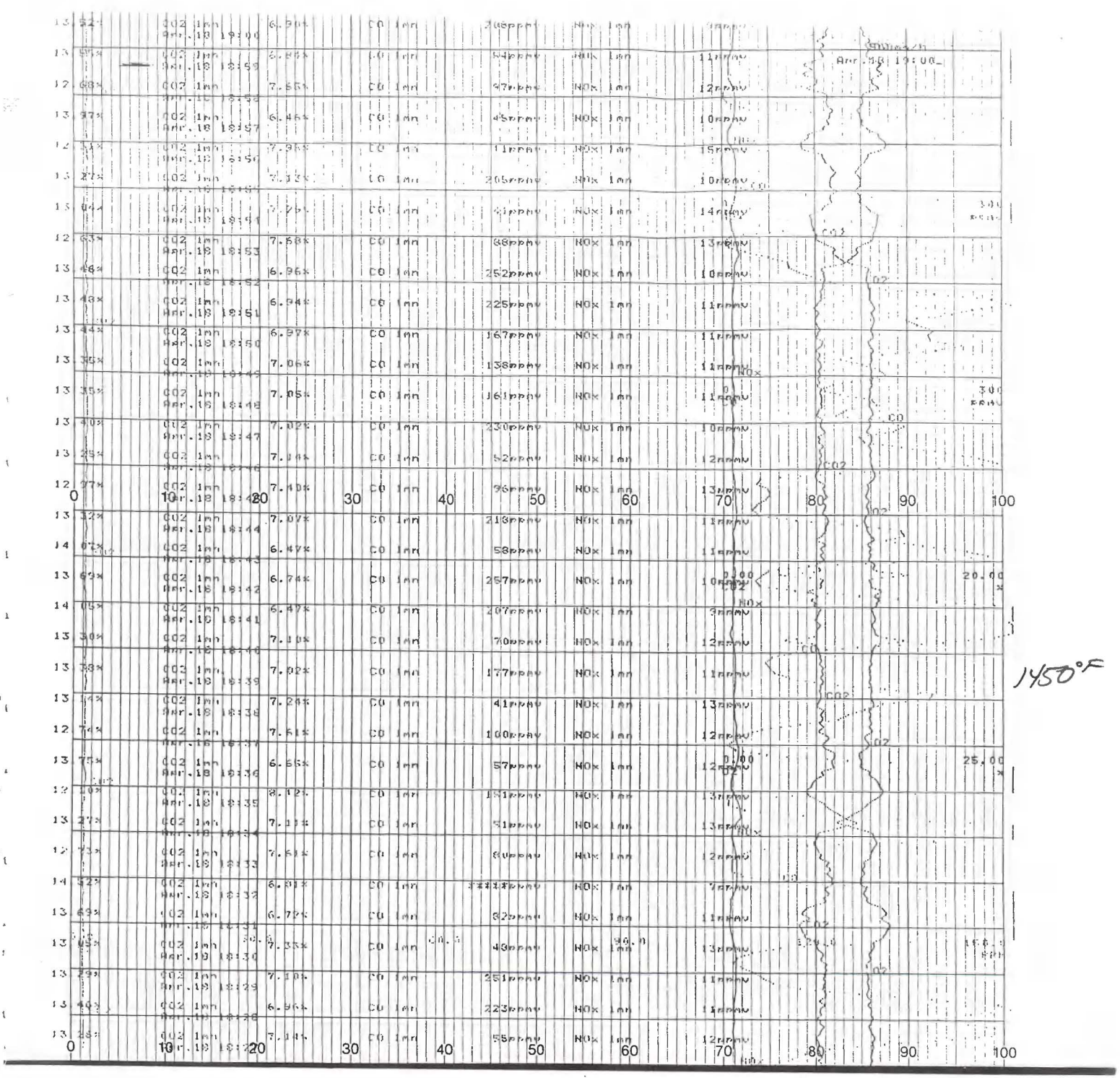

CO Low 62.0
CO MID 120
CO SPAN 278
NOx MID 180
NOx SPAN 255

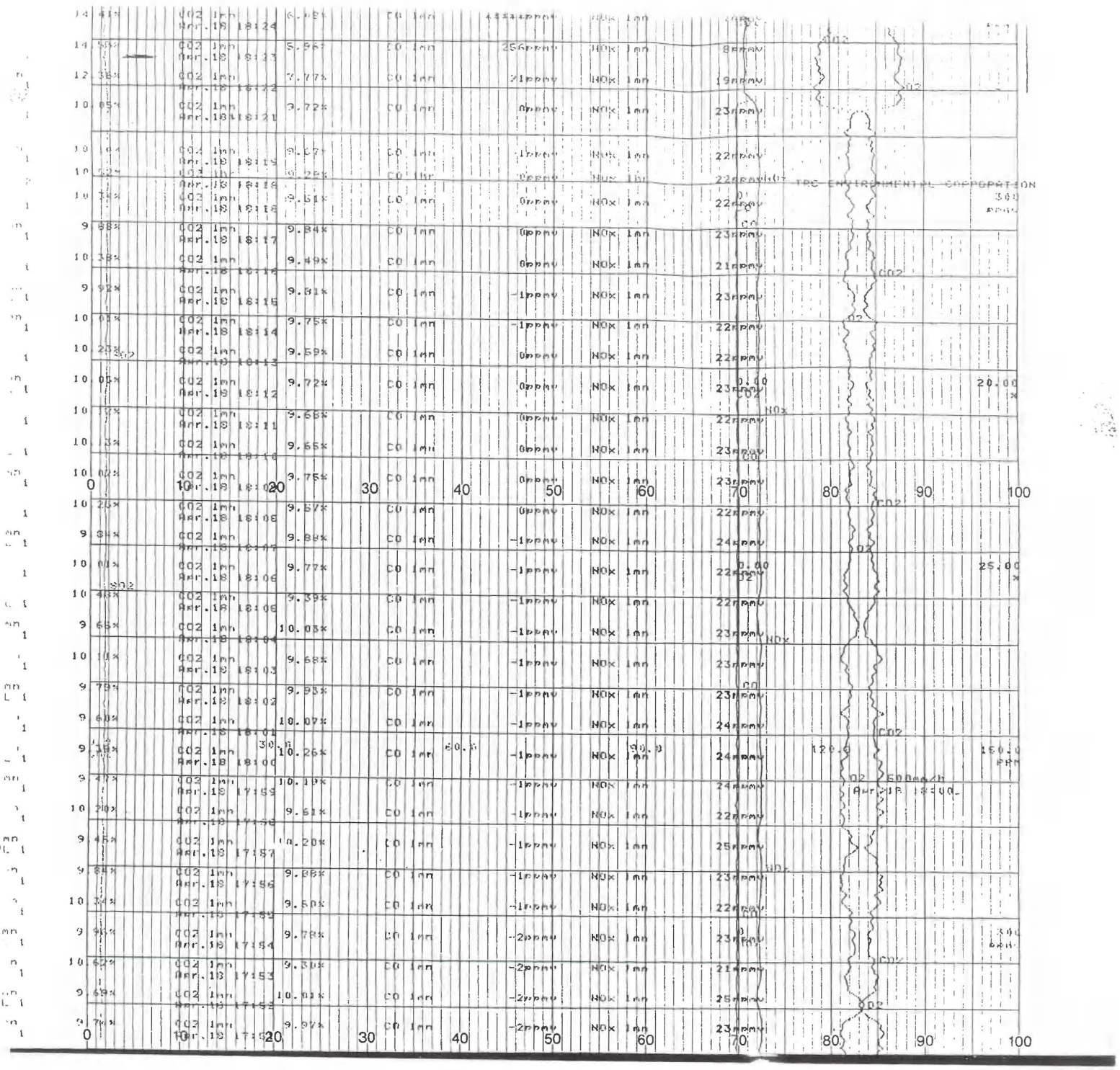

TRC ENVIRONMENTAL CORPORATION
Apr.18.96 11:39
Apr.18.96 11:37
Apr.18.96 11:34
SO2 SPAN 123
SO2 84.6 MID

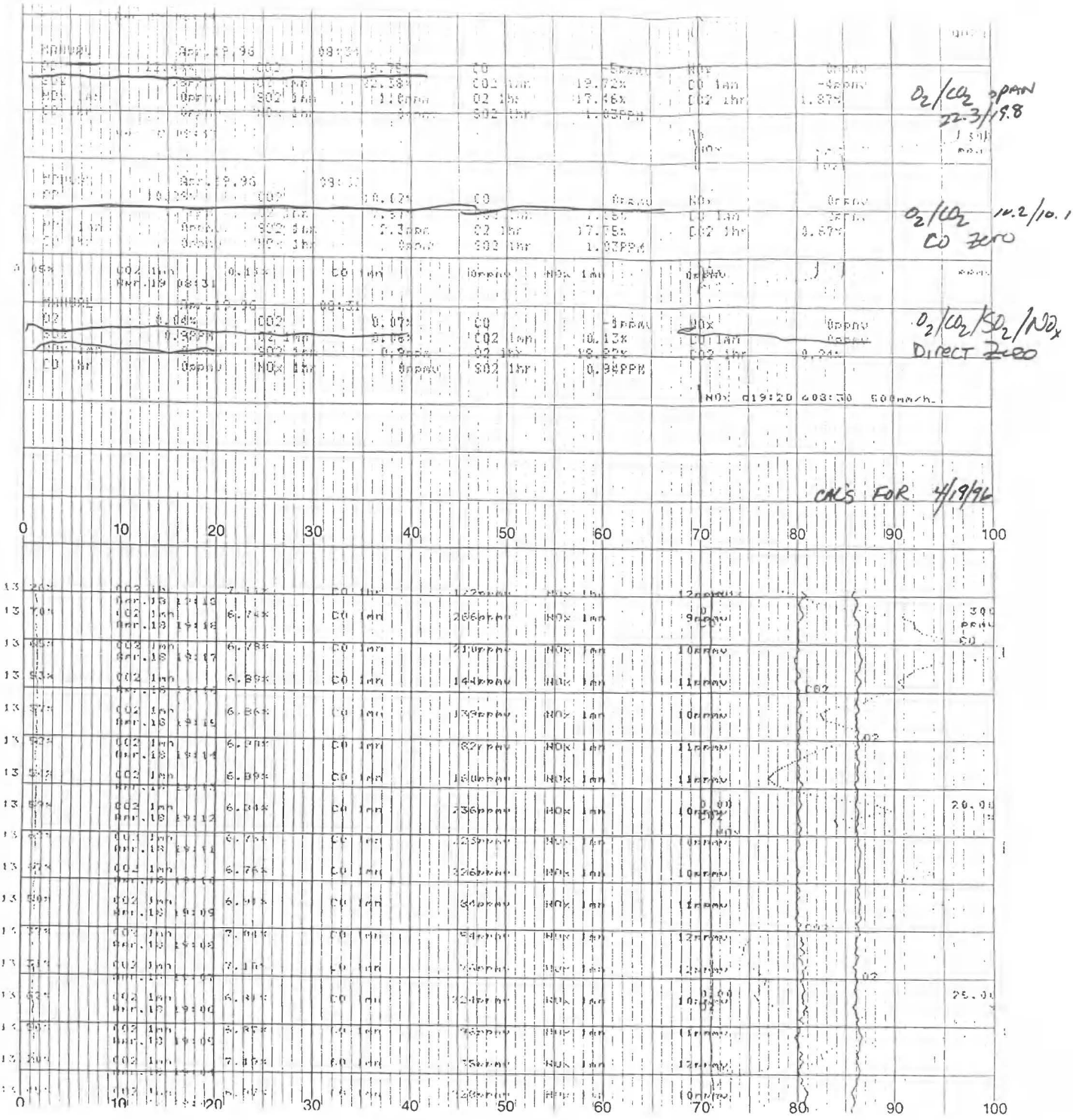

0
10
20
30
40
50
60
70
80
90
100
CO2 1mn
Apr.18 15:29
CO 1mn
4ppmv
NOx 1mn
CO2 1mn
Apr.18 15:27
0.23%
CO 1mn
NOx 1mn
CO2 1mn
Apr.18 15:26
CO 1mn
5ppmv
NOx
CO2 1mn
0.15%
CO 1mn
8ppmv
NOx 1mn
CO2 1mn
Apr.18 15:24
0.15%
CO 1mn
1ppmv
NOx 1mn
CO2 1mn
Apr.18 15:23
0.14%
CO 1mn
6ppmv
NOx 1mn
CO2 1mn
0.14%
CO 1mn
3ppmv
NOx 1mn
CO2 1mn
0.09%
CO 1mn
8ppmv
NOx 1mn
CO2 1mn
Apr.18 15:19
0.15%
CO 1mn
5ppmv
NOx 1mn
Apr.18 15:18
CO2 1mn
0.15%
CO 1mn
6ppmv
NOx 1mn

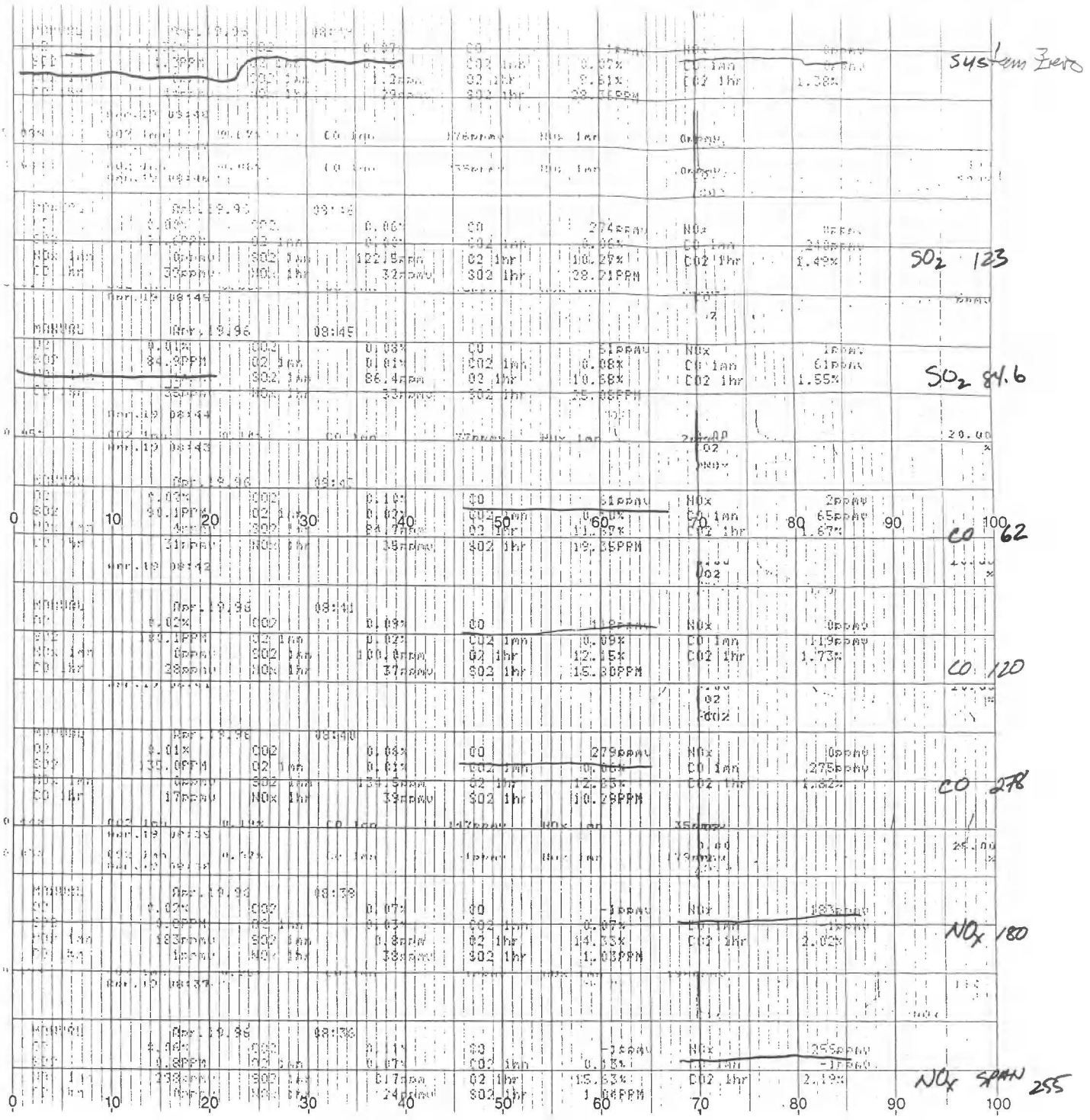

CO 120
O2/CO2 ZERO
NOx 180
O2/CO2/CO ZERO
10.2/10.1
O2/CO2/SO2/NOx
SO2 ZERO
0
10
20
30
40
50
60
70
80
90
100

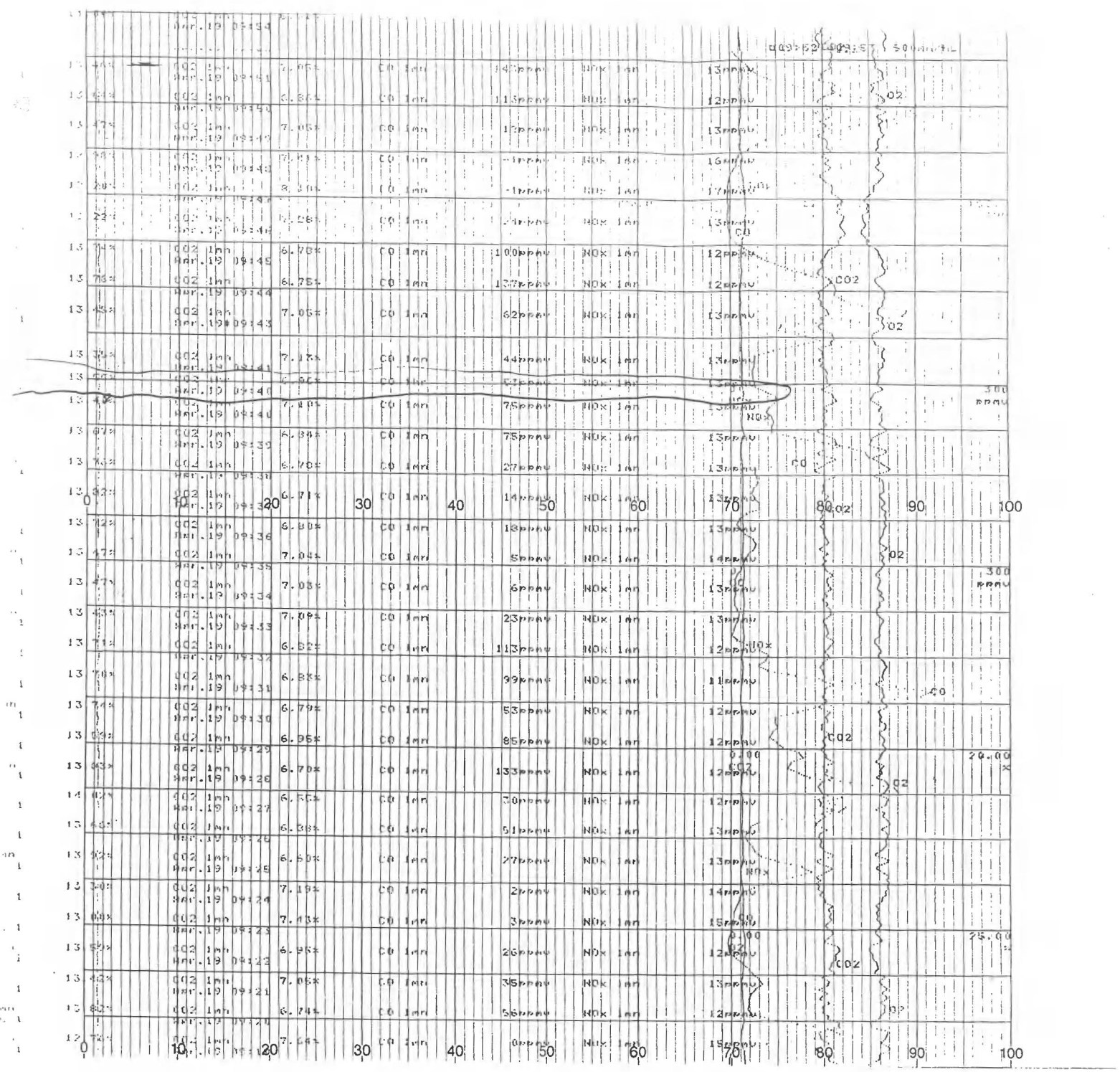

STOP
1950°F
GOING TO
1400 OF
IN
STACK
DIAGNOSTIC
1772
1950 OF
SO2 BY C

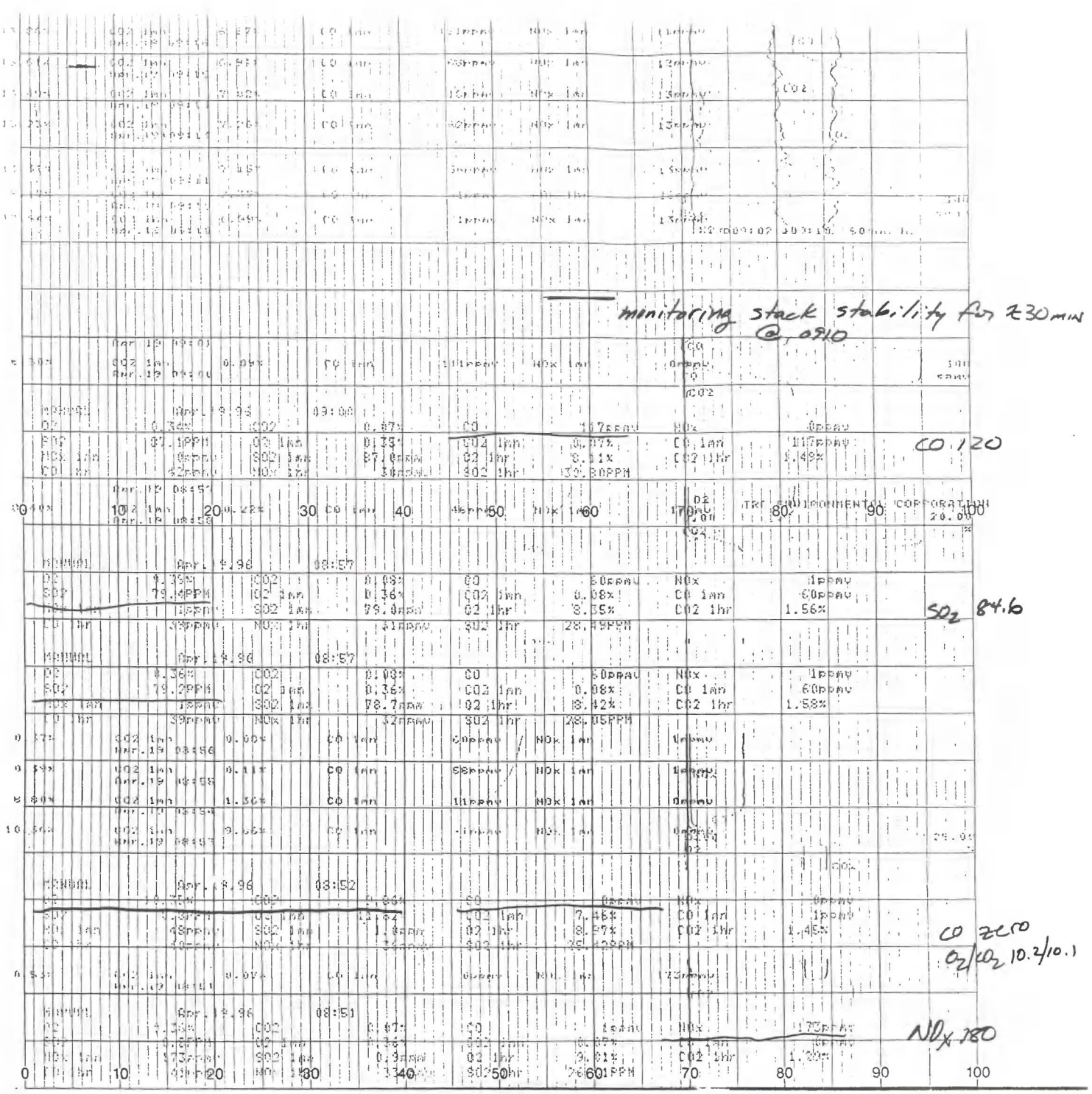

1450°F

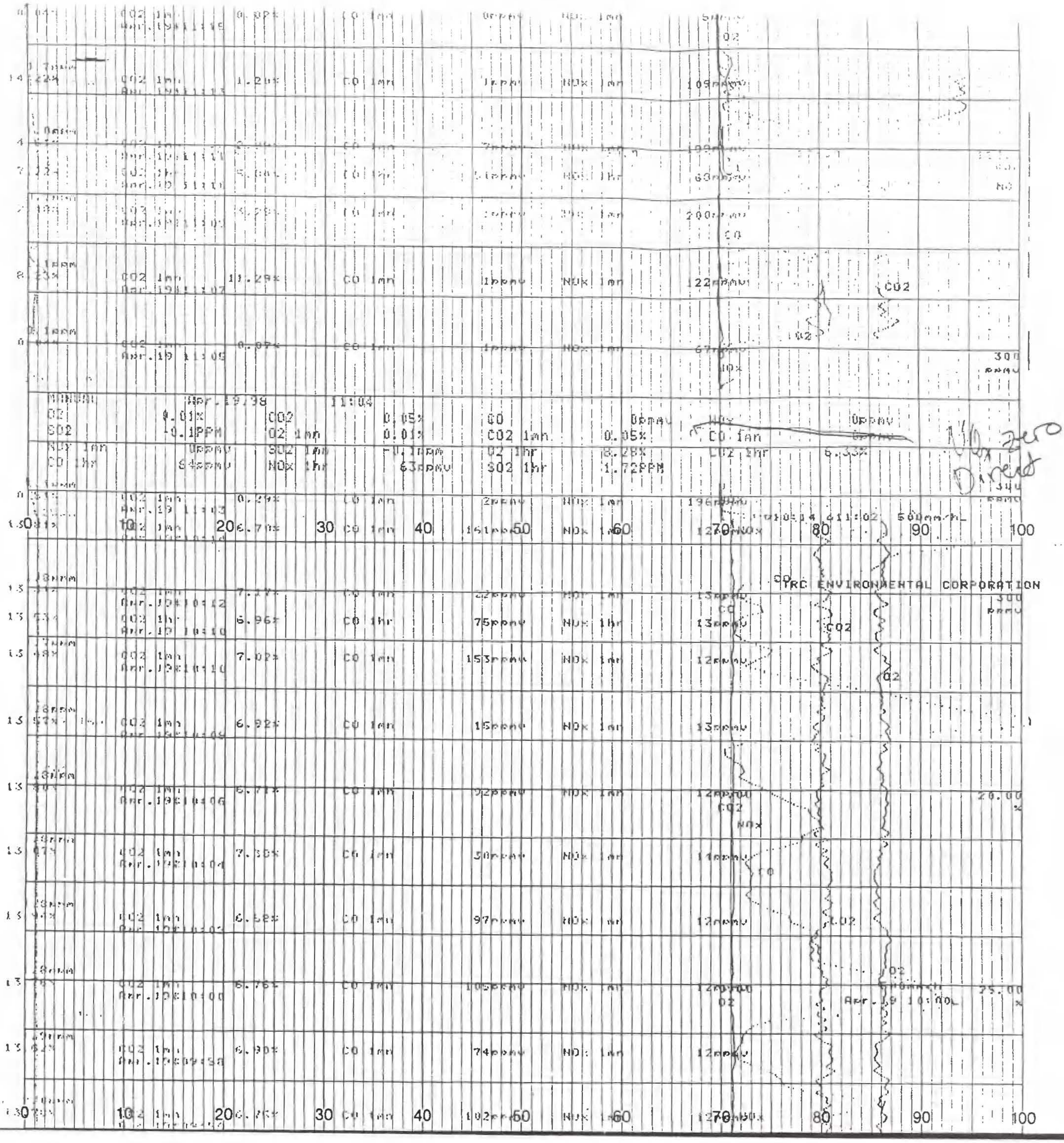

TRC ENVIRONMENTAL CORPORATION
CO2
NOx
SO2
CO
0
10
20
30
40
50
60
70
80
90
100


O2/CO2 SPAN
22.3/19.8
O2/CO2 14.2/10.1
CO ZERO
O2/CO2/SO2/NOx
DIRECT ZERO
CALS FOR 4/19/96
0
10
20
30
40
50
60
70
80
90
100


