MASTER

Annual Report

Volume III

Continued

**ENVIRONMENTAL BASELINE MONITORING IN THE AREA OF GENERAL CRUDE OIL--
DEPARTMENT OF ENERGY PLEASANT BAYOU NUMBER 1--
A GEOPRESSURED-GEOTHERMAL TEST WELL--1978**

by

Thomas C. Gustavson

**APPENDIX II:
AIR QUALITY MONITORING
RADIAN CORPORATION
AUSTIN, TEXAS**

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**Bureau of Economic Geology
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W. L. Fisher, Director**

1979

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RADIAN

CORPORATION

DCN 78-100-212-06

AIR MONITORING REPORT
FOR
THE UNIVERSITY OF TEXAS
BUREAU OF ECONOMIC GEOLOGY
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Presented to:
Dr. Tom Gustavson
Land Resources Laboratory
Bureau of Economic Geology
Box X
University of Texas at Austin
Austin, Texas 78712

Prepared by:
Radian Staff

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I. GENERAL DESCRIPTION OF AIR MONITORING PROGRAM

Radian Corporation is under contract to the University of Texas, Bureau of Economic Geology, to provide ambient air quality monitoring at one site near Chocolate Bayou, Texas. This site measures and records concentrations for sulfur dioxide, hydrogen sulfide, methane, and particulates. A bag sample is collected bi-weekly and returned to Radian's Austin facilities and analyzed for methane.

Figure I shows the configuration of this type of monitoring station. The trailer provides a sturdy and protective covering as well as mobility. Figure II shows the air monitoring site.

FIGURE I

AMBIENT AIR MONITORING SYSTEM I

FIGURE II
AIR MONITORING SITE

II. DESCRIPTION OF INSTRUMENT SYSTEMS

The ambient air monitoring station is equipped to monitor the parameters shown below:

Sulfur Dioxide
Particulates,
Methane
Hydrogen Sulfide

A. Air Quality Instrumentation

1. Description

Sulfur dioxide is measured with a Meloy Model SA185-2A sulfur analyzer, which is an EPA-approved analyzer. This automated analyzer utilizes the flame photometric principle to measure sulfur levels with a minimum detectable sensitivity of 5 ppb, and a linearity of $\pm 1\%$. The analyzer is operated with an H_2S scrubber to make it specific to SO_2 concentrations.

Hydrogen sulfide is measured using a Meloy Model SA185-2 analyzer equipped with an SO_x scrubber. Specifications for this analyzer are the same as for the SA185-2A.

Methane is monitored with a Bendix Model 8200 gas chromatograph. This instrument uses a flame ionization detector and has a minimum detectable sensitivity of 5 ppb. The Model 8200 works on a five-minute cycle, i.e., one air sample is analyzed every five minutes.

The air sample is drawn in through a glass cane and manifold supplied by the Ace Glass Company. The system has a 25 mm diameter, and a constant air flow through the system is

provided by an air pump rated at 60 cfm at 0" head pressure. The manifold has sampling ports to which $\frac{1}{4}$ " Teflon lines to the instruments are connected. All joints in the sampling system are secured by O-ring compression fittings. The manifold is contained in a heated (100°F) chamber to prevent condensation of moisture.

The trailer has two heavy duty high volume particulate samplers (Hi-Vols). Fiberglass filter paper is brought to a controlled humidity before weighing. Each Hi-Vol has a flow recorder to permit correction for changes in air flow runs for a 24-hour period (midnight to midnight), and is turned on and off by the computer. The Hi-Vols were designed following guidelines recommended by the Environmental Protection Agency and were manufactured by Radian.

2. Calibration

The trailer contains a Meloy Model RAD-1 calibration unit. This unit provides a zero air supply and SO₂ span gas from an SO₂ permeation tube. The calibration is automatically performed once a day, and is controlled by the computer. The SO₂ channel is first switched to zero. Then the computer monitors the output of each analyzer and takes a new zero reading after a stable zero signal has been reached. This zero reading is compared by the computer to the zero reading obtained 24 hours before, and if a drift in excess of 10 ppb has occurred, an excess zero drift light on the System Status Panel is turned on. The instruments are then returned to the monitor mode, and after two minutes the computer resumes data taking.

The SO₂ permeation tubes were manufactured by Metronics Association, Inc. These tubes were then individually calibrated for Radian by the National Bureau of Standards.

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The Model 8200 methane analyzer is calibrated with undiluted span gas. This span gas contains methane in air. The Model 8200 is zeroed with air from a Bendix Model 8834 zero air unit. In addition, the instrument is electronically re-zeroed at the start of every five-minute cycle.

In addition to the daily instrument zero/spans, all instruments are multipoint calibrated monthly. Calibration standards and equipment used in the monthly multipoints is distinct from the equipment used for daily zero/span operations.

Quality assurance audits are performed on each instrument once a quarter. These audits are performed by Radian's Quality Assurance personnel using instrumentation and standards different from those used in the monthly multipoint calibrations.

A General Metals Calibration Kit is used to calibrate the Hi-Vol particulate samplers.

B. Data Acquisition System

The basis of the data acquisition system is a Data General NOVA 1200 minicomputer. The NOVA, which has a basic cycle time of 1.2 μ sec, is equipped with automatic program load and power fail/automatic restart features. The computer utilizes 8K 16-bit words of core memory. Analog-to-digital conversion is accomplished via an ADC built by Radian Corporation. The input/output unit for system 034 is Texas Instruments' KSR 733 keyboard/printer. This model provides keyboard entry and hard copy printed output. The data are also recorded on a cassette magnetic tape unit with three drives. The cassette unit is utilized for program storage and loading as well as recording. To reduce wear on mechanical parts, the power to the teletype and cassette units is turned on only when the

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unit(s) is to be used. Several important functions in the instruments as well as in the computer and the trailer are monitored by means of lights on a System Status Panel. The information displayed by these lights is written onto cassette tape to monitor the complete status of the system every five minutes.

III. BAG SAMPLING PROGRAM

Grab-bag samples are collected bi-weekly and analyzed for methane. The ambient air samples are collected in tedlar bags using a metal bellows pump connected to the ambient sample manifold. Each bag sample is collected over a three-hour period.

The bag samples are returned to Austin for analysis for methane concentration. The analysis is performed on either a Bendix 8202 or a Baseline Industries Model 1030 gas chromatograph using a flame ionization detector. The minimum detectable limit using this technique is less than 1 ppm.

Results of the bag sampling analyses are given below:

<u>Date</u>	<u>Time</u>	<u>Methane Concentration (ppm)</u>
8/1/78	1500-1800	1.57
8/14/78	1400-1700	1.58

IV. OPERATING TIME ANALYSIS

This section presents the operating statistics for each of the major subsystems contained in the monitoring station. Table I shows the specific number of hours that each of these subsystems was inoperative for the month. The column labeled "DIGITIZING SYSTEM" refers to the entire data acquisition system, and downtime hours appearing in this column are hours of total data loss. These instances include, in addition to computer downtime, power failures, no power available, and self-automated shutdown periods such as during air conditioner malfunctions.

Calibration time is not considered to be downtime and is not included in the downtime figures. The amount of time used in calibrating the instruments is given at the bottom of the downtime analysis table and is reported as total calibration hours for each channel for the entire month. As is evident in the calibration figures, channels can be calibrated independently of one another. No calibration time is given for particulate monitoring since Hi-Vol calibration occurs infrequently and only during the off-duty cycle for each Hi-Vol while another Hi-Vol is taking data.

TABLE I.
DOWNTIME HOURS FOR CHOCOLATE BAYOU

SITE 033

DIGITIZING

DATE	SYSTEM	S02	H2S	VOLT	CH4	PART
8/ 1/78	0.	0.	0.	0.	0.	0.
8/ 2/78	0.	0.	0.	0.	0.	24.
8/ 3/78	21.	0.	0.	0.	0.	24.
8/ 4/78	9.	0.	0.	0.	0.	24.
8/ 5/78	0.	0.	0.	0.	0.	0.
8/ 6/78	0.	0.	0.	0.	0.	24.
8/ 7/78	2.	0.	0.	0.	0.	24.
8/ 8/78	0.	0.	0.	0.	0.	0.
8/ 9/78	0.	0.	0.	0.	0.	24.
8/10/78	0.	0.	0.	0.	0.	24.
8/11/78	0.	1.	1.	0.	0.	24.
8/12/78	0.	0.	0.	0.	0.	24.
8/13/78	0.	0.	0.	0.	0.	24.
8/14/78	0.	0.	0.	0.	0.	24.
8/15/78	0.	0.	0.	0.	0.	0.
8/16/78	8.	0.	0.	0.	0.	24.
8/17/78	0.	0.	0.	0.	0.	0.
8/18/78	0.	0.	0.	0.	0.	24.
8/19/78	0.	0.	0.	0.	0.	24.
8/20/78	0.	0.	0.	0.	0.	24.
8/21/78	3.	0.	0.	0.	0.	24.
8/22/78	0.	0.	0.	0.	0.	0.
8/23/78	0.	0.	0.	0.	0.	24.
8/24/78	0.	7.	7.	0.	0.	24.
8/25/78	0.	0.	11.	0.	0.	24.
8/26/78	0.	0.	0.	0.	0.	24.
8/27/78	0.	0.	0.	0.	0.	24.
8/28/78	0.	0.	0.	0.	0.	0.
8/29/78	9.	0.	0.	0.	0.	24.
8/30/78	13.	0.	0.	0.	0.	24.
8/31/78	0.	0.	0.	0.	0.	0.
CAL TIME		14.	14.	0.	25.	

V. DATA PRESENTATION AND SUMMARY

This section includes summaries for various recorded data at the monitoring sites. The data presentations indicate the variability of pollutant concentrations and parameters with time. All parameters, except suspended particulates (24-hour samples), are sampled once each second, but recorded as five-minute arithmetic averages of the one-second samples. This averaging technique tends to smooth instantaneous maximum values.

Inherent in any data acquisition system is random noise, both from the recording instruments and quantization in the analog-to-digital conversion. The lower threshold for all analytical instruments is twice the maximum noise level generated by the instruments. This lower threshold is 5 ppb for all of these instruments. Therefore, any values appearing in the data presentations that are less than 5 ppb indicate only a trace of pollutant in question and should not be construed to be absolute levels. In addition, when concentration levels drop below the lower threshold, the recorded quantity is simply random noise and averages tend toward zero. If a zero concentration appears in the data presentation, this does not indicate absolute zero concentration.

All pollutant data (except for particulate data) are taken at the monitoring site in integer parts per billion (ppb) but are presented here in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) assuming standard temperature and pressure of 25°C and 760 mm Hg (1013.2 millibars), respectively. The scale factors required to convert $\mu\text{g}/\text{m}^3$ at standard conditions back to ppb for the various pollutants are given in the following table.

Pollutant

To Convert $\mu\text{g}/\text{m}^3$ at 25°C and
760 mm Hg to ppb Multiply by

SO_2	.384
H_2S	.723
CH_4	1.536

The units of the air quality parameters are given at the top of each table. It should be noted here that inside temperature is monitored and recorded as a functional part of the system but is not presented in this report.

It should be noted that the SO_x scrubber was installed on the H_2S analyzer on 16 August at 9:35. Data from that analyzer from 9:35 on that date are H_2S data. Prior to 16 August, the data represented total sulfur measurements.

Table II presents the national ambient air quality standards (NAAQS) for criteria pollutants.

Table III displays the monthly statistics for the monitoring station for the month. To insure statistical significance, and to reduce the possibility of introducing a bias in the presentation, averages are computed only when at least 50 percent of the samples are present. If less than the required samples are present for a particular parameter, that entry will be blank. The number of samples present for a particular parameter is defined as the total possible number of five-minute samples for the averaging time less the computer downtime less the channel downtime less the channel calibration time. The averages in Table III are arithmetic averages with the following exception:

- Particulate averages are computed as the geometric mean.

Table IV displays the daily averages. Again, 50 percent of the five-minute samples are required in order to compute an average. A blank entry indicates an insufficient number of five-minute samples present for that day. Particulate averages are computed the same way as described in Table III.

Table V presents the maximum daily five-minute averages retained in the data base as well as the times of occurrence. For each parameter, a five-minute maximum average is printed if any samples are present for that day. Therefore, the maximum five-minute average when a given channel has experienced considerable downtime or calibration time during the day in question may be misrepresentative of the maximum expected for that parameter on that day.

Table VI indicates the five largest averages for various averaging times. The table shows the period of time covered by the average. Maxima are chosen so that time segments are independent. The maximum averages reported are found using a 'sliding average' technique with the exception of the 24-hour particulate average, which is computed from midnight to midnight. For averaging times less than or equal to three hours, the sliding average is stepped one five-minute sample at a time. For longer averaging times, the step size is twelve samples or one hour. For averaging times less than or equal to one hour, 100 percent of the five-minute samples must be present to compute an average. Averaging times greater than one hour require 90 percent. Whether or not a sliding average is computed is solely determined by the number of samples present in that averaging time and is independent of daily or monthly averaging criteria.

Table VII demonstrates the diurnal variation of various recorded parameters. Hourly averages are determined by arithmetically averaging five-minute samples. For all parameters, a blank entry in the diurnal variation table indicates that less than half (i.e., less than 6) of the five-minute samples for that hour are present.

Times given in the data presentations correspond to the appropriate local times, i.e., Central Daylight Savings Time or Central Standard Time, depending on the time of the year.

TABLE II
NATIONAL AMBIENT AIR QUALITY STANDARDS

	<u>Primary</u>	<u>Secondary</u>
<u>Particulate</u>		
Annual G.M.**	75 $\mu\text{g}/\text{m}^3$	60 $\mu\text{g}/\text{m}^3$
24 Hr. Max.*	260	150
<u>Sulfur Oxides</u>		
Annual	80 (.03 ppm)	
24 Hr. Max.*	365 (.14 ppm)	
3 Hr. Max.*	--	1300 (.5 ppm)
<u>Oxidant</u>		
1 Hr. Max.*	160* (.08 ppm)	160
<u>Hydrocarbons</u>		
3 Hr. Max.*	160 (.24 ppm)	160
6-9 a.m.		
<u>Carbon Monoxide</u>		
$\mu\text{g}/\text{m}^3$		
Max. 8 Hrs.*	10000 (9 ppm)	10000
Max. 1 Hr.*	40000 (35 ppm)	40000
<u>Nitrogen Dioxide</u>		
Annual	100 (.05 ppm)	100

Units are micrograms per cubic meter and ppm in parentheses.

*Not to be exceeded more than once per year.

**Geometric Mean.

TABLE III
AVERAGES FOR AUGUST 1 THRU 31, 1978

TABLE III. AVERAGES FOR AUG 1 THRU 31 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

SULFUR DIOXIDE(SO₂)

HYDROGEN SULFIDE

METHANE

SITE 033
.3

033
.8

033
1015.2

PARTICULATE

SITE 033
35.43

TABLE IV
DAILY AVERAGES FOR AUGUST 1 THRU 31, 1978

TABLE IV. DAILY AVERAGES FOR AUG 1 THRU 31 1978
 (UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
 TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

DATE	SITE	SULFUR DIOXIDE(SO ₂)	HYDROGEN SULFIDE	METHANE
	033	033	033	
8/ 1	.2	.6	837.6	
8/ 2	.0	.0	890.9	
8/ 3				
8/ 4	1.5	.2	1053.3	
8/ 5	.0	1.9	1221.2	
8/ 6	.0	2.2	1175.4	
8/ 7	1.0	2.1	1295.5	
8/ 8	.0	.9	1232.0	
8/ 9	1.3	3.4	1285.1	
8/10	.1	.3	1119.7	
8/11	.1	.1	951.5	
8/12	.0	.0	889.1	
8/13	.0	.0	924.0	
8/14	.0	.0	890.3	
8/15	.0	.2	845.0	
8/16	.0	.0	834.6	
8/17	.0	.2	820.9	
8/18	.0	.1	829.5	
8/19	.0	.3	844.7	
8/20	.0	.4	982.8	
8/21	.0	.1	1007.9	
8/22	.0	.2	1045.0	
8/23	.0	.6	1054.2	
8/24	.1	1.3	1202.8	
8/25	5.2	2.0	994.2	
8/26	.1	.9	1081.9	
8/27	.0	.9	1134.4	
8/28	.0	.2	879.6	
8/29	.0	2.2	982.7	
8/30				
8/31	.1	.6	1091.9	

TABLE IV. DAILY AVERAGES FOR AUG 1 THRU 31 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

PARTICULATE

SITE 033

DATE

8/ 1	71.0
8/ 2	
8/ 3	
8/ 4	
8/ 5	82.0
8/ 6	
8/ 7	
8/ 8	62.0
8/ 9	
8/10	

8/11	
8/12	
8/13	
8/14	
8/15	41.0
8/16	
8/17	32.0
8/18	
8/19	
8/20	

8/21	
8/22	23.0
8/23	
8/24	
8/25	
8/26	
8/27	
8/28	19.0
8/29	
8/30	

8/31	12.0
------	------

TABLE V
MAXIMUM FIVE-MINUTE AVERAGES AND
TIMES OF OCCURRENCE FOR
AUGUST 1 THRU 31, 1978

CORPORATION

TABLE V. MAXIMUM FIVE MINUTE AVERAGES AND TIME OF OCCURRENCE FOR AUG 1 THRU 31 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

