Background Report Reference

AP-42 Section Number: 12.11

Background Chapter: 2

Reference Number: 24

Title: Quantification of Fugitive Lead Emissions from Smelter and Oxide Plant Sources for GNB, Inc.

Lake Engineering, Inc.

April 1992

USE

24

A

AP-42 section: 7.11 2nd lead Ref #: 4

Date: 10/29/92 Rating:

Firm/company: CNB INC, Columbus, CA

Tested by: LAKE ENGINEERING, INC Atlanta GA.

Test date: April 92

Special Process: Blast furnace fugitive Emissions

$$\left(\frac{\text{Mass}}{\text{Volume}}\right)_{\text{Indoor Air Concentration of Lead}} \times \left(\frac{\text{Volume}}{\text{time}}\right)_{\text{Exhaust Stack Air Flow Rate}} = \left(\frac{\text{Mass}}{\text{time}}\right)_{\text{Lead Emission Rate}}$$

Test conditions: Usual ☐, unusual ☐

Sampling Method: new Method.

Sampling location and Velocity Method: gave similar

Calibration Info: YES ☐, NO ☐ results to Sampling Calculation -

PARAMETER:		Run # 1	Run # 2	Run # 3	Avg.
Lead	lb/hr	0.0507	0.0226		0.037
Particulate					
Sulfur Dioxide					

Production Data: 3 tons/hr (letter)

97% ↓ ⇒ Uncontrolled 0.2 lb/ton

Emission Factors: $\frac{0.037 \text{ lb/hr}}{3 \text{ tons/hr}} = 0.012 \text{ lb/ton}$

Ref 4

This test was conducted by Lake Engineering, Inc, to quantify ~~blast~~ the blast furnace fugitive emissions. ~~The area tested~~ The area tested included two conventional blast furnaces and the plant's existing sanitary hooding was assumed to be 97% effective in capturing fugitive emissions. [redacted]

The uncontrolled lead emission factor was found to be significantly lower than the lowest end of the range currently sited in AP-42 document. This result ~~was~~ is consistant with ~~the~~ findings at nine other smelters that this firm has evaluated. The lead E.F for ~~the~~ this test is rated "A". ~~The~~ lead emission rate was calculated according to the following concept:

Lead Emission Rate = Indoor Air Concentration of Lead × Exhaus Air flow Rate

LAKE
ENGINEERING, INC.

June 22, 1992

Brahim Richani, Ph.D.
Environmental Engineer
Pacific Environmental Services, Inc.
3325 Chapel Hill Boulevard
Suite 250
Durham, NC 27707

Re: Revision to AP-42 Section 7.11 for secondary lead smelting

Dear Dr. Richani:

We have been requested by GNB Incorporated to respond to your June 5, 1992 letter to Robert Steinwurtzel, counsel to the Association of Battery Recyclers. GNB Incorporated operates three secondary lead smelters in the U.S. and our company has, in addition to many other activities, developed detailed emission inventories and dispersion models for all three. We have also provided such services for six other secondary lead smelters in the country, a sizable percentage of the industry. We are, therefore, very familiar with AP-42 and appreciate this opportunity to give input regarding its revision for this industry.

It has not been our practice to rely upon AP-42 in estimating stack emissions at these facilities. The wide variety in ventilation equipment and control devices found in the industry has lead us to rely upon direct stack test data in all of the above mentioned cases. Even in estimating emissions for new sources we have exclusively relied upon stack test results from comparable equipment. Unfortunately, for your purposes, very few of these tests have included rigorous records of the production or throughput data needed to derive emission factors. We do not have any input on improving the existing AP-42 stack emission factors.

In the area of estimating fugitive lead emissions, we have found that the existing AP-42 factors consistently overpredict ambient concentrations when used in developing dispersion models. Rather than rely upon AP-42 in those situations, we have typically used a combination of building opening airflow and indoor air lead concentration in combination to derive exhaust mass rates of lead. We have recently completed such a study for GNB's facility in Columbus, Georgia. A copy of the report is enclosed for your review with GNB's permission. The area tested included two conventional blast furnaces operating at a combined

SUITE 500, 35 GLENLAKE PARKWAY
ATLANTA, GEORGIA 30328
(404) 395-0464 FAX: (404) 395-0474

throughput of 3 tons per hour of production. The report results found blast furnace fugitive emissions of roughly 0.04 lb/hr or 0.0133 lb/ton (controlled). We assume that the plant's existing sanitary hooding is 97% effective in capturing fugitive emissions which would imply an uncontrolled lead emission factor of 0.2 lb/ton. This is significantly lower than the lowest end of the range currently cited in AP-42 table 7.11-2 at 1.75 lb/ton. This result is consistent with our findings at the nine smelters we have evaluated. We would, therefore, suggest a reduction in the table 7.11-2 factor for lead fugitives at smelting operations from the current 1.75-7.0 lb/ton range to a level ranging from 0.2 to 0.4 lb/ton. Our experience indicates that the 1.75-7.0 lb/ton range is unrealistic.

It is hoped that the above discussion and attached report are useful to you in your revision effort. Please feel free to call me with any questions you may have regarding these issues.

Sincerely,

LAKE ENGINEERING, INC.

Russell S. Kemp, P.E.
Project Engineer

RSK:rc

Enclosure

cc: Ed Puckett
Rob Steinwurtzel

499.1

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QUANTIFICATION OF FUGITIVE LEAD EMISSIONS FROM SMELTER AND OXIDE PLANT SOURCES

for

GNB Incorporated
Resource Recycling Division

Columbus, GA

April 1992

Prepared by

Lake Engineering, Inc.
35 Glenlake Parkway, Suite 500
Atlanta, Georgia 30328
(404) 395-0464

491.1122

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Appendices

1.0 INTRODUCTION

As part of an ongoing compliance program, GNB Incorporated conducted physical testing of fugitive lead emissions from the smelter and lead oxide buildings at its Columbus, Georgia facility. This testing was motivated by a desire to obtain reliable estimates of the fugitive lead emissions for each of these two structures. Alternative methods such as AP-42 emission factors and indoor air quality studies were employed for this purpose in developing an emission inventory for the site in September 1991. The September study used a dispersion model calibration to arrive at an estimate of blast furnace fugitive emissions which fell between that derived by AP-42 factors and indoor air concentration approaches.

The Georgia Environmental Protection Division (EPD) requested that GNB undertake direct physical testing to measure the fugitive emissions of lead from the smelter and oxide plant buildings. Using input from meetings with EPD personnel, GNB prepared a test plan which detailed the proposed sampling locations and methodology. EPD personnel reviewed a draft of the plan during a visit to the site on March 13, 1992. The resulting Testing Plan for Smelter and Oxide Building Fugitive Emissions was submitted to EPD for approval on March 23, 1992 and is included as **Appendix A** to this report.

Testing for fugitive emissions was performed on March 27, 29, and 31, 1992. The obtained results were substantially lower than predicted by AP-42 factors for the furnace fugitives. Lead emissions results for the refinery, battery breaking, and oxide production areas were in general agreement with the estimates made in the September emission inventory and modeling report.

2.0 APPROACH

In accordance with the plan, personnel type sampling pumps were suspended beneath major roof openings in the subject building for a full work shift. Air velocity through the openings was measured using a hand-held velometer three times during each shift. Two full-shift samples were collected from the smelter complex, one of which contained two furnace "puff" occurrences. A single full-shift sample set was collected from the oxide plant roof openings.