System Zero
SO_2 123
SO_2 84.6
CO 62
CO 120
CO 278
NO_x 180
NO_x SPAN 255
0
10
20
30
40
50
60
70
80
90
100


CO2 1mn
Mar.19 09:50
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:49
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:48
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:47
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:46
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:45
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:44
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:43
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:42
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:41
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:40
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:39
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:38
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:37
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:36
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:35
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:34
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:33
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:32
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:31
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:30
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:29
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:28
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:27
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:26
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:25
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:24
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:23
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:22
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:21
CO 1mn
NOx 1mn
CO2 1mn
Mar.19 09:20
CO 1mn
NOx 1mn
0 10 20 30 40 50 60 70 80 90 100
0 10 20 30 40 50 60 70 80 90 100


monitoring stack stability for ≥30min
@ 0810
CO 120
SO2 84.6
CO zero
O2/CO2 10.2/10.1
NOx 180



CO2 1mn 1.28% CO 1mn 1ppmv NOx 1mn 109ppmv
CO2 1mn 11.29% CO 1mn 1ppmv NOx 1mn 122ppmv
CO2
Apr.19 11:09 67ppmv
NOx
300 ppmv
MANUAL Apr.19/98 11:04
O2 0.01% CO2 0.05% CO 0ppmv NOx 0ppmv
SO2 -0.1PPM O2 1mn 0.01% CO2 1mn 0.05% CO 1mn
NOx 1mn 0ppmv SO2 1mn -0.1PPM O2 1hr 8.28% CO2 1hr 6.33%
CO 1hr 64ppmv NOx 1hr 63ppmv SO2 1hr 1.72PPM
NOx zero Direct
CO2 1mn 0.29% CO 1mn 2ppmv NOx 1mn 196ppmv
Apr.19 11:03
0 10 20 30 40 50 60 70 80 90 100
TRC ENVIRONMENTAL CORPORATION
Apr.19 10:12
CO2 1hr 6.96% CO 1hr 75ppmv NOx 1hr 13ppmv
Apr.19 10:10
CO2 1mn 7.02% CO 1mn 153ppmv NOx 1mn 12ppmv
O2
CO2 1mn 6.92% CO 1mn 15ppmv NOx 1mn 13ppmv
CO2
NOx
20.00 %
CO2 1mn 7.30% CO 1mn 58ppmv NOx 1mn 11ppmv
Apr.19 10:04
CO
CO2 1mn 6.68% CO 1mn 97ppmv NOx 1mn 12ppmv
CO2
O2
Apr.19 10:00
25.00 %
CO2 1mn 6.90% CO 1mn 74ppmv NOx 1mn 12ppmv
Apr.19 09:58
0 10 20 30 40 50 60 70 80 90 100

Apr.19 11:41
CO2 1h 0.22% CO 1hr ppmv NOx 1hr 57ppmv
Apr.19 11:40

CO2 1mn 0.09% CO 1mn 1ppmv NOx 1mn 0ppmv
Apr.19 11:39

CO2 1mn 0.05% CO 1mn 1ppmv NOx 1mn 0ppmv
Apr.19 11:37

CO2 1mn 0.09% CO 1mn 1ppmv NOx 1mn 0ppmv
Apr.19 11:35

CO2 1mn 0.12% CO 1mn 1ppmv NOx 1mn 0ppmv
Apr.19 11:33

CO2 1mn 0.10% CO 1mn 2ppmv NOx 1mn 0ppmv
Apr.19 11:31

CO2 1mn 0.03% CO 1mn 2ppmv NOx 1mn 1ppmv
Apr.19 11:29

CO2 1mn 0.06% CO 1mn 17ppmv NOx 1mn 133ppmv
Apr.19 11:27

CO2 1mn 0.04% CO 1mn 2ppmv NOx 1mn 172ppmv
Apr.19 11:25

MANUAL	Apr.19.96	11:24			
O2 0.39%	CO2 0.04%	CO 2ppmv	NOx 172ppmv		
SO2 0.2PPM	O2 1mn 0.39%	CO2 1mn 0.04%	CO 1mn 2ppmv		
NOx 1mn 172ppmv	SO2 1mn 0.2ppm	O2 1hr 2.89%	CO2 1hr 0.37%		
CO 1hr 2ppmv	NOx 1hr 96ppmv	SO2 1hr 0.24PPM			

NOx 180

CO2 1mn 0.04% CO 1mn 2ppmv NOx 1mn 0ppmv
Apr.19 11:23

MANUAL	Apr.19.96	11:22	
O2 0.38%	CO2 0.04%	CO 1ppmv	NOx 0ppmv
SO2 0.2PPM	O2 1mn 0.38%	CO2 1mn 0.04%	CO 1mn 2ppmv
NOx 1mn 0ppmv	SO2 1mn 0.3ppm	O2 1hr 3.25%	CO2 1hr 0.42%
CO 1hr 2ppmv	NOx 1hr 95ppmv	SO2 1hr 0.24PPM	

NOx sys Zero

CO2 1mn 0.08% CO 1mn 0ppmv NOx 1mn 132ppmv
Apr.19 11:21

MANUAL	Apr.19.96	11:20	
O2 0.01%	CO2 0.02%	CO 1ppmv	NOx 181ppmv
SO2 -0.2PPM	O2 1mn 0.01%	CO2 1mn 0.02%	CO 1mn 0ppmv
NOx 1mn 190ppmv	SO2 1mn -0.2ppm	O2 1hr 3.33%	CO2 1hr 0.49%
CO 1hr 1ppmv	NOx 1hr 118ppmv	SO2 1hr 0.21PPM	

NOx 180 DIRECT

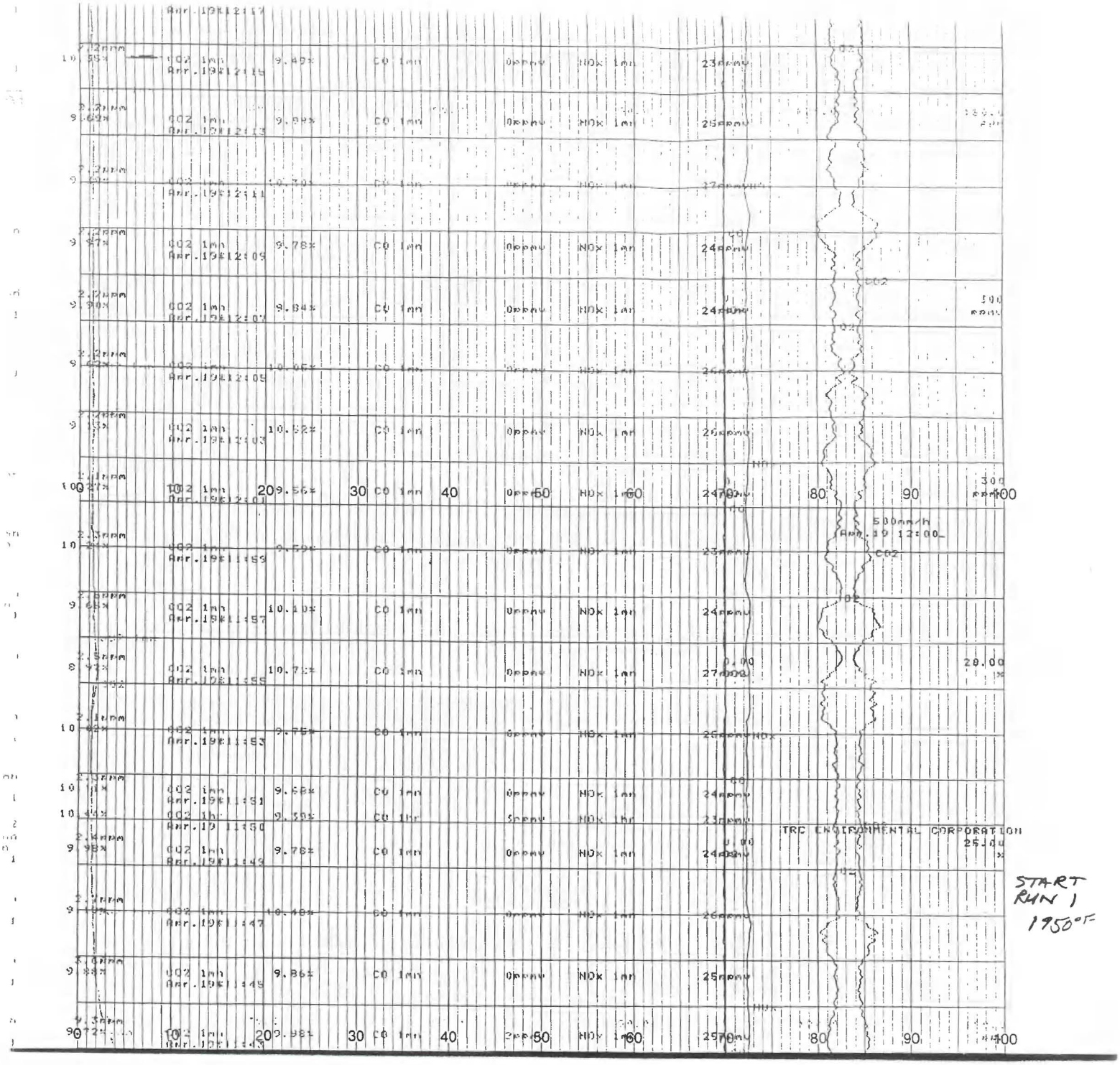
CO2 1mn 0.02% CO 1mn 0ppmv NOx 1mn 251ppmv
Apr.19 11:20

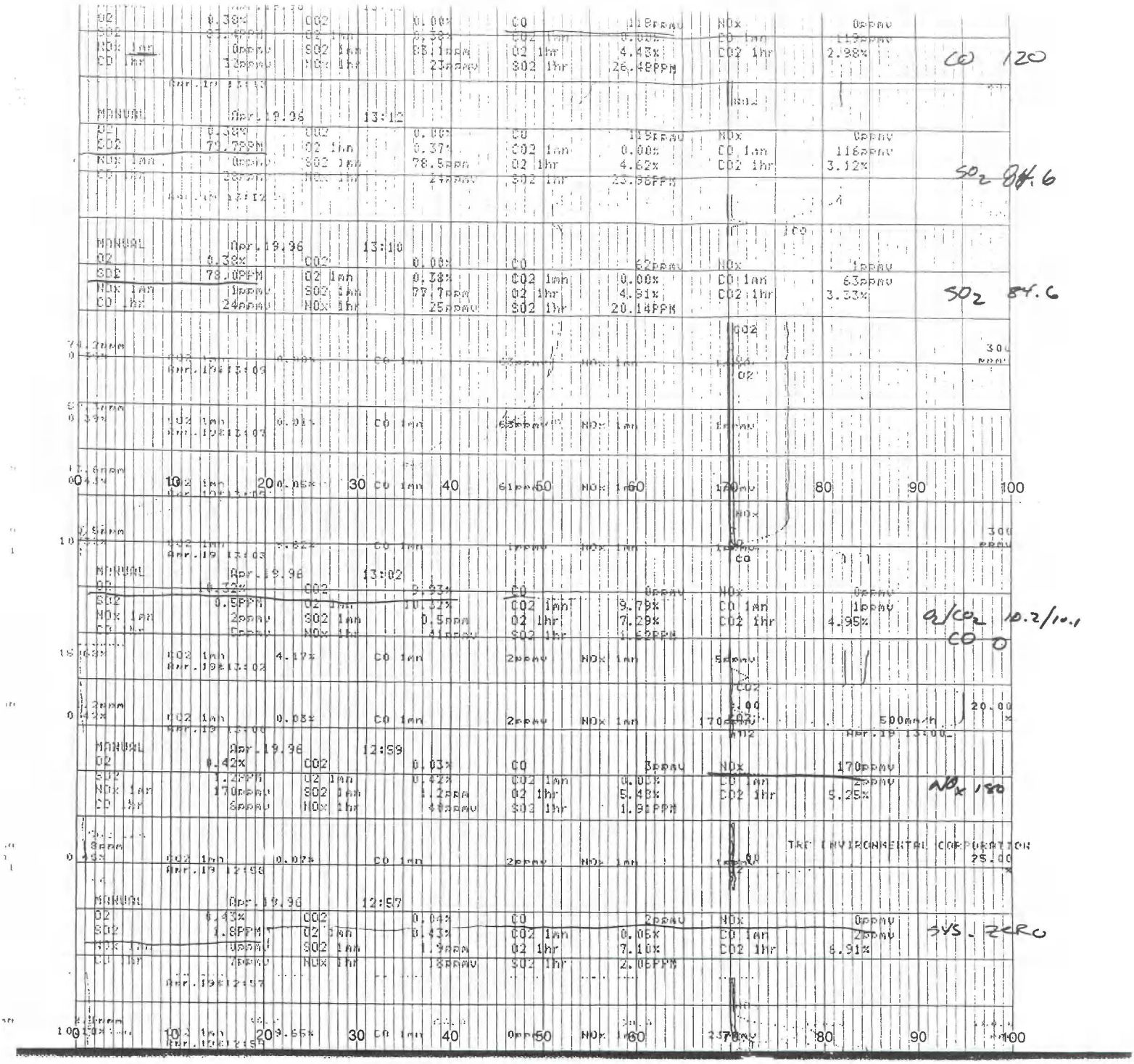
MANUAL	Apr.19.96	11:19	
O2 0.01%	CO2 0.02%	CO 0ppmv	NOx 255ppmv
SO2 -0.1PPM	O2 1mn 0.01%	CO2 1mn 0.02%	CO 1mn 1ppmv
NOx 1mn 252ppmv	SO2 1mn -0.2ppm	O2 1hr 3.54%	CO2 1hr 0.54%
CO 1hr 2ppmv	NOx 1hr 97ppmv	SO2 1hr 0.25PPM	

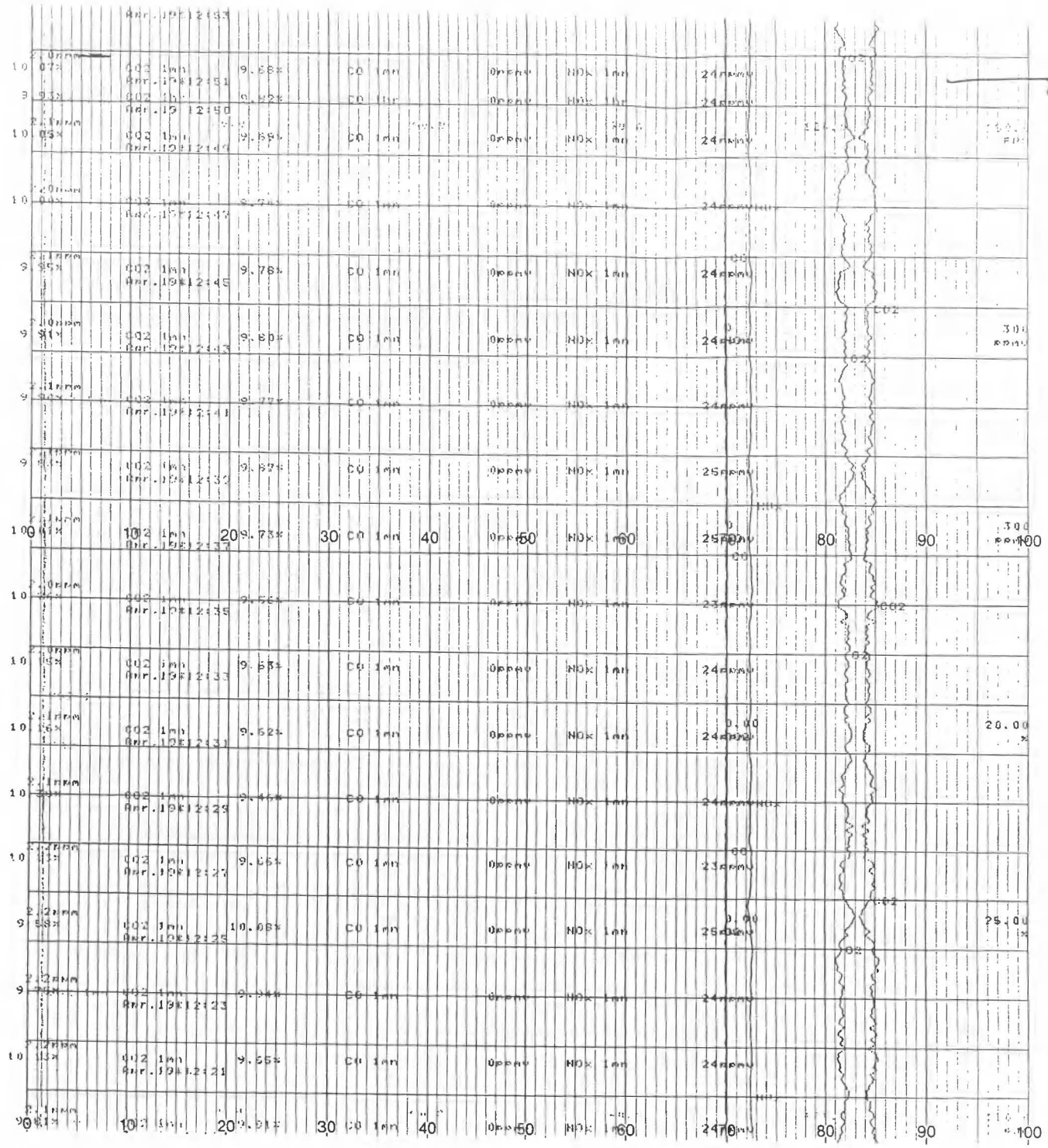
NOx 255 DIRECT

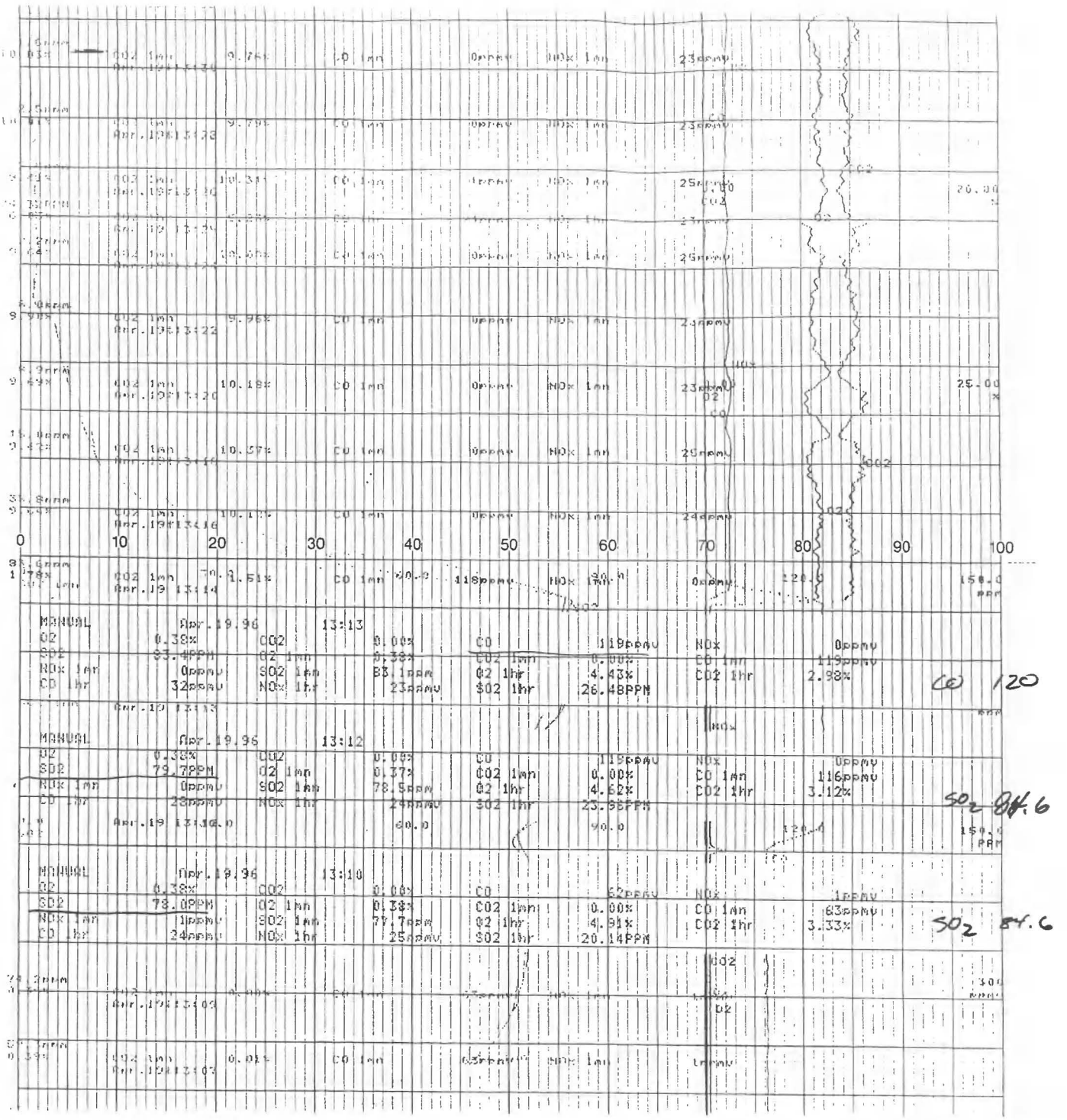
CO2 1mn 0.03% CO 1mn 0ppmv NOx 1mn 132ppmv
Apr.19 11:19

0 10 20 30 40 50 60 70 80 90 100


CO2 1hr
CO 1hr
NOx 1hr
TRC ENVIRONMENTAL CORPORATION
500mm/h
Anr.19 12:00
START
RUN 1
1950°F


MANUAL
Apr.19.96
13:12
O2 0.38%
CO2 0.08%
CO 118PPMV
NOx 0PPMV
SO2 79.72PPM
O2 1hr 6.37%
CO2 1hr 0.00%
CO 1hr 116PPMV
NOx 1hr 78.5PPMV
SO2 1hr 23.98PPM
CO2 1hr 3.12%
CO 120
SO2 84.6
MANUAL
Apr.19.96
13:10
O2 0.38%
CO2 0.08%
CO 62PPMV
NOx 1PPMV
SO2 78.08PPM
O2 1hr 6.33%
CO2 1hr 0.00%
CO 1hr 63PPMV
NOx 1hr 1PPMV
SO2 1hr 20.14PPM
CO2 1hr 3.33%
SO2 84.6
MANUAL
Apr.19.96
13:02
O2 14.32%
CO2 2.93%
CO 0PPMV
NOx 0PPMV
SO2 0.5PPM
O2 1hr 10.32%
CO2 1hr 9.79%
CO 1hr 1PPMV
NOx 1hr 2PPMV
SO2 1hr 0.5PPM
O2 1hr 7.29%
CO2 1hr 4.95%
CO2/CO2 10.2/10.1
CO 0
MANUAL
Apr.19.96
12:59
O2 0.42%
CO2 0.03%
CO 3PPMV
NOx 170PPMV
SO2 1.2PPM
O2 1hr 0.42%
CO2 1hr 0.00%
CO 1hr 2PPMV
NOx 1hr 170PPMV
SO2 1hr 1.2PPM
O2 1hr 5.43%
CO2 1hr 5.25%
CO 8PPMV
NOx 180
TRI ENVIRONMENTAL CORPORATION
MANUAL
Apr.19.96
12:57
O2 0.43%
CO2 0.04%
CO 2PPMV
NOx 0PPMV
SO2 1.8PPM
O2 1hr 0.43%
CO2 1hr 0.05%
CO 1hr 2PPMV
NOx 1hr 0PPMV
SO2 1hr 1.9PPM
O2 1hr 7.10%
CO2 1hr 6.91%
CO 7PPMV
NOx 1hr 18PPMV
SO2 1hr 2.06PPM
SVS. ZERO