SULFUR DIOXIDE(SO2)

SITE 033

DATE

8/ 1	26.0(12:50)
8/ 2	.0(0:00)
8/ 3	.0(0:00)
8/ 4	2.6(9:30)
8/ 5	.0(0:00)
8/ 6	.0(0:00)
8/ 7	23.4(13:35)
8/ 8	2.6(0:10)
8/ 9	31.3(8:50)
8/10	2.6(13:15)

8/11	15.6(9:50)
8/12	.0(0:00)
8/13	.0(0:00)
8/14	.0(0:00)
8/15	.0(0:00)
8/16	.0(0:00)
8/17	.0(0:00)
8/18	.0(0:10)
8/19	.0(0:00)
8/20	.0(0:00)

8/21	2.6(15:15)
8/22	.0(0:00)
8/23	.0(0:00)
8/24	5.2(14:40)
8/25	20.8(0:05)
8/26	15.6(20:55)
8/27	.0(0:00)
8/28	.0(0:00)
8/29	.0(0:00)
8/30	2.6(12:35)

8/31	10.4(11:50)
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CORPORATION

TABLE V. MAXIMUM FIVE MINUTE AVERAGES AND TIME OF OCCURRENCE FOR AUG 1 THRU 31 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

HYDROGEN SULFIDE

SITE 033

DATE

8/ 1	67.8(12:50)
8/ 2	.0(0:00)
8/ 3	.0(0:00)
8/ 4	4.2(15:50)
8/ 5	9.7(10:45)
8/ 6	11.1(12:25)
8/ 7	15.2(13:35)
8/ 8	6.9(16:50)
8/ 9	18.0(8:50)
8/10	2.8(0:40)

8/11	26.3(9:50)
8/12	1.4(3:25)
8/13	.0(0:00)
8/14	1.4(3:35)
8/15	5.5(12:10)
8/16	.0(0:00)
8/17	4.2(13:45)
8/18	1.4(6:35)
8/19	1.4(0:25)
8/20	2.8(5:55)

8/21	1.4(0:05)
8/22	1.4(2:40)
8/23	2.8(13:25)
8/24	29.1(13:55)
8/25	4.2(12:55)
8/26	5.5(2:20)
8/27	5.5(3:35)
8/28	2.8(3:35)
8/29	4.2(3:25)
8/30	4.2(16:25)

8/31	15.2(13:45)
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CORPORATION

TABLE V. MAXIMUM FIVE MINUTE AVERAGES AND TIME OF OCCURRENCE FOR AUG 1 THRU 31 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

METHANE

SITE 033

DATE

8/ 1	992.5(0:00)
8/ 2	1005.5(23:40)
8/ 3	976.8(1:20)
8/ 4	2739.1(9:30)
8/ 5	2048.8(8:10)
8/ 6	2166.6(4:55)
8/ 7	2494.2(8:10)
8/ 8	3385.1(5:50)
8/ 9	2163.4(7:25)
8/10	1473.1(1:10)

8/11	1390.4(5:00)
8/12	1053.0(8:15)
8/13	1272.5(20:25)
8/14	1157.9(20:25)
8/15	931.9(22:40)
8/16	887.6(1:25)
8/17	951.4(18:15)
8/18	1034.2(4:45)
8/19	935.2(6:45)
8/20	1632.0(7:15)

8/21	1994.7(6:15)
8/22	1727.7(8:05)
8/23	2828.3(11:20)
8/24	3143.5(7:20)
8/25	1581.2(7:45)
8/26	2583.4(6:30)
8/27	2069.3(7:40)
8/28	1097.3(0:00)
8/29	1275.8(1:50)
8/30	1447.7(19:55)

8/31	2576.9(6:15)
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**TABLE VI
THE FIVE MAXIMUM INDEPENDENT
SLIDING AVERAGES FOR
AUGUST 1 THRU 31, 1978**

TABLE VI. THE FIVE MAXIMUM INDEPENDENT SLIDING AVERAGES FOR AUG 1-31 1978
UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METERSULFUR DIOXIDE
30-MINUTE

SITE	033	
1	8/ 9(8:35- 9:05)	25.2
2	8/ 7(13:20-13:50)	16.1
3	8/24(23:55- 0:25)	13.9
4	8/25(0:35- 1:05)	12.6
5	8/25(2:05- 2:35)	12.2

SULFUR DIOXIDE
3-HOUR

SITE	033	
1	8/25(0:00- 3:00)	12.2
2	8/25(4:10- 7:10)	10.9
3	8/25(7:20-10:20)	10.3
4	8/ 9(8:30-11:30)	8.7
5	8/ 7(11:35-14:35)	6.9

SULFUR DIOXIDE
24-HOUR

SITE	033	
1	8/24- 8/25(23:00)	5.5
2	8/ 8- 8/ 9(15:00)	1.3
3	8/ 7- 8/ 8(1:00)	1.0
4	8/ 4- 8/ 5(9:00)	.9
5	8/ 1- 8/ 2(1:00)	.2

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TABLE VI. THE FIVE MAXIMUM INDEPENDENT SLIDING AVERAGES FOR AUG 1-31 1978
UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER

HYDROGEN SULFIDE
1-HOUR

SITE

033

1	8/ 9(8:35- 9:35)	14.2
2	8/ 1(11:55-12:55)	14.0
3	8/24(13:05-14:05)	11.5
4	8/ 9(10:55-11:55)	11.2
5	8/ 7(12:50-13:50)	9.9

DIURNAL VARIATION OF METHANE(UG/M**3 X 10**-1)
TRAILER NO. - 33 PERIOD(8/ 1/78 TO 8/31/78)

DAY	HOUR																								MEAN
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1	89	82	81	:	84	85	84	84	82	82	82	82	:	:	83	83	84	84	84	84	85	86	86	86	84
2	87	87	86	:	93	88	85	85	76	88	90	90	91	90	90	90	90	89	89	90	91	93	94	98	89
3	96	95	93																						95
4										141:	98	94	97	97	100	103	107	101	101	104	107	106	117	130	105
5	132	131	164	:	128	140	149	176	179	107	115	122	109	108	100	97	95	105	102	98	104	109	125	114	122
6	109	129	128	:	186	183	127	120	120	109	104	101	96	91	89	95	105	110	104	109	105	131	118	127	117
7	124	130	138	:	157	187	201	226	237	170		100	96	96	97	96	95	96	98	97	97	100	101	104	130
8	101	104	122	135:	166	258	258	200	91	89	93	107	103	101	92	97	98	102	104	98	114	107	109	110	123
9	113	145	137	:	140	145	180	209	192	151	131	119	117	113	103	98	98	100	100	102	105	111	121	122	128
10	133	137	138	:	143	135	136	133	121	111	107	108	101	98	96	96	95	94	92	94	96	99	103	102	112
11	108	108	106	:	121	116	107	109	98	90	89	87	86	87	86	87	86	86	87	86	89	88	86	90	95
12	89	89	88	:	92	92	94	94	95	92	88	88	87	87	86	86	85	86	86	88	87	89	90	86	89
13	88	88	89:	:	108	104	101	104	105	93	89	89	89	89	88	88	88	88	88	87	94	88	89	91	92
14	94	90	91	:	96	96	95	94	97	94	92	92	:	:	84	86	83	83	83	83	87	84	84	84	89
15	86	84	84	:	86	88	85	85	85	84	84	84	84	84	84	83	83	83	82	82	83	87	89	86	85
16	85	86		:							84	85	84	84	83	82	82	82	82	82	83	85	85	85	84
17	83	84	85	:	84	85	85	83	84	82	81	81	81	81	81	81	80	80	81	81	81	82	81	81	82
18	82	82	84	:	87	84	86	86	83	82	83	83:	82:	82	83	82	83	82	82	82	82	83	82	83	83
19	84	85	87	:	85	85	87	90	87	84	83	83	87	85	83	83	83	83	83	83	84	83	84	84	85
20	84	85	87	:	108	116	143	153	125	106	92	90	92	92	91	93	90	90	88	87	86	87	87	89	98
21	86	89	91	96	112	149	181	143	108	96	101	91				96	86	84	84	83	84	86	87	88	101
22	88	91	106	:	144	135	141	129	163	115	97	89	96	99	93	89	87	88	88	91	90	90	94	92	104
23	95	105	102	:	114	110	103	113	186	158	105	125	103	101	99	99	91	91	89	90	88	88	84	85	105
24	89	96	99	:	148	182	207	264	173	124	117	97	100	96	95	96	103	98	104	97	90	92	102	105	120
25	88	87	97	:	102	104	104	134	142	106	97	92	95	97	101	91	91	90	92	97	91	102	100	89	100
26	88	88	91	:	93	134	215	205	161	111	92	87	87	87	88	91	90	91	91	92	94	106	117	94	108
27	95	115	109	:	121	129	147	254	257	166	96	84	82	82	82	84	86	86	83	90	92	89	89	98	114
28	98	85	88	:	87	85	86	84	87	87	88	86	87	84	85	88	89	92	95	88	89	90	88	89	88
29	92	115	109	:	99	98	102	111	113	99	92	88	86	87	86										98
30														97	100	91	93	90	90	107	92	100	106	107	98
31	124	133	134	:	130	159	229	159	93	92	86	88	93	80	82	81	87	91	92	85	93	98	103	100	109
MEAN	97	101	104	115	115	125	134	139	128	107	95	94	93	92	90	90	90	91	91	91	92	94	96	96	

TOTAL NUMBER OF OBSERVATIONS = 7757. MEAN = 102.

: INDICATES CALIBRATION DURING THE HOUR

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DCN 78-100-212-07

AIR MONITORING REPORT
FOR
THE UNIVERSITY OF TEXAS
BUREAU OF ECONOMIC GEOLOGY
SEPTEMBER 1978
REPORT NO. 7

14 November 1978

Presented to:
Dr. Tom Gustavson
Land Resources Laboratory
Bureau of Economic Geology
Box X
University of Texas at Austin
Austin, Texas 78712

Prepared by:
Radian Staff

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I. GENERAL DESCRIPTION OF AIR MONITORING PROGRAM

Radian Corporation is under contract to the University of Texas, Bureau of Economic Geology, to provide ambient air quality monitoring at one site near Chocolate Bayou, Texas. This site measures and records concentrations for sulfur dioxide, hydrogen sulfide, methane, and particulates. A bag sample is collected bi-weekly and returned to Radian's Austin facilities and analyzed for methane.

Figure I shows the configuration of this type of monitoring station. The trailer provides a sturdy and protective covering as well as mobility. Figure II shows the air monitoring site.

FIGURE I

AMBIENT AIR MONITORING SYSTEM I

FIGURE II
AIR MONITORING SITE

II. DESCRIPTION OF INSTRUMENT SYSTEMS

The ambient air monitoring station is equipped to monitor the parameters shown below:

Sulfur Dioxide
Particulates
Methane
Hydrogen Sulfide

A. Air Quality Instrumentation

1. Description

Sulfur dioxide is measured with a Meloy Model SA185-2A sulfur analyzer, which is an EPA-approved analyzer. This automated analyzer utilizes the flame photometric principle to measure sulfur levels with a minimum detectable sensitivity of 5 ppb, and a linearity of $\pm 1\%$. The analyzer is operated with an H_2S scrubber to make it specific to SO_2 concentrations.

Hydrogen sulfide is measured using a Meloy Model SA185-2 analyzer equipped with an SO_x scrubber. Specifications for this analyzer are the same as for the SA185-2A.

Methane is monitored with a Bendix Model 8200 gas chromatograph. This instrument uses a flame ionization detector and has a minimum detectable sensitivity of 5 ppb. The Model 8200 works on a five-minute cycle, i.e., one air sample is analyzed every five minutes.

The air sample is drawn in through a glass cane and manifold supplied by the Ace Glass Company. The system has a 25 mm diameter, and a constant air flow through the system is

provided by an air pump rated at 60 cfm at 0" head pressure. The manifold has sampling ports to which $\frac{1}{4}$ " Teflon lines to the instruments are connected. All joints in the sampling system are secured by O-ring compression fittings. The manifold is contained in a heated (100°F) chamber to prevent condensation of moisture.

The trailer has two heavy duty high volume particulate samplers (Hi-Vols). Fiberglass filter paper is brought to a controlled humidity before weighing. Each Hi-Vol has a flow recorder to permit correction for changes in air flow runs for a 24-hour period (midnight to midnight), and is turned on and off by the computer. The Hi-Vols were designed following guidelines recommended by the Environmental Protection Agency and were manufactured by Radian.

2. Calibration

The trailer contains a Meloy Model RAD-1 calibration unit. This unit provides a zero air supply and SO₂ span gas from an SO₂ permeation tube. The calibration is automatically performed once a day, and is controlled by the computer. The SO₂ channel is first switched to zero. Then the computer monitors the output of each analyzer and takes a new zero reading after a stable zero signal has been reached. This zero reading is compared by the computer to the zero reading obtained 24 hours before, and if a drift in excess of 10 ppb has occurred, an excess zero drift light on the System Status Panel is turned on. The instruments are then returned to the monitor mode, and after two minutes the computer resumes data taking.

The SO₂ permeation tubes were manufactured by Metronics Association, Inc. These tubes were then individually calibrated for Radian by the National Bureau of Standards.

The Model 8200 methane analyzer is calibrated with undiluted span gas. This span gas contains methane in air. The Model 8200 is zeroed with air from a Bendix Model 8834 zero air unit. In addition, the instrument is electronically re-zeroed at the start of every five-minute cycle.

In addition to the daily instrument zero/spans, all instruments are multipoint calibrated monthly. Calibration standards and equipment used in the monthly multipoints is distinct from the equipment used for daily zero/span operations.

Quality assurance audits are performed on each instrument once a quarter. These audits are performed by Radian's Quality Assurance personnel using instrumentation and standards different from those used in the monthly multipoint calibrations.

A General Metals Calibration Kit is used to calibrate the Hi-Vol particulate samplers.

B. Data Acquisition System

The basis of the data acquisition system is a Data General NOVA 1200 minicomputer. The NOVA, which has a basic cycle time of 1.2 μ sec, is equipped with automatic program load and power fail/automatic restart features. The computer utilizes 8K 16-bit words of core memory. Analog-to-digital conversion is accomplished via an ADC built by Radian Corporation. The input/output unit for system 034 is Texas Instruments' KSR 733 keyboard/printer. This model provides keyboard entry and hard copy printed output. The data are also recorded on a cassette magnetic tape unit with three drives. The cassette unit is utilized for program storage and loading as well as recording. To reduce wear on mechanical parts, the power to the teletype and cassette units is turned on only when the

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unit(s) is to be used. Several important functions in the instruments as well as in the computer and the trailer are monitored by means of lights on a System Status Panel. The information displayed by these lights is written onto cassette tape to monitor the complete status of the system every five minutes.

III. BAG SAMPLING PROGRAM

Grab-bag samples are collected bi-weekly and analyzed for methane. The ambient air samples are collected in tedlar bags using a metal bellows pump connected to the ambient sample manifold. Each bag sample is collected over a three-hour period.

The bag samples are returned to Austin for analysis for methane concentration. The analysis is performed on either a Bendix 8202 or a Baseline Industries Model 1030 gas chromatograph using a flame ionization detector. The minimum detectable limit using this technique is less than 1 ppm.

Results of the bag sampling analyses are given below:

<u>Date</u>	<u>Time</u>	<u>Methane Concentration (ppm)</u>
9/26/78*	0200-0500	Below detectable limit

*Only one (1) bag sample analysis was available this month because of the system downtime during the first half of the month.

IV. OPERATING TIME ANALYSIS

This section presents the operating statistics for each of the major subsystems contained in the monitoring station. Table I shows the specific number of hours that each of these subsystems was inoperative for the month. The column labeled "DIGITIZING SYSTEM" refers to the entire data acquisition system, and downtime hours appearing in this column are hours of total data loss. These instances include, in addition to computer downtime, power failures, no power available, and self-automated shutdown periods such as during air conditioner malfunctions.

Calibration time is not considered to be downtime and is not included in the downtime figures. The amount of time used in calibrating the instruments is given at the bottom of the downtime analysis table and is reported as total calibration hours for each channel for the entire month. As is evident in the calibration figures, channels can be calibrated independently of one another. No calibration time is given for particulate monitoring since Hi-Vol calibration occurs infrequently and only during the off-duty cycle for each Hi-Vol while another Hi-Vol is taking data.