Sampling pump locations were selected to provide representative coverage of the roof openings. Three pumps were added along the top of the large opening connecting the smelting and battery breaking buildings. These pumps were located to determine whether emissions from furnace upsets were being pulled to the powered roof exhausters in the breaker area.

Full data regarding exit air flow temperatures and wind speed/direction were collected during each sampling period.

3.0 RESULTS AND INTERPRETATION

Appendix B contains a compilation of laboratory results, field notes, and concentration calculations for the sampling shifts. Sample pump locations are noted in the same fashion as in the sampling plan.

Appendix C contains raw calculation worksheets used to derive mass emission rates from the collected flow data and measured lead-in-air concentrations. The cross sectional emission area associated with each pump was determined by apportioning the total roof vent areas according to pump locations. The three measured outlet flow velocities taken near each pump were averaged to obtain a shift-wise velocity average for use in flow calculations. Temperature measurements were then used to adjust calculated flows to standard conditions and compute mass-rate lead emissions from the sampling pump concentrations.

Calculated mass-rate lead emissions are as follows:

	3/27/92 lb/hr	3/29/92 lb/hr	3/31/92 lb/hr	AVG lb/hr	Sept. 91 Model lb/hr
Blast Furnace Fugitives	0.0507	0.0226		0.037	0.12
Breaker Area Fugitives	0.0173	0.0114		0.014	0.02
Refinery Area Fugitives	0.0135	0.012		0.013	0.016
Oxide Building Fugitives			0.0059	0.0059	0.0038

The emission rates used in the September 1991 modeling report are shown for comparison.

The results show that the upset conditions which occurred during the March 27 sampling doubled the lead emissions from the furnace and breaker areas but left the refinery area emissions largely unaffected. This is consistent with the indoor air flow pattern toward

the powered breaker area exhaust fans which tend to draw air from the furnace area and away from the refinery.

It is significant to note that the measured emission rates for the breaker area, refinery, and oxide plant agree quite well with rates derived from personnel sampling results used in the September 1991 model. The blast furnace fugitive results are significantly lower than those previously derived by model calibration, even during worst case upset conditions. The following listing shows how the measured furnace fugitive results compare with emission rates derived by other methods:

Blast Furnace Fugitive Emissions

Personnel Sampling Calculation	0.034 lb/hr Pb
Measured, March 1992	0.037 lb/hr Pb
Model Calibration, September 1991	0.12 lb/hr Pb
AP-42 Emission Factors	0.37 lb/hr Pb

Again, the measured results agree well with those derived from personnel sampling data.

4.0 IMPLICATIONS FOR MODELING AND FURTHER STUDY

The modeling performed in September 1991 should be considered to agree with the emission rates measured in this study for the oxide plant, breaker area fans, and refinery fugitives. Based upon these new data, however, modeling of blast furnace fugitives should probably be performed using the 0.037 lb/hr rate as a volume type source rather than as a low- flow stack as was done previously. A brief check of this approach shows reasonable agreement with monitored ambient air results as in the previous model calibration exercise. For consistency, modeling of the refinery and oxide plant fugitives should also be as volume type sources.

The very strong agreement between the results of this study and those derived from personnel sampling results suggest that future progress at the facility can be tracked through ongoing personnel sampling performed for OSHA compliance. This correlation will be extremely useful in evaluating the effect of the plannned blast furnace fugitive control ventilation system.

Based upon the above results it is expected that the proposed furnace fugitive control system at a 90% capture efficiency will reduce the blast furnace fugitive lead emission by 0.033 lb/hr to 0.0037 lb/hr. The expected improvement in breaker fan emissions would correspondingly be given by evaluating the relative influence of furnace emission changes on breaker fan emissions:

Comparing results from 3/27/92 and 3/29/92 -

Furnace $\frac{0.0507}{0.0226} = 2.243$

Breaker $\frac{0.0173}{0.0114} = 1.518$

Then a 90% reduction in furnace emission should have an effect on breaker fan emission of

$$(90)\ \frac{1.518}{2.243} = 61\%$$

Breaker fan emissions would, therefore, reduce by 60% to 0.0055 lb/hr lead with the installation of 90% control on the blast furnace fugitive emission source.

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APPENDIX A

TEST PLAN

GNB Incorporated Automotive Battery Division

3639 Joy Road
Columbus, GA 31906
Telephone (404) 689-0761

March 23, 1992

Mr. Frederick Rowe
Air Pollution Compliance Program
Georgia Environmental Protection Division
Floyd Tower East, Suite 1162
205 Butler St., S.E.
Atlanta, GA 30334

RE: Fugitive Emissions Test Plan

Dear Mr. Rowe:

Attached is a copy of the testing plan as discussed during your visit to the Columbus site on Friday March 13, 1992.

We are prepared to proceed with the testing as soon as we receive your approval of the plan.

If you have any questions, feel free to call Ken Strunk or myself.

Sincerely,

Jerry Duerksen

Jerry Duerksen
Columbus Regional Director
GNB Incorporated

Enclosures

JD/pp

copy: Jim Bonk
Steve Emmons
Ken Strunk
Russell Kemp
Ralph Kafka
Rick McReynolds
Wayne Shelton

file c:\wp51\text\jd212

TESTING PLAN FOR SMELTER AND OXIDE BUILDING FUGITIVE EMISSIONS

GNB Incorporated, Columbus, Georgia

On February 26, 1992, representatives of GNB Incorporated and the Georgia Environmental Protection Division (EPD) met to discuss approaches to estimating fugitive lead emissions from GNB's Columbus, Georgia facility. The primary focus of the meeting was the estimation of fugitive emissions from the main smelting building which houses two blast furnaces, a battery breaking system, raw material storage bins, and lead refining kettles. This estimate is key to developing a computer dispersion model of the facility which accurately represents the ambient air impacts from the plant.

This plan is intended to produce data from which lead emissions from the smelter and oxide production buildings can be directly calculated. It is believed that estimates calculated from such direct measurements will prove to be more reliable than estimates developed from published AP-42 emission factors. Modeling performed using AP-42 derived emissions has been found to greatly over predict ambient lead concentrations. The plan which follows will lead to a model which more accurately represents the true ambient air quality near the GNB complex.

General Approach

The mass rate of lead emissions from each of the smelter and the oxide building will be calculated directly from measurements of exhaust vent flow rates and lead-in-air concentrations measured in the buildings from areas likely to be representative of exit concentrations. The general calculation concept is:

$$\left[\frac{\text{Mass}}{\text{Volume}}\right] \times \left[\frac{\text{Volume}}{\text{Time}}\right] = \left[\frac{\text{Mass}}{\text{Time}}\right]$$

$$\left[\begin{array}{l}\text{Indoor Air}\\ \text{Concentration}\\ \text{of Lead}\end{array}\right] \quad \left[\begin{array}{l}\text{Exhaust Air}\\ \text{Flow Rates}\end{array}\right] \quad \left[\begin{array}{c}\text{Lead Emission}\\ \text{Rate}\end{array}\right]$$

The measurement problem is, therefore, composed of two distinct parts: indoor lead-in-air concentrations and exhaust air flow rates.