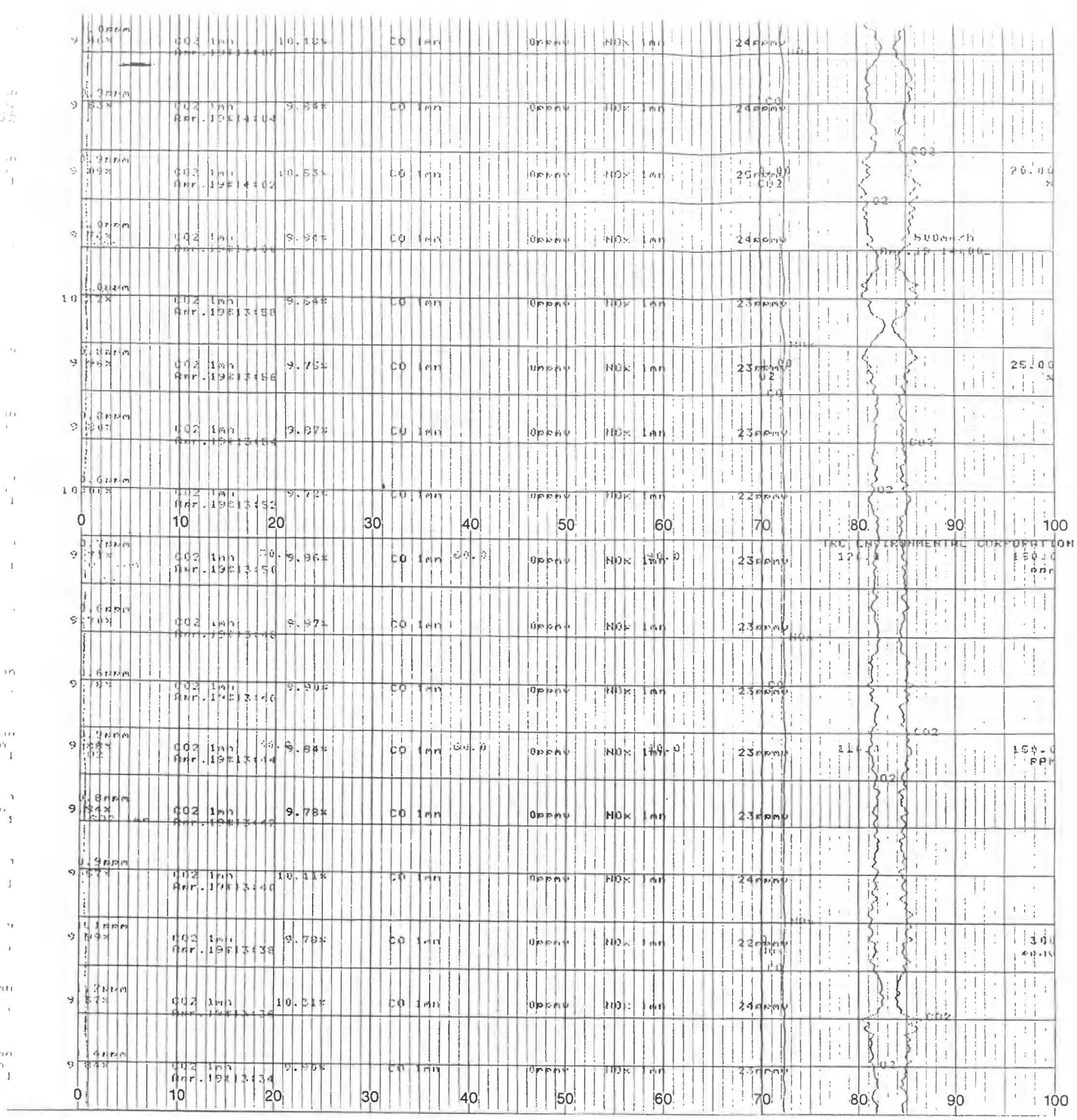

END OF RUN 1

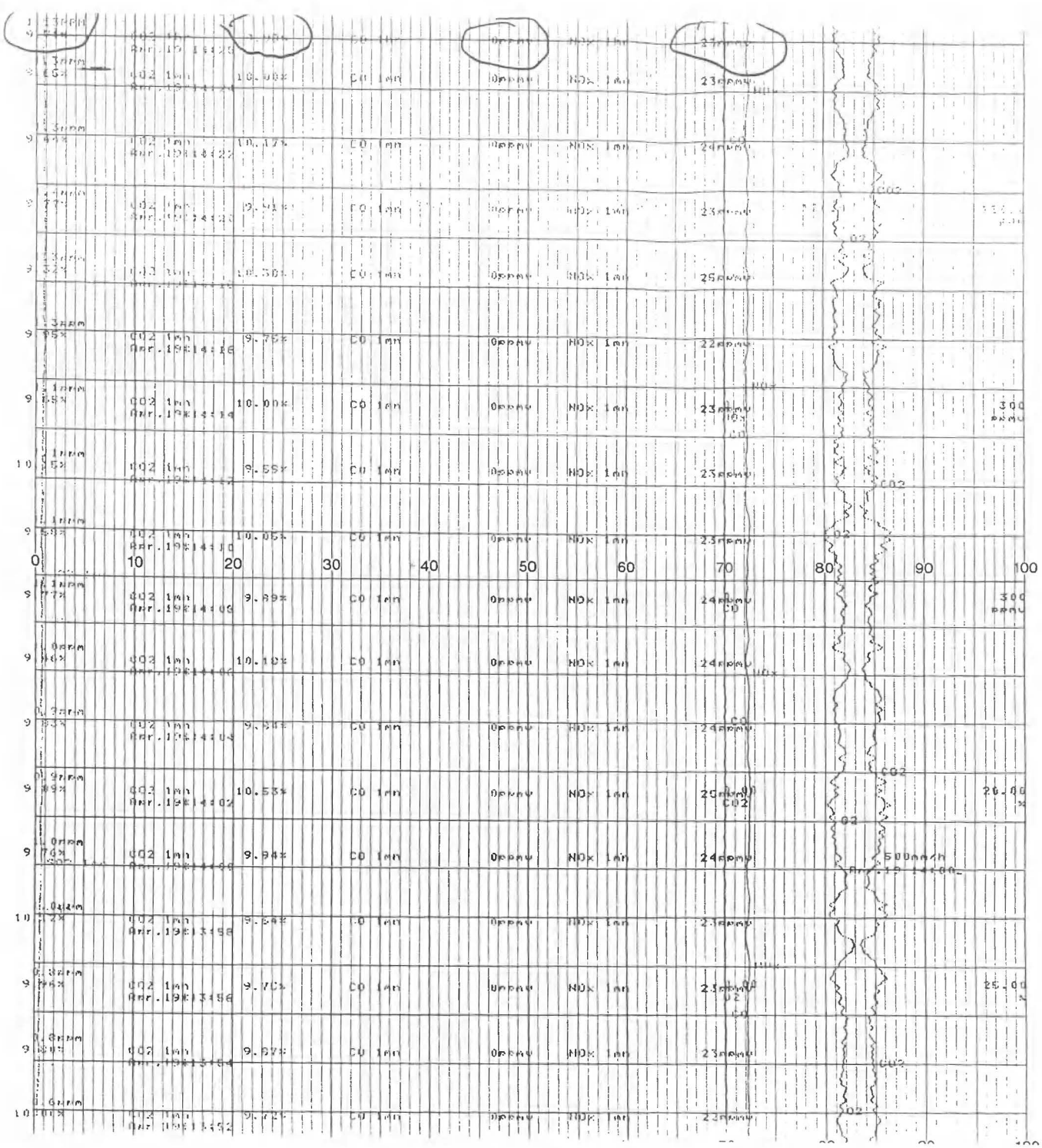


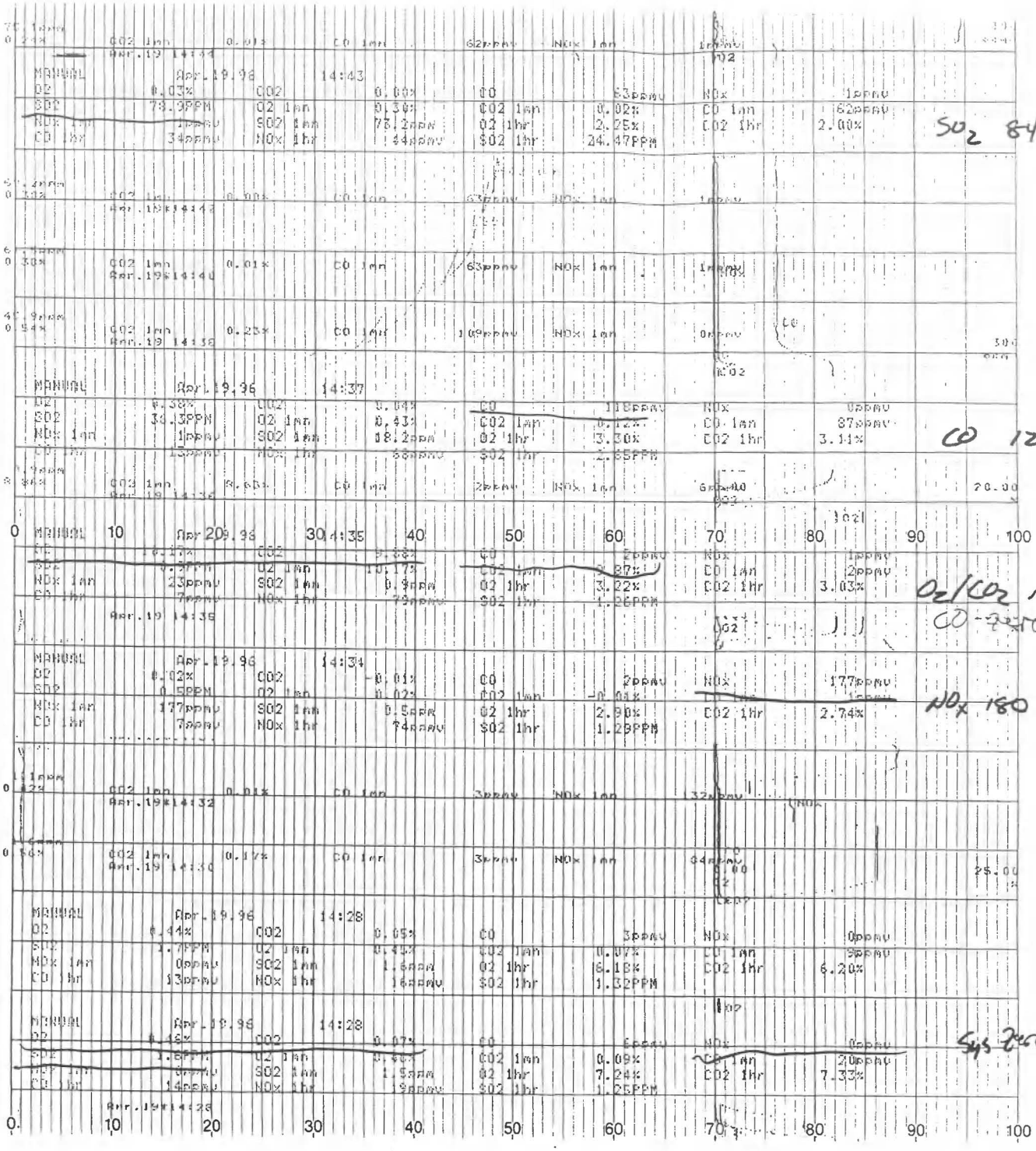
CO 120

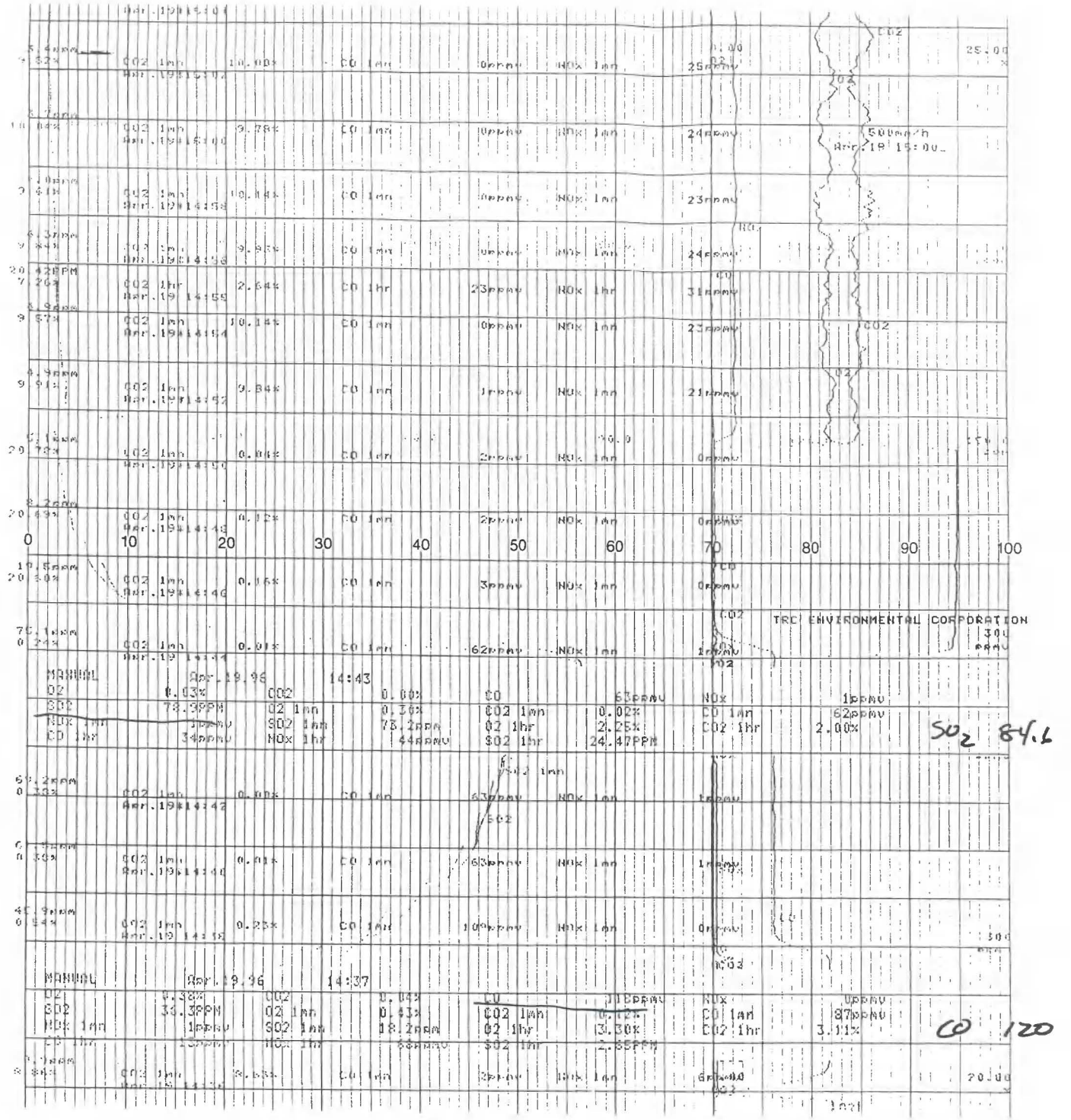
SO_2 84.6

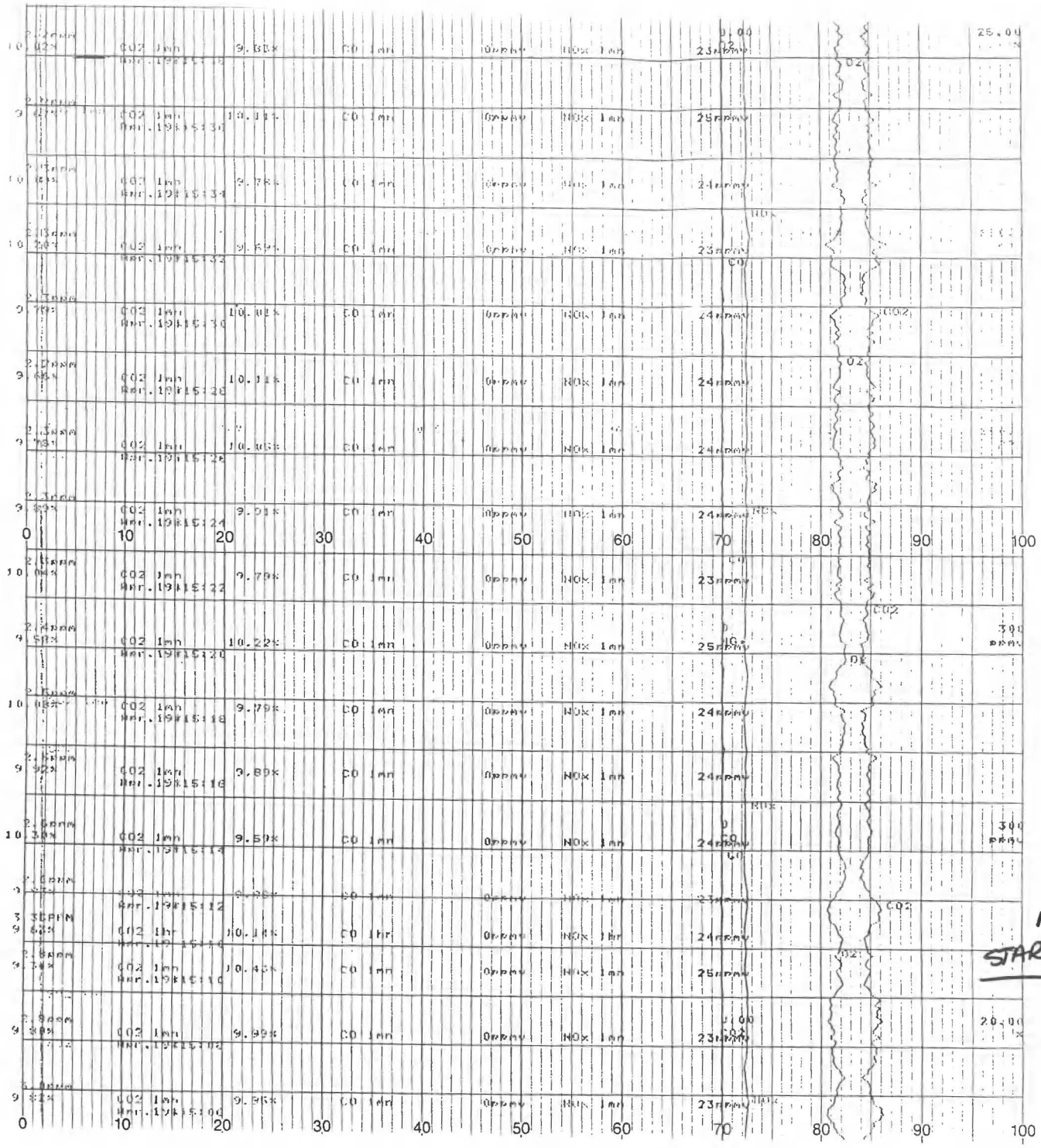
SO_2 84.6

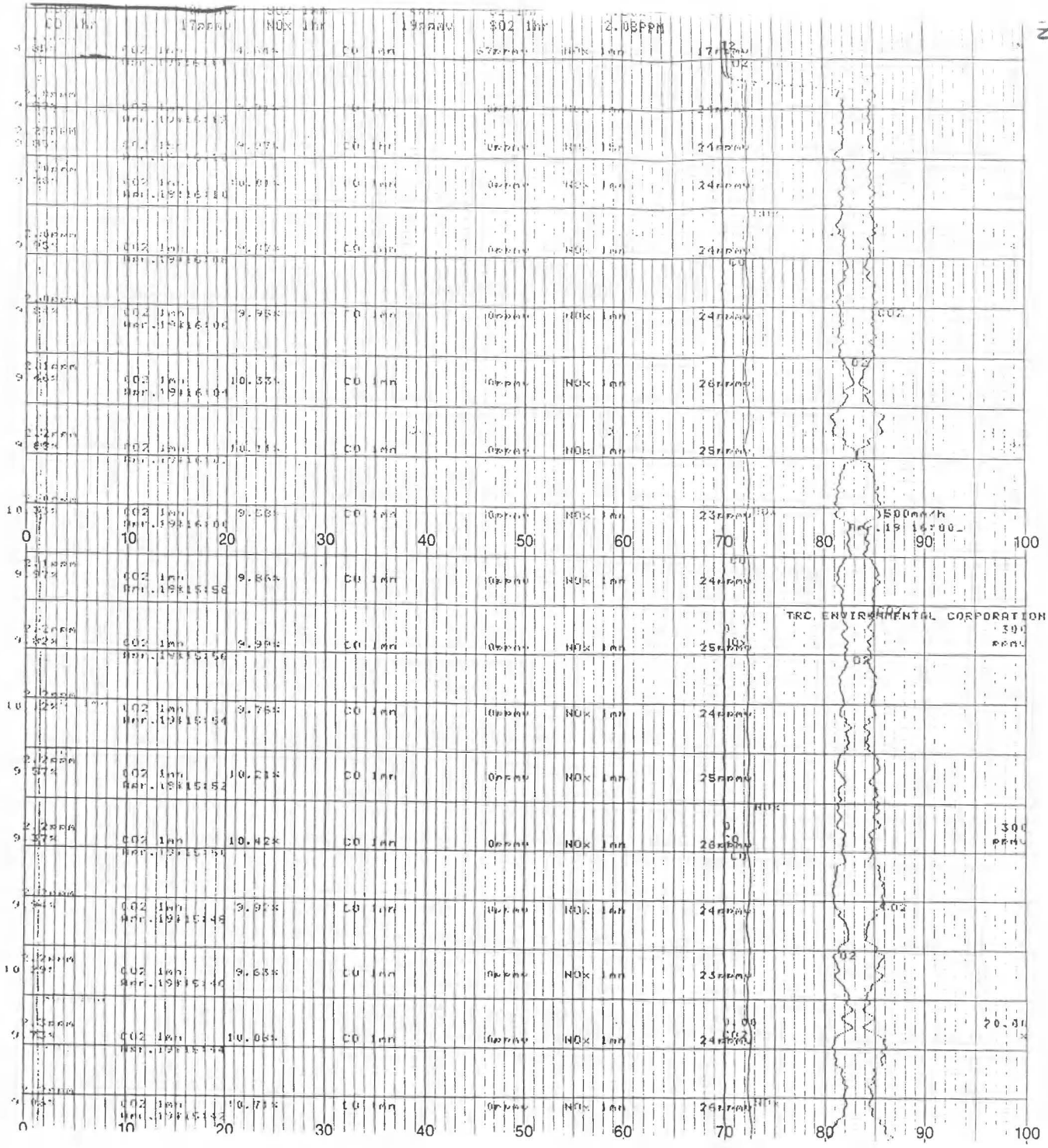

CO2 1mn
CO 1mn
NOx 1mn
0ppmv
24ppmv
9.84%
10.53%
9.96%
9.78%
10.11%
9.70%
10.21%
9.90%
0
10
20
30
40
50
60
70
80
90
100
INC. ENVIRONMENTAL CORPORATION