TABLE I.
DOWNTIME HOURS FOR CHOCOLATE BAYOU

SITE 033

DIGITIZING

DATE	SYSTEM	S02	H2S	VOLT	CH4	PART
9/ 1/78	11.	0.	0.	0.	0.	24.
9/ 2/78	24.	0.	0.	0.	0.	24.
9/ 3/78	24.	0.	0.	0.	0.	24.
9/ 4/78	24.	0.	0.	0.	0.	24.
9/ 5/78	24.	0.	0.	0.	0.	24.
9/ 6/78	24.	0.	0.	0.	0.	24.
9/ 7/78	24.	0.	0.	0.	0.	24.
9/ 8/78	24.	0.	0.	0.	0.	24.
9/ 9/78	24.	0.	0.	0.	0.	24.
9/10/78	24.	0.	0.	0.	0.	24.
9/11/78	24.	0.	0.	0.	0.	24.
9/12/78	24.	0.	0.	0.	0.	24.
9/13/78	17.	1.	0.	0.	5.	24.
9/14/78	18.	1.	0.	0.	6.	24.
9/15/78	8.	0.	0.	0.	16.	24.
9/16/78	0.	0.	0.	0.	24.	0.
9/17/78	0.	0.	0.	0.	24.	24.
9/18/78	0.	0.	0.	0.	24.	24.
9/19/78	2.	0.	0.	0.	20.	24.
9/20/78	12.	0.	0.	0.	12.	24.
9/21/78	12.	0.	0.	0.	12.	24.
9/22/78	0.	0.	0.	0.	12.	24.
9/23/78	0.	0.	0.	0.	0.	24.
9/24/78	0.	0.	0.	0.	0.	24.
9/25/78	0.	0.	0.	0.	0.	24.
9/26/78	3.	0.	0.	0.	0.	24.
9/27/78	0.	0.	0.	0.	0.	24.
9/28/78	0.	0.	0.	0.	0.	24.
9/29/78	0.	0.	0.	0.	0.	24.
9/30/78	0.	0.	0.	0.	0.	24.
CAL TIME		8.	8.	0.	3.	

V. DATA PRESENTATION AND SUMMARY

This section includes summaries for various recorded data at the monitoring sites. The data presentations indicate the variability of pollutant concentrations and parameters with time. All parameters, except suspended particulates (24-hour samples), are sampled once each second, but recorded as five-minute arithmetic averages of the one-second samples. This averaging technique tends to smooth instantaneous maximum values.

Inherent in any data acquisition system is random noise, both from the recording instruments and quantization in the analog-to-digital conversion. The lower threshold for all analytical instruments is twice the maximum noise level generated by the instruments. This lower threshold is 5 ppb for all of these instruments. Therefore, any values appearing in the data presentations that are less than 5 ppb indicate only a trace of pollutant in question and should not be construed to be absolute levels. In addition, when concentration levels drop below the lower threshold, the recorded quantity is simply random noise and averages tend toward zero. If a zero concentration appears in the data presentation, this does not indicate absolute zero concentration.

All pollutant data (except for particulate data) are taken at the monitoring site in integer parts per billion (ppb) but are presented here in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) assuming standard temperature and pressure of 25°C and 760 mm Hg (1013.2 millibars), respectively. The scale factors required to convert $\mu\text{g}/\text{m}^3$ at standard conditions back to ppb for the various pollutants are given in the following table.

Pollutant

To Convert $\mu\text{g}/\text{m}^3$ at 25°C and
760 mm Hg to ppb Multiply by

SO_2	.384
H_2S	.723
CH_4	1.536

The units of the air quality parameters are given at the top of each table. It should be noted here that inside temperature is monitored and recorded as a functional part of the system but is not presented in this report.

It should be noted that the SO_x scrubber was installed on the H_2S analyzer on 16 August at 9:35. Data from that analyzer from 9:35 on that date are H_2S data. Prior to 16 August, the data represented total sulfur measurements.

Table II presents the national ambient air quality standards (NAAQS) for criteria pollutants.

Table III displays the monthly statistics for the monitoring station for the month. To insure statistical significance, and to reduce the possibility of introducing a bias in the presentation, averages are computed only when at least 50 percent of the samples are present. If less than the required samples are present for a particular parameter, that entry will be blank. The number of samples present for a particular parameter is defined as the total possible number of five-minute samples for the averaging time less the computer downtime less the channel downtime less the channel calibration time. The averages in Table III are arithmetic averages with the following exception:

- Particulate averages are computed as the geometric mean.

Table IV displays the daily averages. Again, 50 percent of the five-minute samples are required in order to compute an average. A blank entry indicates an insufficient number of five-minute samples present for that day. Particulate averages are computed the same way as described in Table III.

Table V presents the maximum daily five-minute averages retained in the data base as well as the times of occurrence. For each parameter, a five-minute maximum average is printed if any samples are present for that day. Therefore, the maximum five-minute average when a given channel has experienced considerable downtime or calibration time during the day in question may be misrepresentative of the maximum expected for that parameter on that day.

Table VI indicates the five largest averages for various averaging times. The table shows the period of time covered by the average. Maxima are chosen so that time segments are independent. The maximum averages reported are found using a 'sliding average' technique with the exception of the 24-hour particulate average, which is computed from midnight to midnight. For averaging times less than or equal to three hours, the sliding average is stepped one five-minute sample at a time. For longer averaging times, the step size is twelve samples or one hour. For averaging times less than or equal to one hour, 100 percent of the five-minute samples must be present to compute an average. Averaging times greater than one hour require 90 percent. Whether or not a sliding average is computed is solely determined by the number of samples present in that averaging time and is independent of daily or monthly averaging criteria.

Table VII demonstrates the diurnal variation of various recorded parameters. Hourly averages are determined by arithmetically averaging five-minute samples. For all parameters, a blank entry in the diurnal variation table indicates that less than half (i.e., less than 6) of the five-minute samples for that hour are present.

Times given in the data presentations correspond to the appropriate local times, i.e., Central Daylight Savings Time or Central Standard Time, depending on the time of the year.

TABLE II
NATIONAL AMBIENT AIR QUALITY STANDARDS

	<u>Primary</u>	<u>Secondary</u>
<u>Particulate</u>		
Annual G.M.**	75 $\mu\text{g}/\text{m}^3$	60 $\mu\text{g}/\text{m}^3$
24 Hr. Max.*	260	150
<u>Sulfur Oxides</u>		
Annual	80 (.03 ppm)	
24 Hr. Max.*	365 (.14 ppm)	
3 Hr. Max.*	--	1300 (.5 ppm)
<u>Oxidant</u>		
1 Hr. Max.*	160* (.08 ppm)	160
<u>Hydrocarbons</u>		
3 Hr. Max.*	160 (.24 ppm)	160
6-9 a.m.		
<u>Carbon Monoxide</u>		
$\mu\text{g}/\text{m}^3$		
Max. 8 Hrs.*	10000 (9 ppm)	10000
Max. 1 Hr.*	40000 (35 ppm)	40000
<u>Nitrogen Dioxide</u>		
Annual	100 (.05 ppm)	100

Units are micrograms per cubic meter and ppm in parentheses.

*Not to be exceeded more than once per year.

**Geometric Mean.

TABLE III
AVERAGES FOR SEPTEMBER 1 THRU 30, 1978

TABLE III. AVERAGES FOR SEPT 1 THRU 30 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

	SULFUR DIOXIDE(SO2)	HYDROGEN SULFIDE	METHANE
SITE	033	033	033
	1.2	.3	

	PARTICULATE
SITE	033

TABLE IV
DAILY AVERAGES FOR SEPTEMBER 1 THRU 30, 1978

TABLE IV. DAILY AVERAGES FOR SEPT 1 THRU 30 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

	SULFUR DIOXIDE(SO2)	HYDROGEN SULFIDE	METHANE
SITE	033	033	033
DATE			
9/ 1	. 0	. 0	1031. 6
9/ 2			
9/ 3			
9/ 4			
9/ 5			
9/ 6			
9/ 7			
9/ 8			
9/ 9			
9/10			
9/11			
9/12			
9/13			
9/14			
9/15	. 0	. 0	
9/16	. 0	. 0	
9/17	. 0	. 0	
9/18	. 4	. 0	
9/19	. 5	. 0	
9/20	. 0	. 0	
9/21	. 0	. 0	
9/22	. 0	. 7	
9/23	. 1	1. 4	1036. 2
9/24	4. 6	1. 2	1018. 7
9/25	5. 9	. 6	995. 3
9/26	. 5	. 0	1072. 3
9/27	2. 0	. 0	977. 1
9/28	5. 1	. 0	982. 3
9/29	. 0	. 0	1016. 0
9/30	. 1	. 0	1135. 8

TABLE IV. DAILY AVERAGES FOR SEPT 1 THRU 30 1978
 (UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
 TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

PARTICULATE

DATE	SITE 033
9/ 1	
9/ 2	
9/ 3	
9/ 4	
9/ 5	
9/ 6	
9/ 7	
9/ 8	
9/ 9	
9/10	
9/11	
9/12	
9/13	
9/14	
9/15	
9/16	20.0
9/17	
9/18	
9/19	
9/20	
9/21	
9/22	
9/23	
9/24	
9/25	
9/26	
9/27	
9/28	
9/29	
9/30	

TABLE V
MAXIMUM FIVE-MINUTE AVERAGES AND
TIMES OF OCCURRENCE FOR
SEPTEMBER 1 THRU 30, 1978

TABLE V. MAXIMUM FIVE MINUTE AVERAGES AND TIME OF OCCURRENCE FOR SEPT 1 THRU 30 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

SULFUR DIOXIDE(SO₂)

SITE 033

DATE

9/ 1 . 0(0:00)

9/ 2

9/ 3

9/ 4

9/ 5

9/ 6

9/ 7

9/ 8

9/ 9

9/10

9/11

9/12

9/13 . 0(5:50)

9/14 . 0(11:05)

9/15 . 0(8:40)

9/16 . 0(0:00)

9/17 . 0(0:00)

9/18 2.6(14:05)

9/19 2.6(0:00)

9/20 . 0(0:00)

9/21 . 0(11:55)

9/22 7.8(5:25)

9/23 10.4(17:45)

9/24 28.7(12:45)

9/25 36.5(10:20)

9/26 13.0(11:40)

9/27 31.3(13:05)

9/28 54.7(7:55)

9/29 . 0(0:00)

9/30 7.8(10:10)

TABLE V. MAXIMUM FIVE MINUTE AVERAGES AND TIME OF OCCURRENCE FOR SEPT 1 THRU 30 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

HYDROGEN SULFIDE

DATE	SITE	033
9/ 1		. 0(0:00)
9/ 2		
9/ 3		
9/ 4		
9/ 5		
9/ 6		
9/ 7		
9/ 8		
9/ 9		
9/10		
9/11		
9/12		
9/13		1. 4(13:55)
9/14		. 0(11:05)
9/15		. 0(8:40)
9/16		. 0(0:00)
9/17		. 0(0:00)
9/18		. 0(0:00)
9/19		. 0(0:00)
9/20		. 0(0:00)
9/21		. 0(11:55)
9/22		1. 4(12:30)
9/23		1. 4(0:00)
9/24		1. 4(0:00)
9/25		5. 5(8:50)
9/26		1. 4(2:15)
9/27		. 0(0:00)
9/28		. 0(0:00)
9/29		. 0(0:00)
9/30		. 0(0:00)

TABLE V. MAXIMUM FIVE MINUTE AVERAGES AND TIME OF OCCURRENCE FOR SEPT 1 THRU 30 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

METHANE

DATE	SITE	033
9/ 1	1323.3	(9:15)
9/ 2		
9/ 3		
9/ 4		
9/ 5		
9/ 6		
9/ 7		
9/ 8		
9/ 9		
9/10		
9/11		
9/12		
9/13	840.1	(15:20)
9/14		
9/15		
9/16		
9/17		
9/18		
9/19	951.4	(10:15)
9/20		
9/21		
9/22	1170.9	(22:10)
9/23	1399.5	(23:40)
9/24	1377.4	(0:05)
9/25	1431.4	(9:00)
9/26	2924.0	(19:20)
9/27	1183.3	(7:20)
9/28	1262.7	(8:50)
9/29	1606.6	(7:50)
9/30	1969.3	(7:00)

**TABLE VI
THE FIVE MAXIMUM INDEPENDENT
SLIDING AVERAGES FOR
SEPTEMBER 1 THRU 30, 1978**

TABLE VI. THE FIVE MAXIMUM INDEPENDENT SLIDING AVERAGES FOR SEP 1-30 1978
UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER

SITE		033		SULFUR DIOXIDE 30-MINUTE	
1	9/28(7:40- 8:10)	48.2			
2	9/25(15:50-16:20)	33.0			
3	9/25(9:55-10:25)	32.6			
4	9/28(9:30-10:00)	29.1			
5	9/28(8:15- 8:45)	27.8			

SITE		033		SULFUR DIOXIDE 3-HOUR	
1	9/28(7:25-10:25)	30.3			
2	9/25(14:55-17:55)	20.0			
3	9/24(10:05-13:05)	17.8			
4	9/27(11:50-14:50)	13.2			
5	9/25(7:40-10:40)	8.8			

SITE		033		SULFUR DIOXIDE 24-HOUR	
1	9/27- 9/28(12:00)	7.1			
2	9/25- 9/26(9:00)	6.1			
3	9/23- 9/24(16:00)	4.7			
4	9/18- 9/19(11:00)	.7			
5	9/29- 9/30(11:00)	.1			

TABLE VI. THE FIVE MAXIMUM INDEPENDENT SLIDING AVERAGES FOR SEP 1-30 1978
UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER

SITE		033		HYDROGEN SULFIDE		1-HOUR	
1	9/25(7:50- 8:50)		1.7				
2	9/22(12:25-13:25)		1.4				
3	9/22(13:30-14:30)		1.4				
4	9/22(14:35-15:35)		1.4				
5	9/22(15:40-16:40)		1.4				

TABLE VI. THE FIVE MAXIMUM AVERAGES FOR SEP 1-30 1978
UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER

METHANE
3-HOUR (6-9AM)

SITE	033
1	9/30(6:00- 9:00) 1751.8
2	9/29(6:00- 9:00) 1290.4
3	9/28(6:00- 9:00) 1121.7
4	9/27(6:00- 9:00) 1106.0
5	9/24(6:00- 9:00) 1073.4

TABLE VII
DIURNAL VARIATION OF RECORDED PARAMETERS

DIURNAL VARIATION OF SULFUR DIOXIDE(UG/M**3)
TRAILER NO. - 33 PERIOD(9/ 1/78 TO 9/30/78)

	HOUR																								MEAN	
DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1	0	0	0	0	0	0	0	0	0	0	0	0	0												0	
2																										
3																										
4																										
5																										
6																										
7																										
8																										
9																										
10																										
11																										
12																										
13							0			0	:	:	0	:	0											0
14											:	:	0:	0	0	0	0	0	0	0	0	0	0	0	0	0
15										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	:	1:	2	1	0	1	1	1	1	1	1	1	0
19	1	1	1	1	0	1	1	0	1	2	:	:		2	0	0	0	0	0	0	0	0	0	0	0	1
20	0	0	0	0	0	0	0	0	0	0	0	0													0	
21													0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	1	0	0	0	0	0:	0:	0:	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	5	14	10	12	24	13	16	14	0	3	0	0	0	0	0	0	0	0	0	5
25	0	0	0	0	0	0	0	0	0	8	33:	24:	14	9	8	17	27	16	3	0	0	0	0	0	0	6
26	0	0	0	0	0	0	0	0	0		:	5:	3	3	0	0	0	0	0	0	0	0	0	0	0	1
27	0	0	0	0	0	0	0	0	0	0	0	0	6	22	11	0	0	0	0	0	0	5	3	0	2	
28	7	0	0	0	0	0	5	29	33	26	22	1	0	0	0	0	0	0	0	0	0	0	0	0	0	5
29	0	0	0	0	0	0	0	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MEAN	1	0	0	0	0	0	1	3	3	3	5	3	2	3	1	1	2	1	0	0	0	0	0	0	0	

TOTAL NUMBER OF OBSERVATIONS = 4348. MEAN = 1.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF HYDROGEN SULFIDE (UG/M**3)
 TRAILER NO. - 33 PERIOD(9/ 1/78 TO 9/30/78)

DAY	HOUR																								MEAN	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1	0	0	0	0	0	0	0	0	0	0	0	0	0													0
2																										
3																										
4																										
5																										
6																										
7																										
8																										
9																										
10																										
11																										
12																										
13							0			0	:	:	0	:	0	0										0
14													0:	0	0	0	0	0	0							0
15										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	:	0:	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	:	:		0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0														0
21											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0:	1:	1	1	1	1	1	1	1	1	1	1	1	1	1	1
23	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
24	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
25	1	1	1	1	1	1	1	1	1	1	1:	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	1
26	0	0	0	0	0	0	0	0			:	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MEAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

TOTAL NUMBER OF OBSERVATIONS = 4366. MEAN = 0.

: INDICATES CALIBRATION DURING THE HOUR

TOTAL NUMBER OF OBSERVATIONS = 2570. MEAN = 102.

: INDICATES CALIBRATION DURING THE HOUR

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DCN 78-100-212-08

AIR MONITORING REPORT
FOR
THE UNIVERSITY OF TEXAS
BUREAU OF ECONOMIC GEOLOGY
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REPORT NO. 8

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Presented to:
Dr. Tom Gustavson
Land Resources Laboratory
Bureau of Economic Geology
Box X
University of Texas at Austin
Austin, Texas 78712

Prepared by:
Radian Staff

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I. GENERAL DESCRIPTION OF AIR MONITORING PROGRAM

Radian Corporation is under contract to the University of Texas, Bureau of Economic Geology, to provide ambient air quality monitoring at one site near Chocolate Bayou, Texas. This site measures and records concentrations for sulfur dioxide, hydrogen sulfide, methane, and particulates. A bag sample is collected bi-weekly and returned to Radian's Austin facilities and analyzed for methane.

Figure I shows the configuration of this type of monitoring station. The trailer provides a sturdy and protective covering as well as mobility. Figure II shows the air monitoring site.