Modeling of the facility performed in 1991 applied this approach using indoor lead-in-air concentration averages taken from worker personnel samples for the work areas within the smelter and oxide buildings. Where AP-42 emission calculations were found to greatly over predict ambient impacts, this approach was found to under predict. This under prediction is

likely caused by several mechanisms which make personnel monitor results differ from the air quality leaving through roof vents. Among these mechanisms is the fact that the worker mounted sample results are from a full eight-hour work shift which includes breaks. It is also possible that lead-in-air concentrations may be higher nearer the ceiling because of the temperature of the key emitting processes within the buildings and the buoyancy of the fugitive emissions.

This study will seek to improve the estimates developed previously by collecting indoor lead-in-air concentration data from personnel sampling pumps mounted on structural members near the ceiling exhaust vents. Concurrent with these samples, roof vent flow velocities will be measured using hand held velometers.

Plan Details

Samples of lead-in-air concentrations will be collected using standard OSHA type personnel sampling pumps. Six to eight pumps will be used to provide simultaneous coverage of several different work areas. The pumps' air flows will be calibrated using the bubble and burette method and complete calibration records maintained for the testing report. Barometric pressure and temperature will be recorded during each sampling event to be used in calculating the true pump flows from the calibrations.

Air quality samples will be taken at the locations shown on **Figure 1.** Personnel sampling pumps will be hung through the roof vents in the oxide, smelter, and refinery building roofs to a level two feet below each opening. As shown in the figure, six samples will be collected from the refinery and smelter and six samples will be collected from the oxide plant. In addition, a sample will be collected from beneath the breaker exhaust fans whenever samples are collected from the smelter building.

A single set of full shift samples will be collected from the oxide building and from the refinery, smelter, breaker building combination. At least three times during each full shift sample, velometers will be used to measure the air flow velocity out of ridge vents and other roof openings associated with the sample locations. **Figures 2** and **3** schematically show the locations of these vents and openings. The sizes of each opening will also be measured to compute the exhaust area in square feet.

The supervisor's report form will be used to document any furnace "puffs" which might occur during sampling of the smelter building. If no puffs occur during the scheduled eight-hour sampling, a followup sampling will be performed using the two pumps in the smelter roof and the nearest refinery roof pump. These followup samplings will be repeated until a "puff" occurs and is measured.

Emission Estimation and Reporting

All the data collected above will be tabulated in report form for submittal to the EPD. This report will include pump calibration data, laboratory analysis reports, wind data, and all other pertinent field notes or observations. An estimate of the lead mass emission rate for

each opening will be calculated from averages of the flow rate and indoor air quality results associated with that opening. Significant variation in these rates among the openings could lead to modeling the emissions from each building with several sources rather than one aggregate mass rate.

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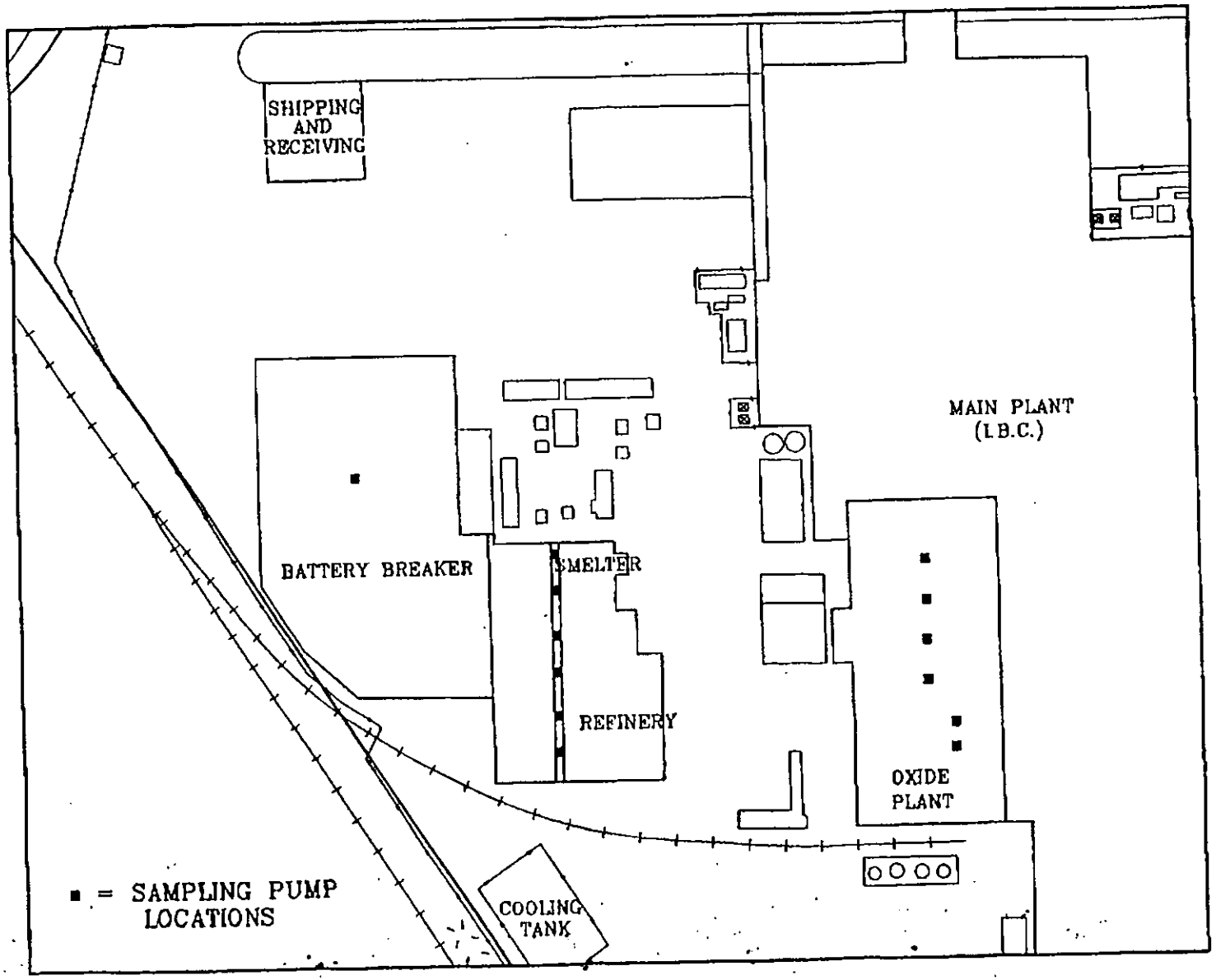