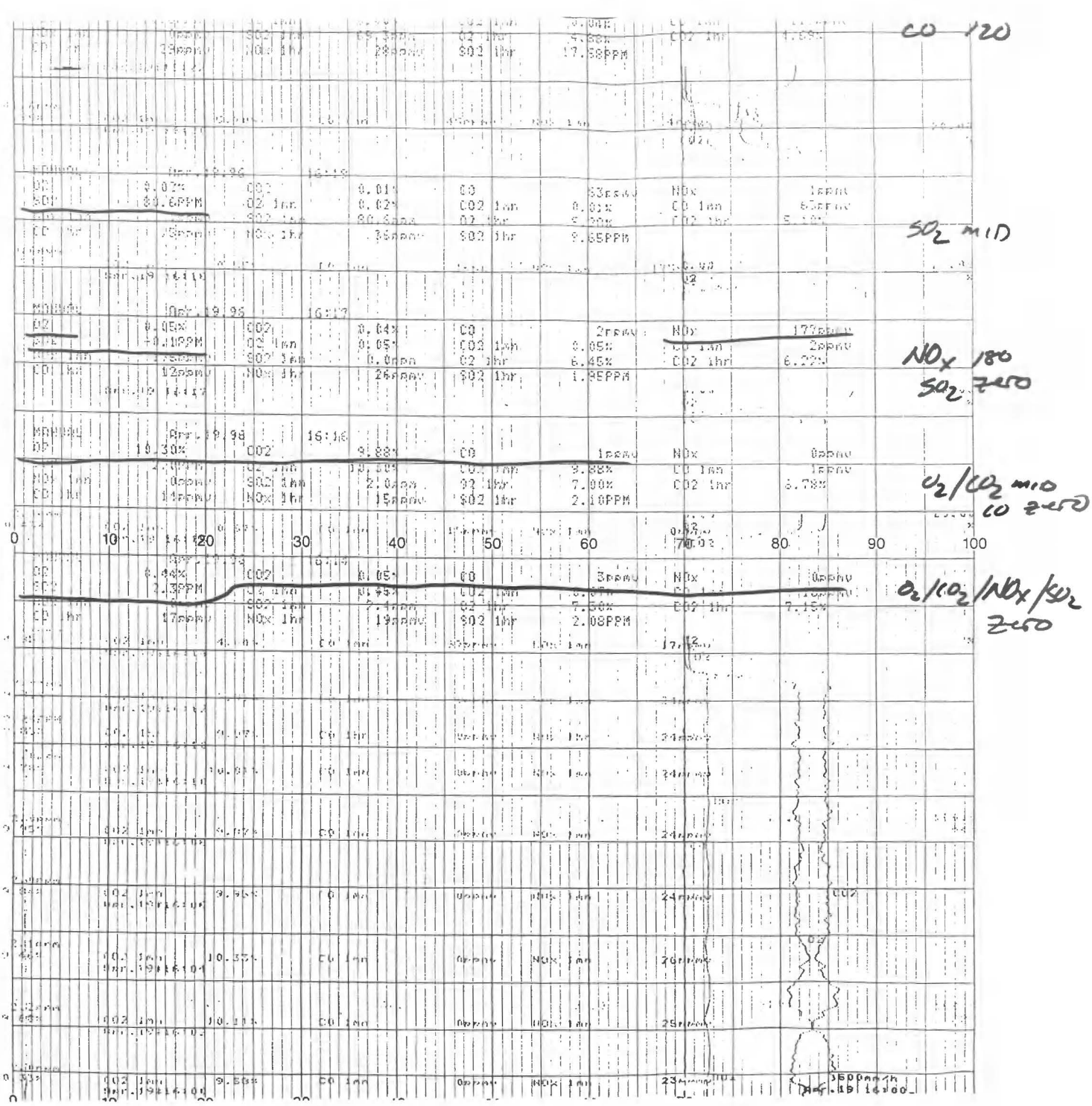

0
10
20
30
40
50
60
70
80
90
100

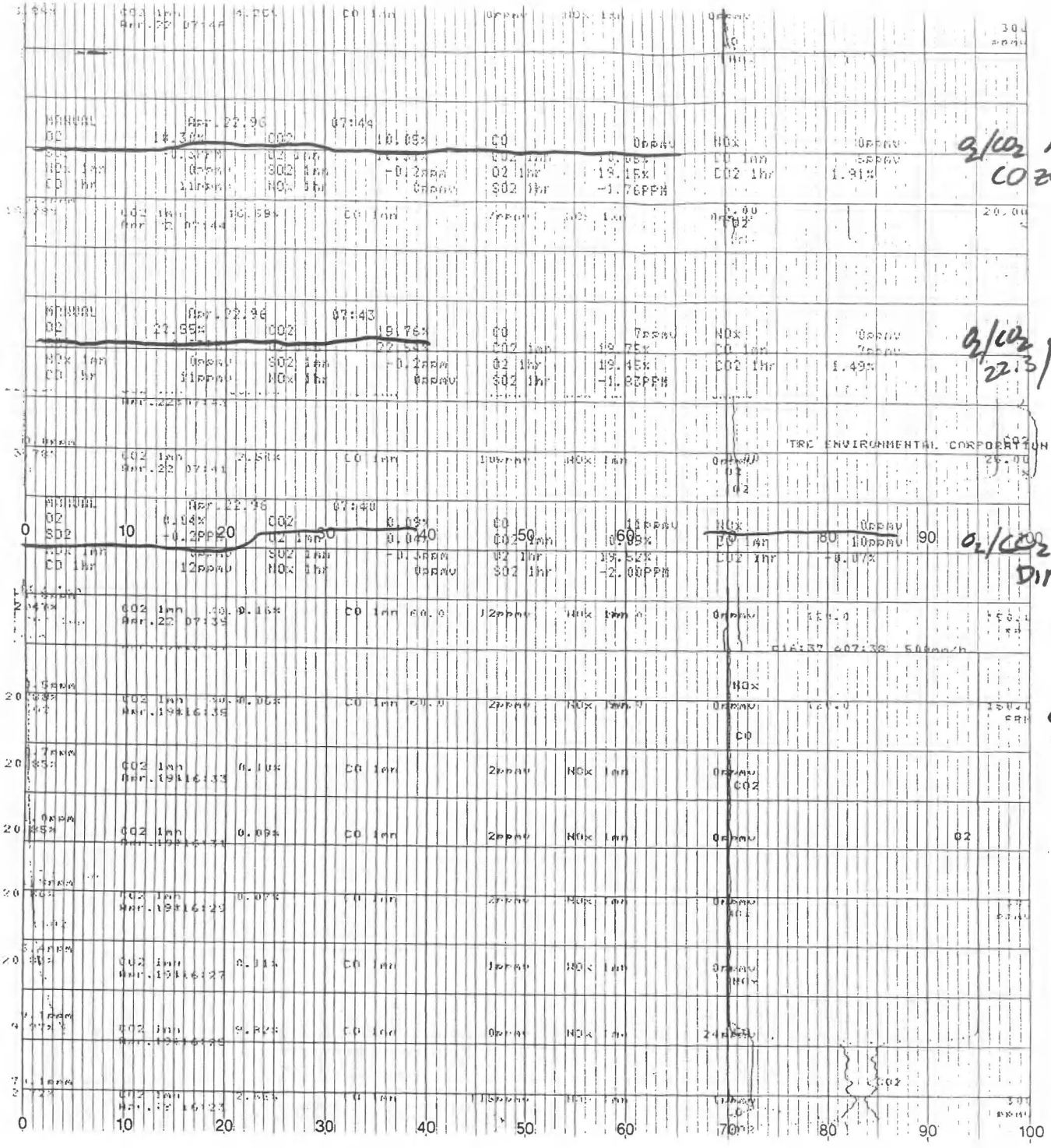

MANUAL
Apr.19.96 14:43
O2 0.03%
CO2 0.00%
CO 63ppmv
NOx 1ppmv
SO2 73.3PPM
O2 1hr 0.13%
CO2 1hr 0.02%
CO 1hr 2.00%
NOx 1hr 1ppmv
SO2 1hr 78.2ppm
CO 1hr 34ppmv
NOx 1hr 44ppmv
SO_2 84.6
MANUAL
Apr.19.96 14:37
O2 0.38%
CO2 0.04%
CO 118ppmv
NOx 0ppmv
SO2 34.3PPM
O2 1hr 0.43%
CO2 1hr 0.12%
CO 1hr 87ppmv
NOx 1ppmv
SO2 1hr 38.2ppm
O2 1hr 3.30%
CO2 1hr 3.11%
CO 120
CO2 1hr
SO2 1hr 2.65PPM
NOx 1hr 68ppmv
MANUAL
Apr.19.96 14:35
O2 0.13%
CO2 0.03%
CO 2ppmv
NOx 1ppmv
SO2 0.3PPM
O2 1hr 10.17%
CO2 1hr 8.27%
CO 1hr 2ppmv
NOx 1hr 23ppmv
SO2 1hr 0.9ppm
O2 1hr 3.22%
CO2 1Hr 3.03%
O_2/CO_2 10.2/10.1
CO 2220
CO 1hr 7ppmv
NOx 1hr 79ppmv
SO2 1hr 1.26PPM
MANUAL
Apr.19.96 14:34
O2 0.02%
CO2 -0.01%
CO 2ppmv
NOx 177ppmv
SO2 0.5PPM
O2 1hr 0.02%
CO2 1hr -0.01%
NOx 1hr 177ppmv
CO 1hr 7ppmv
SO2 1hr 0.5ppm
O2 1hr 2.90%
CO2 1Hr 2.74%
NOx 180
NOx
SO2 1hr 1.23PPM
MANUAL
Apr.19.96 14:28
O2 6.44%
CO2 0.05%
CO 3ppmv
NOx 0ppmv
SO2 1.7PPM
O2 1hr 0.42%
CO2 1hr 0.07%
CO 1hr 9ppmv
NOx 1hr 0ppmv
SO2 1hr 1.6ppm
O2 1hr 6.18%
CO2 1Hr 6.20%
CO 1hr 13ppmv
NOx 1hr 16ppmv
SO2 1hr 1.32PPM
MANUAL
Apr.19.96 14:28
O2 6.48%
CO2 0.07%
CO 5ppmv
NOx 0ppmv
SO2 1.8PPM
O2 1hr 0.44%
CO2 1hr 0.09%
CO 1hr 20ppmv
NOx 1hr 0ppmv
SO2 1hr 1.5ppm
O2 1hr 7.24%
CO2 1Hr 7.33%
CO 1hr 14ppmv
NOx 1hr 19ppmv
SO2 1hr 1.25PPM
SO_2 2450
0
10
20
30
40
50
60
70
80
90
100

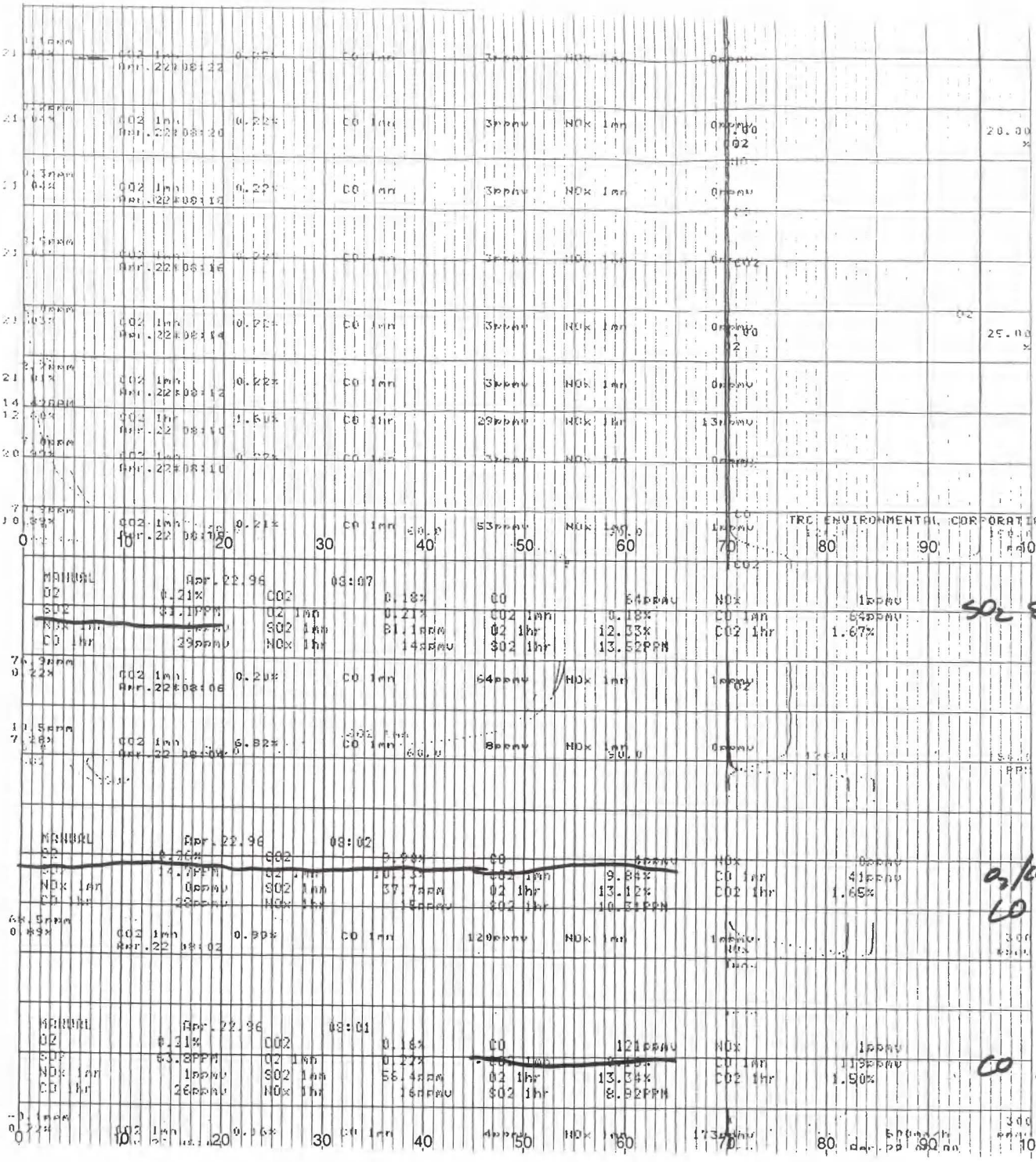

TRC ENVIRONMENTAL CORPORATION
MANUAL Apr.19.96 14:43
O2 0.03%
SO2 73.3PPM
NOx 1mn 1PPMV
CO 1hr 34PPMV
CO2 1mn 0.00%
O2 1mn 0.36%
SO2 1mn 75.2PPM
NOx 1hr 44PPMV
CO 1mn 63PPMV
CO2 1mn 0.02%
O2 1hr 2.25%
SO2 1hr 24.47PPM
NOx 1mn 1PPMV
CO 1mn 62PPMV
CO2 1hr 2.00%
SO2 84.6
MANUAL Apr.19.96 14:37
O2 0.38%
SO2 34.3PPM
NOx 1mn 1PPMV
CO 1hr 120PPMV
CO2 1mn 0.04%
O2 1mn 0.43%
SO2 1mn 18.2PPM
NOx 1hr 44PPMV
CO 1mn 118PPMV
CO2 1hr 3.30%
SO2 1hr 2.85PPM
NOx 1mn 0PPMV
CO 1mn 87PPMV
CO2 1hr 3.11%
CO 120

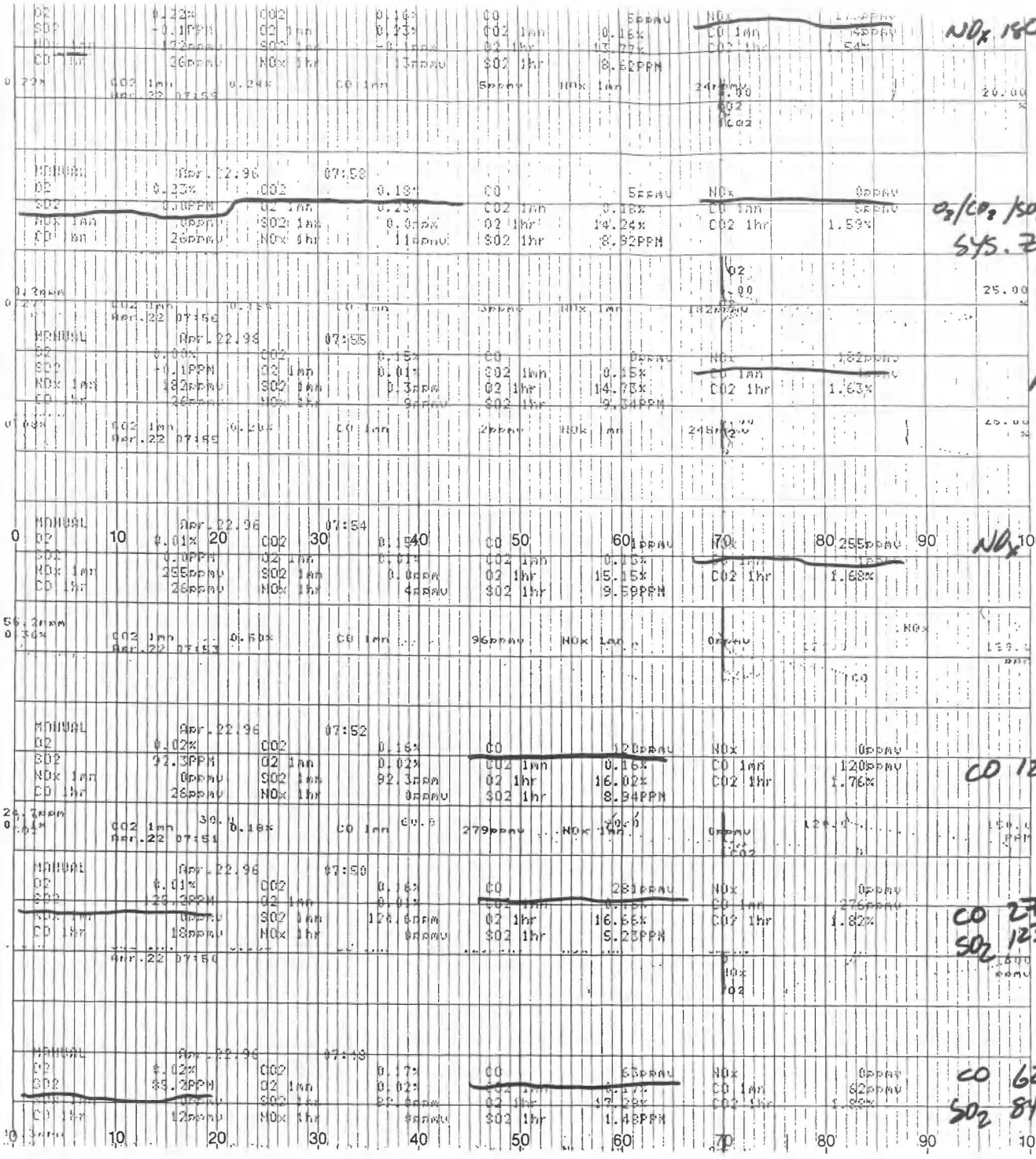

1510
START RUN

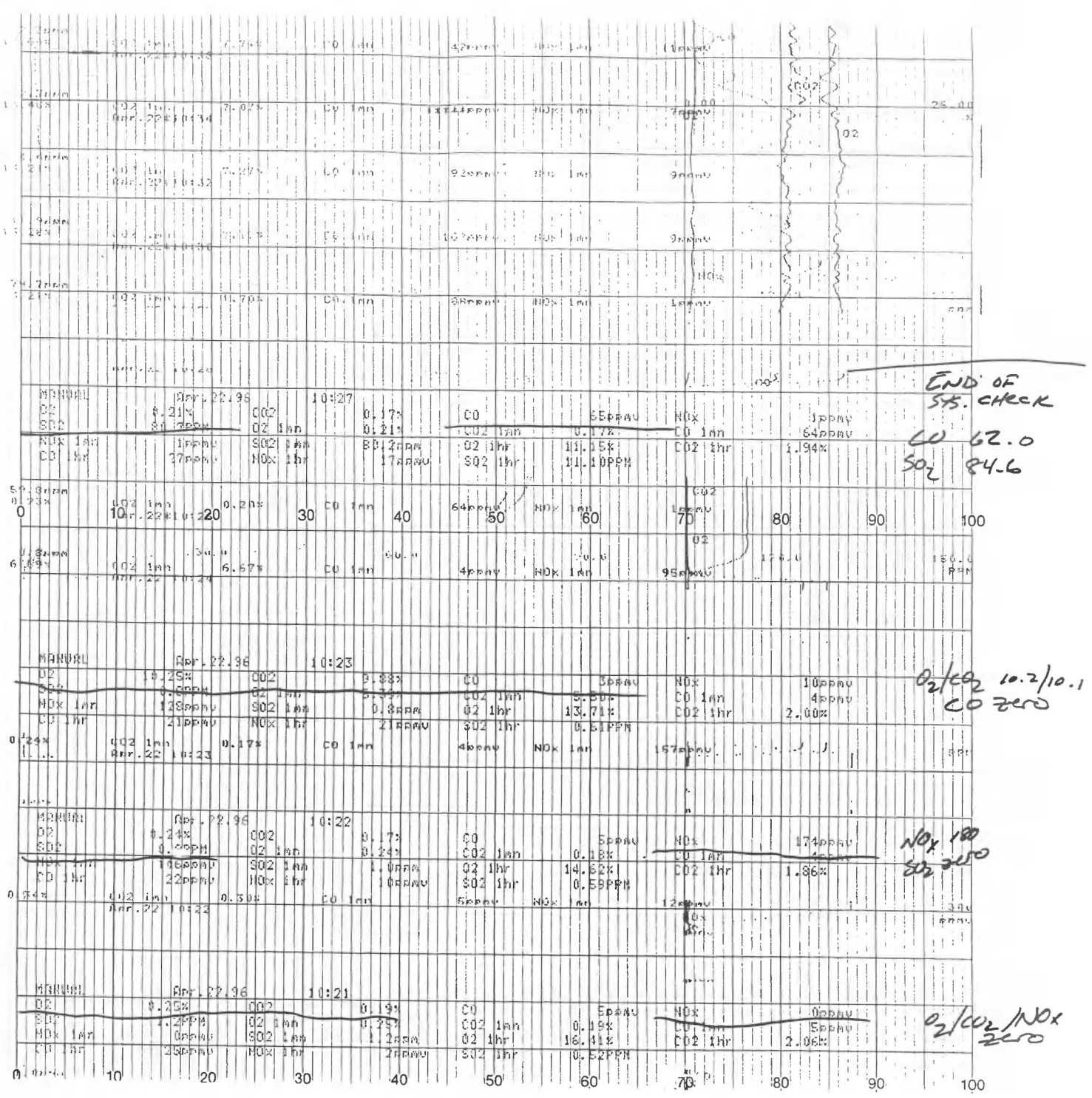

CO 1hr
NOx 1hr
SO2 1hr
2.08PPM
CO 1mn
NOx 1mn
O2 1mn
Mar.19 16:00
TRC ENVIRONMENTAL CORPORATION
500mm/h
300 PPM
0
10
20
30
40
50
60
70
80
90
100

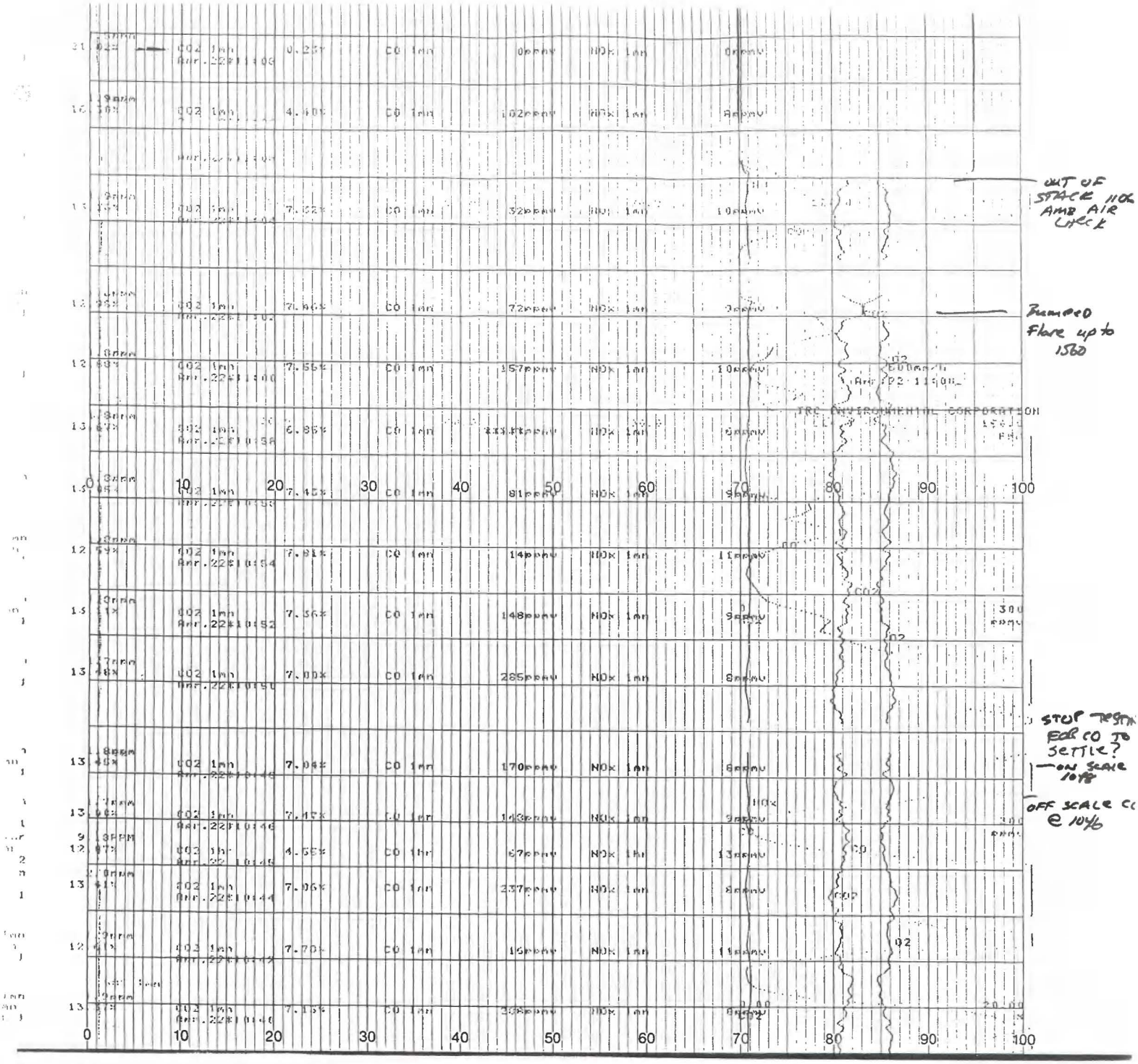

CO 120
SO2 MID
NOx 180
SO2 ZERO
O2/CO2 MID
CO ZERO
O2/CO2/NOx/SO2
ZERO
0
10
20
30
40
50
60
70
80
90
100

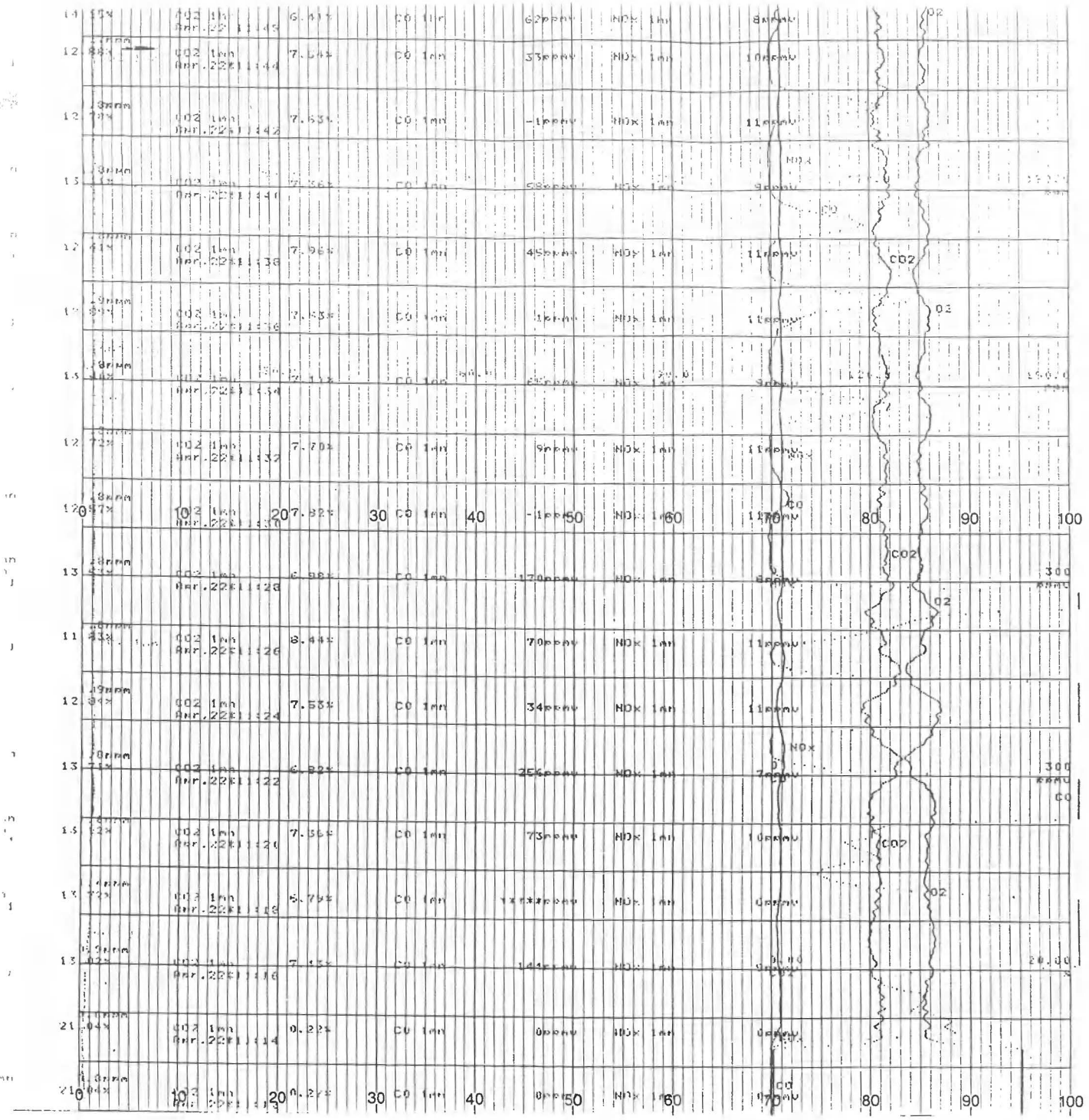

O2/CO2 10.2/10.1
CO zero
O2/CO2 22.3/19.8
TIRE ENVIRONMENTAL CORPORATION
O2/CO2/NO2/SO2
DIRECT
ZERO
CALS
4/22/96
0
10
20
30
40
50
60
70
80
90
100