FIGURE I

AMBIENT AIR MONITORING SYSTEM I

FIGURE II
AIR MONITORING SITE

II. DESCRIPTION OF INSTRUMENT SYSTEMS

The ambient air monitoring station is equipped to monitor the parameters shown below:

Sulfur Dioxide
Particulates
Methane
Hydrogen Sulfide

A. Air Quality Instrumentation

1. Description

Sulfur dioxide is measured with a Meloy Model SA185-2A sulfur analyzer, which is an EPA-approved analyzer. This automated analyzer utilizes the flame photometric principle to measure sulfur levels with a minimum detectable sensitivity of 5 ppb, and a linearity of $\pm 1\%$. The analyzer is operated with an H_2S scrubber to make it specific to SO_2 concentrations.

Hydrogen sulfide is measured using a Meloy Model SA185-2 analyzer equipped with an SO_x scrubber. Specifications for this analyzer are the same as for the SA185-2A.

Methane is monitored with a Bendix Model 8200 gas chromatograph. This instrument uses a flame ionization detector and has a minimum detectable sensitivity of 5 ppb. The Model 8200 works on a five-minute cycle, i.e., one air sample is analyzed every five minutes.

The air sample is drawn in through a glass cane and manifold supplied by the Ace Glass Company. The system has a 25 mm diameter, and a constant air flow through the system is

provided by an air pump rated at 60 cfm at 0" head pressure. The manifold has sampling ports to which $\frac{1}{4}$ " Teflon lines to the instruments are connected. All joints in the sampling system are secured by O-ring compression fittings. The manifold is contained in a heated (100°F) chamber to prevent condensation of moisture.

The trailer has two heavy duty high volume particulate samplers (Hi-Vols). Fiberglass filter paper is brought to a controlled humidity before weighing. Each Hi-Vol has a flow recorder to permit correction for changes in air flow runs for a 24-hour period (midnight to midnight), and is turned on and off by the computer. The Hi-Vols were designed following guidelines recommended by the Environmental Protection Agency and were manufactured by Radian.

2. Calibration

The trailer contains a Meloy Model RAD-1 calibration unit. This unit provides a zero air supply and SO₂ span gas from an SO₂ permeation tube. The calibration is automatically performed once a day, and is controlled by the computer. The SO₂ channel is first switched to zero. Then the computer monitors the output of each analyzer and takes a new zero reading after a stable zero signal has been reached. This zero reading is compared by the computer to the zero reading obtained 24 hours before, and if a drift in excess of 10 ppb has occurred, an excess zero drift light on the System Status Panel is turned on. The instruments are then returned to the monitor mode, and after two minutes the computer resumes data taking.

The SO₂ permeation tubes were manufactured by Metronics Association, Inc. These tubes were then individually calibrated for Radian by the National Bureau of Standards.

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The Model 8200 methane analyzer is calibrated with undiluted span gas. This span gas contains methane in air. The Model 8200 is zeroed with air from a Bendix Model 8834 zero air unit. In addition, the instrument is electronically re-zeroed at the start of every five-minute cycle.

In addition to the daily instrument zero/spans, all instruments are multipoint calibrated monthly. Calibration standards and equipment used in the monthly multipoints is distinct from the equipment used for daily zero/span operations.

Quality assurance audits are performed on each instrument once a quarter. These audits are performed by Radian's Quality Assurance personnel using instrumentation and standards different from those used in the monthly multipoint calibrations.

A General Metals Calibration Kit is used to calibrate the Hi-Vol particulate samplers.

B. Data Acquisition System

The basis of the data acquisition system is a Data General NOVA 1200 minicomputer. The NOVA, which has a basic cycle time of 1.2 μ sec, is equipped with automatic program load and power fail/automatic restart features. The computer utilizes 8K 16-bit words of core memory. Analog-to-digital conversion is accomplished via an ADC built by Radian Corporation. The input/output unit for system 034 is Texas Instruments' KSR 733 keyboard/printer. This model provides keyboard entry and hard copy printed output. The data are also recorded on a cassette magnetic tape unit with three drives. The cassette unit is utilized for program storage and loading as well as recording. To reduce wear on mechanical parts, the power to the teletype and cassette units is turned on only when the

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unit(s) is to be used. Several important functions in the instruments as well as in the computer and the trailer are monitored by means of lights on a System Status Panel. The information displayed by these lights is written onto cassette tape to monitor the complete status of the system every five minutes.

III. BAG SAMPLING PROGRAM

Grab-bag samples are collected bi-weekly and analyzed for methane. The ambient air samples are collected in tedlar bags using a metal bellows pump connected to the ambient sample manifold. Each bag sample is collected over a three-hour period.

The bag samples are returned to Austin for analysis for methane concentration. The analysis is performed on either a Bendix 8202 or a Baseline Industries Model 1030 gas chromatograph using a flame ionization detector. The minimum detectable limit using this technique is less than 1 ppm.

Results of the bag sampling analyses are given below:

<u>Date</u>	<u>Time</u>	<u>Methane Concentration (ppm)</u>
10/17/78*	0200-0500	4.2

*Only one (1) bag sample analysis analysis was available this month.

IV. OPERATING TIME ANALYSIS

This section presents the operating statistics for each of the major subsystems contained in the monitoring station. Table I shows the specific number of hours that each of these subsystems was inoperative for the month. The column labeled "DIGITIZING SYSTEM" refers to the entire data acquisition system, and downtime hours appearing in this column are hours of total data loss. These instances include, in addition to computer downtime, power failures, no power available, and self-automated shutdown periods such as during air conditioner malfunctions.

Calibration time is not considered to be downtime and is not included in the downtime figures. The amount of time used in calibrating the instruments is given at the bottom of the downtime analysis table and is reported as total calibration hours for each channel for the entire month. As is evident in the calibration figures, channels can be calibrated independently of one another. No calibration time is given for particulate monitoring since Hi-Vol calibration occurs infrequently and only during the off-duty cycle for each Hi-Vol while another Hi-Vol is taking data.

TABLE I.
DOWNTIME HOURS FOR CHOCOLATE BAYOU

SITE 033

DIGITIZING						
DATE	SYSTEM	S02	H2S	VOLT	CH4	PART
10/ 1/78	0.	0.	0.	0.	0.	24.
10/ 2/78	0.	0.	0.	0.	0.	24.
10/ 3/78	0.	0.	0.	0.	0.	24.
10/ 4/78	0.	0.	0.	0.	0.	24.
10/ 5/78	0.	0.	0.	0.	0.	24.
10/ 6/78	0.	0.	0.	0.	0.	24.
10/ 7/78	0.	0.	0.	0.	0.	24.
10/ 8/78	0.	0.	0.	0.	0.	24.
10/ 9/78	1.	0.	0.	0.	0.	24.
10/10/78	9.	0.	0.	0.	0.	24.
10/11/78	13.	0.	0.	0.	9.	24.
10/12/78	0.	0.	0.	0.	24.	0.
10/13/78	10.	0.	0.	0.	13.	24.
10/14/78	24.	0.	0.	0.	0.	24.
10/15/78	24.	0.	0.	0.	0.	24.
10/16/78	10.	0.	0.	0.	0.	24.
10/17/78	0.	0.	0.	0.	0.	0.
10/18/78	0.	0.	0.	0.	2.	24.
10/19/78	0.	0.	0.	0.	0.	24.
10/20/78	0.	0.	0.	0.	0.	24.
10/21/78	0.	0.	0.	0.	0.	0.
10/22/78	0.	0.	0.	0.	0.	24.
10/23/78	0.	0.	0.	0.	0.	24.
10/24/78	1.	0.	0.	0.	0.	24.
10/25/78	24.	0.	0.	0.	0.	24.
10/26/78	12.	0.	0.	0.	0.	24.
10/27/78	0.	0.	0.	0.	0.	24.
10/28/78	0.	0.	0.	0.	0.	24.
10/29/78	0.	0.	0.	0.	0.	24.
10/30/78	0.	0.	0.	0.	0.	24.
10/31/78	0.	0.	0.	0.	0.	24.
CAL TIME		10.	9.	0.	14.	

V. DATA PRESENTATION AND SUMMARY

This section includes summaries for various recorded data at the monitoring sites. The data presentations indicate the variability of pollutant concentrations and parameters with time. All parameters, except suspended particulates (24-hour samples), are sampled once each second, but recorded as five-minute arithmetic averages of the one-second samples. This averaging technique tends to smooth instantaneous maximum values.

Inherent in any data acquisition system is random noise, both from the recording instruments and quantization in the analog-to-digital conversion. The lower threshold for all analytical instruments is twice the maximum noise level generated by the instruments. This lower threshold is 5 ppb for all of these instruments. Therefore, any values appearing in the data presentations that are less than 5 ppb indicate only a trace of pollutant in question and should not be construed to be absolute levels. In addition, when concentration levels drop below the lower threshold, the recorded quantity is simply random noise and averages tend toward zero. If a zero concentration appears in the data presentation, this does not indicate absolute zero concentration.

All pollutant data (except for particulate data) are taken at the monitoring site in integer parts per billion (ppb) but are presented here in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) assuming standard temperature and pressure of 25°C and 760 mm Hg (1013.2 millibars), respectively. The scale factors required to convert $\mu\text{g}/\text{m}^3$ at standard conditions back to ppb for the various pollutants are given in the following table.

PollutantTo Convert $\mu\text{g}/\text{m}^3$ at 25°C and
760 mm Hg to ppb Multiply by

SO ₂	.384
H ₂ S	.723
CH ₄	1.536

The units of the air quality parameters are given at the top of each table. It should be noted here that inside temperature is monitored and recorded as a functional part of the system but is not presented in this report.

It should be noted that the SO_x scrubber was installed on the H₂S analyzer on 16 August at 9:35. Data from that analyzer from 9:35 on that date are H₂S data. Prior to 16 August, the data represented total sulfur measurements.

Table II presents the national ambient air quality standards (NAAQS) for criteria pollutants.

Table III displays the monthly statistics for the monitoring station for the month. To insure statistical significance, and to reduce the possibility of introducing a bias in the presentation, averages are computed only when at least 50 percent of the samples are present. If less than the required samples are present for a particular parameter, that entry will be blank. The number of samples present for a particular parameter is defined as the total possible number of five-minute samples for the averaging time less the computer downtime less the channel downtime less the channel calibration time. The averages in Table III are arithmetic averages with the following exception:

- Particulate averages are computed as the geometric mean.

Table IV displays the daily averages. Again, 50 percent of the five-minute samples are required in order to compute an average. A blank entry indicates an insufficient number of five-minute samples present for that day. Particulate averages are computed the same way as described in Table III.

Table V presents the maximum daily five-minute averages retained in the data base as well as the times of occurrence. For each parameter, a five-minute maximum average is printed if any samples are present for that day. Therefore, the maximum five-minute average when a given channel has experienced considerable downtime or calibration time during the day in question may be misrepresentative of the maximum expected for that parameter on that day.

Table VI indicates the five largest averages for various averaging times. The table shows the period of time covered by the average. Maxima are chosen so that time segments are independent. The maximum averages reported are found using a 'sliding average' technique with the exception of the 24-hour particulate average, which is computed from midnight to midnight. For averaging times less than or equal to three hours, the sliding average is stepped one five-minute sample at a time. For longer averaging times, the step size is twelve samples or one hour. For averaging times less than or equal to one hour, 100 percent of the five-minute samples must be present to compute an average. Averaging times greater than one hour require 90 percent. Whether or not a sliding average is computed is solely determined by the number of samples present in that averaging time and is independent of daily or monthly averaging criteria.

Table VII demonstrates the diurnal variation of various recorded parameters. Hourly averages are determined by arithmetically averaging five-minute samples. For all parameters, a blank entry in the diurnal variation table indicates that less than half (i.e., less than 6) of the five-minute samples for that hour are present.

Times given in the data presentations correspond to the appropriate local times, i.e., Central Daylight Savings Time or Central Standard Time, depending on the time of the year.

TABLE II
NATIONAL AMBIENT AIR QUALITY STANDARDS

	<u>Primary</u>	<u>Secondary</u>
<u>Particulate</u>		
Annual G.M.**	75 $\mu\text{g}/\text{m}^3$	60 $\mu\text{g}/\text{m}^3$
24 Hr. Max.*	260	150
<u>Sulfur Oxides</u>		
Annual	80 (.03 ppm)	
24 Hr. Max.*	365 (.14 ppm)	
3 Hr. Max.*	--	1300 (.5 ppm)
<u>Oxidant</u>		
1 Hr. Max.*	160* (.08 ppm)	160
<u>Hydrocarbons</u>		
3 Hr. Max.*	160 (.24 ppm)	160
6-9 a.m.		
<u>Carbon Monoxide</u>		
$\mu\text{g}/\text{m}^3$		
Max. 8 Hrs.*	10000 (9 ppm)	10000
Max. 1 Hr.*	40000 (35 ppm)	40000
<u>Nitrogen Dioxide</u>		
Annual	100 (.05 ppm)	100

Units are micrograms per cubic meter and ppm in parentheses.

*Not to be exceeded more than once per year.

**Geometric Mean.

TABLE III
AVERAGES FOR OCTOBER 1 THRU 31, 1978

TABLE III. AVERAGES FOR OCT 1 THRU 31 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

	SULFUR DIOXIDE(SO2)	HYDROGEN SULFIDE	METHANE
SITE	033	033	033
	2.2	1.0	1087.3

	PARTICULATE
SITE	033
	47.3

**TABLE IV
DAILY AVERAGES FOR OCTOBER 1 THRU 31, 1978**

TABLE IV. DAILY AVERAGES FOR OCT 1 THRU 31 1978
 (UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
 TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

DATE	SULFUR DIOXIDE(SO2)	HYDROGEN SULFIDE	METHANE
	SITE 033	033	033
10/ 1	2.2	.0	1051.3
10/ 2	.0	.0	1022.3
10/ 3	.0	.0	968.8
10/ 4	.1	.1	1386.9
10/ 5	.0	.0	958.1
10/ 6	.0	1.1	1064.8
10/ 7	.7	3.5	1017.8
10/ 8	.0	3.9	1196.7
10/ 9	.0	.5	1043.7
10/10	.0	.2	1035.6
10/11			
10/12	.0	.0	
10/13	.0	.1	
10/14			
10/15			
10/16	.0	.0	954.0
10/17	9.7	.3	1009.6
10/18	4.2	14.1	1206.9
10/19	13.9	.0	1347.2
10/20	2.3	.0	1158.2
10/21	.0	.0	1044.1
10/22	.1	.0	935.9
10/23	.1	.0	1107.5
10/24	.0	.0	951.0
10/25			
10/26			
10/27	4.8	.2	1093.7
10/28	.7	.1	1067.9
10/29	3.5	.0	1021.2
10/30	13.7	.8	1250.3
10/31	.0	.0	1167.1

TABLE IV. DAILY AVERAGES FOR OCT 1 THRU 31 1978
 (UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
 TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

PARTICULATE

SITE 033

DATE

10/ 1
 10/ 2
 10/ 3
 10/ 4
 10/ 5
 10/ 6
 10/ 7
 10/ 8
 10/ 9
 10/10

10/11
 10/12
 10/13
 10/14
 10/15
 10/16
 10/17
 10/18
 10/19
 10/20

37.0

53.0

10/21
 10/22
 10/23
 10/24
 10/25
 10/26
 10/27
 10/28
 10/29
 10/30

54.0

10/31

TABLE V
MAXIMUM FIVE-MINUTE AVERAGES AND
TIMES OF OCCURRENCE FOR
OCTOBER 1 THRU 31, 1978

TABLE V. MAXIMUM FIVE MINUTE AVERAGES AND TIME OF OCCURRENCE FOR OCT 1 THRU 31 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

SULFUR DIOXIDE(SO2)

DATE	SITE	033
10/ 1	39.1	(12:45)
10/ 2	.0	(0:00)
10/ 3	.0	(0:00)
10/ 4	7.8	(10:55)
10/ 5	.0	(0:00)
10/ 6	.0	(0:00)
10/ 7	28.7	(10:40)
10/ 8	.0	(0:00)
10/ 9	.0	(0:00)
10/10	2.6	(15:45)
10/11	.0	(12:30)
10/12	.0	(0:00)
10/13	.0	(0:00)
10/14		
10/15		
10/16	.0	(11:00)
10/17	33.9	(11:20)
10/18	65.1	(15:00)
10/19	83.4	(9:55)
10/20	18.2	(11:50)
10/21	.0	(0:00)
10/22	13.0	(9:10)
10/23	5.2	(11:30)
10/24	.0	(0:05)
10/25		
10/26	.0	(12:35)
10/27	49.5	(17:30)
10/28	15.6	(9:40)
10/29	39.1	(11:50)
10/30	83.4	(10:40)
10/31	.0	(0:00)

TABLE V. MAXIMUM FIVE MINUTE AVERAGES AND TIME OF OCCURRENCE FOR OCT 1 THRU 31 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