SAMPLING PUMP LOCATIONS

FIGURE 1

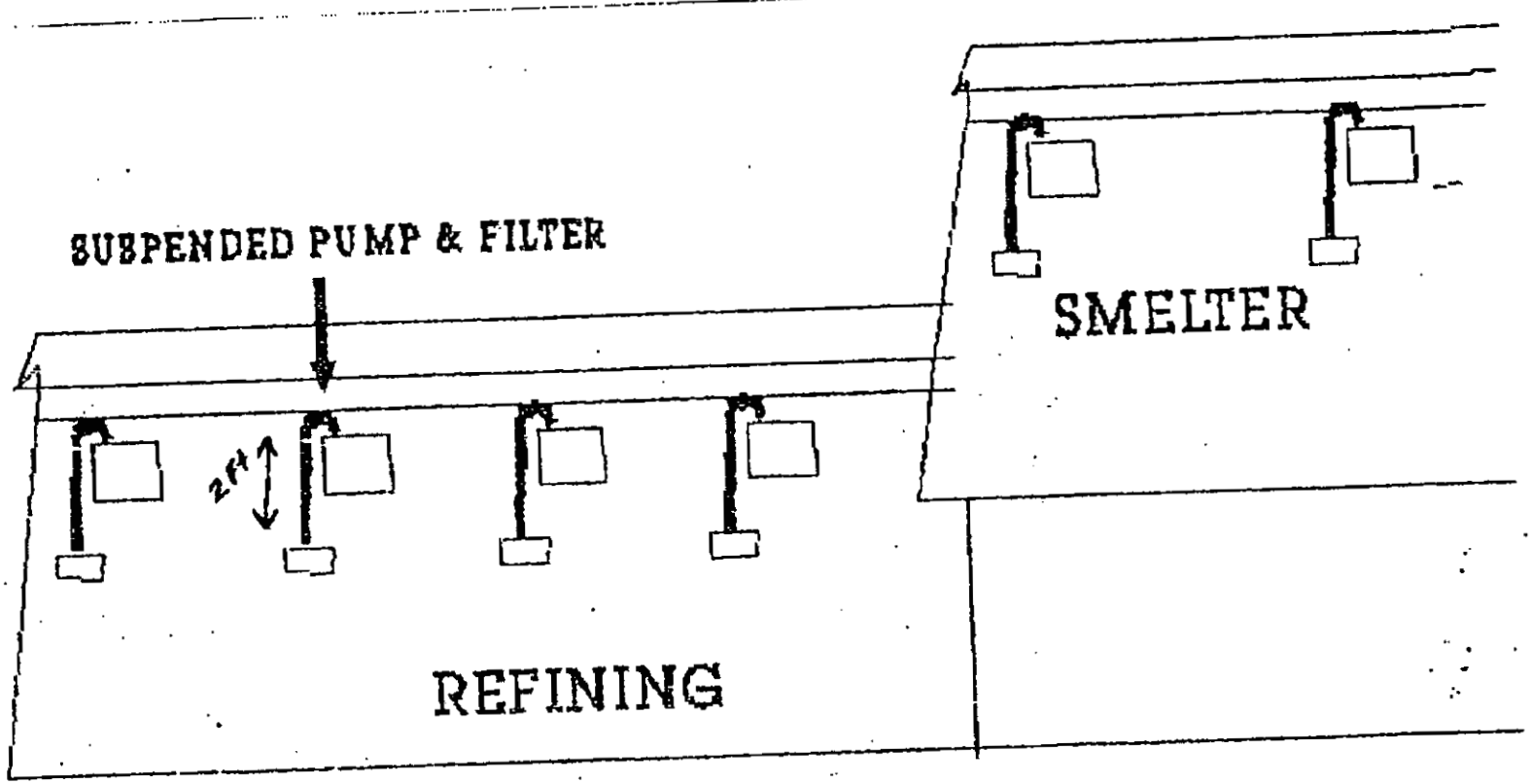


FIGURE 2

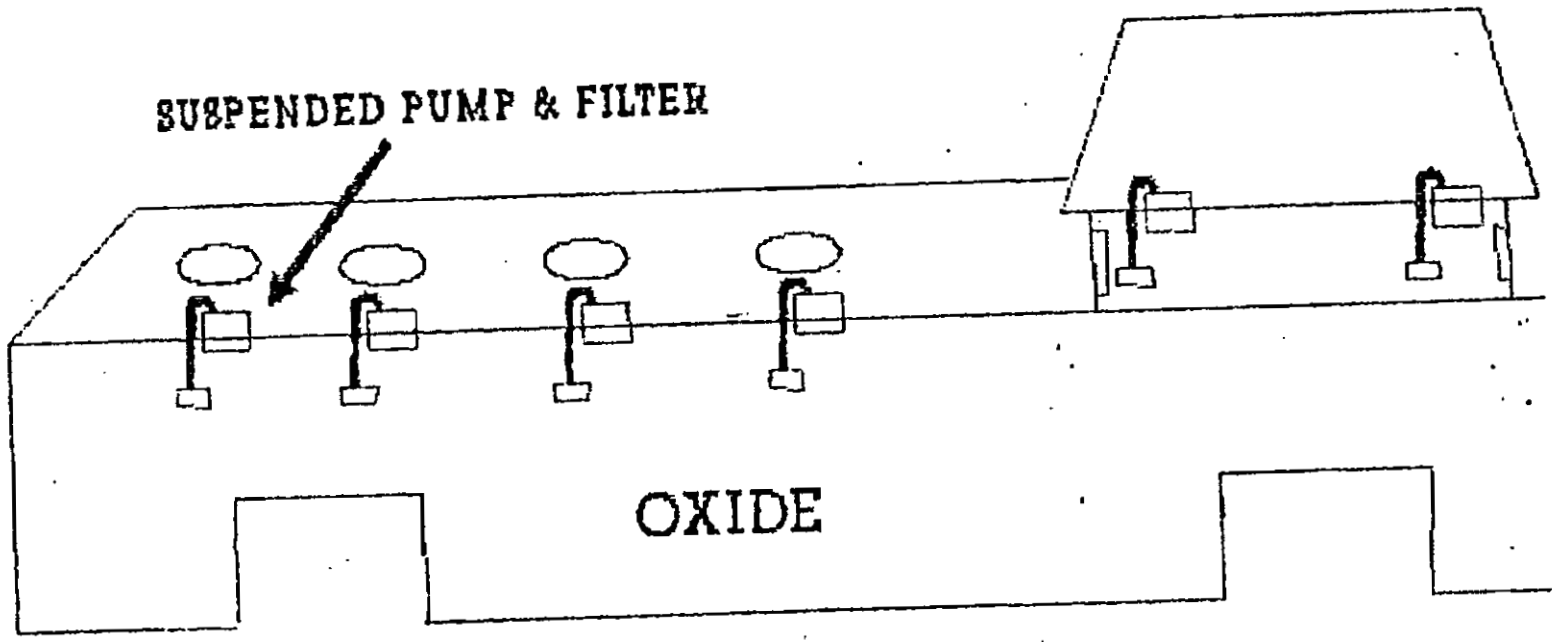


FIGURE 3

APPENDIX B

LABORATORY RESULTS
FIELD NOTES
CONCENTRATION CALCULATIONS

METALS CEILING AIR MONITOR RESULTS 4/2/92

DATE OF TEST: 3/27/92 SMELTER

FILTER	COLOR	TOTAL Pb	Pb ug/M3
1	D	552.5	575.5
2	D	290.0	302.1
3	D	145.0	151.0
4	D	82.5	86.0
5	L	20.0	21.9
6	M	75.0	78.1
7	D	155.0	161.5
8	L	12.5	14.1
9	VD	87.5	91.2

DATE OF TEST: 3/29/92 SMELTER

FILTER	COLOR	TOTAL Pb	Pb ug/M3
1	D	255.0	265.6
2	D	177.5	184.9
3	D	177.5	184.9
4	L	17.5	18.2
5	VD	67.5	70.3
6	D	35.0	36.5
7	M	45.0	46.9
8	M	72.5	75.5
9	L	50.0	52.1

DATE OF TEST: 3/31/92 OXIDE PLANT

FILTER	COLOR	TOTAL Pb	Pb ug/M3
1	M	180.7	186.3
2	M	179.5	184.7
3	M	145.9	152.0
4	M	238.6	244.5
5	M	97.8	100.0
6	M	148.0	151.0