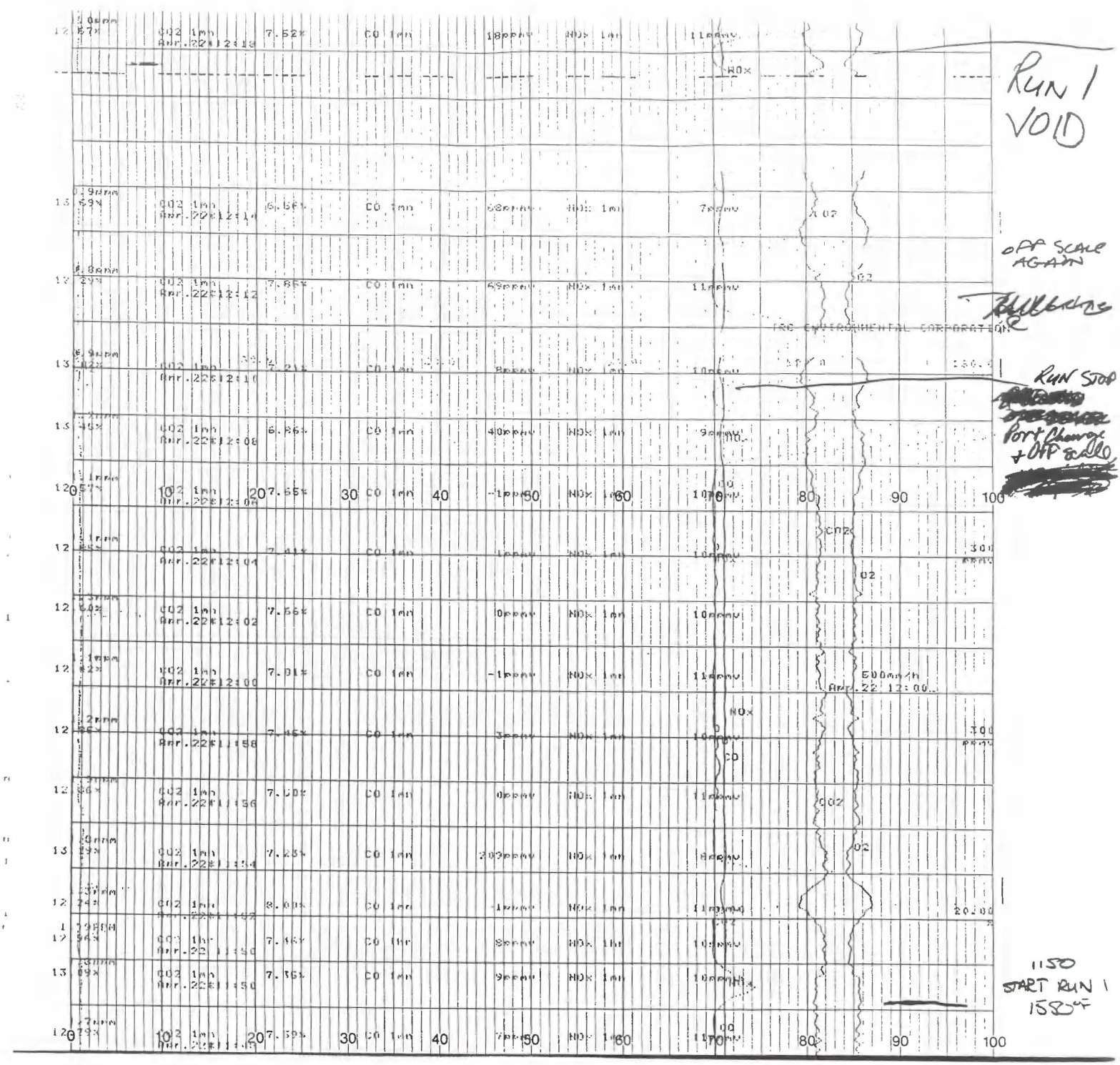

SYS. CAL CHECK
TRC ENVIRONMENTAL CORPORATION
MANUAL Apr.22.96 08:07
O2 0.21% CO2 0.18% CO 64ppmv NOx 1ppmv
SO2 $1.1PPM O2 1hr 0.21% CO2 1hr 0.18% CO 1hr 64ppmv
NOx 1hr 1ppmv SO2 1hr 81.1ppm O2 1hr 12.33% CO2 1hr 1.67%
CO 1hr 29ppmv NOx 1hr 145ppmv $O2 1hr 13.52PPM
SO2 54.6
MANUAL Apr.22.96 08:02
O2 0.96% CO2 9.84% CO 1ppmv NOx 0ppmv
SO2 14.7PPM O2 1hr 10.13% SO2 1hr 9.84% CO 1hr 41ppmv
NOx 1hr 0ppmv SO2 1hr 37.7ppm O2 1hr 13.12% CO2 1hr 1.65%
CO 1hr 28ppmv NOx 1hr 75ppmv $O2 1hr 10.3PPM
O2/CO2 10.2/10.
CO 0
MANUAL Apr.22.96 08:01
O2 0.11% CO2 0.16% CO 121ppmv NOx 1ppmv
SO2 $3.8PPM O2 1hr 0.22% SO2 1hr 0.16% CO 1hr 119ppmv
NOx 1hr 1ppmv SO2 1hr 56.4ppm O2 1hr 13.04% CO2 1hr 1.90%
CO 1hr 26ppmv NOx 1hr 16ppmv $O2 1hr 8.92PPM
CO 120

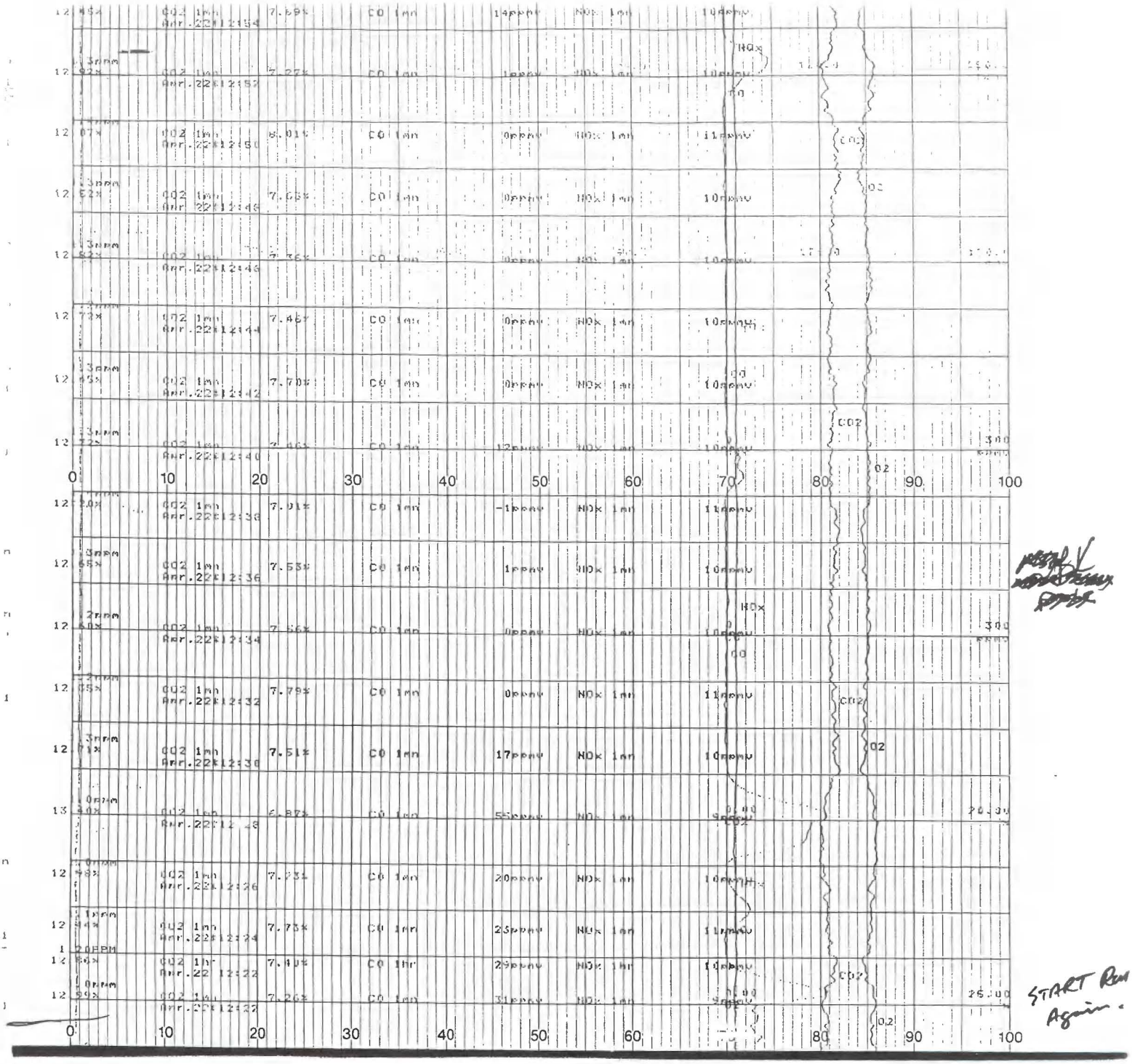

NOx 180
O2/CO2/SO2/NOx
SYS. ZERO
NOx 180
NOx 255
CO 120
CO 27
SO2 123
CO 62.0
SO2 84.6


END OF SYS. CHECK
CO 62.0
SO2 84.6
O2/CO2 10.2/10.1
CO ZERO
NOx 180
SO2 350
O2/CO2/NOx ZERO

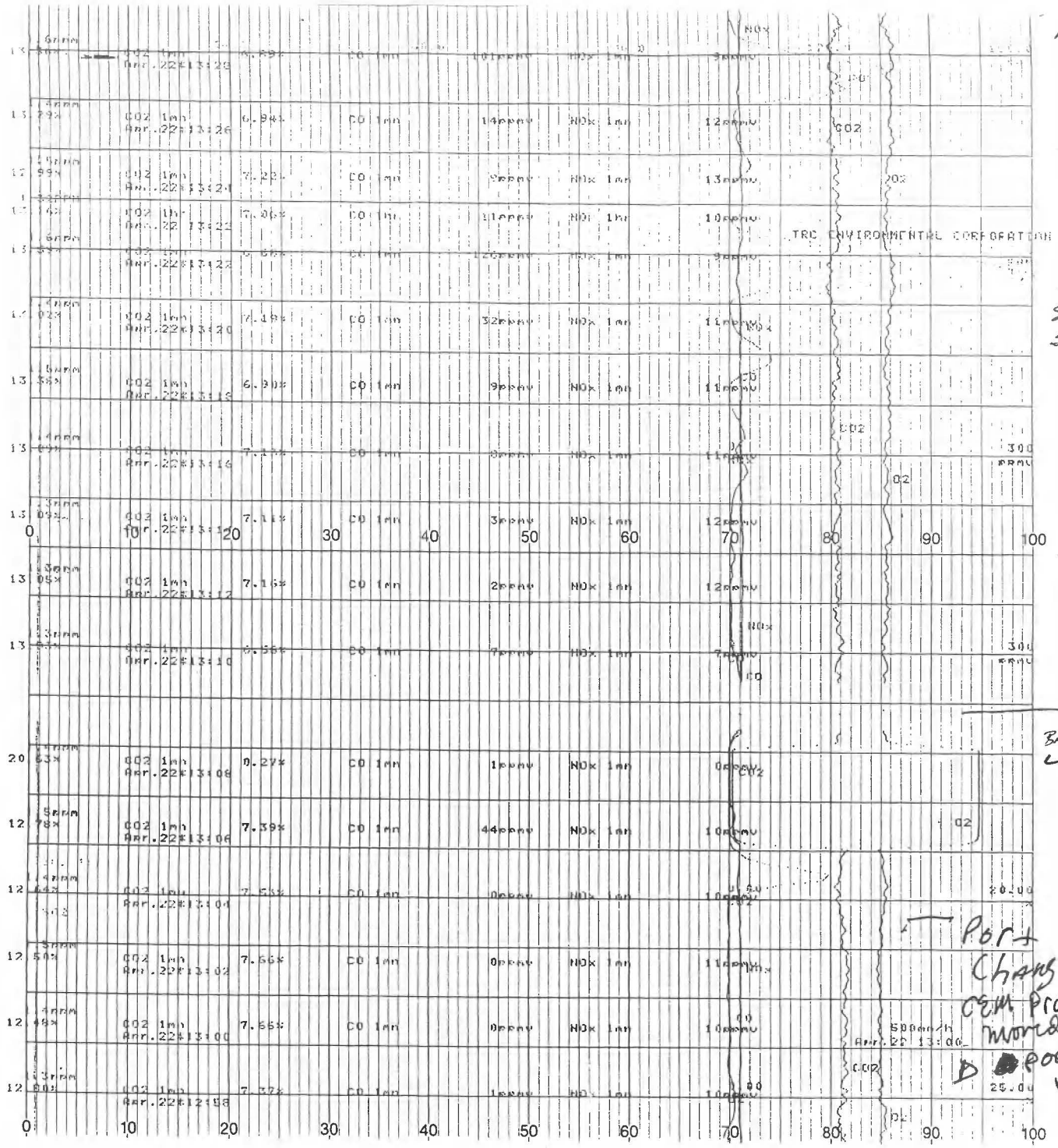

OUT OF STACK 11% AMB AIR CHECK
Bumped Flare up to 1560
STOP TEST FOR CO TO SETTLE?
ON SCALE 10%
OFF SCALE CO @ 10%
TRC ENVIRONMENTAL CORPORATION
0 10 20 30 40 50 60 70 80 90 100

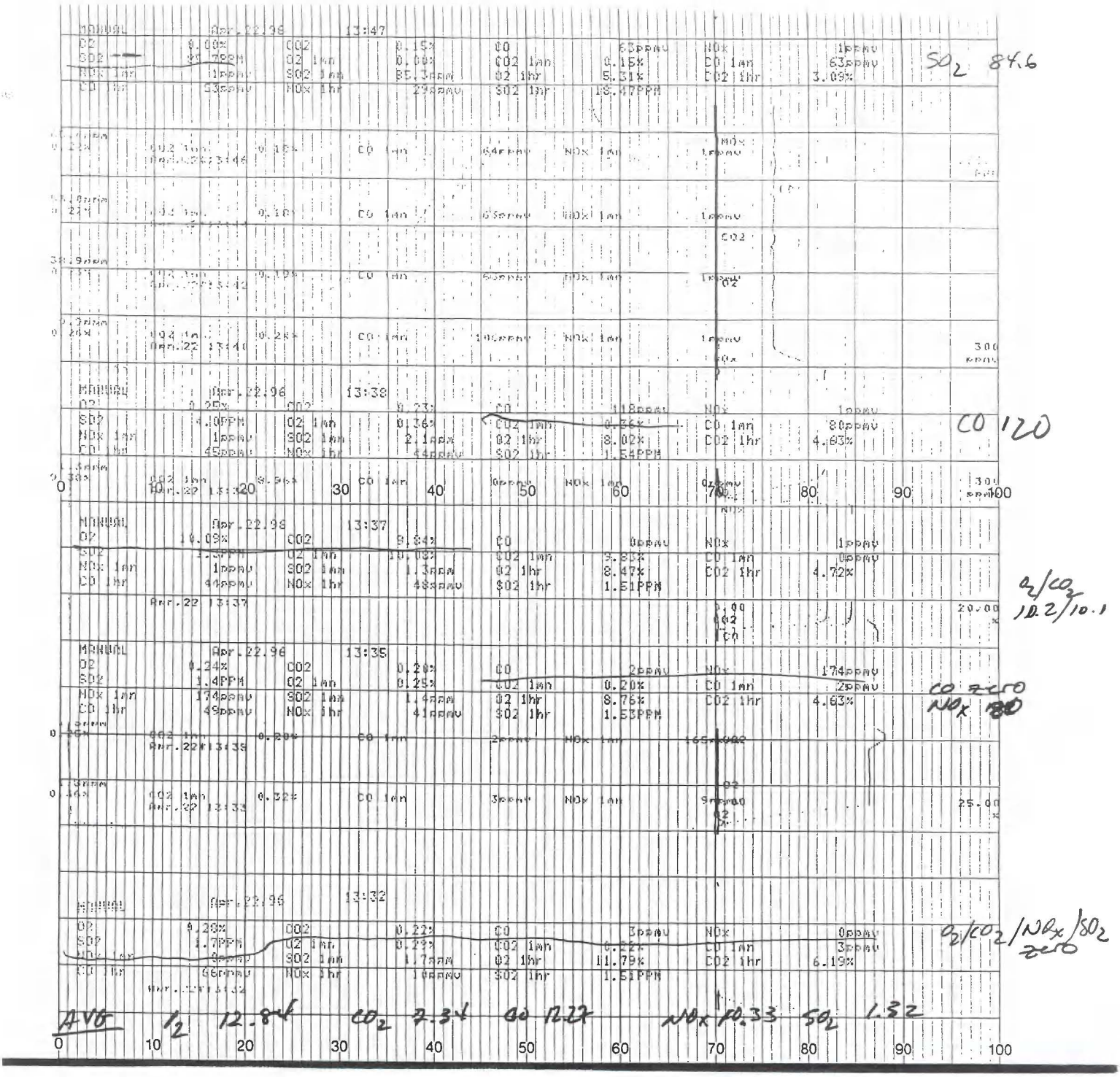

CO2
O2
NOx
CO
0
10
20
30
40
50
60
70
80
90
100
300
20.00

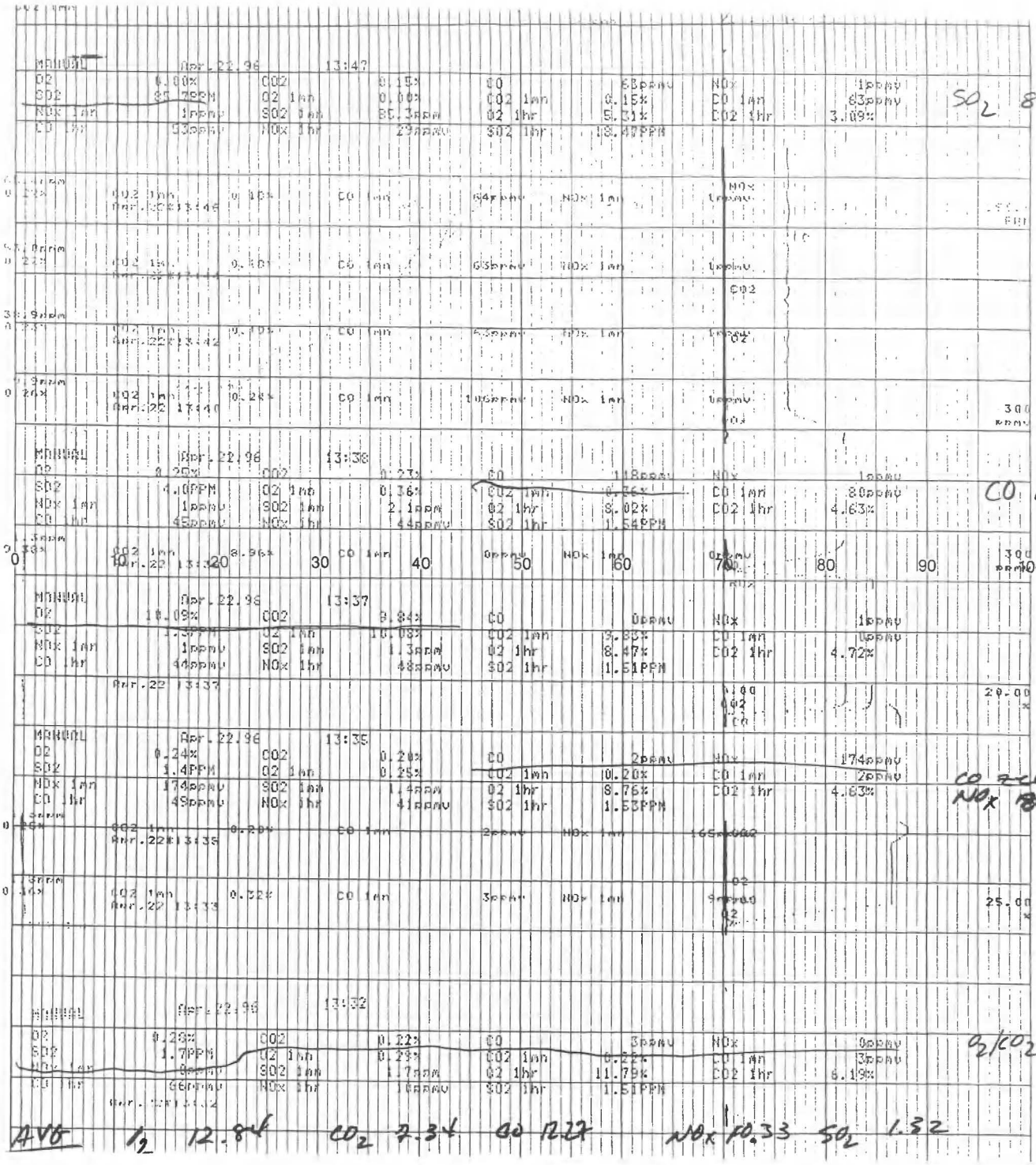

RUN 1
VOID
OFF SCALE
AGAIN
RUN STOP
Port change
+ DHP added
1150
START RUN 1
158°F
CO2
O2
NOx
CO
500ml/h
Apr.22 12:00
0
10
20
30
40
50
60
70
80
90
100

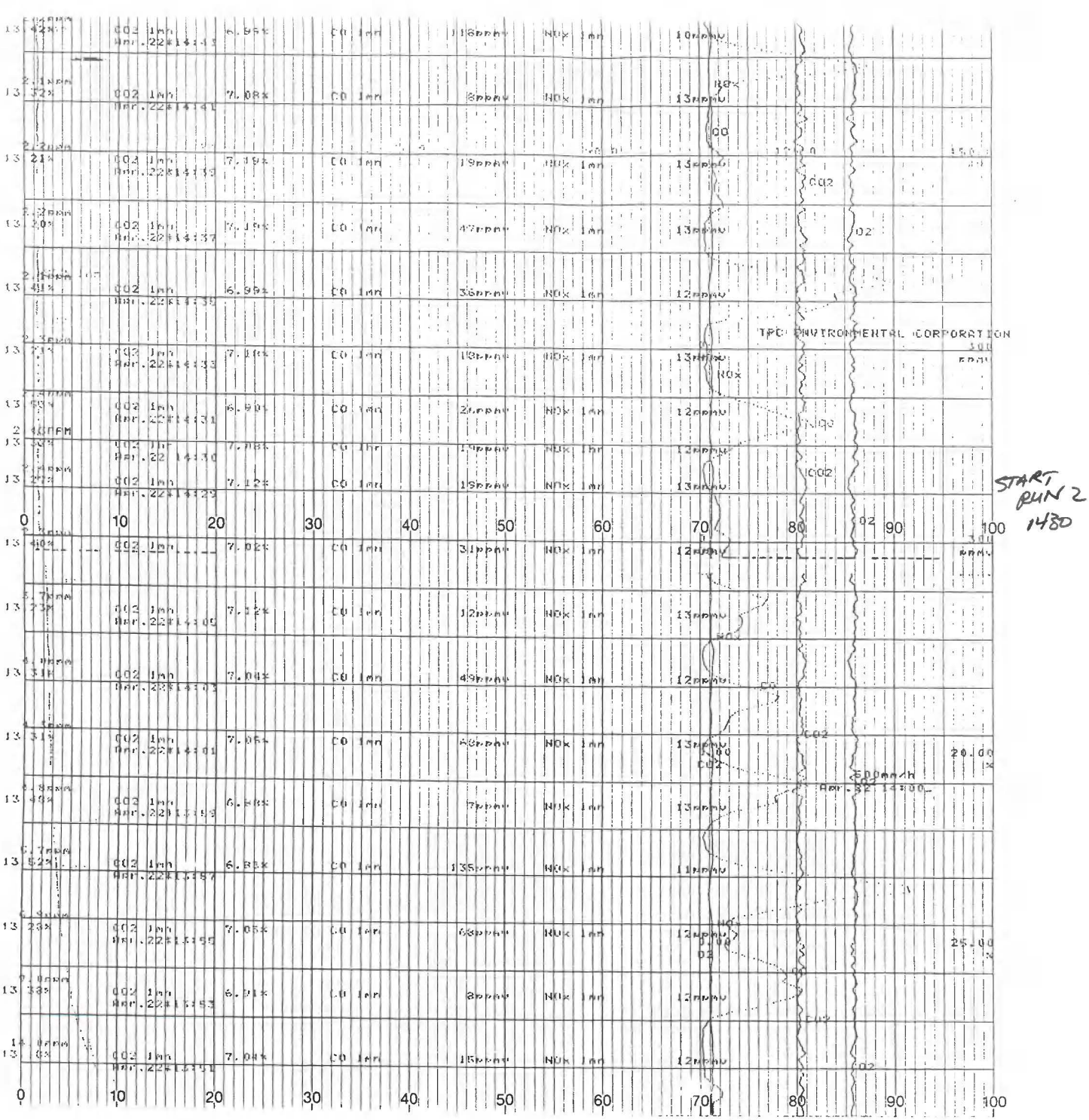


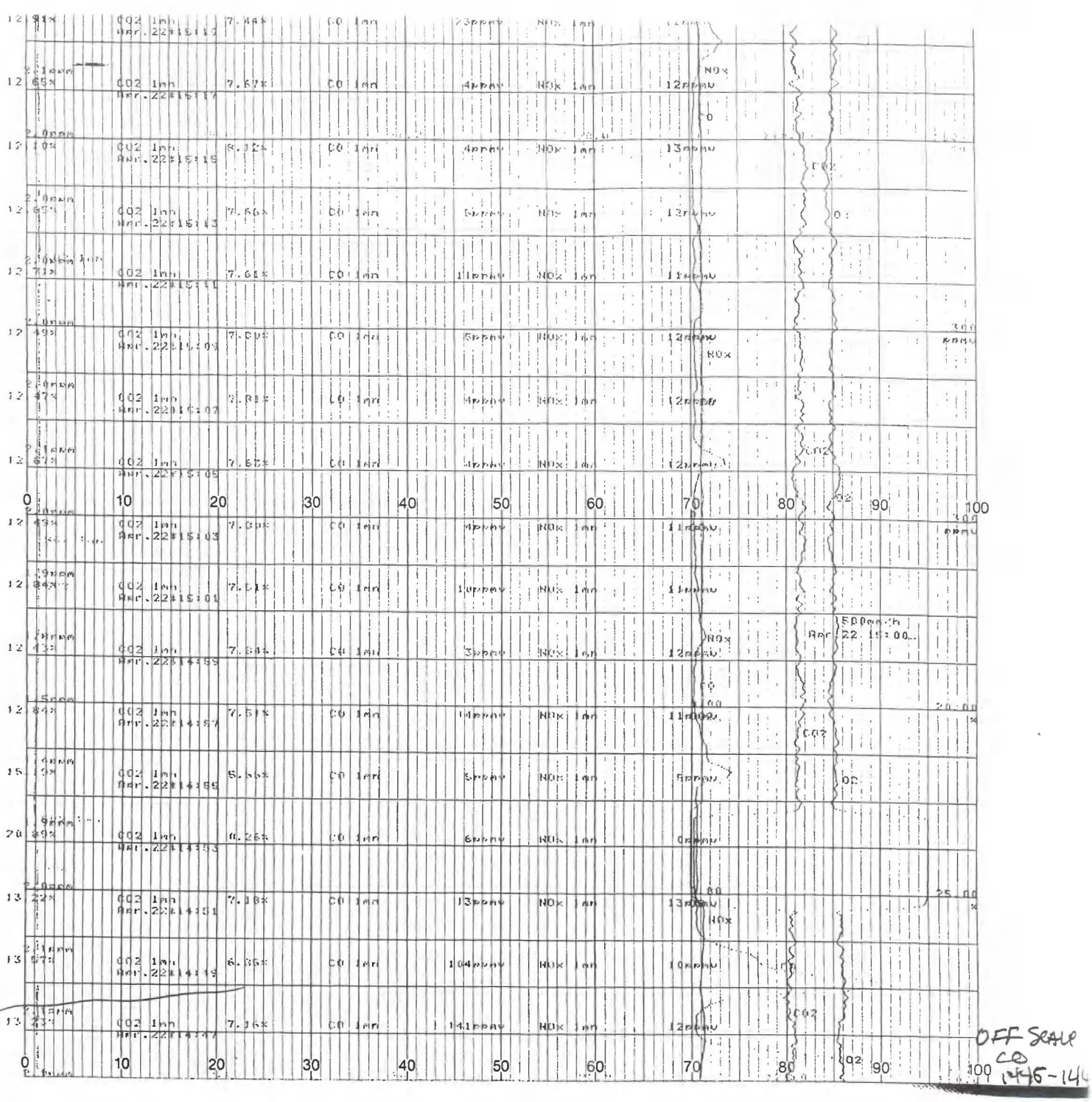
START Run Again.