HYDROGEN SULFIDE

DATE	SITE	033
10/ 1		. 0(0:00)
10/ 2		. 0(0:00)
10/ 3		. 0(0:00)
10/ 4		2. 8(6:35)
10/ 5		. 0(0:00)
10/ 6		4. 2(22:05)
10/ 7		6. 9(9:20)
10/ 8		8. 3(8:50)
10/ 9		5. 5(11:35)
10/10		22. 1(15:45)
10/11		8. 3(12:30)
10/12		. 0(0:00)
10/13		4. 2(10:05)
10/14		
10/15		
10/16		. 0(11:00)
10/17		31. 8(15:15)
10/18		215. 9(11:40)
10/19		1. 4(10:40)
10/20		. 0(0:00)
10/21		. 0(0:00)
10/22		4. 2(4:35)
10/23		. 0(0:00)
10/24		. 0(0:05)
10/25		
10/26		1. 4(23:05)
10/27		42. 9(9:55)
10/28		30. 4(10:05)
10/29		. 0(0:00)
10/30		113. 5(12:35)
10/31		. 0(0:00)

TABLE V. MAXIMUM FIVE MINUTE AVERAGES AND TIME OF OCCURRENCE FOR OCT 1 THRU 31 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

METHANE

DATE	SITE	033
<hr/>		
10/ 1		1466. 6(10: 35)
10/ 2		1469. 8(8: 05)
10/ 3		1314. 2(23: 20)
10/ 4		2430. 4(3: 50)
10/ 5		1625. 5(7: 35)
10/ 6		1635. 2(1: 40)
10/ 7		1387. 1(7: 00)
10/ 8		2615. 3(3: 45)
10/ 9		1654. 1(7: 40)
10/10		1450. 9(8: 15)
<hr/>		
10/11		954. 7(13: 35)
10/12		
10/13		884. 4(11: 15)
10/14		
10/15		
10/16		1355. 2(19: 40)
10/17		2535. 9(14: 25)
10/18		1930. 9(22: 45)
10/19		3515. 3(8: 50)
10/20		2649. 9(4: 10)
<hr/>		
10/21		1577. 9(4: 20)
10/22		1174. 2(10: 25)
10/23		1616. 4(7: 10)
10/24		1270. 6(21: 00)
10/25		
10/26		1272. 5(19: 05)
10/27		1456. 8(23: 35)
10/28		1492. 0(0: 30)
10/29		1253. 6(23: 55)
10/30		1876. 8(1: 00)
<hr/>		
10/31		1816. 3(0: 25)

**TABLE VI
THE FIVE MAXIMUM INDEPENDENT
SLIDING AVERAGES FOR
OCTOBER 1 THRU 31, 1978**

TABLE VI. THE FIVE MAXIMUM INDEPENDENT SLIDING AVERAGES FOR OCT 1-31 1978
UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER

SULFUR DIOXIDE
30-MINUTE

SITE	033	
1	10/30(10:25-10:55)	79.9
2	10/19(9:35-10:05)	75.5
3	10/30(11:00-11:30)	67.7
4	10/19(10:10-10:40)	58.2
5	10/19(10:45-11:15)	56.4

SULFUR DIOXIDE
3-HOUR

SITE	033	
1	10/30(9:05-12:05)	58.3
2	10/19(9:10-12:10)	50.9
3	10/17(10:05-13:05)	26.5
4	10/27(15:50-18:50)	26.3
5	10/19(16:00-19:00)	24.1

SULFUR DIOXIDE
24-HOUR

SITE	033	
1	10/29-10/30(12:00)	15.2
2	10/18-10/19(0:00)	13.9
3	10/16-10/17(0:00)	9.7
4	10/26-10/27(19:00)	4.8
5	10/20-10/21(1:00)	2.3

TABLE VI. THE FIVE MAXIMUM INDEPENDENT SLIDING AVERAGES FOR OCT 1-31 1978
UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER

HYDROGEN SULFIDE
1-HOUR

ITE

033

1	10/18(11:15-12:15)	205.7
2	10/18(14:10-15:10)	96.9
3	10/30(11:40-12:40)	17.6
4	10/ 8(8:15- 9:15)	6.9
5	10/ 7(9:55-10:55)	6.6

TABLE VI. THE FIVE MAXIMUM AVERAGES FOR OCT 1-31 1978
UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER

METHANE
3-HOUR (6-9AM)

SITE

033

1	10/19(	6:00-	9:00)	2295.1
2	10/ 4(	6:00-	9:00)	1796.0
3	10/ 8(	6:00-	9:00)	1512.4
4	10/18(	6:00-	9:00)	1490.7
5	10/23(	6:00-	9:00)	1417.1

TABLE VII
DIURNAL VARIATION OF RECORDED PARAMETERS

DIURNAL VARIATION OF SULFUR DIOXIDE(UG/M**3)
TRAILER NO. - 33 PERIOD(10/ 1/78 TO 10/31/78)

	HOUR																								MEAN
DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1	0	0	0	0	0	0	0	0	0	0	0	1	24	19	9	0	0	0	0	0	0	0	0	0	2
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	1	2	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	:	:	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	:	0	0	0	0	0	0	0	0	0	0	0	0
11													:	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14																									
15																									
16											:	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	6	15	4	0	0	0	0	0	3	19	31	28	9	7	:	19	20	19	11	14	12	7	1	10
18	0	0	1	0	0	0	0	0	0	7	12	3	7	0	0	11	13	15	17	4	6	6	0	0	4
19	0	0	0	0	0	0	0	0	3	45	61	44	18	10	9	12	22	24	26	19	12	10	11	2	14
20	0	0	0	0	0	0	0	0	0	0	2	11	13	8	5	9	6	1	0	0	0	0	0	0	2
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25																									
26													:	0	0	0	0	0	0	0	0	0	0	0	0
27	2	8	9	3	11	0	0	0	0	2	0	0	0	0	0	1	15	43	21	0	0	0	0	0	5
28	0	0	0	0	0	0	0	0	0	8	9	0	0	0	0	0	0	0	0	0	0	0	0	0	1
29	0	0	0	0	0	0	0	0	6	4	5	23	29	15	0	0	0	0	0	0	0	1	0	0	4
30	0	0	0	6	16	36	44	34	13	40	70	60	:	0	0	0	0	0	0	0	0	0	0	0	14
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MEAN	0	1	1	1	1	2	2	1	1	4	8	7	5	2	1	1	3	4	3	1	1	1	1	0	

TOTAL NUMBER OF OBSERVATIONS = 7246. MEAN = 2.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF HYDROGEN SULFIDE (UG/M**3)
TRAILER NO. - 33 PERIOD(10/ 1/78 TO 10/31/78)

	HOUR																								MEAN
DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	1	1	2	3	2	2	1	0	0	2	3	3	4	3	1
7	2	2	2	2	3	4	4	4	5	6	7	6	5	4	3	3	3	3	1	3	4	3	3	2	4
8	4	4	5	5	4	5	5	5	7	7	6	5	5	5	4	5	4	3	3	1	1	1	1	1	4
9	1	1	1	0	0	0	0	0	1	2	:	:	1	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	:	0	0	2	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	:	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14																									
15																									
16											:	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	:	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	22	148	65	0	83	17	0	0	0	0	0	0	0	0	14
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25																									
26											:	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0	1
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MEAN	0	0	0	0	0	0	0	0	1	1	2	7	4	0	4	1	0	0	0	0	0	0	0	0	0

TOTAL NUMBER OF OBSERVATIONS = 7259. MEAN = 1.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF METHANE(UG/M**3 X 10**-1)
TRAILER NO. - 33 PERIOD(10/ 1/78 TO 10/31/78)

	HOUR																								MEAN
DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
1	102	114	111	110	107	111	122	127	121	130	136	102	107	107	96	91	88	87	94	92	89	91	92	98	105
2																									
3	87	98	105	113	103	102	103	107	95	89	88	91	89	90	91	91	91	97	98	91	95	94	99	121	97
4	119	160	162	223	219	214	203	182	154	119	111	102	99	105	110	103	105	103	106	128	134	142	137	92	139
5	91	89	88	88	86	88	128	146	135	116	86	85	86	84	83	86	82	83	85	86	90	98	100	106	96
6	124	161	148	152	143	117	102	104	98	91	89	89	88	88	86	87	90	90	95	101	97	98	100	114	107
7	104	100	110	112	109	119	126	128	118	109	99	89	91	89	89	88	89	90	91	93	95	94	109	104	102
8	104	147	151	205	232	219	182	148	124	107	92	88	86	86	86	86	86	87	87	89	94	92	98	97	120
9	95	99	117	114	105	139	119	146	150	132	:	:	88	87	87	87	86	87	90	96	91	94	94	97	105
10	96	94	97	106	106	105	109	130	140	123	99	89	:	:	87	87	82								104
11													:	92:	89										90
12																									
13											:	86:													86
14																									
15																									
16											:	94	93	91	91	91	91	90	97	109	96	97	98	106	96
17	102	105	105	102	107	101	103	99	99	102	103	106	102	95	111	:	91	91	91	94	116	101	105	96	101
18	101	120	138		: 136	143	145	150	152	133	118		96	95	96	73	96	96	106	128	161	116	116	113	121
19	113	127	114		: 125	136	181	226	282	249	169	131	103	96	96	99	100	103	111	103	104	102	111	122	135
20	123	129	133		: 187	143	134	143	132	123	111	101	98	95	94	99	99	96	95	100	100	102	109	112	116
21	109	107	103		: 154	141	131	122	117	107	92	91	90	89	88	88	89	91	93	108	97	100	98	93	104
22	92	90	93		: 91	99	102	101	100	97	94	92	90	90	91	94	92	90	91	91	92	96	92	94	94
23	93	95	94		: 98	102	127	152	146	132	126	115	102	110	102	99	97	100	102	101	101	125	118	118	111
24	94	92	91		: 91	91	90	93	93	93	96	96	96	96	91	90	88	88	99	95	102	114	111		95
25																									
26													:	101	97	94	97	98	109	118	118	113	108	107	105
27	116	122	125		: 103	104	106	107	118	109	100	107	99	98	99	102	104	110	110	111	109	113	115	134	110
28	142	129	123		: 120	107	122	123	123	104	96	98	94	93	91	92	91	91	95	95	95	109	113	114	107
29	105	100	99	103:	104	110	105	114	110	114	109	104	101	95	91	90	89	90	94	94	97	109	112	114	102
30	162	180	153		: 128	125	134	134	137	137	141	121	96	101	105	99	102	98	101	114	113	114	136	142	125
31	170	150	147		: 153	141	133	126	115	102	98	97	93	94	96	94	99	100	95	96	119	110	111	144	117
MEAN	111	119	119	131	128	125	128	132	130	119	107	99	95	94	94	92	93	94	97	101	105	105	108	111	

TOTAL NUMBER OF OBSERVATIONS = 6311. MEAN = 109.

: INDICATES CALIBRATION DURING THE HOUR

RADIAN CORPORATION

DCN 79-120-212-09

AIR MONITORING REPORT
FOR
THE UNIVERSITY OF TEXAS
BUREAU OF ECONOMIC GEOLOGY
NOVEMBER 1978
REPORT NO. 9

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Presented to:
Dr. Tom Gustavson
Land Resources Laboratory
Bureau of Economic Geology
Box X
University of Texas at Austin
Austin, Texas 78712

Prepared by:
Radian Staff

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I. GENERAL DESCRIPTION OF AIR MONITORING PROGRAM

Radian Corporation is under contract to the University of Texas, Bureau of Economic Geology, to provide ambient air quality monitoring at one site near Chocolate Bayou, Texas. This site measures and records concentrations for sulfur dioxide, hydrogen sulfide, methane, and particulates. A bag sample is collected bi-weekly and returned to Radian's Austin facilities and analyzed for methane.

Figure I shows the configuration of this type of monitoring station. The trailer provides a sturdy and protective covering as well as mobility. Figure II shows the air monitoring site.

FIGURE I

AMBIENT AIR MONITORING SYSTEM I

FIGURE II
AIR MONITORING SITE

II. DESCRIPTION OF INSTRUMENT SYSTEMS

The ambient air monitoring station is equipped to monitor the parameters shown below:

Sulfur Dioxide
Particulates
Methane
Hydrogen Sulfide

A. Air Quality Instrumentation

1. Description

Sulfur dioxide is measured with a Meloy Model SA185-2A sulfur analyzer, which is an EPA-approved analyzer. This automated analyzer utilizes the flame photometric principle to measure sulfur levels with a minimum detectable sensitivity of 5 ppb, and a linearity of $\pm 1\%$. The analyzer is operated with an H_2S scrubber to make it specific to SO_2 concentrations.

Hydrogen sulfide is measured using a Meloy Model SA185-2 analyzer equipped with an SO_x scrubber. Specifications for this analyzer are the same as for the SA185-2A.

Methane is monitored with a Bendix Model 8200 gas chromatograph. This instrument uses a flame ionization detector and has a minimum detectable sensitivity of 5 ppb. The Model 8200 works on a five-minute cycle, i.e., one air sample is analyzed every five minutes.

The air sample is drawn in through a glass cane and manifold supplied by the Ace Glass Company. The system has a 25 mm diameter, and a constant air flow through the system is

provided by an air pump rated at 60 cfm at 0" head pressure. The manifold has sampling ports to which $\frac{1}{4}$ " Teflon lines to the instruments are connected. All joints in the sampling system are secured by O-ring compression fittings. The manifold is contained in a heated (100°F) chamber to prevent condensation of moisture.

The trailer has two heavy duty high volume particulate samplers (Hi-Vols). Fiberglass filter paper is brought to a controlled humidity before weighing. Each Hi-Vol has a flow recorder to permit correction for changes in air flow runs for a 24-hour period (midnight to midnight), and is turned on and off by the computer. The Hi-Vols were designed following guidelines recommended by the Environmental Protection Agency and were manufactured by Radian.

2. Calibration

The trailer contains a Meloy Model RAD-1 calibration unit. This unit provides a zero air supply and SO₂ span gas from an SO₂ permeation tube. The calibration is automatically performed once a day, and is controlled by the computer. The SO₂ channel is first switched to zero. Then the computer monitors the output of each analyzer and takes a new zero reading after a stable zero signal has been reached. This zero reading is compared by the computer to the zero reading obtained 24 hours before, and if a drift in excess of 10 ppb has occurred, an excess zero drift light on the System Status Panel is turned on. The instruments are then returned to the monitor mode, and after two minutes the computer resumes data taking.

The SO₂ permeation tubes were manufactured by Metronics Association, Inc. These tubes were then individually calibrated for Radian by the National Bureau of Standards.

The Model 8200 methane analyzer is calibrated with undiluted span gas. This span gas contains methane in air. The Model 8200 is zeroed with air from a Bendix Model 8834 zero air unit. In addition, the instrument is electronically re-zeroed at the start of every five-minute cycle.

In addition to the daily instrument zero/spans, all instruments are multipoint calibrated monthly. Calibration standards and equipment used in the monthly multipoints is distinct from the equipment used for daily zero/span operations.

Quality assurance audits are performed on each instrument once a quarter. These audits are performed by Radian's Quality Assurance personnel using instrumentation and standards different from those used in the monthly multipoint calibrations.

A General Metals Calibration Kit is used to calibrate the Hi-Vol particulate samplers.

B. Data Acquisition System

The basis of the data acquisition system is a Data General NOVA 1200 minicomputer. The NOVA, which has a basic cycle time of 1.2 μ sec, is equipped with automatic program load and power fail/automatic restart features. The computer utilizes 8K 16-bit words of core memory. Analog-to-digital conversion is accomplished via an ADC built by Radian Corporation. The input/output unit for system 034 is Texas Instruments' KSR 733 keyboard/printer. This model provides keyboard entry and hard copy printed output. The data are also recorded on a cassette magnetic tape unit with three drives. The cassette unit is utilized for program storage and loading as well as recording. To reduce wear on mechanical parts, the power to the teletype and cassette units is turned on only when the

unit(s) is to be used. Several important functions in the instruments as well as in the computer and the trailer are monitored by means of lights on a System Status Panel. The information displayed by these lights is written onto cassette tape to monitor the complete status of the system every five minutes.

III. BAG SAMPLING PROGRAM

Grab-bag samples are collected bi-weekly and analyzed for methane. The ambient air samples are collected in tedlar bags using a metal bellows pump connected to the ambient sample manifold. Each bag sample is collected over a three-hour period.

The bag samples are returned to Austin for analysis for methane concentration. The analysis is performed on either a Bendix 8202 or a Baseline Industries Model 1030 gas chromatograph using a flame ionization detector. The minimum detectable limit using this technique is less than 1 ppm.

Results of the bag sampling analyses are given below:

<u>Date</u>	<u>Time</u>	<u>Methane Concentration (ppm)</u>
11/2/78*	0800-0900	4.1

*Only one (1) bag sample analysis was available this month.

IV. OPERATING TIME ANALYSIS

This section presents the operating statistics for each of the major subsystems contained in the monitoring station. Table I shows the specific number of hours that each of these subsystems was inoperative for the month. The column labeled "DIGITIZING SYSTEM" refers to the entire data acquisition system, and downtime hours appearing in this column are hours of total data loss. These instances include, in addition to computer downtime, power failures, no power available, and self-automated shutdown periods such as during air conditioner malfunctions.

Calibration time is not considered to be downtime and is not included in the downtime figures. The amount of time used in calibrating the instruments is given at the bottom of the downtime analysis table and is reported as total calibration hours for each channel for the entire month. As is evident in the calibration figures, channels can be calibrated independently of one another. No calibration time is given for particulate monitoring since Hi-Vol calibration occurs infrequently and only during the off-duty cycle for each Hi-Vol while another Hi-Vol is taking data.