* COLOR
- VD-VERY DARK
- D-DARK
- M-MEDIUM
- L-LIGHT

PERSONNEL EXPOSURE SAMPLING CALCULATIONS

PLANT GNB, RRD. SE.
LOCATION Columbus, GA.
SAMPLING DATE 27 March 1992

CALIBRATION TEMP 75 °F
+ 460 535 °R
CALIBRATION PRESS 30.01 "Hg

NAME	POSITION	PUMP FILTER	TOTAL-TIME	AVE TEMP	AVE B.P.	CALIB. FLOW	NET PARTICULATE	NET LEAD ug/m3	AIR FLOW FT/MIN
	1	1	757AM - 407PM 490 MIN.			2.0 8AM 1.9 12NOON 1.9 4PM		525.5	300 8AM 400 12 NOON 380 4PM
	2	2	754AM - 409PM 495 MIN.	88-8AM 93-12NOON 92-4PM		2.0 8AM 2.0 12 NOON 2.0 4PM		302.1	300 8AM 540 12 NOON 600 4PM
	3	3	750AM - 413PM 503 MIN.			2.0 8AM 2.0 12 NOON 1.9 4PM		151.0	210 8AM 300 12 NOON 360 4PM
	4	4	748AM - 415PM 507 MIN.	78-8AM 85-12 NOON 86-4PM		2.0 8AM 2.0 12 NOON 2.0 4PM		86.0	210 8AM 620 12 NOON 240 4PM
	5	5	746AM - 417PM 511 MIN.			2.0 8AM 2.0 12 NOON 2.0 4PM		21.9	200 8AM 270 12 NOON 340 4PM
	6	6	745AM - 419PM 514 MIN.			2.0 8AM 2.0 12 NOON 2.0 4PM		78.1	200 8AM 320 12 NOON 260 4PM

$$\frac{P\ CAL}{P\ Fld} \times \frac{T\ Fld}{T\ CAL} \quad \_\_\_\_ \quad \_\_\_\_ = \_\_\_\_ \times \_\_\_\_ = \_\_\_\_$$

9:25 AM #2 FURNACE PUFFED
3:21 PM #1 FURNACE PUFFED

PERSONNEL EXPOSURE SAMPLING. CALCULATIONS

LANT GNB RRD SE

OCATION Columbus, GA.

AMPLING DATE 27 March 92

CALIBRATION TEMP 75 °F

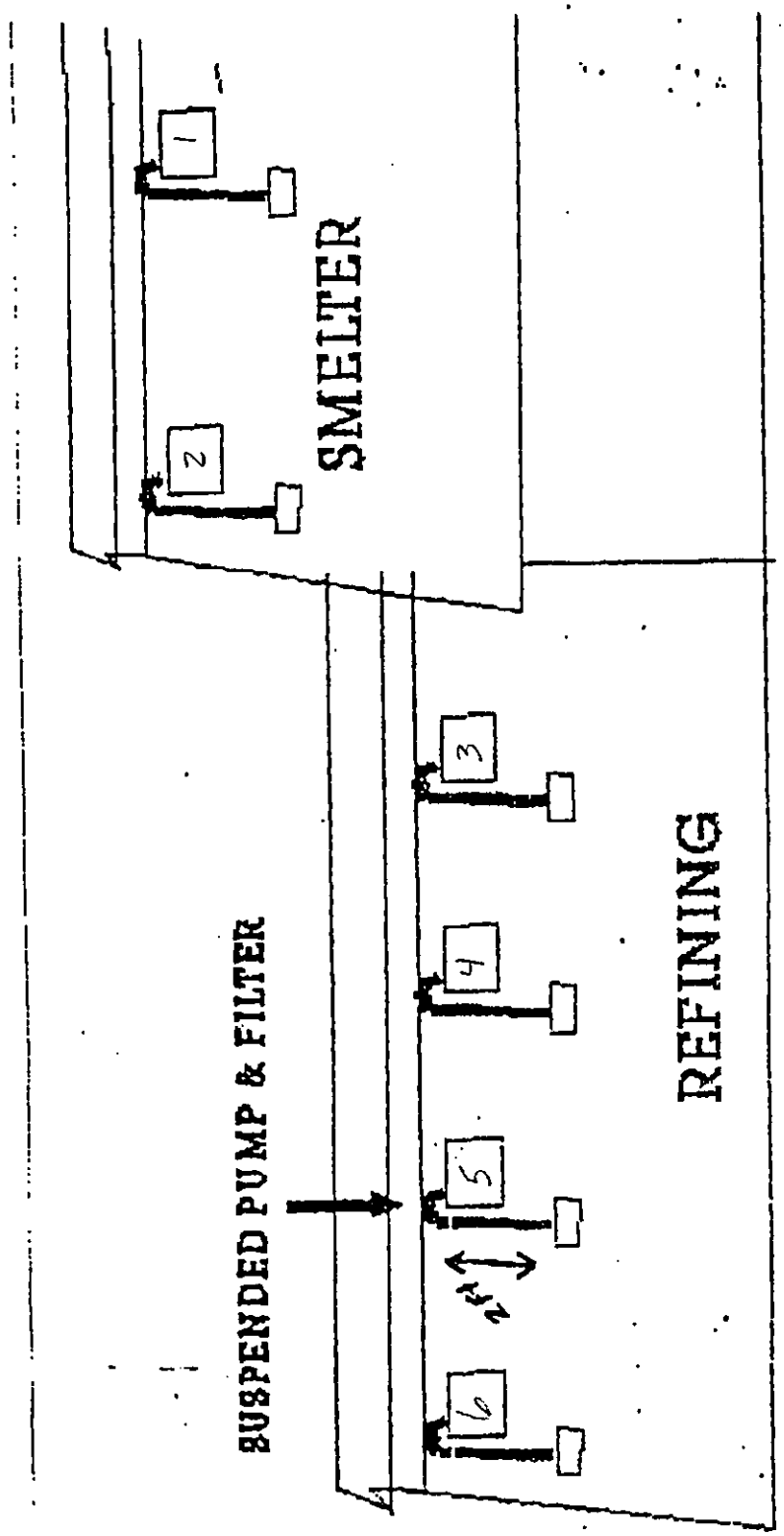
+ 460 535 °R

CALIBRATION PRESS 30.01 " Hg

AME	POSITION	PUMP FILTER	TOTAL-TIME	AVE TEMP	AVE B.P.	CALIB. FLOW	NET PARTICULATE	ug/m3 NET LEAD	AIR F/CL FT/MIN
	7	7	8AM-4PM 480 MIN			2.0 8AM 2.0 12 NOON 2.0 4PM		161.5	150 8AM 250 12-NOON 380 4PM
	8	8	801AM-402PM 481 MIN			2.0 8AM 2.0 12 NOON 2.0 4PM		14.1	60 8AM 100 12-NOON 250 4PM
	9	9	802 AM-404PM 482 MIN			2.0 8AM 2.0 12 NOON 2.0 4PM		91.2	50 8AM 280 12-NOON 270 4PM