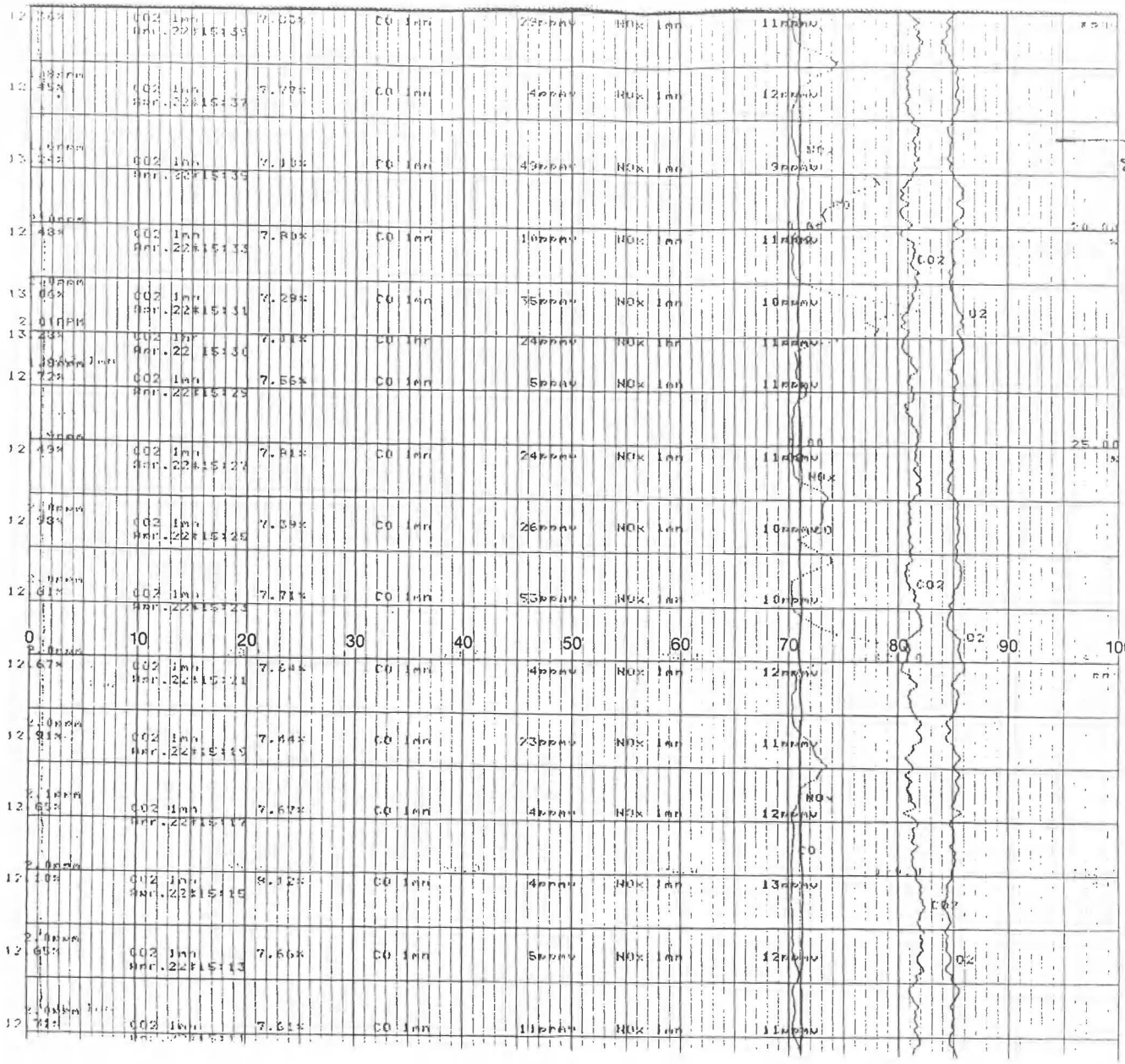

1330
TRC ENVIRONMENTAL CORPORATION
OFF SCALE ≈ 400ppm
BACK ON LINE 1310
Port Change
CEM Probe moved to Port 1302
0
10
20
30
40
50
60
70
80
90
100

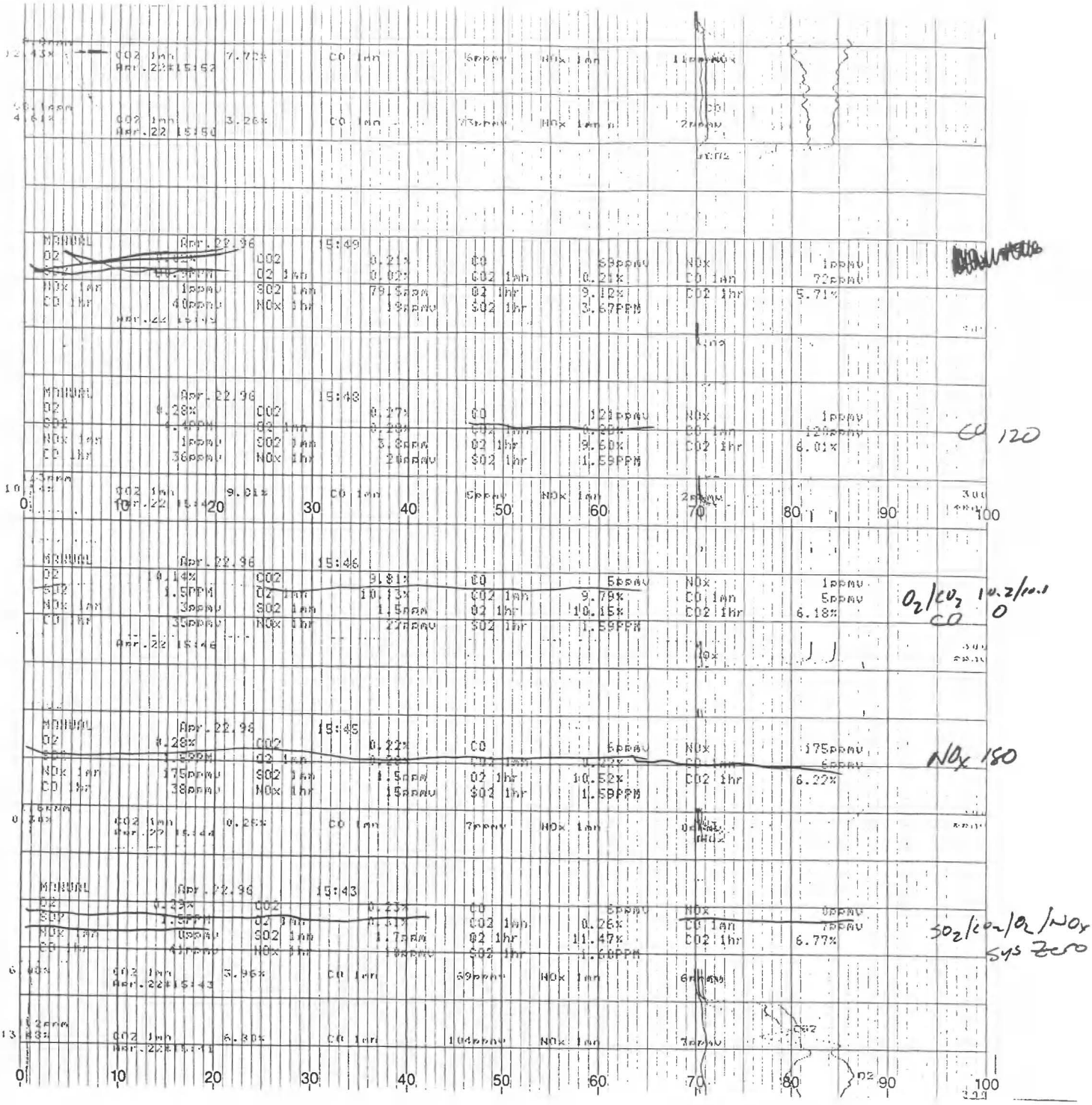

MANUAL Apr.22.96 13:47
O2 9.00% CO2 0.15% CO 63ppmv NOx 1ppmv
SO2 27.7PPM O2 1mn 0.00% CO2 1mn 0.15% CO 1mn 63ppmv
NOx 1mn 1ppmv SO2 1mn 85.3ppm O2 1hr 5.31% CO2 1hr 3.09%
CO 1hr 53ppmv NOx 1hr 29ppmv SO2 1hr 18.47PPM
SO2 84.6
CO 120
MANUAL Apr.22.96 13:38
O2 0.25% CO2 0.23% CO 118ppmv NOx 1ppmv
SO2 4.0PPM O2 1mn 0.36% CO2 1mn 0.36% CO 1mn 80ppmv
NOx 1mn 1ppmv SO2 1mn 2.1ppm O2 1hr 8.02% CO2 1hr 4.83%
CO 1hr 45ppmv NOx 1hr 44ppmv SO2 1hr 1.54PPM
MANUAL Apr.22.96 13:37
O2 10.09% CO2 9.84% CO 0ppmv NOx 1ppmv
SO2 1.5PPM O2 1mn 10.08% CO2 1mn 9.83% CO 1mn 0ppmv
NOx 1mn 1ppmv SO2 1mn 1.3ppm O2 1hr 8.47% CO2 1hr 4.72%
CO 1hr 44ppmv NOx 1hr 48ppmv SO2 1hr 1.51PPM
O2/CO2 10.2/10.1
MANUAL Apr.22.96 13:35
O2 0.24% CO2 0.20% CO 2ppmv NOx 174ppmv
SO2 1.4PPM O2 1mn 0.25% CO2 1mn 0.20% CO 1mn 2ppmv
NOx 1mn 174ppmv SO2 1mn 1.4ppm O2 1hr 8.76% CO2 1hr 4.83%
CO 1hr 49ppmv NOx 1hr 41ppmv SO2 1hr 1.53PPM
CO zero
NOx 180
MANUAL Apr.22.96 13:32
O2 9.28% CO2 0.22% CO 3ppmv NOx 0ppmv
SO2 1.7PPM O2 1mn 0.22% CO2 1mn 0.22% CO 1mn 3ppmv
NOx 1mn 0ppmv SO2 1mn 1.7ppm O2 1hr 11.79% CO2 1hr 6.19%
CO 1hr 96ppmv NOx 1hr 10ppmv SO2 1hr 1.51PPM
O2/CO2/NOx/SO2 zero
AVG O2 12.8% CO2 2.3% CO 12.2% NOx 0.33 SO2 1.32
0 10 20 30 40 50 60 70 80 90 100


MANUAL Apr.22.96 13:47
O2 8.00% CO2 0.15% CO 68ppmv NOx 1ppmv
SO2 85.78PPM O2 1mn 0.00% CO2 1mn 0.15% CO 1mn 63ppmv
NOx 1mn 1ppmv SO2 1mn 85.3ppm O2 1hr 9.31% CO2 1hr 3.09%
CO 1hr 93ppmv NOx 1hr 23ppmv SO2 1hr 18.47PPM
SO2 84.6
CO2 1mn 0.10% CO 1mn 84ppmv NOx 1mn 1ppmv
Apr.22 13:46
CO2 1mn 0.18% CO 1mn 65ppmv NOx 1mn 1ppmv
Apr.22 13:44
CO2 1mn 0.10% CO 1mn 43ppmv NOx 1mn 1ppmv
Apr.22 13:42
CO2 1mn 0.28% CO 1mn 106ppmv NOx 1mn 1ppmv
Apr.22 13:40
MANUAL Apr.22.96 13:38
O2 8.20% CO2 0.23% CO 118ppmv NOx 1ppmv
SO2 4.0PPM O2 1mn 0.36% CO2 1mn 0.36% CO 1mn 80ppmv
NOx 1mn 1ppmv SO2 1mn 2.1ppm O2 1hr 8.02% CO2 1hr 4.63%
CO 1hr 45ppmv NOx 1hr 44ppmv SO2 1hr 1.54PPM
CO 120
CO2 1mn 8.96% CO 1mn 0ppmv NOx 1mn 0ppmv
Apr.22 13:20
MANUAL Apr.22.96 13:37
O2 10.09% CO2 9.84% CO 0ppmv NOx 1ppmv
SO2 1.3PPM O2 1mn 10.08% CO2 1mn 9.85% CO 1mn 0ppmv
NOx 1mn 1ppmv SO2 1mn 1.3ppm O2 1hr 8.47% CO2 1hr 4.72%
CO 1hr 44ppmv NOx 1hr 48ppmv SO2 1hr 1.51PPM
O2/CO2 10.2/10.1
Apr.22 13:37
MANUAL Apr.22.96 13:35
O2 0.24% CO2 0.20% CO 2ppmv NOx 174ppmv
SO2 1.4PPM O2 1mn 0.25% CO2 1mn 0.20% CO 1mn 2ppmv
NOx 1mn 174ppmv SO2 1mn 1.4ppm O2 1hr 8.76% CO2 1hr 4.63%
CO 1hr 49ppmv NOx 1hr 41ppmv SO2 1hr 1.53PPM
CO ZERO
NOx 180
CO2 1mn 0.20% CO 1mn 2ppmv NOx 1mn 165ppmv
Apr.22 13:35
CO2 1mn 0.32% CO 1mn 3ppmv NOx 1mn 9ppmv
Apr.22 13:33
MANUAL Apr.22.96 13:32
O2 8.28% CO2 0.22% CO 3ppmv NOx 0ppmv
SO2 1.7PPM O2 1mn 0.23% CO2 1mn 0.22% CO 1mn 3ppmv
NOx 1mn 9ppmv SO2 1mn 1.7ppm O2 1hr 11.79% CO2 1hr 6.19%
CO 1hr 66ppmv NOx 1hr 10ppmv SO2 1hr 1.51PPM
O2/CO2/NOx/SO2 ZERO
AVG 12.84 CO2 2.34 CO 122 NOx 10.33 SO2 1.32


TPC ENVIRONMENTAL CORPORATION
START
RUN 2
1480


CO2 1mn
Mar.22#15:13
7.48%
CO 1mn
NOx 1mn
CO2 1mn
Mar.22#15:17
7.67%
CO 1mn
4ppmv
NOx 1mn
12ppmv
NOx
CO
CO2 1mn
Mar.22#15:15
8.12%
CO 1mn
4ppmv
NOx 1mn
13ppmv
CO2
CO2 1mn
Mar.22#15:13
7.86%
CO 1mn
5ppmv
NOx 1mn
13ppmv
O2
CO2 1mn
Mar.22#15:11
7.61%
CO 1mn
11ppmv
NOx 1mn
11ppmv
CO2 1mn
Mar.22#15:09
7.08%
CO 1mn
5ppmv
NOx 1mn
12ppmv
NOx
CO2 1mn
Mar.22#15:07
7.81%
CO 1mn
4ppmv
NOx 1mn
12ppmv
CO2
CO2 1mn
Mar.22#15:05
7.63%
CO 1mn
4ppmv
NOx 1mn
12ppmv
0
10
20
30
40
50
60
70
80
90
100
CO2 1mn
Mar.22#15:03
7.08%
CO 1mn
4ppmv
NOx 1mn
11ppmv
CO2 1mn
Mar.22#15:01
7.51%
CO 1mn
10ppmv
NOx 1mn
11ppmv
CO2 1mn
7.84%
CO 1mn
3ppmv
NOx 1mn
12ppmv
NOx
Mar 22. 15:00
Mar.22#14:59
CO
CO2 1mn
Mar.22#14:57
7.51%
CO 1mn
14ppmv
NOx 1mn
11ppmv
CO2
CO2 1mn
Mar.22#14:55
5.56%
CO 1mn
5ppmv
NOx 1mn
5ppmv
O2
CO2 1mn
Mar.22#14:53
6.26%
CO 1mn
6ppmv
NOx 1mn
0ppmv
CO2 1mn
Mar.22#14:51
7.18%
CO 1mn
13ppmv
NOx 1mn
13ppmv
NOx
CO2 1mn
Mar.22#14:49
6.36%
CO 1mn
104ppmv
NOx 1mn
10ppmv
CO2 1mn
Mar.22#14:47
7.16%
CO 1mn
141ppmv
NOx 1mn
12ppmv
CO2
0
10
20
30
40
50
60
70
80
90
100
OFF SCALE
CO
1445-144


STOP RUN 2
1552
0
10
20
30
40
50
60
70
80
90
100



CO 120

O_2/CO_2 10.2/10.1
CO 0

NOx 180

$SO_2/CO_2/O_2/NO_x$
SYS ZERO

12.43% CO2 1mn 7.85% CO 1mn 5ppmv NOx 1mn 12ppmv
Apr.22 16:03

12.75% CO2 1mn 7.64% CO 1mn 6ppmv NOx 1mn 11ppmv
Apr.22 16:07
20.00

12.50% CO2 1mn 7.75% CO 1mn 6ppmv NOx 1mn 11ppmv
Apr.22 16:05

12.77% CO2 1mn 7.61% CO 1mn 7ppmv NOx 1mn 11ppmv
Apr.22 16:03

12.35% CO2 1mn 7.85% CO 1mn 5ppmv NOx 1mn 12ppmv
Apr.22 16:01
25.00

500mm/h
Apr.22 16:00

12.93% CO2 1mn 7.53% CO 1mn 20ppmv NOx 1mn 11ppmv
Apr.22 15:57

12.59% CO2 1mn 7.62% CO 1mn 60ppmv NOx 1mn 10ppmv
Apr.22 15:57

9.32% CO2 1mn 5.86% CO 1mn 49ppmv NOx 1mn 6ppmv
Apr.22 15:55

0 10 20 30 40 50 60 70 80 90 100

MANUAL Apr.22.96 15:54
O2 CO2 0.20% CO 70ppmv NOx 1ppmv
SO2 84.7PPM O2 1mn 0.02% CO2 1mn 0.20% CO 1mn 70ppmv
NOx 1mn 1ppmv SO2 1mn 84.7ppm O2 1hr 9.12% CO2 1hr 5.69%
CO 1hr 44ppmv NOx 1hr 17ppmv SO2 1hr 8.43PPM

SO2 84.6

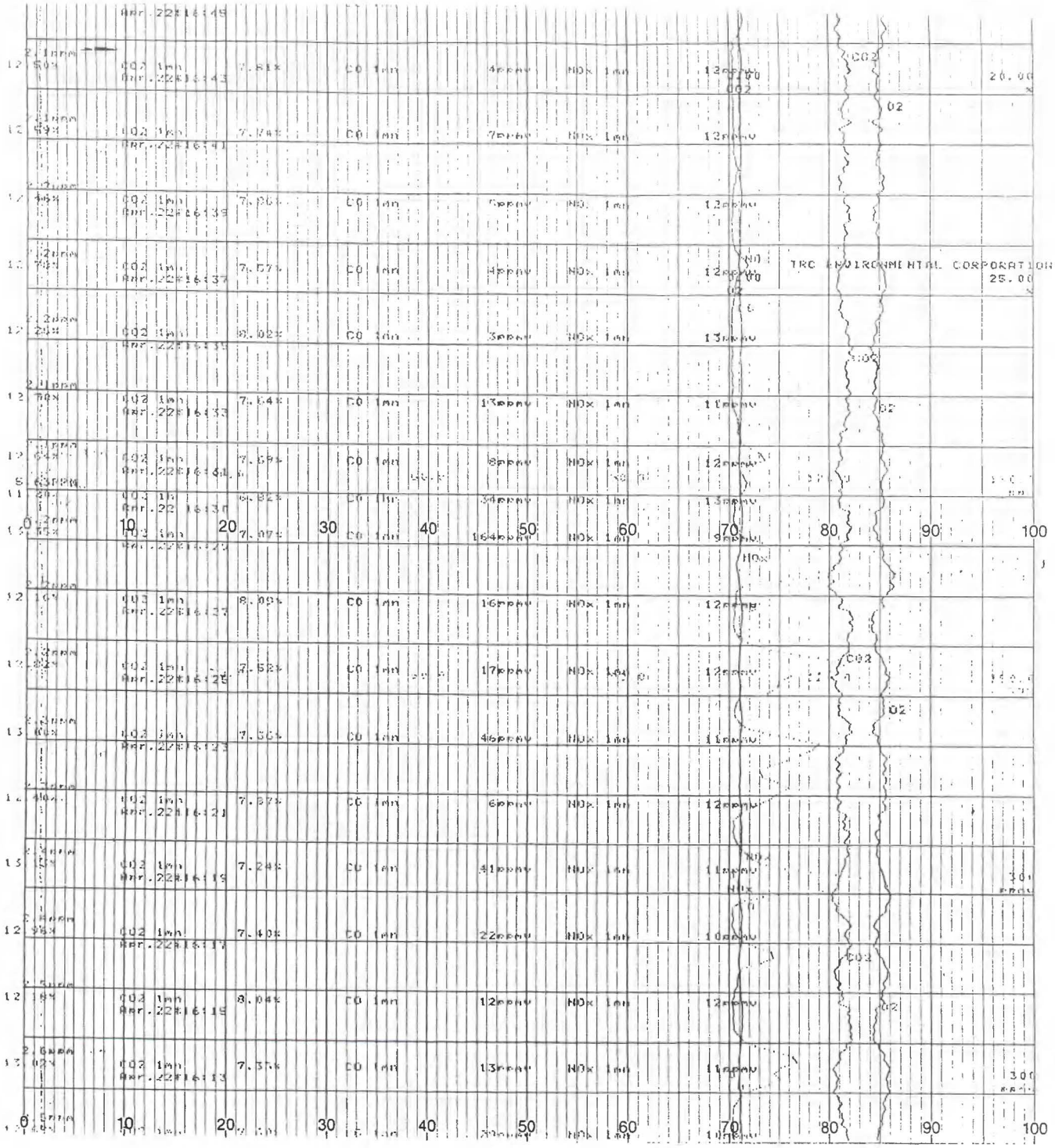
12.43% CO2 1mn 7.72% CO 1mn 5ppmv NOx 1mn 11ppmv
Apr.22 15:52