TABLE I.
 DOWNTIME HOURS FOR CHOCOLATE BAYOU

SITE 033

DIGITIZING

DATE	SYSTEM	S02	H2S	VOLT	CH4	PART
11/ 1/78	0.	0.	0.	0.	0.	24.
11/ 2/78	0.	0.	3.	0.	1.	24.
11/ 3/78	0.	0.	1.	0.	14.	24.
11/ 4/78	0.	0.	0.	0.	23.	24.
11/ 5/78	0.	2.	0.	0.	23.	24.
11/ 6/78	0.	2.	1.	0.	23.	24.
11/ 7/78	0.	0.	0.	0.	12.	0.
11/ 8/78	0.	0.	0.	0.	0.	24.
11/ 9/78	0.	0.	0.	0.	0.	24.
11/10/78	0.	0.	1.	0.	0.	24.
11/11/78	0.	0.	0.	0.	0.	24.
11/12/78	0.	0.	0.	0.	0.	24.
11/13/78	0.	0.	1.	0.	0.	24.
11/14/78	7.	0.	0.	0.	0.	24.
11/15/78	0.	9.	0.	0.	0.	0.
11/16/78	0.	0.	0.	0.	0.	0.
11/17/78	0.	0.	0.	0.	0.	24.
11/18/78	1.	0.	0.	0.	1.	24.
11/19/78	24.	0.	0.	0.	0.	24.
11/20/78	24.	0.	0.	0.	0.	24.
11/21/78	10.	0.	0.	0.	0.	24.
11/22/78	10.	0.	0.	0.	1.	0.
11/23/78	18.	0.	0.	0.	3.	24.
11/24/78	12.	0.	0.	0.	12.	24.
11/25/78	0.	0.	0.	0.	23.	0.
11/26/78	10.	1.	1.	0.	13.	24.
11/27/78	14.	10.	10.	0.	9.	24.
11/28/78	8.	14.	0.	0.	16.	24.
11/29/78	0.	0.	0.	0.	23.	0.
11/30/78	0.	0.	0.	0.	23.	0.
CAL TIME		34.	17.	0.	17.	

Downtime Summary for November 1978

During November, extended downtime occurred on the NOVA computer, the Bendix 8200 methane analyzer, and the suspended particulate (hi-volume) sampler.

A. Data Acquisition

The computer's analog-to-digital converter failed in mid-November (11/19 to 11/23) causing data loss on all reporting parameters. Intermittent power failures at that time also caused the data acquisition and processing programs to go down.

B. Methane Analyses

During two intervals in early and mid-November, problems with the methane chromatograph's sample valve caused the instruments' flame ionization detector to fail. The valve was repaired after the first series of detector failures, and replaced after the second set of failures in late November (11/23 to 11/29).

C. Particulate Analyses

The particulate samplers all underwent preventative maintenance in early November and were fully functional. However, their operation is tied to the NOVA computer. Power failures cause the NOVA to drop its timing program which in turn causes the particulate sampler to run too long or to shut off too quickly. Continual power failures during November were responsible for the loss of two-thirds of the particulate samples.

V. DATA PRESENTATION AND SUMMARY

This section includes summaries for various recorded data at the monitoring sites. The data presentations indicate the variability of pollutant concentrations and parameters with time. All parameters, except suspended particulates (24-hour samples), are sampled once each second, but recorded as five-minute arithmetic averages of the one-second samples. This averaging technique tends to smooth instantaneous maximum values.

Inherent in any data acquisition system is random noise, both from the recording instruments and quantization in the analog-to-digital conversion. The lower threshold for all analytical instruments is twice the maximum noise level generated by the instruments. This lower threshold is 5 ppb for all of these instruments. Therefore, any values appearing in the data presentations that are less than 5 ppb indicate only a trace of pollutant in question and should not be construed to be absolute levels. In addition, when concentration levels drop below the lower threshold, the recorded quantity is simply random noise and averages tend toward zero. If a zero concentration appears in the data presentation, this does not indicate absolute zero concentration.

All pollutant data (except for particulate data) are taken at the monitoring site in integer parts per billion (ppb) but are presented here in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) assuming standard temperature and pressure of 25°C and 760 mm Hg (1013.2 millibars), respectively. The scale factors required to convert $\mu\text{g}/\text{m}^3$ at standard conditions back to ppb for the various pollutants are given in the following table.

Pollutant

To Convert $\mu\text{g}/\text{m}^3$ at 25°C and
760 mm Hg to ppb Multiply by

SO_2	.384
H_2S	.723
CH_4	1.536

The units of the air quality parameters are given at the top of each table. It should be noted here that inside temperature is monitored and recorded as a functional part of the system but is not presented in this report.

It should be noted that the SO_x scrubber was installed on the H_2S analyzer on 16 August at 9:35. Data from that analyzer from 9:35 on that date are H_2S data. Prior to 16 August, the data represented total sulfur measurements.

Table II presents the national ambient air quality standards (NAAQS) for criteria pollutants.

Table III displays the monthly statistics for the monitoring station for the month. To insure statistical significance, and to reduce the possibility of introducing a bias in the presentation, averages are computed only when at least 50 percent of the samples are present. If less than the required samples are present for a particular parameter, that entry will be blank. The number of samples present for a particular parameter is defined as the total possible number of five-minute samples for the averaging time less the computer downtime less the channel downtime less the channel calibration time. The averages in Table III are arithmetic averages with the following exception:

- Particulate averages are computed as the geometric mean.

Table IV displays the daily averages. Again, 50 percent of the five-minute samples are required in order to compute an average. A blank entry indicates an insufficient number of five-minute samples present for that day. Particulate averages are computed the same way as described in Table III.

Table V presents the maximum daily five-minute averages retained in the data base as well as the times of occurrence. For each parameter, a five-minute maximum average is printed if any samples are present for that day. Therefore, the maximum five-minute average when a given channel has experienced considerable downtime or calibration time during the day in question may be misrepresentative of the maximum expected for that parameter on that day.

Table VI indicates the five largest averages for various averaging times. The table shows the period of time covered by the average. Maxima are chosen so that time segments are independent. The maximum averages reported are found using a 'sliding average' technique with the exception of the 24-hour particulate average, which is computed from midnight to midnight. For averaging times less than or equal to three hours, the sliding average is stepped one five-minute sample at a time. For longer averaging times, the step size is twelve samples or one hour. For averaging times less than or equal to one hour, 100 percent of the five-minute samples must be present to compute an average. Averaging times greater than one hour require 90 percent. Whether or not a sliding average is computed is solely determined by the number of samples present in that averaging time and is independent of daily or monthly averaging criteria.

Table VII demonstrates the diurnal variation of various recorded parameters. Hourly averages are determined by arithmetically averaging five-minute samples. For all parameters, a blank entry in the diurnal variation table indicates that less than half (i.e., less than 6) of the five-minute samples for that hour are present.

Times given in the data presentations correspond to the appropriate local times, i.e., Central Daylight Savings Time or Central Standard Time, depending on the time of the year.

TABLE II
NATIONAL AMBIENT AIR QUALITY STANDARDS

	<u>Primary</u>	<u>Secondary</u>
<u>Particulate</u>		
Annual G.M.**	75 $\mu\text{g}/\text{m}^3$	60 $\mu\text{g}/\text{m}^3$
24 Hr. Max.*	260	150
<u>Sulfur Oxides</u>		
Annual	80 (.03 ppm)	
24 Hr. Max.*	365 (.14 ppm)	
3 Hr. Max.*	--	1300 (.5 ppm)
<u>Oxidant</u>		
1 Hr. Max.*	160* (.08 ppm)	160
<u>Hydrocarbons</u>		
3 Hr. Max.*	160 (.24 ppm)	160
6-9 a.m.		
<u>Carbon Monoxide</u>		
$\mu\text{g}/\text{m}^3$		
Max. 8 Hrs.*	10000 (9 ppm)	10000
Max. 1 Hr.*	40000 (35 ppm)	40000
<u>Nitrogen Dioxide</u>		
Annual	100 (.05 ppm)	100

Units are micrograms per cubic meter and ppm in parentheses.

*Not to be exceeded more than once per year.

**Geometric Mean.

TABLE III
AVERAGES FOR NOVEMBER 1 THRU 30, 1978

TABLE III. AVERAGES FOR NOV 1 THRU 30 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

SULFUR DIOXIDE(SO2)

HYDROGEN SULFIDE

METHANE

SITE 033
5.1

033
.4

033
1

PARTICULATE

SITE 033
33.1

TABLE IV
DAILY AVERAGES FOR NOVEMBER 1 THRU 30, 1978

TABLE IV. DAILY AVERAGES FOR NOV 1 THRU 30 1978
 (UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
 TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

DATE	SULFUR DIOXIDE(SO2)	HYDROGEN SULFIDE	METHANE
	SITE 033	033	033
11/ 1	.0	.1	1341.9
11/ 2	.5	.1	1346.7
11/ 3	.0	.2	
11/ 4	.0	.0	
11/ 5	.0	.4	
11/ 6	.8	.2	
11/ 7	.2	.1	
11/ 8	.0	.0	992.1
11/ 9	.0	.6	1159.5
11/10	.0	.1	935.4
11/11	.0	.0	966.9
11/12	.0	.0	1053.8
11/13	.0	.0	903.7
11/14	2.1	.0	857.2
11/15		.0	860.2
11/16	.3	.0	1075.4
11/17	35.0	.1	1120.5
11/18	52.2	4.3	1142.0
11/19			
11/20			
11/21	30.7	.0	1118.6
11/22	2.0	3.2	961.6
11/23			
11/24			
11/25	.3	.0	
11/26	.0	.0	
11/27			
11/28		.0	
11/29		.0	
11/30	.0	.0	

TABLE IV. DAILY AVERAGES FOR NOV 1 THRU 30 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

PARTICULATE

SITE 033

DATE

11/ 1	
11/ 2	
11/ 3	
11/ 4	
11/ 5	
11/ 6	
11/ 7	27.0
11/ 8	
11/ 9	
11/10	
11/11	
11/12	
11/13	
11/14	
11/15	49.0
11/16	33.0
11/17	
11/18	
11/19	
11/20	
11/21	
11/22	47.0
11/23	
11/24	
11/25	28.0
11/26	
11/27	
11/28	
11/29	23.0
11/30	33.0

TABLE V
MAXIMUM FIVE-MINUTE AVERAGES AND
TIMES OF OCCURRENCE FOR
NOVEMBER 1 THRU 30, 1978

TABLE V. MAXIMUM FIVE MINUTE AVERAGES AND TIME OF OCCURRENCE FOR NOV 1 THRU 30 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

SULFUR DIOXIDE(SO2)

DATE	SITE	033
11/ 1		5.2(13:25)
11/ 2		145.9(11:00)
11/ 3		.0(0:00)
11/ 4		.0(0:00)
11/ 5		.0(0:00)
11/ 6		2.6(5:00)
11/ 7		2.6(0:10)
11/ 8		.0(0:00)
11/ 9		.0(0:00)
11/10		.0(0:00)
11/11		.0(0:00)
11/12		.0(0:00)
11/13		.0(0:00)
11/14		10.4(21:00)
11/15		46.9(14:25)
11/16		33.9(11:05)
11/17		112.0(14:55)
11/18		1156.6(7:50)
11/19		
11/20		
11/21		114.6(15:00)
11/22		36.5(2:30)
11/23		2.6(0:15)
11/24		2.6(12:50)
11/25		2.6(0:00)
11/26		.0(0:00)
11/27		
11/28		
11/29		.0(15:00)
11/30		.0(0:00)

TABLE V. MAXIMUM FIVE MINUTE AVERAGES AND TIME OF OCCURRENCE FOR NOV 1 THRU 30 1978
 (UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
 TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

HYDROGEN SULFIDE

SITE 033

DATE

11/ 1	15.2(8:35)
11/ 2	2.8(12:30)
11/ 3	59.5(7:55)
11/ 4	2.8(17:00)
11/ 5	13.8(22:35)
11/ 6	20.8(14:15)
11/ 7	1.4(0:00)
11/ 8	.0(0:00)
11/ 9	8.3(13:20)
11/10	1.4(0:00)

11/11	.0(0:00)
11/12	.0(0:00)
11/13	.0(0:00)
11/14	.0(0:00)
11/15	1.4(18:45)
11/16	1.4(2:55)
11/17	1.4(0:45)
11/18	217.3(12:05)
11/19	
11/20	

11/21	.0(10:25)
11/22	9.7(13:55)
11/23	4.2(0:05)
11/24	.0(12:25)
11/25	.0(0:00)
11/26	.0(0:00)
11/27	
11/28	1.4(2:00)
11/29	.0(0:00)
11/30	.0(0:00)

TABLE V. MAXIMUM FIVE MINUTE AVERAGES AND TIME OF OCCURRENCE FOR NOV 1 THRU 30 1978
 (UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
 TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

METHANE

DATE	SITE	033
11/ 1	2389. 4(	2:25)
11/ 2	2602. 3(	8:40)
11/ 3	1998. 0(	8:40)
11/ 4		
11/ 5		
11/ 6		
11/ 7	1088. 2(	14:45)
11/ 8	1336. 3(	18:15)
11/ 9	2036. 4(	6:50)
11/10	1336. 3(	18:40)
11/11	1574. 7(	7:15)
11/12	2376. 3(	21:00)
11/13	1120. 1(	0:45)
11/14	1005. 5(	6:55)
11/15	1103. 8(	17:40)
11/16	1625. 5(	8:25)
11/17	1682. 8(	18:30)
11/18	1390. 4(	4:00)
11/19		
11/20		
11/21	1864. 5(	19:05)
11/22	1692. 5(	0:05)
11/23	1066. 1(	6:20)
11/24		
11/25		
11/26	4072. 1(	13:55)
11/27	2933. 1(	14:10)
11/28	108. 1(	0:10)
11/29		
11/30		

TABLE VI
THE FIVE MAXIMUM INDEPENDENT
SLIDING AVERAGES FOR
NOVEMBER 1 THRU 30, 1978

TABLE VI. THE FIVE MAXIMUM INDEPENDENT SLIDING AVERAGES FOR NOV 1-30 1978
UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER

SULFUR DIOXIDE
30-MINUTE

SITE	033	
1	11/18(7:45- 8:15)	307.4
2	11/18(10:15-10:45)	201.4
3	11/18(12:15-12:45)	161.9
4	11/21(14:50-15:20)	97.7
5	11/17(11:25-11:55)	96.8

SULFUR DIOXIDE
3-HOUR

SITE	033	
1	11/18(7:45-10:45)	136.3
2	11/17(11:15-14:15)	89.4
3	11/18(12:15-15:15)	82.5
4	11/17(14:20-17:20)	76.8
5	11/21(13:25-16:25)	73.3

SULFUR DIOXIDE
24-HOUR

SITE	033	
1	11/17-11/18(11:00)	58.3
2	11/24-11/25(11:00)	1.6
3	11/ 6-11/ 7(3:00)	1.0
4	11/ 1-11/ 2(12:00)	.5

TABLE VI. THE FIVE MAXIMUM INDEPENDENT SLIDING AVERAGES FOR NOV 1-30 1978
UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER

HYDROGEN SULFIDE
1-HOUR

SITE	033	
1	11/18(11:10-12:10)	97.9
2	11/ 3(7:00- 8:00)	5.5
3	11/22(13:20-14:20)	4.6
4	11/22(14:25-15:25)	4.2
5	11/22(15:30-16:30)	4.2

TABLE VI. THE FIVE MAXIMUM AVERAGES FOR NOV 1-30 1978
UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER

METHANE
3-HOUR (6-9AM)

SITE

033

1	11/ 2(	6:00-	9:00)	1803.1
2	11/ 1(	6:00-	9:00)	1769.2
3	11/ 9(	6:00-	9:00)	1754.2
4	11/ 3(	6:00-	9:00)	1690.9
5	11/16(	6:00-	9:00)	1291.0

TABLE VII
DIURNAL VARIATION OF RECORDED PARAMETERS

DIURNAL VARIATION OF SULFUR DIOXIDE(UG/M**3)
TRAILER NO. - 33 PERIOD(11/ 1/78 TO 11/30/78)

DAY	HOUR																								MEAN
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0:	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	1
3	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	:		2	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	2	1	1	0:	0	0	0	0	0	0	0	0	0	:	0:	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0:	0	0	0	0	0	0	0:	:	0:	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0:	0	0	0	0	0	0	0	0	0	0:	0:	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0:	0	0	0	0	0	0	0:	:	0:	0:	:	:	:	:	:	:	10	10	10	10	2
15				:					:	:	:	:	:	:	7:	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0:	0	0	0	0	0	0	3	5	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0:	0	0	0	0	25:	56:	71	86	83	95	85	66	82	73	49	18	41	0	0	0	35
18	36	0	0	0:	40	56	81	172	105	70	140	44	101	62	72	63	50	37	0	9	54	5	0	0	53
19																									
20																									
21											64:	57	53	55	68	86	60	0	0	0	0	0	0	0	31
22	0	0	12									0	1	3	3	3	3	3	0	0	2	3	3	3	2
23	2	1	1	0:	0	0																			0
24												1	2	3	3	3	3	3	3	3	3	3	3	3	3
25	3	3	3	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0:	0	0	0	0	0	0	0	0	0												0
27																									
28																									
29	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MEAN	2	0	1	0	2	3	4	9	6	6	13	11	11	11	12	10	9	5	2	1	4	1	1	1	