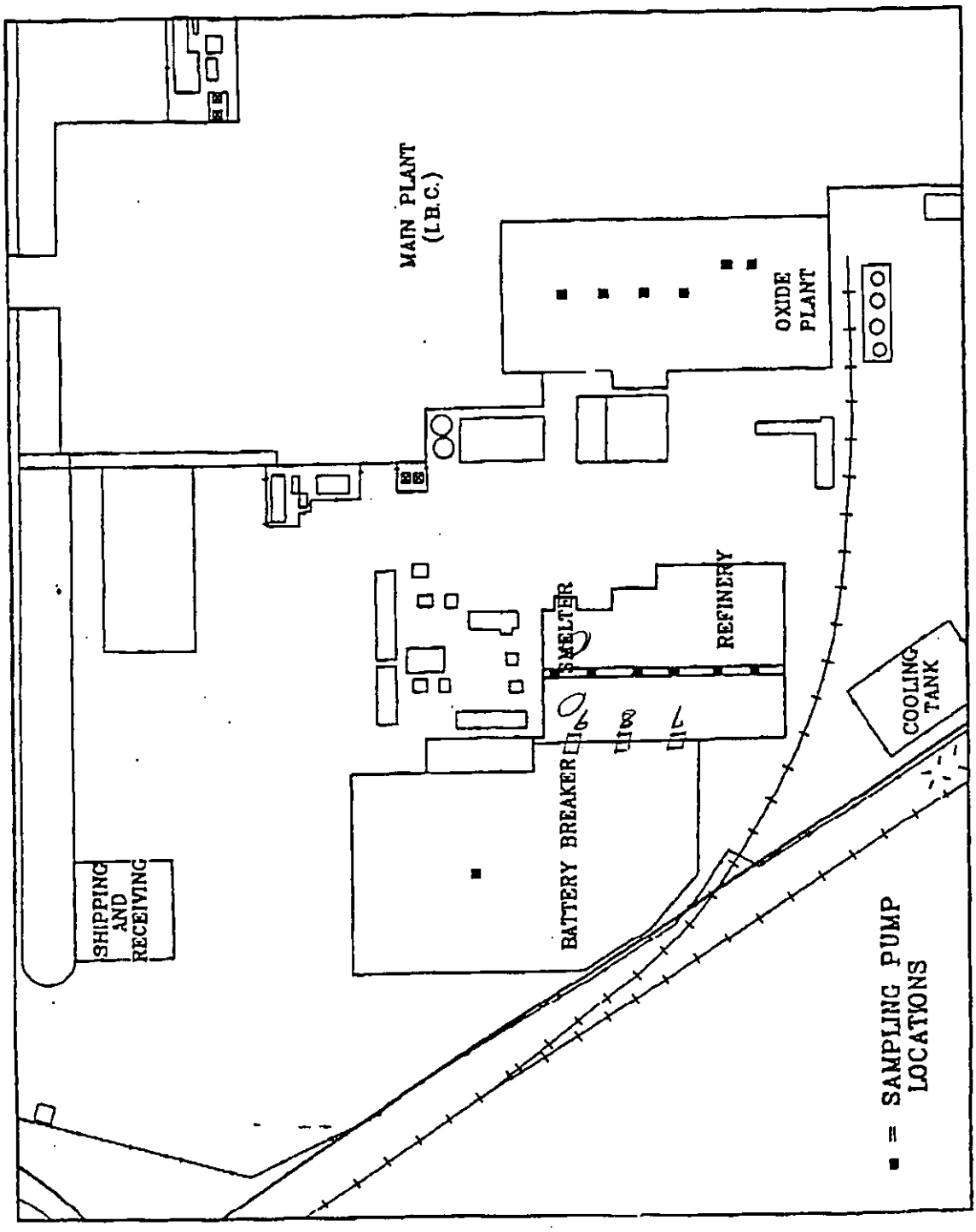
$$\frac{P\,CAL}{P\,FLD} \times \frac{T\,FLD}{T\,CAL} \quad \_\_\_\_ \quad \_\_\_\_ = \_\_\_\_ \times \_\_\_\_ = \_\_\_\_$$

FIGURE 2



3/17/92

FIGURE 1



SAMPLING PUMP LOCATIONS

3/27/92

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3/27/92

Time	Wind Speed	Direction	Barometric Pressure
8 AM	2-5 mph	210°-270°	30.02↑
9 AM	2-10	240°-330°	30.05↑
10 AM	5-15	270°-360°	30.07↑
11 AM	5-15	270°-360°	30.09
12 AM	5-18 ~~GUSTS~~	270°-360°	30.09
1 PM	5-18 (23)	270°-360°	30.09
2 PM	5-18 (23)	270°-360°	30.09
3 PM	5-18 (23)	270°-360°	30.09
4 PM	5-18 (23)	270°-360°	30.09

	3/29/92	27	
8 AM	0-2	270°-360°	30.27
9 AM	2-7	300°-360°	30.23
10 AM	2-10	0-360°	30.29
11 AM	5-12	360°	30.27
12 AM	8-20	360°	30.21
1 PM	3-14	360°	30.18
2 PM	3-12	360°	30.15
3 PM	2-10	360°	30.13
4 PM	5-16	360°	30.12

PERSONNEL EXPOSURE SAMPLING CALCULATIONS

PLANT GNB RRD SE

LOCATION Columbus, GA.

SAMPLING DATE 29 March 1972

CALIBRATION TEMP 75 °F

+ 460 535 °R

CALIBRATION PRESS 30.09 "Hg

NAME	POSITION	PUMP FILTER	TOTAL-TIME	AVE TEMP	AVE B.P.	CALIB. FLOW	NET PARTICULATE	NET µg/m³ HEAD	AIR FLOW FT³/MIN
			8AM - 402PM			2.0 - 8AM 2.0 12-NOON			360 - 8AM 350 - 12NOON
	1	1	482 MIN			2.0 4PM		265.5	360 4PM
			801AM - 405PM	82-8AM 96-12NOON		2.0 8AM 2.0 12 NOON			340 - 8AM 300 12NOON
	2	2	484 MIN.	96-4PM		2.0 4PM		184.9	360 4PM
			803AM - 409PM			2.0 8AM 2.0 12NOON			240 8AM 250 12NOON
	3	3	486 MIN			2.0 4PM		184.9	280 4PM
			804AM - 411PM	78-8AM 92-12NOON		2.0 8AM 2.0 12-NOON			350 - 8AM 290 - 12NOON
	4	4	487 MIN	96-4PM		2.0 4PM		18.2	400 4PM
			805AM - 413PM			2.0 8AM 2.0 12NOON			280 8AM 220 12NOON
	5	5	488 MIN.			2.0 4PM		70.3	360 4PM
			806AM - 415PM			2.0 8AM 2.0 12-NOON			310 8AM 270 12NOON
	6	6	489 MIN.			2.0 4PM		36.5	380 4PM

$$\frac{P\ CAL}{P\ Fld} \times \frac{T\ Fld}{T\ CAL} \quad \_\_\_\_ \quad \_\_\_\_ = \_\_\_\_ \times \_\_\_\_ = \_\_\_\_$$

NO UPSET CONDITIONS

PERSONNEL EXPOSURE SAMPLING CALCULATIONS

LANT GNB RRD SE

OCATION Bilimbas, GA.