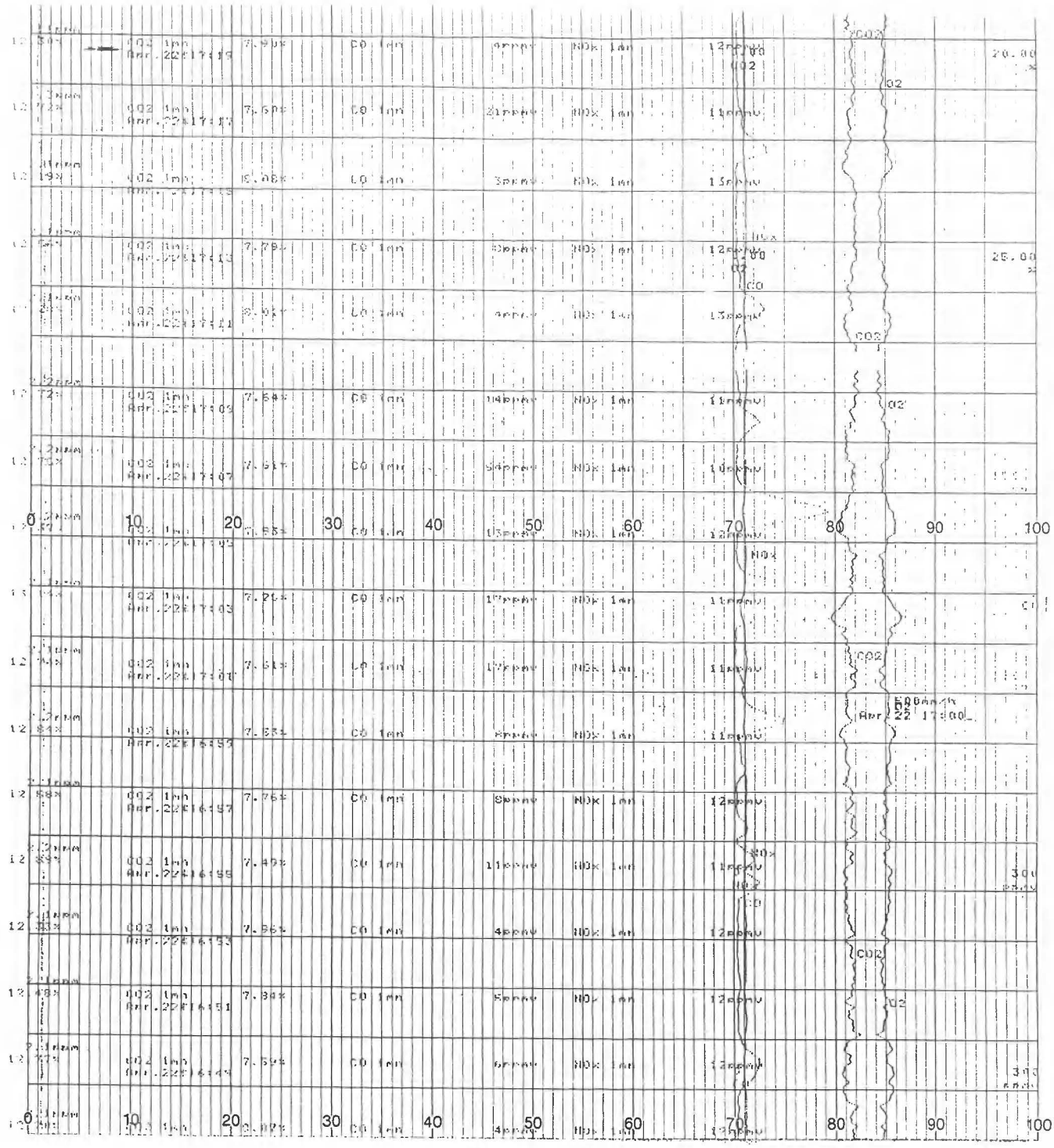
4.61% CO2 1mn 3.26% CO 1mn 73ppmv NOx 1mn 2ppmv
Apr.22 15:50

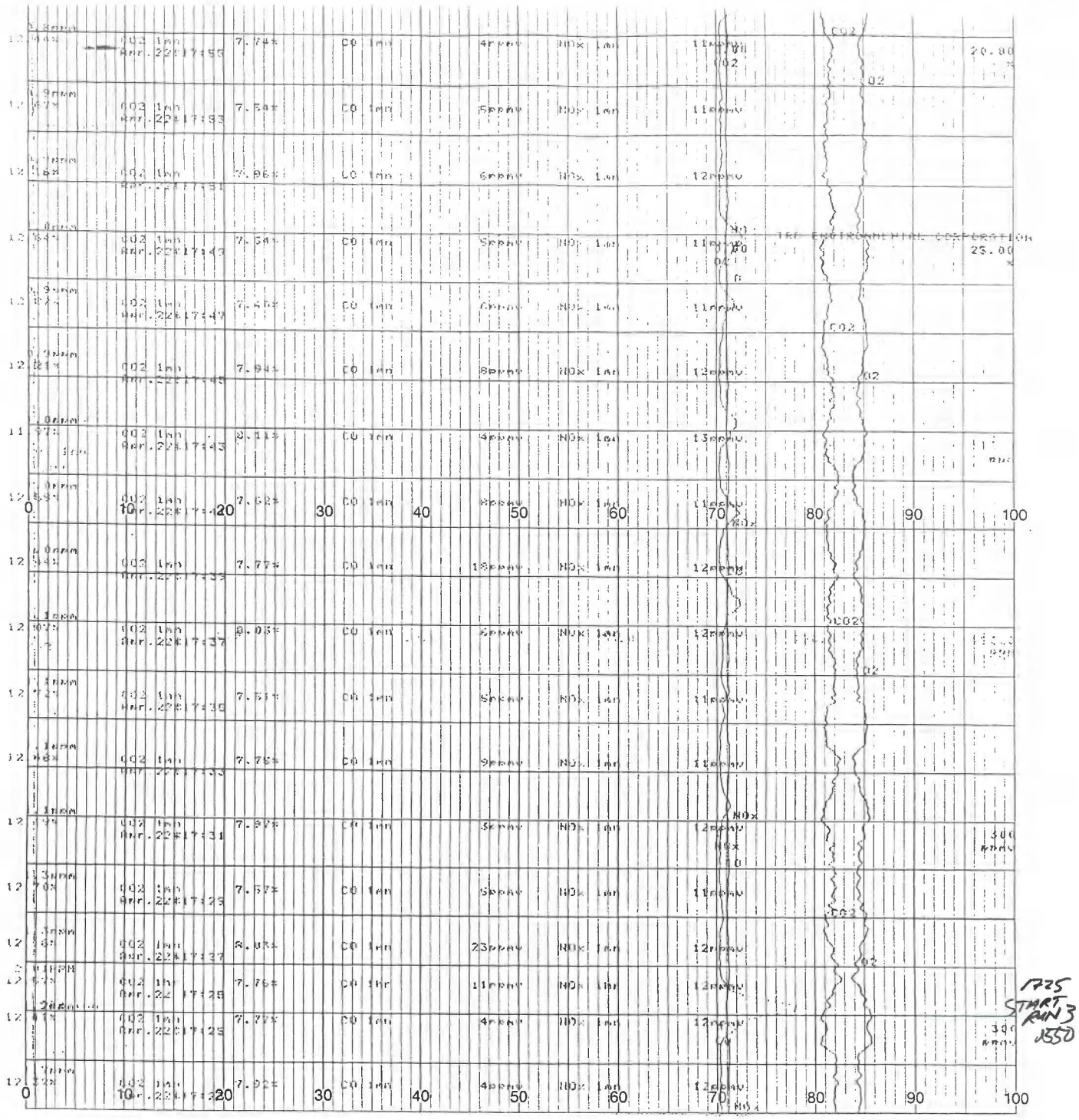
MANUAL Apr.22.96 15:49
O2 CO2 0.21% CO 69ppmv NOx 1ppmv
SO2 O2 1mn 0.02% CO2 1mn 0.21% CO 1mn 72ppmv
NOx 1mn 1ppmv SO2 1mn 79.5ppm O2 1hr 9.12% CO2 1hr 5.71%
CO 1hr 40ppmv NOx 1hr 19ppmv SO2 1hr 3.67PPM

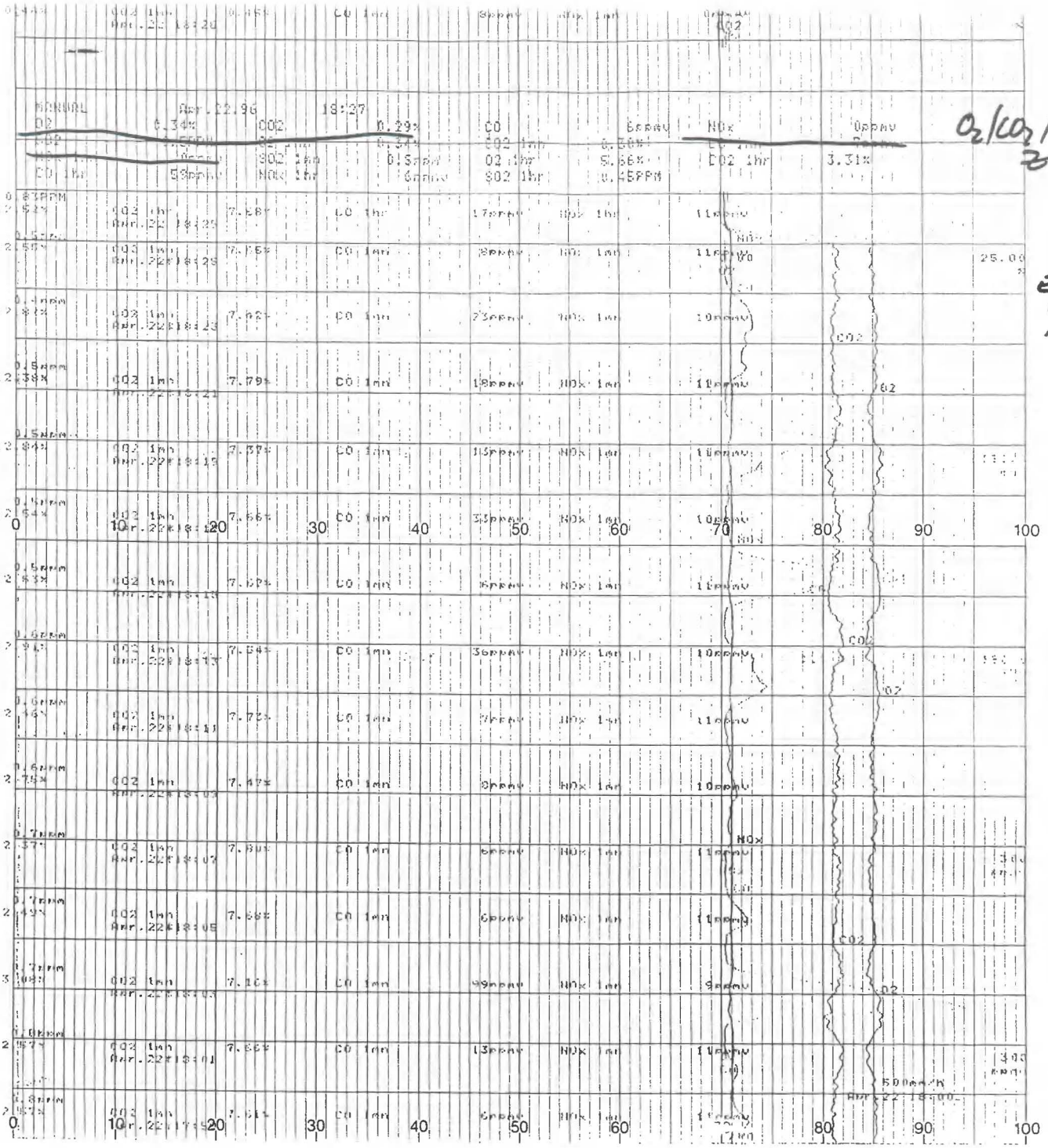
MANUAL Apr.22.96 15:48
O2 0.28% CO2 0.27% CO 121ppmv NOx 1ppmv
SO2 4.4PPM O2 1mn 0.28% CO2 1mn 0.20% CO 1mn 120ppmv
NOx 1mn 1ppmv SO2 1mn 3.3ppm O2 1hr 9.60% CO2 1hr 6.01%
CO 1hr 36ppmv NOx 1hr 20ppmv SO2 1hr 1.59PPM

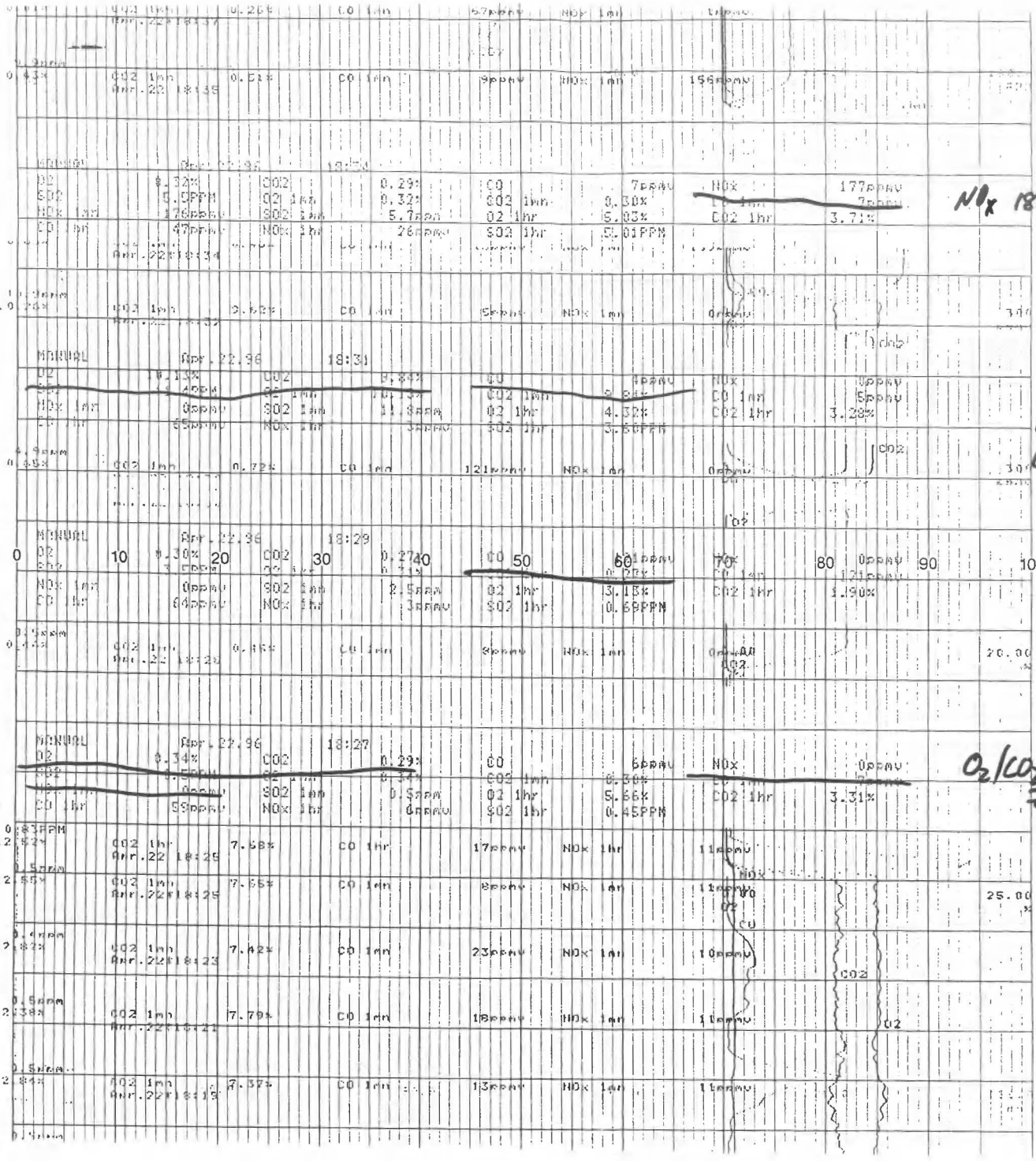
CO 120

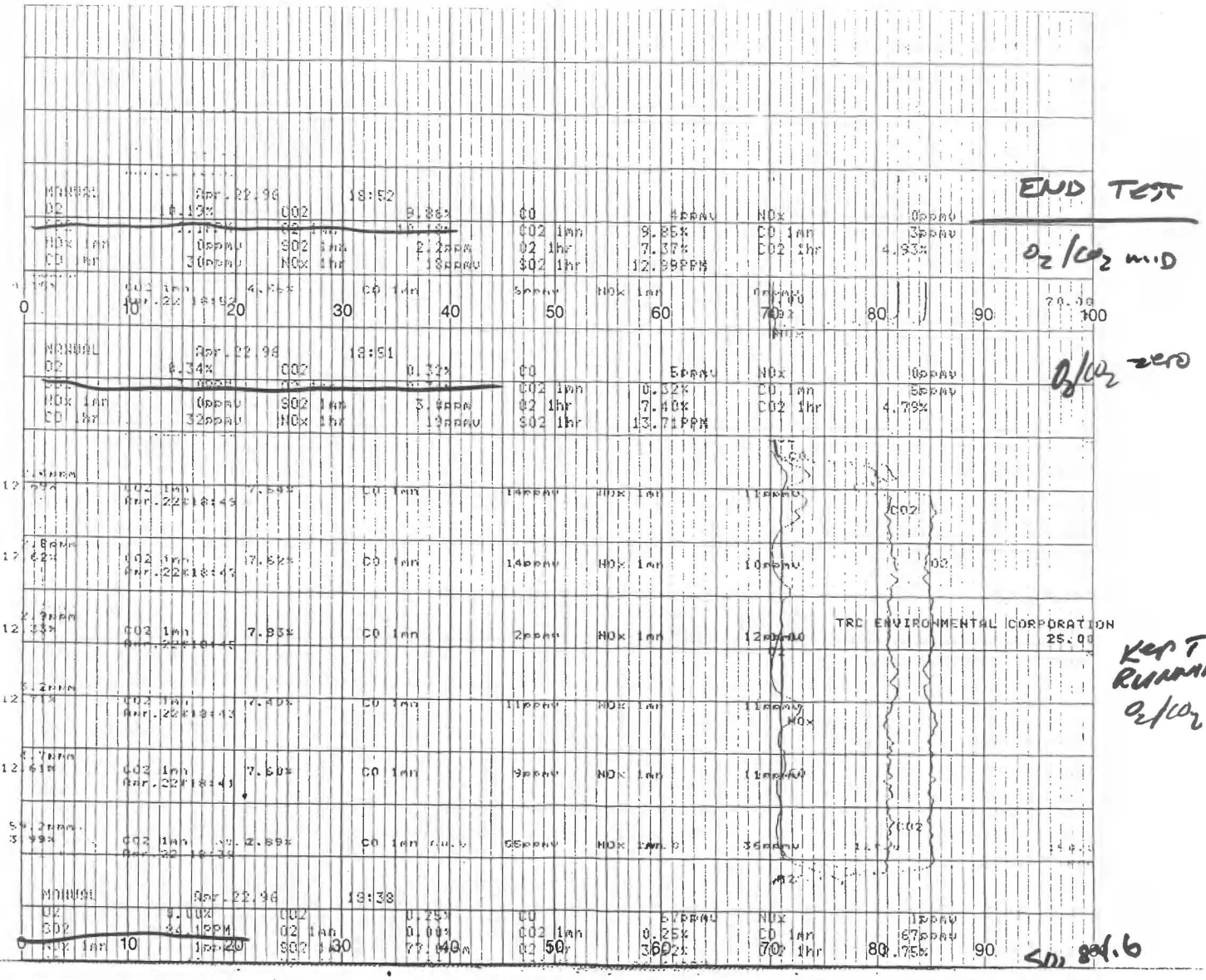

TRC ENVIRONMENTAL CORPORATION
CO2
O2
NO
NOx
0
10
20
30
40
50
60
70
80
90
100


CO2
O2
CO
NOx
0
10
20
30
40
50
60
70
80
90
100


CO2
O2
NOx
THE ENVIRONMENTAL CORPORATION
0
10
20
30
40
50
60
70
80
90
100
1725
START
RUN 3
1550


O2/CO2/SO2/NO
zero
END
RUN 3
1825
0
10
20
30
40
50
60
70
80
90
100


NOx 180
O2/CO2 mid
CO zero
CO 120
O2/CO2/SO2/NOx
zero
END
Rnd 3
1825


END TEST
O2/CO2 mid
O2/CO2 zero
TRC ENVIRONMENTAL CORPORATION
Kept Running O2/CO2
SO2 804.6

APPENDIX E

CALIBRATION DATA SHEETS

Scott Specialty Gases

2330 HAMILTON BOULEVARD SOUTH PLAINFIELD NJ 07080 (908)754-7700 FAX:(908)754-7303

CERTIFICATE OF ANALYSIS:Interference-Free Multi-Component EPA Protocol GAS

Customer
TRC ENVIRONMENTAL
ATTN: ED SANTOS
5 WATERSIDE CROSSING
WINDSOR CT 06095

Assay Laboratory
Scott Specialty Gases
2330 Hamilton Blvd
South Plainfield NJ 07080

Purchase order 90PSO2/120PCO/N2E
Scott Project #0741302

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay and Certification of Gaseous Calibration Standards -Procedure G1 September 1993

Cylinder Number ALM038611 | Certification Date 01-19-1996 | Expiration Date 1-19-1998
Cylinder Pressure 2000psig

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
(CARBON MONOXIDE)	120ppm	+/-1%NIST Directly Traceable
(SULFUR DIOXIDE)	90.8ppm	+/-1%NIST Directly Traceable
(Nitrogen cas7727379)	Balance	4

*Do not use when cylinder Pressure is below 150 psig

*Analytical accuracy is inclusive of usual known error sources which at least includes precision of the measurement processes

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
NTRM1679	08/11/96	ALM041538	97.1 ppmCO in N2
NTRM1694	05/11/97	ALM040185	94.4 ppmSO2 in N2

INSTRUMENTATION

Instrument/Model/Serial#		Date Last Calibrated	Analytical Principle
CO:NICOLET/8220AAB9400258	-	12/26/1995	FTIR
SO2:NICOLET/8220AAB9400258	-	01-19-1996	FTIR

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
CARBON MONOXIDE	Date: 01-10-1996 Response units: ppm Z1=0 R1=97.1 T1=120 R2=97.1 Z2=0 T2=120 Z3=0 T3=120 R3=97.1 Ave. Conc. of Cust. Cyl.= 120	Date: 01-19-1996 Response units: ppm Z1=0 R1=97.1 T1=120 R2=97.1 Z2=0 T2=120 Z3=0 T3=120 R3=97.1 Ave. Conc. of Cust. Cyl.= 120	Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=0.9999999 Constants: A=-7.8316E-03 B=1.0783E-04 C= D= E=
SULFUR DIOXIDE	Date: 01-10-1996 Response units: ppm Z1=0 R1=94.4 T1=90.3 R2=94.4 Z2=0 T2=90.4 Z3=0 T3=90.4 R3=94.4 Ave. Conc. of Cust. Cyl.= 90.4	Date: 01-19-1996 Response units: ppm Z1=0 R1=94.4 T1=91.1 R2=94.4 Z2=0 T2=91.1 Z3=0 T3=91.1 R3=94.4 Ave. Conc. of Cust. Cyl.= 91.1	Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=1 Constants: A=1.46931E-1 B=9.36614E-1 C=4.07252E-5 D= E=

Special Notes

Analyst Toni Delong

Scott Specialty Gases

2330 HAMILTON BOULEVARD SOUTH PLAINFIELD NJ 07080 (908)754-7700 FAX:(908)754-7303

CERTIFICATE OF ANALYSIS:Interference-Free Multi-Component EPA Protocol GAS

Customer
TRC ENVIRONMENTAL
ATTN: RAY POTTER
5 WATERSIDE CROSSING
RECEIVING DEPARTMENT
WINDSOR CT 06095

Assay Laboratory
Scott Specialty Gases
2330 Hamilton Blvd
South Plainfield NJ 07080

Purchase order 120pSO2/280CO/N2E
Scott Project #0741303

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay and Certification of Gaseous Calibration Standards -Procedure G1 September 1993

Cylinder Number ALM063760 **Certification Date** 01-18-1996 **Expiration Date** 1-18-1998
Cylinder Pressure 2000psig

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
(CARBON MONOXIDE)	278ppm	+/-1%NIST Directly Traceable
(SULFUR DIOXIDE)	123ppm	+/-1%NIST Directly Traceable
(Nitrogen cas7727379)	Balance	

*Do not use when cylinder Pressure is below 150 psig
*Analytical accuracy is inclusive of usual known error sources which at least includes precision of the measurement processes

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
CRM2636	08/12/96	ALM034179	244.2 ppmCO in N2
NTRM1694	05/11/97	ALM040185	94.4 ppmSO2 in N2

INSTRUMENTATION

Instrument/Model/Serial#		Date Last Calibrated	Analytical Principle
CO:NICOLET/8220AAB9400258	-	12/26/1995	FTIR
SO2:NICOLET/8220AAB9400258	-	01-18-1996	FTIR

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
CARBON MONOXIDE	Date: 01-10-1996 Response units: ppm Z1=0 R1= 244.2 T1=278 R2= 244.2 Z2=0 T2=278 Z3=0 T3=278 R3= 244.2 Ave. Conc. of Cust. Cyl.= 278	Date: 01-18-1996 Response units: ppm Z1=0 R1= 244.2 T1=278 R2= 244.2 Z2=0 T2=278 Z3=0 T3=278 R3= 244.2 Ave. Conc. of Cust. Cyl.= 278	Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=0.9999999 Constants: A= -7.8316E-03 B=1.0783E-04 C= D= E=
SULFUR DIOXIDE	Date: 01-10-1996 Response units: ppm Z1=0 R1= 94.4 T1=122 R2= 94.4 Z2=0 T2=122 Z3=0 T3=122 R3= 94.4 Ave. Conc. of Cust. Cyl.= 122	Date: 01-18-1996 Response units: ppm Z1=0 R1= 94.4 T1=123 R2= 94.4 Z2=0 T2=123 Z3=0 T3=123 R3= 94.4 Ave. Conc. of Cust. Cyl.= 123	Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=1 Constants: A= 1.46931E-1 B=9.36614E-1 C= 4.07252E-5 D= E=

Special Notes

Analyst Tom Delong

Scott Specialty Gases

2330 HAMILTON BOULEVARD SOUTH PLAINFIELD NJ 07080 (908)754-7700 FAX:(908)754-7303

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS CERTIFICATION

Customer	Assay Laboratory	
TRC ENVIRONMENTAL	Scott Specialty Gases	Purchase order 28500
5 Waterside Crossing	2330 Hamilton Blvd	Scott Project #0743885
Receiving Department	South Plainfield NJ 07080	
Windsor CT 06095		
Attn: RAY POTTER		

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay and Certification of Gaseous Calibration Standards -Procedure G1 September 1993

Cylinder Number ALM026170 **Certification Date** 03-22-1996 **Expiration Date** 3-22-1999
Cylinder Pressure 2000psig

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
(CARBON DIOXIDE)	10.2%	+/-1%NIST Directly Traceable
(OXYGEN)	10.2%	+/-NIST Directly Traceable
(Nitrogen cas7727379)	Balance	

*Do not use when cylinder Pressure is below 150 psig
*Analytical accuracy is inclusive of usual known error sources which at least includes precision of the measurement processes

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
NTRM18C00	12/21/96	ALM047422	17.95 %CO2 in N2
CRM2658	11/23/96	ALM032048	9.68 %O2 in N2

INSTRUMENTATION

Instrument/Model/Serial#		Date Last Calibrated	Analytical Principle
CO2:HORIBA/AIA-23/5657161705	-	03/11/1996	NDIR
O2:HORIBA/MPA-21A/8506581308	-	03/11/1996	Paramagnetic