TOTAL NUMBER OF OBSERVATIONS = 6096. MEAN = 5.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF HYDROGEN SULFIDE (UG/M**3)
TRAILER NO. - 33 PERIOD(11/ 1/78 TO 11/30/78)

DAY	HOUR																								MEAN
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1	0	0	0	0:	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0:	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0:	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
5	0	0	0	0:	0	1	1	0	0	0	0	0	1	1	1	1	0	0	1	0	0	0	2	0	0
6	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0
7	0	0	1	0:	0	0	0	0	0	0	0	0	0	0	0:	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0:	0	0	0	0	0	0	0	0	0:	1	1	1	1	1	1	1	1	1	1	1	0
10	0	1	1	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0:	0	0	0	0	0	0	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0:	0	0	0	0	0	0:	0	0	0:	0	0:	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0:	0	0	0	0	0	0:	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	1	0:	0	0	0	0	0:	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0:	0	0	0	0	0	0	0	62	36	0	0	0	0	0	0	0	0	0	0	0	4
19																									
20																									
21											0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0										2	4	4	4	4	4	4	4	4	4	4	4	3
23	4	4	4	1:	0	0																			2
24													0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0:	0	0	0	0	0	0	0	0	0												0
27																									
28	0	0	0									0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MEAN	0	0	0	0	0	0	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0

TOTAL NUMBER OF OBSERVATIONS = 6531. MEAN = 0.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF METHANE(UG/M**3 X 10**-1)
TRAILER NO. - 33 PERIOD(11/ 1/78 TO 11/30/78)

	HOUR																								MEAN
DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1	161	172	221	:	214	212	200	174	155	125	102	94	92	96	100	97	98	107	104	99	114	109	105	112	133
2	127	129	166	:	178	180	131	164	246	185	145		101	97	98	101	98	110	116	117	120	121	116	122	135
3	140	132	127	:	122	143	160	161	187	170															149
4				:																					
5				:																					
6				:																					
7				:										98	100	98	100	100	97	97	98	97	104	103	99
8	103	109	111	:	102	96	94	96	99	99	98	95	92	92	92	94	94	100	114	103	100	97	99	100	99
9	130	121	118	:	131	142	186	185	156	153	119	97	95	91	88	89	95	98	102	106	88	89	98	93	116
10	92	91	90	:	93	93	95	108	108	91	88	88	88	87	87	87	90	90	100	100	106	100	91	90	94
11	90	91	90	:	99	105	106	124	106	93	91	90	89	90	91	90	96	91	92	94	96	96	101	111	97
12	108	101	121	:	98	108	111	99	100	111	98	93	92	93	92	93	112	117	98	104	155	127	98	99	106
13	103	98	93	:	98	94	94	97	99	90	87	85	86	86	87	86	84	84	83	85	88	88	96	89	90
14	84	84	85	:	87	86	87	87	85	84	84	83	84	83								92	90	87	86
15	88	87	86	:	90	89	91	91	88	85	85	85	84	84	84	84	84	88	85	85	85	86	83	82	86
16	83	93	101	:	104	105	108	127	152	151	151	131	91	84	83	83	97	109	104	106	109	102	102	100	108
17	100	99	99	:	96	99	103	109	118	118	113	113	112	111	106	109	110	119	136	128	136	129	110	106	112
18	115	117	123	:	123	120	118	118	115	114	112	107	108	109	110	107	110	105	113	125	119	107	115		114
19				:																					
20				:																					
21				:							110	112	112	111	107	93	116	87	119	125	120	106	126	119	112
22	127	115	122	:								92	87	83	98	96	97	92	86	96	90	69	67		96
23	65		67	:	76	82																			72
24				:																					
25				:																					
26				:																					
27				:										124											124
28				:																					
29				:																					
30				:																					
MEAN	108	109	115	:	0	115	118	120	124	129	119	106	98	95	95	94	94	99	100	104	104	109	102	101	100

TOTAL NUMBER OF OBSERVATIONS = 4053. MEAN = 107.

: INDICATES CALIBRATION DURING THE HOUR

RADIAN

CORPORATION

DCN 79-120-212-10

AIR MONITORING REPORT
FOR
THE UNIVERSITY OF TEXAS
BUREAU OF ECONOMIC GEOLOGY
DECEMBER 1978
REPORT NO. 10

5 February 1979

Presented to:
Dr. Tom Gustavson
Land Resources Laboratory
Bureau of Economic Geology
Box X
University of Texas at Austin
Austin, Texas 78712

Prepared by:
Radian Staff

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I. GENERAL DESCRIPTION OF AIR MONITORING PROGRAM

Radian Corporation is under contract to the University of Texas, Bureau of Economic Geology, to provide ambient air quality monitoring at one site near Chocolate Bayou, Texas. This site measures and records concentrations for sulfur dioxide, hydrogen sulfide, methane, and particulates. A bag sample is collected bi-weekly and returned to Radian's Austin facilities and analyzed for methane.

Figure I shows the configuration of this type of monitoring station. The trailer provides a sturdy and protective covering as well as mobility. Figure II shows the air monitoring site.

FIGURE I

AMBIENT AIR MONITORING SYSTEM I

FIGURE II
AIR MONITORING SITE

II. DESCRIPTION OF INSTRUMENT SYSTEMS

The ambient air monitoring station is equipped to monitor the parameters shown below:

Sulfur Dioxide
Particulates
Methane
Hydrogen Sulfide

A. Air Quality Instrumentation

1. Description

Sulfur dioxide is measured with a Meloy Model SA185-2A sulfur analyzer, which is an EPA-approved analyzer. This automated analyzer utilizes the flame photometric principle to measure sulfur levels with a minimum detectable sensitivity of 5 ppb, and a linearity of $\pm 1\%$. The analyzer is operated with an H_2S scrubber to make it specific to SO_2 concentrations.

Hydrogen sulfide is measured using a Meloy Model SA185-2 analyzer equipped with an SO_x scrubber. Specifications for this analyzer are the same as for the SA185-2A.

Methane is monitored with a Bendix Model 8200 gas chromatograph. This instrument uses a flame ionization detector and has a minimum detectable sensitivity of 5 ppb. The Model 8200 works on a five-minute cycle, i.e., one air sample is analyzed every five minutes.

The air sample is drawn in through a glass cane and manifold supplied by the Ace Glass Company. The system has a 25 mm diameter, and a constant air flow through the system is

provided by an air pump rated at 60 cfm at 0" head pressure. The manifold has sampling ports to which $\frac{1}{4}$ " Teflon lines to the instruments are connected. All joints in the sampling system are secured by O-ring compression fittings. The manifold is contained in a heated (100°F) chamber to prevent condensation of moisture.

The trailer has two heavy duty high volume particulate samplers (Hi-Vols). Fiberglass filter paper is brought to a controlled humidity before weighing. Each Hi-Vol has a flow recorder to permit correction for changes in air flow runs for a 24-hour period (midnight to midnight), and is turned on and off by the computer. The Hi-Vols were designed following guidelines recommended by the Environmental Protection Agency and were manufactured by Radian.

2. Calibration

The trailer contains a Meloy Model RAD-1 calibration unit. This unit provides a zero air supply and SO₂ span gas from an SO₂ permeation tube. The calibration is automatically performed once a day, and is controlled by the computer. The SO₂ channel is first switched to zero. Then the computer monitors the output of each analyzer and takes a new zero reading after a stable zero signal has been reached. This zero reading is compared by the computer to the zero reading obtained 24 hours before, and if a drift in excess of 10 ppb has occurred, an excess zero drift light on the System Status Panel is turned on. The instruments are then returned to the monitor mode, and after two minutes the computer resumes data taking.

The SO₂ permeation tubes were manufactured by Metronics Association, Inc. These tubes were then individually calibrated for Radian by the National Bureau of Standards.

The Model 8200 methane analyzer is calibrated with undiluted span gas. This span gas contains methane in air. The Model 8200 is zeroed with air from a Bendix Model 8834 zero air unit. In addition, the instrument is electronically re-zeroed at the start of every five-minute cycle.

In addition to the daily instrument zero/spans, all instruments are multipoint calibrated monthly. Calibration standards and equipment used in the monthly multipoints is distinct from the equipment used for daily zero/span operations.

Quality assurance audits are performed on each instrument once a quarter. These audits are performed by Radian's Quality Assurance personnel using instrumentation and standards different from those used in the monthly multipoint calibrations.

A General Metals Calibration Kit is used to calibrate the Hi-Vol particulate samplers.

B. Data Acquisition System

The basis of the data acquisition system is a Data General NOVA 1200 minicomputer. The NOVA, which has a basic cycle time of 1.2 μ sec, is equipped with automatic program load and power fail/automatic restart features. The computer utilizes 8K 16-bit words of core memory. Analog-to-digital conversion is accomplished via an ADC built by Radian Corporation. The input/output unit for system 034 is Texas Instruments' KSR 733 keyboard/printer. This model provides keyboard entry and hard copy printed output. The data are also recorded on a cassette magnetic tape unit with three drives. The cassette unit is utilized for program storage and loading as well as recording. To reduce wear on mechanical parts, the power to the teletype and cassette units is turned on only when the

unit(s) is to be used. Several important functions in the instruments as well as in the computer and the trailer are monitored by means of lights on a System Status Panel. The information displayed by these lights is written onto cassette tape to monitor the complete status of the system every five minutes.

III. BAG SAMPLING PROGRAM

Grab-bag samples are collected bi-weekly and analyzed for methane. The ambient air samples are collected in tedlar bags using a metal bellows pump connected to the ambient sample manifold. Each bag sample is collected over a three-hour period.

The bag samples are returned to Austin for analysis for methane concentration. The analysis is performed on either a Bendix 8202 or a Baseline Industries Model 1030 gas chromatograph using a flame ionization detector. The minimum detectable limit using this technique is less than 1 ppm.

Results of the bag sampling analyses are given below:

<u>Date</u>	<u>Time</u>	<u>Methane Concentration (ppm)</u>
12/19/78*	0600-0900	4.1

*Only one (1) bag sample analysis was available this month.

IV. OPERATING TIME ANALYSIS

This section presents the operating statistics for each of the major subsystems contained in the monitoring station. Table I shows the specific number of hours that each of these subsystems was inoperative for the month. The column labeled "DIGITIZING SYSTEM" refers to the entire data acquisition system, and downtime hours appearing in this column are hours of total data loss. These instances include, in addition to computer downtime, power failures, no power available, and self-automated shutdown periods such as during air conditioner malfunctions.

Calibration time is not considered to be downtime and is not included in the downtime figures. The amount of time used in calibrating the instruments is given at the bottom of the downtime analysis table and is reported as total calibration hours for each channel for the entire month. As is evident in the calibration figures, channels can be calibrated independently of one another. No calibration time is given for particulate monitoring since Hi-Vol calibration occurs infrequently and only during the off-duty cycle for each Hi-Vol while another Hi-Vol is taking data.

TABLE I.
DOWNTIME HOURS FOR CHOCOLATE BAYOU

SITE 033

DIGITIZING						
DATE	SYSTEM	SO2	H2S	VOLT	CH4	PART
12/ 1/78	11.	0.	2.	0.	4.	24.
12/ 2/78	14.	1.	4.	0.	3.	24.
12/ 3/78	24.	0.	0.	0.	0.	24.
12/ 4/78	10.	0.	0.	0.	0.	24.
12/ 5/78	0.	24.	0.	0.	3.	0.
12/ 6/78	0.	3.	1.	0.	2.	24.
12/ 7/78	3.	0.	2.	0.	1.	24.
12/ 8/78	9.	0.	0.	0.	0.	24.
12/ 9/78	0.	0.	0.	0.	0.	0.
12/10/78	0.	6.	0.	0.	0.	24.
12/11/78	0.	0.	0.	0.	0.	24.
12/12/78	0.	0.	0.	0.	0.	24.
12/13/78	0.	0.	0.	0.	0.	24.
12/14/78	0.	0.	0.	0.	0.	24.
12/15/78	0.	0.	0.	0.	0.	0.
12/16/78	0.	0.	0.	0.	0.	0.
12/17/78	0.	0.	0.	0.	0.	24.
12/18/78	0.	0.	0.	0.	0.	24.
12/19/78	0.	0.	0.	0.	0.	24.
12/20/78	2.	0.	0.	0.	0.	24.
12/21/78	9.	0.	0.	0.	0.	24.
12/22/78	0.	0.	0.	0.	0.	0.
12/23/78	0.	0.	0.	0.	0.	24.
12/24/78	0.	0.	0.	0.	0.	24.
12/25/78	0.	0.	0.	0.	0.	24.
12/26/78	0.	0.	0.	0.	0.	24.
12/27/78	0.	0.	0.	0.	0.	24.
12/28/78	0.	0.	0.	0.	0.	0.
12/29/78	0.	0.	0.	0.	0.	24.
12/30/78	0.	0.	0.	0.	0.	24.
12/31/78	0.	0.	0.	0.	0.	24.

CAL TIME 14. 11. 0. 25.

Instrument Operating Time - December, 1978

Extended downtime occurred on Trailer 033's NOVA computer, Meloy SA185-2A sulfur dioxide analyzer, and high-volume particulate samplers.

A. Data Acquisition

In early December (1st to the 4th) the data acquisition system was down for fifty-nine (59) hours. Intermittent power failures at the site resulted in the loss of the computer's data acquisition program.

B. The Meloy SA185-2A analyzer malfunctioned on December 5, causing a day's loss of data. A built in safety switch had sensed a possible problem with the analyzers and had shut it off. After an engineer adjusted the analyzer's sample flow rate, the problem did not recur.

C. Six particulate samples were recovered in December. The other samples were lost because of faulty start and stop commands from the NOVA computer. Power failures caused the NOVA to reset its internal times, which in turn causes the particulate samplers to run too long or to shut down too soon.

V. DATA PRESENTATION AND SUMMARY

This section includes summaries for various recorded data at the monitoring sites. The data presentations indicate the variability of pollutant concentrations and parameters with time. All parameters, except suspended particulates (24-hour samples), are sampled once each second, but recorded as five-minute arithmetic averages of the one-second samples. This averaging technique tends to smooth instantaneous maximum values.

Inherent in any data acquisition system is random noise, both from the recording instruments and quantization in the analog-to-digital conversion. The lower threshold for all analytical instruments is twice the maximum noise level generated by the instruments. This lower threshold is 5 ppb for all of these instruments. Therefore, any values appearing in the data presentations that are less than 5 ppb indicate only a trace of pollutant in question and should not be construed to be absolute levels. In addition, when concentration levels drop below the lower threshold, the recorded quantity is simply random noise and averages tend toward zero. If a zero concentration appears in the data presentation, this does not indicate absolute zero concentration.

All pollutant data (except for particulate data) are taken at the monitoring site in integer parts per billion (ppb) but are presented here in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) assuming standard temperature and pressure of 25°C and 760 mm Hg (1013.2 millibars), respectively. The scale factors required to convert $\mu\text{g}/\text{m}^3$ at standard conditions back to ppb for the various pollutants are given in the following table.

Pollutant

To Convert $\mu\text{g}/\text{m}^3$ at 25°C and
760 mm Hg to ppb Multiply by

SO_2	.384
H_2S	.723
CH_4	1.536

The units of the air quality parameters are given at the top of each table. It should be noted here that inside temperature is monitored and recorded as a functional part of the system but is not presented in this report.

It should be noted that the SO_x scrubber was installed on the H_2S analyzer on 16 August at 9:35. Data from that analyzer from 9:35 on that date are H_2S data. Prior to 16 August, the data represented total sulfur measurements.

Table II presents the national ambient air quality standards (NAAQS) for criteria pollutants.

Table III displays the monthly statistics for the monitoring station for the month. To insure statistical significance, and to reduce the possibility of introducing a bias in the presentation, averages are computed only when at least 50 percent of the samples are present. If less than the required samples are present for a particular parameter, that entry will be blank. The number of samples present for a particular parameter is defined as the total possible number of five-minute samples for the averaging time less the computer downtime less the channel downtime less the channel calibration time. The averages in Table III are arithmetic averages with the following exception:

- Particulate averages are computed as the geometric mean.

Table IV displays the daily averages. Again, 50 percent of the five-minute samples are required in order to compute an average. A blank entry indicates an insufficient number of five-minute samples present for that day. Particulate averages are computed the same way as described in Table III.

Table V presents the maximum daily five-minute averages retained in the data base as well as the times of occurrence. For each parameter, a five-minute maximum average is printed if any samples are present for that day. Therefore, the maximum five-minute average when a given channel has experienced considerable downtime or calibration time during the day in question may be misrepresentative of the maximum expected for that parameter on that day.

Table VI indicates the five largest averages for various averaging times. The table shows the period of time covered by the average. Maxima are chosen so that time segments are independent. The maximum averages reported are found using a 'sliding average' technique with the exception of the 24-hour particulate average, which is computed from midnight to midnight. For averaging times less than or equal to three hours, the sliding average is stepped one five-minute sample at a time. For longer averaging times, the step size is twelve samples or one hour. For averaging times less than or equal to one hour, 100 percent of the five-minute samples must be present to compute an average. Averaging times greater than one hour require 90 percent. Whether or not a sliding average is computed is solely determined by the number of samples present in that averaging time and is independent of daily or monthly averaging criteria.