AMPLING DATE 29 March 1992

CALIBRATION TEMP 75 °F

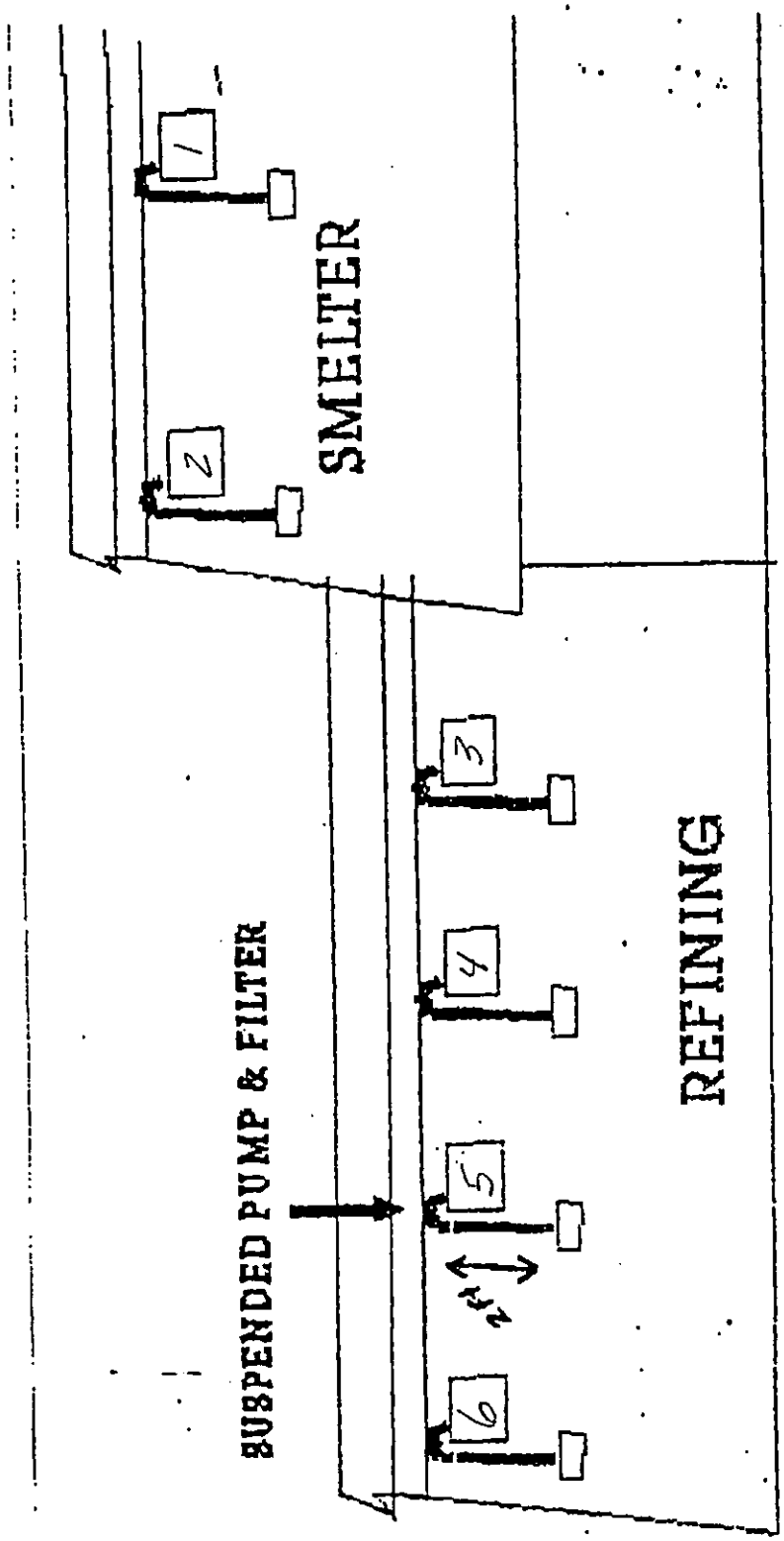
+ 460 535 °R

CALIBRATION PRESS 30.09 "Hg

AME	POSITION	PUMP FILTER	TOTAL-TIME	AVE TEMP	AVE B.P.	CALIB. FLOW	NET PARTICULATE	NET LEAD	AIR FLOW FT/MIN
	7	7	810AM-424PM 494min			2.0 8AM 2.0 12NOON 2.0 4PM		46.9	120-8AM 180-12NOON 150-4PM
	8	8	812AM-428PM 496min			2.0 8AM 2.0 12-NOON 2.0 4PM		75.5	160-8AM 240-12 NOON 230-4PM
	9	9	814AM-433PM 499min			2.0 8AM 2.0 12-NOON 2.0 4PM		52.1	100-8AM 140-12NOON 200 4PM

$$\frac{P\ Cal}{P\ Fld} \times \frac{T\ Fld}{T\ Cal} \quad \_\_\_\_ \quad \_\_\_\_ = \_\_\_\_ \times \_\_\_\_ = \_\_\_\_$$