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
CARBON DIOXIDE	Date: 03-22-1996 Response units: % Z1=0 R1=17.95 T1=10.2 R2=17.95 Z2=0 T2=10.2 Z3=0 T3=10.1 R3=17.95 Ave. Conc. of Cust. Cyl.= 10.2		Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=0.9999919 Constants: A=-3.7268E-02 B=5.7325E-05 C= D= E=
OXYGEN	Date: 03-22-1996 Response units: % Z1=0 R1=9.68 T1=10.2 R2=9.68 Z2=0 T2=10.2 Z3=0 T3=10.2 R3=9.68 Ave. Conc. of Cust. Cyl.= 10.2		Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=0.9999944 Constants: A=-2.8496E-02 B=1.7674E-05 C= D= E=

Special Notes

Analyst John O'Shea

Scott Specialty Gases, Inc.
2330 HAMILTON BOULEVARD SOUTH PLAINFIELD NJ 07080 (908)754-7700 FAX:(908)754-7303

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
TRC ENVIRONMENTAL
Boott Mills South
Foot of John Street
Lowell MA 01852
Attn.: CAREN O'BRIEN

Assay Laboratory
Scott Specialty Gases
2330 Hamilton Blvd
South Plainfield NJ 07080

Purchase order to3527
Scott Project #0730155

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay and Certification of Gaseous Calibration Standards -Procedure 1 September 1993

Cylinder Number ALM027466 **Certification Date** 10-03-1994 **Expiration Date**10-03-1997
Cylinder Pressure 2000psig

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
(CARBON DIOXIDE)	19.8%	+/-1%NIST Directly Traceable
(OXYGEN)	22.3%	+/-NIST Directly Traceable
(Nitrogen cas7727379)	Balance	

*Do not use when cylinder Pressure is below 150 psig
*Analytical accuracy is inclusive of usual known error sources which at least includes precision of the measurement processes

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
SRM2745	10/30/97	SX20316	15.8 %CO2 in N2
CRM2659	10/31/94	ALM017576	20.6 %O2 in N2

INSTRUMENTATION

Instrument/Model/Serial#	Date Last Calibrated	Analytical Principle
CO2;Varian-3700-31608928	09/06/1994	GC TCD
O2;Varian-3700-31608928	09/06/1994	GC TCD

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
CARBON DIOXIDE	Date: 10-03-1994 Response units: % Z1=0 R1= 15.8 T1=19.9 R2= 15.8 Z2=0 T2=19.8 Z3=0 T3=19.8 R3= 15.8 Ave. Conc. of Cust. Cyl.= 19.8		Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=0.9999919 Constants: A= -3.7268E-02 B=5.7325E-05 C= D= E=
OXYGEN	Date: 10-03-1994 Response units: % Z1=0 R1= 20.6 T1=22.3 R2= 20.6 Z2=0 T2=22.2 Z3=0 T3=22.3 R3= 20.6 Ave. Conc. of Cust. Cyl.= 22.3		Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=0.9999944 Constants: A= -2.8496E-02 B=1.7674E-05 C= D= E=

Special Notes

Analyst Adela Sy

Scott Specialty Gases
2330 HAMILTON BOULEVARD SOUTH PLAINFIELD NJ 07080 (908)754-7700 FAX:(908)754-7303

CERTIFICATE OF ANALYSIS:Interference-Free Multi-Component EPA Protocol GAS

Customer
TRC ENVIRONMENTAL
Boot Mills South
Foot of John Street
Lowell MA 01852
Attn.: CAREN O'BRIEN

Assay Laboratory
Scott Specialty Gases
2330 Hamilton Blvd
South Plainfield NJ 07080

Purchase order L27131
Scott Project #0736708

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay and Certification of Gaseous Calibration Standards -Procedure G1 September 1993

Cylinder Number ALM043688 | **Certification Date** 07-31-1995 | **Expiration Date** 7-31-1997
Cylinder Pressure 2000psig

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
(NITRIC OXIDE)	180ppm	+/-1%NIST Directly Traceable
(Nitrogen cas7727379)	Balance	
Total Oxides of Nitrogen	180ppm	Reference Value Only

*Do not use when cylinder Pressure is below 150 psig
*Analytical accuracy is inclusive of usual known error sources which at least includes precision of the measurement processes

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
NTRM1685	08/04/96	ALM036278	245 ppmNO in N2

INSTRUMENTATION

Instrument/Model/Serial#	Date Last Calibrated	Analytical Principle
NO;TECO/10S/25404 225	07/10/1995	CHEMILUMINESCENCE

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
NITRIC OXIDE	Date: 07-20-1995 Response units: ppm Z1=0 R1= 245 T1=180 R2= 245 Z2=0 T2=180 Z3=0 T3=180 R3= 245 Ave. Conc. of Cust. Cyl.= 180	Date: 07-31-1995 Response units: ppm Z1=0 R1= 245 T1=181 R2= 245 Z2=0 T2=180 Z3=0 T3=180 R3 245 Ave. Conc. of Cust. Cyl.= 180	Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=0.99999 Constants: A= 4.315567E-02 B=0.4599E+00 C= D= E=

Special Notes

Analyst Steven Yu

Scott Specialty Gases
2330 HAMILTON BOULEVARD SOUTH PLAINFIELD NJ 07080 (908)754-7700 FAX:(908)754-7303

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
TRC ENVIRONMENTAL
Boott Mills South
Foot of John Street
Lowell MA 01852
Attn.: CAREN O'BRIEN

Assay Laboratory
Scott Specialty Gases
2330 Hamilton Blvd
South Plainfield NJ 07080

Purchase order T03890
Scott Project #0734034

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay and Certification of Gaseous Calibration Standards -Procedure G1 September 1993

Cylinder Number ALM 009773
Cylinder Pressure 2000psig
Certification Date 04-24-1995
Expiration Date 4-24-1997

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
(NITRIC OXIDE)	255ppm	+/-1%NIST Directly Traceable
(Nitrogen cas7727379)	Balance	
Total Oxides of Nitrogen	255ppm	Reference Value Only

*Do not use when cylinder Pressure is below 150 psig
*Analytical accuracy is inclusive of usual known error sources which at least includes precision of the measurement processes

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
NTRM1685	08/04/96	ALM036278	245 ppmNO in N2

INSTRUMENTATION

Instrument/Model/Serial#	Date Last Calibrated	Analytical Principle
NO:TECO/10S/26404 225	04/01/1995	CHEMILUMINESCENCE

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
NITRIC OXIDE	Date: 04-14-1995 Response units: ppm Z1=0 R1= 245 T1=255 R2= 245 Z2=0 T2=255 Z3=0 T3=255 R3= 245 Ave. Conc. of Cust. Cyl. = 255	Date: 04-24-1995 Response units: ppm Z1=0 R1= 245 T1=254 R2= 245 Z2=0 T2=254 Z3=0 T3=254 R3= 245 Ave. Conc. of Cust. Cyl. = 254	Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=0.99999 Constants: A= 4.315567E-02 B=0.4599E+00 C= D= E=

Special Notes

Analyst Adela Sy

Scott Specialty Gases
2330 HAMILTON BOULEVARD SOUTH PLAINFIELD NJ 07080 (908)754-7700 FAX:(908)754-7303

CERTIFICATE OF ANALYSIS:Interference-Free Multi-Component EPA Protocol GAS

Customer
TRC ENVIRONMENTAL
Boot Mills South
Foot of John Street
Lowell MA 01852
Attn.: CAREN O'BRIEN

Assay Laboratory
Scott Specialty Gases
2330 Hamilton Blvd
South Plainfield NJ 07080

Purchase order 28097
Scott Project #0740266

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay and Certification of Gaseous Calibration Standards -Procedure G1 September 1993

Cylinder Number ALM021721
Cylinder Pressure 2000psig
Certification Date 11-27-1995
Expiration Date11-27-1997

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
(CARBON MONOXIDE)	62.0ppm	+/-1%NIST Directly Traceable
(SULFUR DIOXIDE)	84.6ppm	+/-1%NIST Directly Traceable
(Nitrogen cas7727379)	Balance	

*Do not use when cylinder Pressure is below 150 psig
*Analytical accuracy is inclusive of usual known error sources which at least includes precision of the measurement processes

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
NTRM1679	08/11/96	ALM041538	97.1 ppmCO in N2
NTRM1694	05/11/97	ALM040185	94.4 ppmSO2 in N2

INSTRUMENTATION

Instrument/Model/Serial#		Date Last Calibrated	Analytical Principle
CO:NICOLET /8220AAB9400258	-	10/27/1995	FTIR
SO2:NICOLET/8220AAB940058	-	12-01-1995	FTIR

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
CARBON MONOXIDE	Date: 11-20-1995 Response units: ppm Z1=0 R1= 97.1 T1=62.0 R2= 97.1 Z2=0 T2=62.0 Z3=0 T3=62.0 R3= 97.1 Ave. Conc. of Cust. Cyl.= 62	Date: 11-27-1995 Response units: ppm Z1=0 R1= 97.1 T1=62.0 R2= 97.1 Z2=0 T2=62.0 Z3=0 T3=62.0 R3= 97.1 Ave. Conc. of Cust. Cyl.= 62	Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=0.9999999 Constants: A= -7.8316E-03 B=1.0783E-04 C= D= E=
SULFUR DIOXIDE	Date: 11-20-1995 Response units: ppm Z1=0 R1= 94.4 T1=84.4 R2= 94.4 Z2=0 T2=84.5 Z3=0 T3=84.5 R3= 94.4 Ave. Conc. of Cust. Cyl.= 84.5	Date: 11-27-1995 Response units: ppm Z1=0 R1= 94.4 T1=84.7 R2= 94.4 Z2=0 T2=84.8 Z3=0 T3=84.6 R3= 94.4 Ave. Conc. of Cust. Cyl.= 84.7	Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=1 Constants: A= 1.46931E-1 B=9.36614E-1 C= 4.07252E-5 D= E=

Special Notes

Analyst Tom Delong

METHOD 5 DRY GAS METER CALIBRATION

Calibrated By: Brian Kelly

Barometric Pressure, Pb = 29.81 in. Hg

Date: 4/3/96

Meter Box No.: 8138

Orifice Manometer Setting delta H in. H_2O	Gas Volume wet test meter Vw, ft^3	Gas Volume dry test meter Vd, ft^3	Temperature				Time T min.	Y	delta H @	Deviation	
			Wet Test Meter tw, °F	Dry gas meter							
				Inlet tdi, °F	Outlet tdo, °F	Average tda, °F				Y	delta H @
0.5	5.810	5.990	65.0	74	79	76	15.0	0.990	1.812	0.006	0.044
1.0	8.130	8.410	65.0	86	81	83	15.0	0.998	1.845	0.002	0.011
2.0	11.280	11.680	65.0	90	83	87	15.0	1.000	1.910	0.004	0.054
						Average		0.996	1.856		

CALCULATIONS

Y	delta H @
$\frac{Vw * Pb * (tda + 460)}{Vd * (Pb + dH/13.6) * (tw + 460)}$	$\frac{0.0317 * dH}{Pb * (tdo + 460)} * \left[\frac{(tw + 460) * T}{Vw}\right]^2$

Y = Ratio of reading of wet test meter to dry gas meter;
Tolerance for individual value ± 0.02 from average

delta H @ = Orifice pressure differential that equates to 0.75 cfm of air at 68°F and 29.92 inches of mercury, in. H2O;
Tolerance for individual values ± 0.20 from average

METER BOX CALIBRATION WORKSHEET

Time Minutes	Inlet Temp.	Outlet Temp.	Meter Box Ser. #	Date
			8138	4/3/96
0	81	78	DGM Serial #	BAR Press (PB) 29.81
2	81	78	ΔH (.5) 1.0 2.0	Calibrated by B. Kelly
4	83	79		
6	83	79	Final DGM 410.239	Final WTM 6402.13
8	83	79	Initial DGM 404.250	Initial WTM 6396.32
10	83	79	Net DGM 5.99	Net WTM 5.81
12	84	80		
14	84	80	Vac. in. HG.	Average DGM Temperature
15	84	80	3in	76.33
AVG	73.55	79.11	y = ——— =	
			ΔH = ——— [———]^2 =	
		Wet Test Meter Temperature	65	
		Total Time, minutes; seconds	(15.0)	

METER BOX CALIBRATION WORKSHEET

Time Minutes	Inlet Temp.	Outlet Temp.	Meter Box Ser. # 8138	Date 4/3/96
0	85	80	DGM Serial #	BAR Press (PB) 29.81
2	85	80	ΔH .5 (1.0) 2.0	Calibrated by B.Hilly
4	86	81		
6	86	81	Final DGM 421.141	Final WTM 6412.68
8	86	81	Initial DGM 412.~~315~~ 735	Initial WTM 6404.55
10	86	81	Net DGM 8.41	Net WTM 8.13
12	87	81		
14	87	81	Vac. in. HG. 3.L	Average DGM Temperature 83.44
15	87	81		
AVG	86.1	80.7	y = ——— =	
			ΔH = ——— [———]^2 =	
		Wet Test Meter Temperature 65		
		Total Time, minutes; seconds (15.0)		

METER BOX CALIBRATION WORKSHEET

Time Minutes	Inlet Temp.	Outlet Temp.	Meter Box Ser. # 8138	Date 4/3/96
0	88	82	DGM Serial #	BAR Press (PB) 29.81
2	90	82	ΔH .5 1.0 (2.0)	Calibrated by B. Kelly
4	90	82		
6	91	83	Final DGM 434.063	Final WTM 6425.17
8	91	83	Initial DGM 422.384	Initial WTM 6413.89
10	91	83	Net DGM 11.68	Net WTM 11.28
12	91	83		
14	91	83	Vac. in. HG. 3	Average DGM Temperature 86.55
15	91	83		
AVG	90.44	82.66	y = ——— =	
			ΔH = ——— [———]^2 =	
			Wet Test Meter Temperature 65	
			Total Time, minutes; seconds (15.0)	

Thermocouple Calibration Form

Box # 8138

Thermocouple Number	Temperature Reading 1	Reference Temperature 1	Temperature Reading 2	Reference Temperature 2	Temperature Reading 3	Reference Temperature 3
1	202	200	500	500	701	700
2	201	200	500	500	701	700
3	201	200	500	500	701	700
4	201	200	500	500	701	700
5	201	200	500	500	701	700
1	51	50	75	75	100	100
2	50	50	75	75	99	100
3	50	50	75	75	99	100
4	50	50	74	75	100	100
5	50	50	74	75	99	100

Signature of Person Performing Calibration

10/16/95

Calibration Date

AF-018

TRC

METHOD 5 DRY GAS METER CALIBRATION

Calibrated By: Scott James

Barometric Pressure, Pb = 30.42 in. Hg

Date: 5/9/96

Meter Box No.: 8138

Orifice Manometer Setting delta H in. H_2O	Gas Volume wet test meter Vw, ft^3	Gas Volume dry test meter Vd, ft^3	Temperature				Time T min.	Y	delta H @	Deviation	
			Wet Test Meter tw, °F	Dry gas meter							
				Inlet tdi, °F	Outlet tdo, °F	Average tda, °F				Y	delta H @
0.5	5.840	5.974	71.0	86	80	83	15.0	0.999	1.793	0.001	0.063
1.0	8.120	8.333	72.0	88	84	86	15.0	0.997	1.851	0.001	0.005
2.0	11.250	11.567	72.0	92	85	89	15.0	0.998	1.923	0.000	0.067
						Average		0.998	1.856		

CALCULATIONS

Y	delta H @
$\frac{Vw * Pb * (tda + 460)}{Vd * (Pb + dH/13.6) * (tw + 460)}$	$\frac{0.0317 * dH}{Pb * (tdo + 460)} * [\frac{(tw + 460) * T}{Vw}$

Y = Ratio of reading of wet test meter to dry gas meter;
Tolerance for individual value ± 0.02 from average

delta H @ = Orifice pressure differential that equates to 0.75 cfm of air at 68°F and 29.92 inches of mercury, in. H2O;
Tolerance for individual values ± 0.20 from average

METER BOX CALIBRATION WORKSHEET

Time Minutes	Inlet Temp.	Outlet Temp.	Meter Box Ser #	Date
			8138	5/9/96
0	84	78	DGM Serial # 8138	BAR Press (PB) 30.42
2	85	79	ΔH (.5) 1.0 2.0	Calibrated by S. J
4	85	79		
6	86	80	Final DGM 238.876	Final WTM 6596.36
8	87	81	Initial DGM 232.902	Initial WTM 6590.52
10	87	81	Net DGM 5.974	Net WTM 5.84
12	86	82		
14	86	82	Vac. in. HG. 2.0	Average DGM Temperature 83.1
15	86	82		
Ave =	85.8	80.4		
			y = ——— =	
			ΔH = ——— [———]^2 =	
			Wet Test Meter Temperature	71°
			Total Time, minutes; seconds	15.0

Calculations

Y	ΔHθ
$\frac{V_w \; P_b \; (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	$\frac{0.0317 \; \Delta H}{P_b(t_d + 460)} \left[\frac{(t_w + 460)\,\theta}{V_w}\right]^2$

AF-014/A

TRC

METER BOX CALIBRATION WORKSHEET

Time Minutes	Inlet Temp.	Outlet Temp.	Meter Box Ser # 8138	Date 5/9/96
0	87	83	DGM Serial # 8138	BAR Press (PB) 30.42
2	87	83	ΔH .5 (1.0) 2.0	Calibrated by S. J
4	87	83		
6	88	83	Final DGM 250.303	Final WTM 6617.51
8	88	84	Initial DGM 241.970	Initial WTM 6609.39
10	88	84	Net DGM 8.333	Net WTM 8.12
12	89	84		
14	89	84	Vac. in. HG. 2.0	Average DGM Temperature 85.8
15	89	84		
Ave =	88	83.6	y = ——— =	
			ΔH = ——— [———]^2 =	
		Wet Test Meter Temperature		72°
		Total Time, minutes; seconds		15.0

Calculations

Y	ΔHϑ
$\frac{V_w \; P_b \; (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	$\frac{0.0317 \; \Delta H}{P_b(t_d + 460)} \left[\frac{(t_w + 460)\,\theta}{V_w}\right]^2$

AF-014/A

TRC

METER BOX CALIBRATION WORKSHEET

Time Minutes	Inlet Temp.	Outlet Temp.	Meter Box Ser #	Date
			8138	5/9/96
0	89	84	DGM Serial # 8138	BAR Press (PB) 30.42
2	92	86	Δ H .5 1.0 (2.0)	Calibrated by S. J
4	92	85		
6	92	85	Final DGM 263.710	Final WTM 6620.55
8	92	85	Initial DGM 252.143	Initial WTM 6609.30
10	93	85	Net DGM 11.567	Net WTM 11.25
12	93	85		
14	93	86	Vac. in. HG. 2.0	Average DGM Temperature 88.65
15	93	86		
Ave =	92.1	85.2	y = ——— =	
			ΔH = ——— [———]^2 =	
			Wet Test Meter Temperature	72°
			Total Time, minutes; seconds	15.0

Calculations

Y	ΔHθ
$\frac{V_w \; P_b \; (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right) (t_w + 460)}$	$\frac{0.0317 \; \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\,\theta}{V_w}\right]^2$

AF-014/A

TRC

Meter box 8138

Thermocouple Number	Temperature Reading 1	Reference Temperature 1	Temperature Reading 2	Reference Temperature 2	Temperature Reading 3	Reference Temperature 3		
#1	33°	32.0°F	253°	250°F	551°F	550°F	1502°F	1500
	33°		253°		551°		1501°F	
	32°		252°		551°		1501°	
Ave =	33°F		253°F		551°F		1501°F	
#2	33°	32.0°F	253°	250.0°F	551°	550°F	1501°	1500
	33°		253°		551°		1501°	
	33°		252°		551°		1501°	
Ave =	33°F		253°F		551°F		1501°F	
#3	34°	32.0°F	253°	250°F	551°	550°F	1501°	1500°
	33°		253°		551°		1501°	
	34°		252°		561°		1501°	
Ave =	34°		253°		551°		1501°	
#4	34°	32.0°F	253°	250°F	551°	550°F	1501°	1500°
	33°		252°		551°		1501°	
	33°		253°		551°		1501°	
Ave =	33°		253°		551°		1501°	

Scott

Signature of Person Performing Calibration

5/9/96

Calibration Date

TRC

Meterbox 8138

Thermocouple Number	Temperature Reading 1	Reference Temperature 1	Temperature Reading 2	Reference Temperature 2	Temperature Reading 3	Reference Temperature 3		
#5	33°	32°F	253°	250°F	551°	550°F	1501°	150
	33°		253°		551°		1501°	
	34°		253°		551°		1501°	
Ave =	33°		253°		551°		1501°	

Signature of Person Performing Calibration

5/9/96
Calibration Date

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APPENDIX F

FACILITY PROCESS DATA

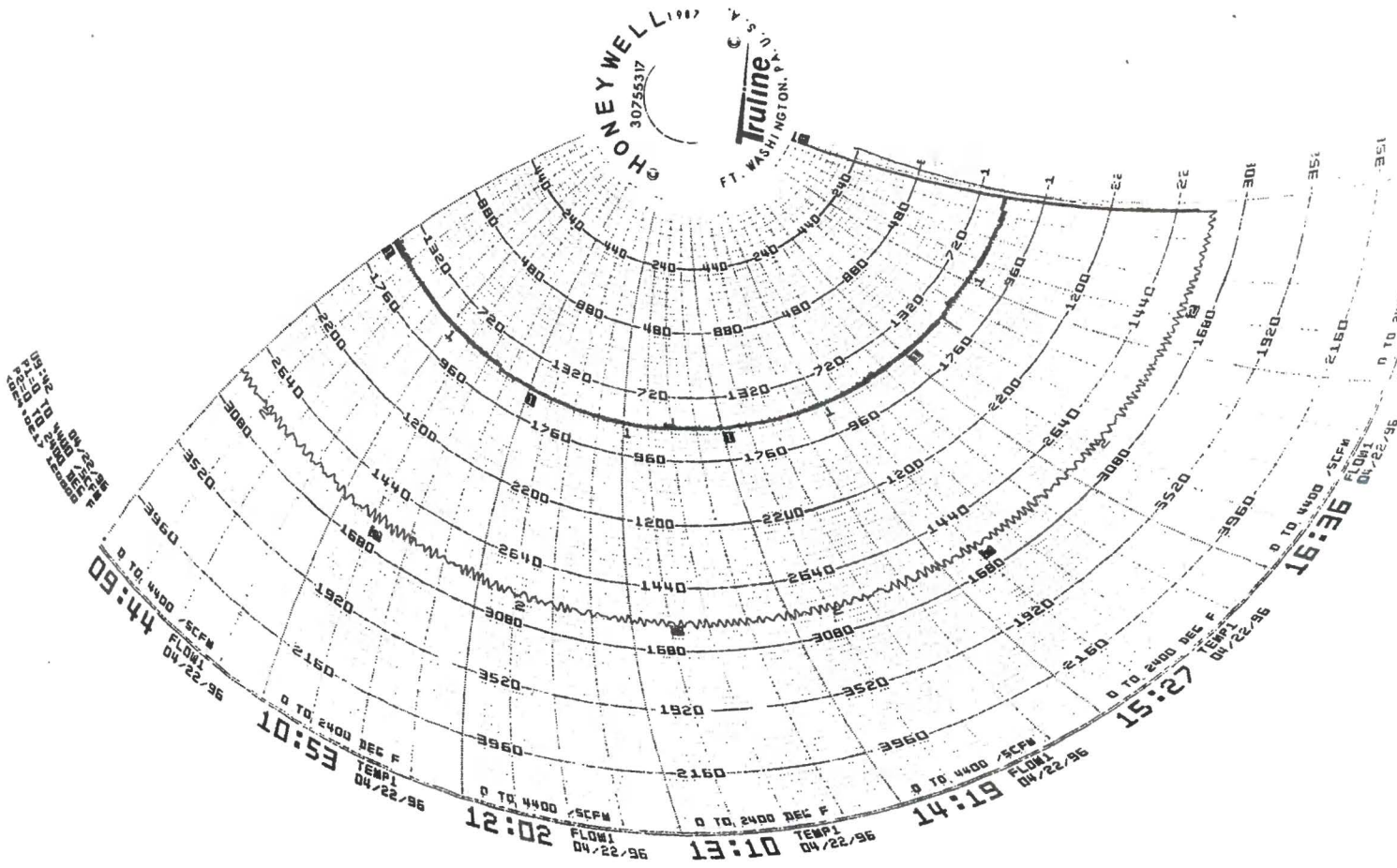
Low Temp

1— 11:50 – 13:29

2ND – 14:30 – 16:20

3RD – 17:25 : 18:49

4-22-96

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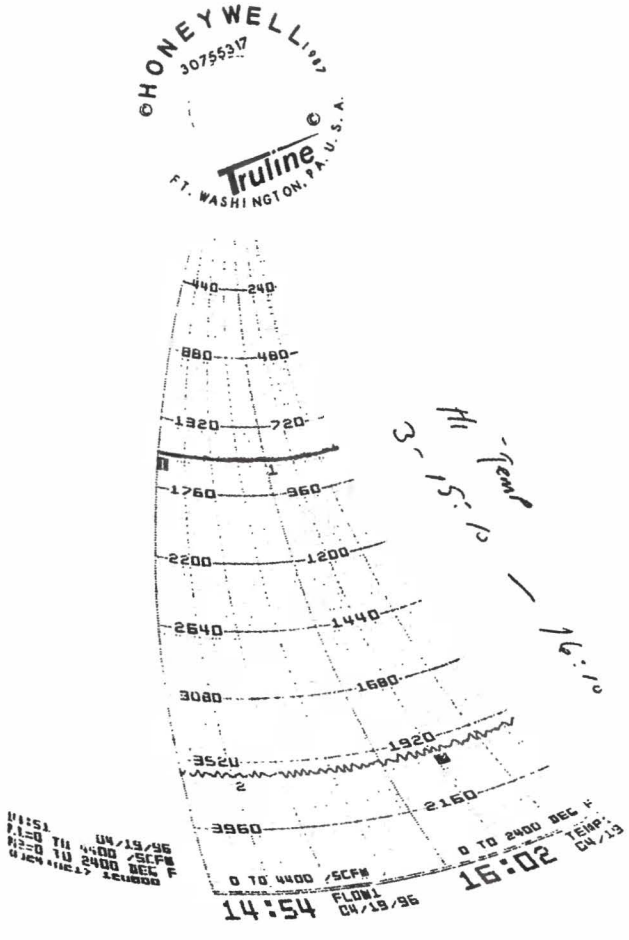
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