Table VII demonstrates the diurnal variation of various recorded parameters. Hourly averages are determined by arithmetically averaging five-minute samples. For all parameters, a blank entry in the diurnal variation table indicates that less than half (i.e., less than 6) of the five-minute samples for that hour are present.

Times given in the data presentations correspond to the appropriate local times, i.e., Central Daylight Savings Time or Central Standard Time, depending on the time of the year.

TABLE II
NATIONAL AMBIENT AIR QUALITY STANDARDS

	<u>Primary</u>	<u>Secondary</u>
<u>Particulate</u>		
Annual G.M.**	75 $\mu\text{g}/\text{m}^3$	60 $\mu\text{g}/\text{m}^3$
24 Hr. Max.*	260	150
<u>Sulfur Oxides</u>		
Annual	80 (.03 ppm)	
24 Hr. Max.*	365 (.14 ppm)	
3 Hr. Max.*	--	1300 (.5 ppm)
<u>Oxidant</u>		
1 Hr. Max.*	160* (.08 ppm)	160
<u>Hydrocarbons</u>		
3 Hr. Max.*	160 (.24 ppm)	160
6-9 a.m.		
<u>Carbon Monoxide</u>		
$\mu\text{g}/\text{m}^3$		
Max. 8 Hrs.*	10000 (9 ppm)	10000
Max. 1 Hr.*	40000 (35 ppm)	40000
<u>Nitrogen Dioxide</u>		
Annual	100 (.05 ppm)	100

Units are micrograms per cubic meter and ppm in parentheses.

*Not to be exceeded more than once per year.

**Geometric Mean.

TABLE III
AVERAGES FOR DECEMBER 1 THRU 31, 1978

TABLE III. AVERAGES FOR DEC 1 THRU 31 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

SULFUR DIOXIDE(SO2)

HYDROGEN SULFIDE

METHANE

SITE 033
9.7

033
.2

033
1093.7

PARTICULATE

SITE 033
32.9

TABLE IV
DAILY AVERAGES FOR DECEMBER 1 THRU 31, 1978

TABLE IV. DAILY AVERAGES FOR DEC 1 THRU 31 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

DATE	SULFUR DIOXIDE(SO ₂)	HYDROGEN SULFIDE	METHANE
	SITE 033	033	033
12/ 1	. 0		
12/ 2			
12/ 3			
12/ 4	. 0	4. 2	1062. 3
12/ 5		. 8	981. 1
12/ 6	. 1	. 0	950. 1
12/ 7	2. 4	. 0	1208. 5
12/ 8	. 0	. 0	1065. 9
12/ 9	. 0	. 0	1029. 5
12/10	2. 3	. 0	1395. 9
12/11	52. 8	. 0	1209. 1
12/12	19. 2	. 0	1529. 3
12/13	21. 0	. 0	1506. 8
12/14	20. 3	. 0	1155. 8
12/15	7. 8	. 2	1285. 2
12/16	13. 1	. 2	1165. 5
12/17	56. 4	. 0	1051. 0
12/18	14. 1	. 0	1127. 9
12/19	. 0	. 7	944. 7
12/20	. 3	. 5	616. 9
12/21	5. 7	. 0	910. 6
12/22	1. 8	. 0	1132. 3
12/23	. 0	. 0	1154. 1
12/24	. 0	. 0	978. 5
12/25	4. 2	. 0	1211. 0
12/26	. 2	. 3	1031. 2
12/27	32. 0	. 0	982. 5
12/28	. 3	. 0	1015. 9
12/29	. 3	. 0	924. 5
12/30	. 0	. 0	924. 2
12/31	. 0	. 0	1042. 8

TABLE IV. DAILY AVERAGES FOR DEC 1 THRU 31 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

PARTICULATE

SITE 033
DATE

12/ 1	
12/ 2	
12/ 3	
12/ 4	
12/ 5	24. 0
12/ 6	
12/ 7	
12/ 8	
12/ 9	20. 0
12/10	
12/11	
12/12	
12/13	
12/14	
12/15	27. 0
12/16	37. 0
12/17	
12/18	
12/19	
12/20	
12/21	
12/22	41. 0
12/23	
12/24	
12/25	
12/26	
12/27	
12/28	62. 0
12/29	
12/30	

12/31

**TABLE V
MAXIMUM FIVE-MINUTE AVERAGES AND
TIMES OF OCCURRENCE FOR
DECEMBER 1 THRU 31, 1978**

TABLE V. MAXIMUM FIVE MINUTE AVERAGES AND TIME OF OCCURRENCE FOR DEC 1 THRU 31 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

SULFUR DIOXIDE(SO2)

DATE	SITE	033
12/ 1		. 0(0:00)
12/ 2		190. 2(8:35)
12/ 3		
12/ 4		5. 2(10:00)
12/ 5		
12/ 6		28. 7(3:50)
12/ 7		88. 6(1:00)
12/ 8		. 0(9:00)
12/ 9		. 0(0:00)
12/10		46. 9(23:00)
12/11		130. 2(16:35)
12/12		93. 8(10:05)
12/13		177. 1(18:25)
12/14		101. 6(7:00)
12/15		52. 1(19:50)
12/16		83. 4(20:50)
12/17		122. 4(13:20)
12/18		52. 1(7:10)
12/19		. 0(0:00)
12/20		75. 5(1:25)
12/21		62. 5(12:00)
12/22		57. 3(9:00)
12/23		. 0(0:00)
12/24		. 0(0:00)
12/25		70. 3(10:05)
12/26		46. 9(10:00)
12/27		112. 0(12:35)
12/28		44. 3(9:00)
12/29		39. 1(11:15)
12/30		. 0(0:00)
12/31		. 0(0:00)

TABLE V. MAXIMUM FIVE MINUTE AVERAGES AND TIME OF OCCURRENCE FOR DEC 1 THRU 31 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

HYDROGEN SULFIDE

DATE	SITE	033
12/ 1		96. 9(18:35)
12/ 2		48. 4(8:35)
12/ 3		
12/ 4		5. 5(10:00)
12/ 5		45. 7(23:50)
12/ 6		. 0(0:00)
12/ 7		. 0(2:00)
12/ 8		. 0(9:00)
12/ 9		. 0(0:00)
12/10		. 0(0:00)
12/11		. 0(0:00)
12/12		. 0(0:00)
12/13		. 0(0:00)
12/14		. 0(0:00)
12/15		66. 4(11:10)
12/16		37. 4(13:25)
12/17		. 0(0:00)
12/18		. 0(0:00)
12/19		181. 3(5:50)
12/20		91. 3(1:25)
12/21		. 0(8:50)
12/22		. 0(0:00)
12/23		. 0(0:00)
12/24		. 0(0:00)
12/25		. 0(0:00)
12/26		87. 2(10:00)
12/27		. 0(0:00)
12/28		. 0(0:00)
12/29		. 0(0:00)
12/30		. 0(0:00)
12/31		. 0(0:00)

TABLE V. MAXIMUM FIVE MINUTE AVERAGES AND TIME OF OCCURRENCE FOR DEC 1 THRU 31 1978
(UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER; WIND SPEED-MILES PER HOUR;
TEMPERATURE-DEGREES FAHRENHEIT; WIND DIRECTION-DEGREES WITH RESPECT TO THE NORTH;)

METHANE

DATE	SITE 033
12/ 1	960. 6(19: 00)
12/ 2	980. 1(4: 00)
12/ 3	
12/ 4	2443. 4(10: 15)
12/ 5	1374. 1(7: 00)
12/ 6	1170. 9(5: 45)
12/ 7	1797. 4(9: 30)
12/ 8	1183. 3(16: 50)
12/ 9	1333. 1(22: 40)
12/10	2825. 0(7: 30)
12/11	1724. 5(17: 35)
12/12	3540. 7(5: 05)
12/13	2554. 8(5: 50)
12/14	1940. 7(3: 45)
12/15	1574. 7(12: 35)
12/16	1485. 5(2: 40)
12/17	1609. 8(6: 35)
12/18	1695. 8(5: 25)
12/19	1463. 3(6: 15)
12/20	1753. 1(1: 25)
12/21	1081. 7(23: 55)
12/22	2306. 7(22: 20)
12/23	2074. 2(8: 05)
12/24	1469. 8(17: 55)
12/25	5955. 5(21: 30)
12/26	2249. 3(0: 05)
12/27	1221. 7(0: 10)
12/28	2618. 6(13: 05)
12/29	2335. 3(4: 35)
12/30	1498. 5(1: 10)
12/31	1682. 8(11: 55)

TABLE VI
THE FIVE MAXIMUM INDEPENDENT
SLIDING AVERAGES FOR
DECEMBER 1 THRU 31, 1978

TABLE VI. THE FIVE MAXIMUM INDEPENDENT SLIDING AVERAGES FOR DEC 1-31 1978
UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER

SITE		033	SULFUR DIOXIDE 30-MINUTE
1	12/13(18:10-18:40)	163.7	
2	12/11(16:30-17:00)	128.5	
3	12/11(17:05-17:35)	114.2	
4	12/17(12:50-13:20)	110.3	
5	12/11(18:10-18:40)	106.8	

SITE		033	SULFUR DIOXIDE 3-HOUR
1	12/11(15:30-18:30)	112.7	
2	12/17(10:35-13:35)	94.9	
3	12/11(18:35-21:35)	86.2	
4	12/13(17:45-20:45)	84.9	
5	12/27(9:55-12:55)	82.9	

SITE		033	SULFUR DIOXIDE 24-HOUR
1	12/11-12/12(11:00)	61.4	
2	12/16-12/17(20:00)	58.6	
3	12/13-12/14(11:00)	36.5	
4	12/26-12/27(22:00)	32.0	
5	12/17-12/18(21:00)	19.5	

TABLE VI. THE FIVE MAXIMUM INDEPENDENT SLIDING AVERAGES FOR DEC 1-31 1978
UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER

SITE	HYDROGEN SULFIDE	
	1-HOUR	
	033	
1	12/19(4:55- 5:55)	17.1
2	12/ 1(17:40-18:40)	15.7
3	12/20(0:45- 1:45)	11.3
4	12/26(9:05-10:05)	7.5
5	12/15(10:10-11:10)	5.5

TABLE VI. THE FIVE MAXIMUM AVERAGES FOR DEC 1-31 1978
UNITS: CONCENTRATIONS-MICROGRAMS PER CUBIC METER

METHANE
3-HOUR (6-9AM)

SITE	033
1	12/12(6:00- 9:00) 2558.2
2	12/10(6:00- 9:00) 2365.1
3	12/13(6:00- 9:00) 1962.6
4	12/23(6:00- 9:00) 1827.3
5	12/22(6:00- 9:00) 1714.2

TABLE VII
DIURNAL VARIATION OF RECORDED PARAMETERS

DIURNAL VARIATION OF SULFUR DIOXIDE(UG/M**3)
TRAILER NO. - 33 PERIOD(12/ 1/78 TO 12/31/78)

DAY	HOUR																								MEAN
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1	0	0	0												0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	:	0	0	0	0	20	0															2
3																									
4											1:	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5				:																					0
6				4:	0	0	0	0	0	0	0	0	0	0	0	:	:	:	:	0:	0	0	0	0	0
7	0	11	5	0:	0	0	0	0	0	20	8	6	1	0	0	0	0	0	0	0	0	0	0	0	2
8									:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0:	0	0	0	0	12							7	0	1	0	0	0	0	8	13	2
11	40	18	0	0:	0	0	4	18	62	56	23	69	52	49	70	104	120	113	102	91	72	91	55	41	53
12	28	17	0	2:	24	68	71	60	28	59	68	25	5	0	0	0	0	0	0	0	0	0	0	0	19
13	0	0	0	0:	0	0	0	0	0	0	42	49	66	0	0	0	0	5	146	64	40	31	47	5	21
14	0	0	0	0:	2	46	76	77	65	68	77	22	4	28	7	11	0	0	0	0	0	0	0	0	20
15	0	0	0	0:	0	0	0	0	0	0	0	5	0	0	10	21	20	0	1	44	43	25	0	16	8
16	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	12	34	0	20	23	53	56	61	52	13
17	56	49	51	54:	52	48	44	41	44	51	64	93	100	87	61	82	70	50	45	43	44	48	40	37	56
18	30	42	45	35:	29	39	47	47	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
19	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	7	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21				:	20:	16	31	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
22	0	0	0	0:	0	0	0	0	9	22	0	0	0	0	0	0	0	12	0	0	0	0	0	0	2
23	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	42:	6	10	0	0	0	1	55	0	0	0	0	0	0	0	0	0	0	0	0	0	4
26	0	0	0	0:	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	17	2	40:	59	68	53	37	65	72	73	78	98	25	0	0	0	0	2	0	42	41	0	0	32
28	0	0	0	0:	0	0	0	0	2	5	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0:	3	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MEAN	6	7	4	8	7	11	12	11	13	15	17	15	13	7	6	9	9	7	12	10	10	11	8	6	

TOTAL NUMBER OF OBSERVATIONS = 7380. MEAN = 10.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF HYDROGEN SULFIDE(UG/M**3)
TRAILER NO. - 33 PERIOD(12/ 1/78 TO 12/31/78)

DAY	HOUR																								MEAN
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1	0	0	0														0	3	13	0	0	0	0	0	1
2					0	0	0	0	5	0															1
3																									
4											4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
5	4	4	4	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	4	1
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8																									
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	17	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
20	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
21										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MEAN	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0

TOTAL NUMBER OF OBSERVATIONS = 7715. MEAN = 0.

: INDICATES CALIBRATION DURING THE HOUR

DIURNAL VARIATION OF METHANE(UG/M**3 X 10**-1)
 TRAILER NO. - 33 PERIOD(12/ 1/78 TO 12/31/78)

DAY	HOUR																								MEAN	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1																83	89	90	84	93	94	92	91	92	91	90
2					94	92	90	90	82	84																89
3																										
4											140	113	111	102	96	94	96	102	103	112	106	105	105	104		106
5	104	113	116		115	124	130	128	111	97	82	88	87		79	87	86	90	73	86	85	89	82	85		98
6		89	85		95	109	99	103	103	99	96	100	101	100	95	95					87	87	87	89		96
7	87	109	108		114	134	162	155	162	171	85	87	135	134	127	121	112	102	102	101	104	108				121
8										112	112	109	108	107	106	106	110	109	109	104	101	102	102	101		107
9	100	98	97		99	99	99	99	100	102	100	99	98	98	98	100	100	101	100	104	110	121	125	122		103
10	153	155	146		182	188	233	275	201	132	105	104	104	102	99	97	97	97	104	128	129	116	137	120		139
11	129	147	116		145	124	123	114	118	107	119	119	107	101	108	114	110	124	123	123	123	126	126	130		121
12	150	177	142		293	334	289	250	229	164	127	101	103	98	103	98	101	105	109	103	101	101	105	119		152
13	115	143	161		207	237	224	201	165	165	181	143	111	100	104	108	116	128	131	144	134	148	147	138		150
14	144	146	153		127	122	114	112	109	105	104	98	99	101	101	107	106	104	109	118	113	122	116	113		115
15	117	119	111	114	137	136	139	150	146	147	142	139	149	141	131	129	121	108	122	121	115	113	117	115		129
16	121	124	133		119	128	125	131	141	132	113	110	102	93	101	102	116	109	107	108	125	120	112	111		117
17	111	115	118		112	115	124	109	106	104	103	103	102	98	95	98	97	96	103	99	98	105	103	102		105
18	100	131	163		154	165	153	138	128	117	108	94	91	91	92	92	92	92	92	92	97	102	100	98	98	112
19	98	98	96	128	115	95	119	101	100	96	91	90	89	88	87	87	87	91	90	88	87	89	89	88		95
20	87	96	84		78	75	73	71	68	65	63	61	58	56	54	51	49	46	44	42	39	37				62
21										100	92	94	91	91	88	86	89	91	90	87	89	91	91	99		91
22	106	105	119		127	130	153	181	180	141	96	88	90	87	87	87	88	98	90	88	94	102	146	117		113
23	100	96	112	121	135	133	160	192	195	185	129	99	89	89	88	86	86	86	88	99	96	103	104	103		115
24	111	121	120		95	93	93	95	98	98	93	91	88	87	86	86	86	92	92	103	116	100	96	114		98
25	144	191	207		153	140	127	120	108	96	92	92	87	86	85	91	94	94	96	98	102	150	179	138		120
26	115	94	104		92	89	92	100	93	95	96	112	127	111	100	100	106	108	109	109	105	100	103	112		103
27	116	110	108		105	101	99	97	98	97	97	98	98	92	91	91	92	93	95	97	99	97	96	97		98
28	95	93	112		121	114	116	118	117	100	89	92		119	101	95	91	94	91	91	93	106	91	93		101
29	96	99	100		151	108	108	102	105	91	88	92	80	80	79	82	82	87	82	83	82	83	83	84		93
30	110	119	97		85	91	85	93	111	110	99	86	84	78	79	79	85	100	92	84	80	88	105	88		92
31	78	78	77		78	78	78	79	105	102	112	134	125	121	114	113	128	126	122	115	112	110	109	109		105
MEAN	112	119	120	121	128	129	131	131	126	115	106	101	101	98	95	96	97	99	99	101	101	104	109	107		

TOTAL NUMBER OF OBSERVATIONS = 7436. MEAN = 109.

: INDICATES CALIBRATION DURING THE HOUR