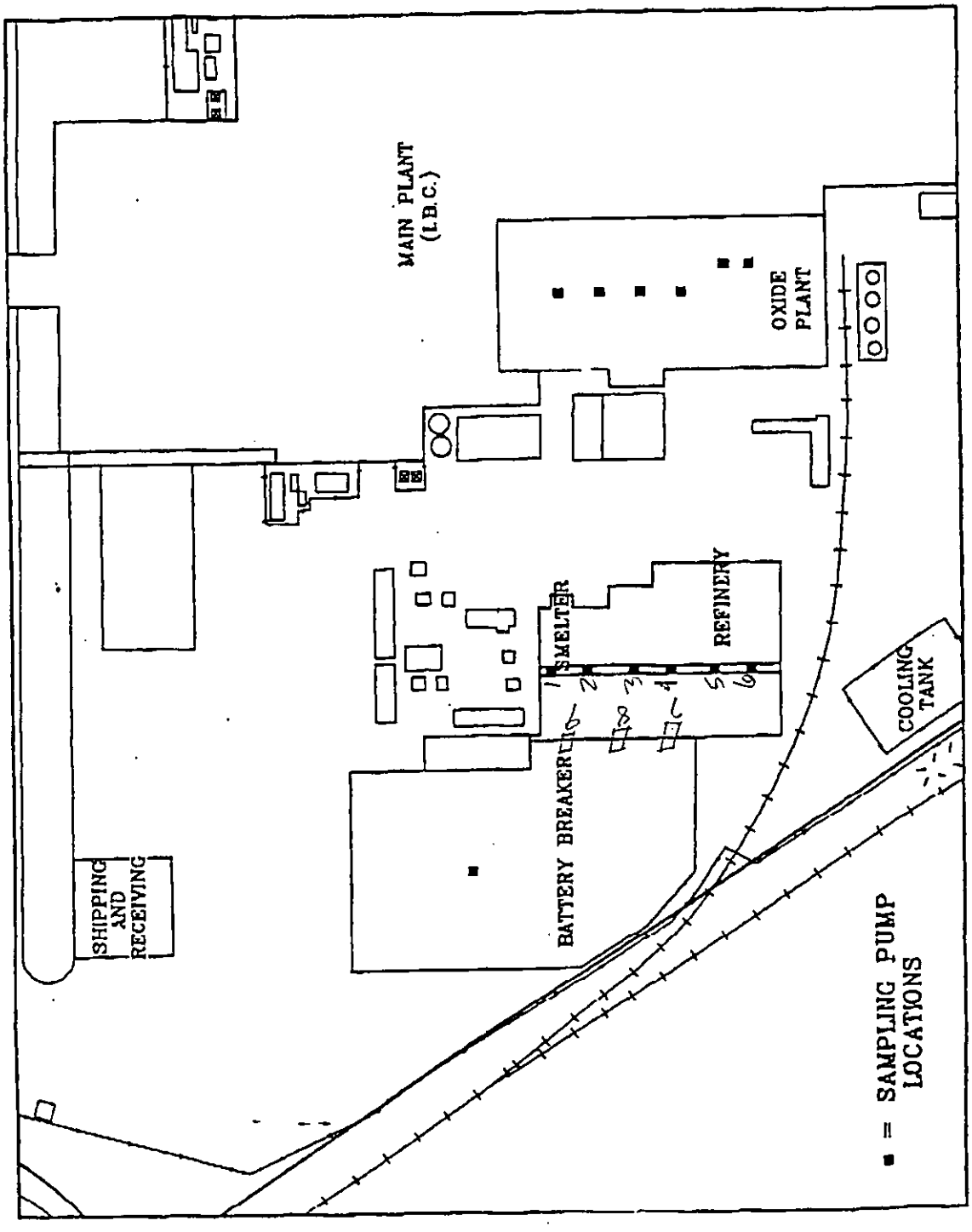
FIGURE 2



8/29/92

FIGURE 1

SAMPLING PUMP LOCATIONS



3/29/92

411-128 1-1 03-18-92 J10

3/27/92

Time	Wind Speed	Direction	Barometric Pressure
8 AM	2-5 mph	210°-270°	30.021
9 AM	2-10	240°-330°	30.051
10 AM	5-15	270°-360°	30.071
11 AM	5-15	270°-360°	30.09
12 AM	5-18 ~~GUST~~	270°-360°	30.09
1 PM	5-18 (23)	270°-360°	30.09
2 PM	5-18 (23)	270°-360°	30.09
3 PM	5-18 (23)	270°-360°	30.09
4 PM	5-18 (23)	270°-360°	30.09

	3/29/92	27	
8 AM	0-2	270°-360°	30.27
9 AM	2-7	300°-360°	30.28
10 AM	2-10	0-360°	30.29
11 AM	5-12	360°	30.27
12 AM	8-20	360°	30.21
1 PM	3-14	360°	30.18
2 PM	3-12	360°	30.15
3 PM	2-10	360°	30.13
4 PM	5-16	360°	30.12

PERSONNEL EXPOSURE SAMPLING CALCULATIONS

LANT GNB RRD SE

OCATION Columbus, GA

AMPLING DATE 31 MARCH 1992

CALIBRATION TEMP 70 °F

+ 460 530 °R

CALIBRATION PRESS 29.83 "Hg

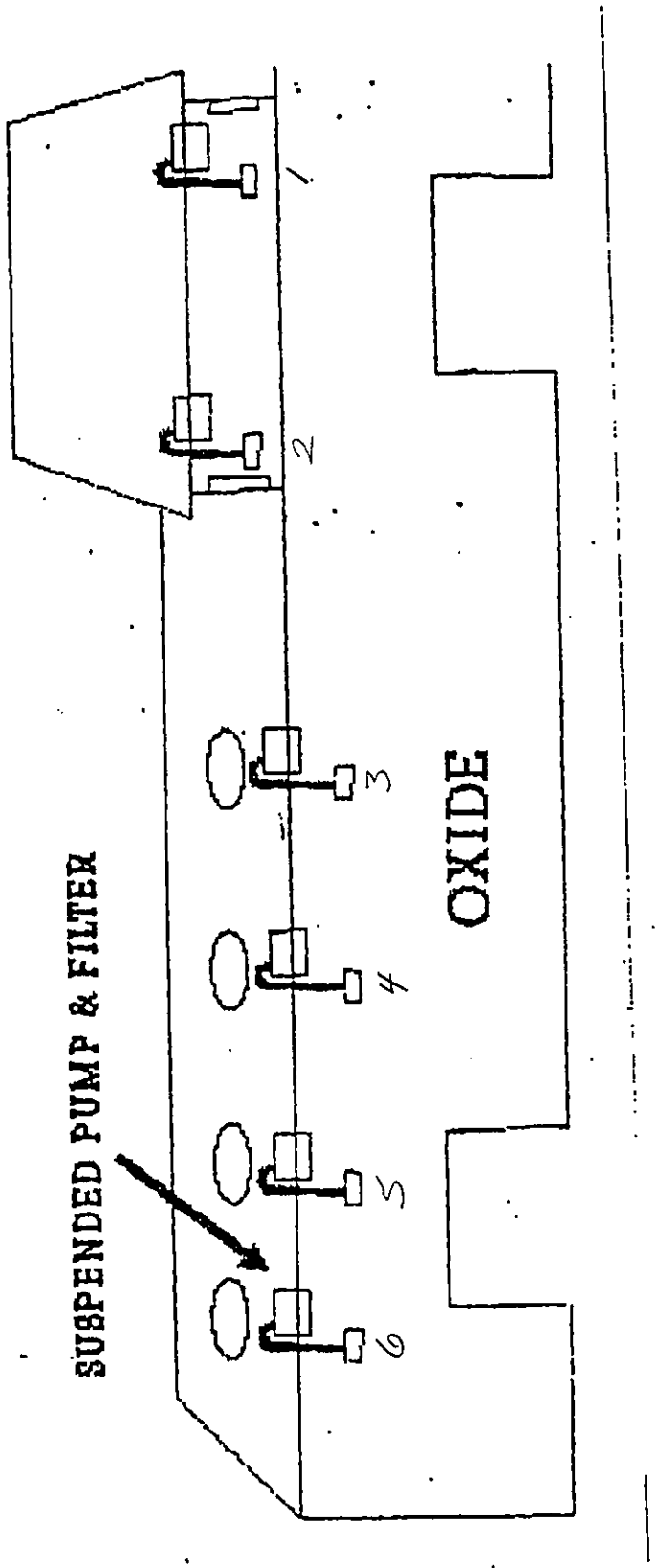
AME	POSITION	PUMP FILTER	TOTAL-TIME	AVE TEMP	AVE B.P.	CALIB. FLOW	NET PARTICULATE	NET LEAD (ug/m3)	AIR FLOW FT/MIN
	1	1	745AM-350PM 485 MIN.			2. 8AM 2. 12-NOON 2-4PM		186.3	380-8AM 360-12 NOON 340-4PM
	2	2	746AM-352PM 486 MIN	94-8AM 93-12 NOON 108-4PM		2. 8AM 2. 12 NOON 2-4PM		184.7	380-8AM 340-12-NOON 340-4PM
	3	3	747AM-354PM 487 MIN			2-8AM 2. 12 NOON 2-4PM		152.0	180-8AM 80-12 NOON 180-4PM
	4	4	748AM-356PM 488 MIN	104-8AM 102-12 NOON 112-4PM		2-8AM 2. 12-NOON 1.9 4PM		244.5	110-8AM 140-12 NOON 150-4PM
	5	5	749-358PM 489 MIN			2-8AM 2-12 NOON 2-4PM		100.0	200-8AM 110-12-NOON 140-4PM
	6	6	750AM-4PM 490 MIN.			2-8AM 2-12 NOON 2-4PM		151.0	200 8AM 100 12-NOON 140 4PM

$$\frac{P\,CAL}{P\,Fld} \times \frac{T\,Fld}{T\,CAL} \quad \_\_\_\_ \quad \_\_\_\_ = \_\_\_\_ \times \_\_\_\_ = \_\_\_\_$$

NO UPSET CONDITIONS

OXIDE

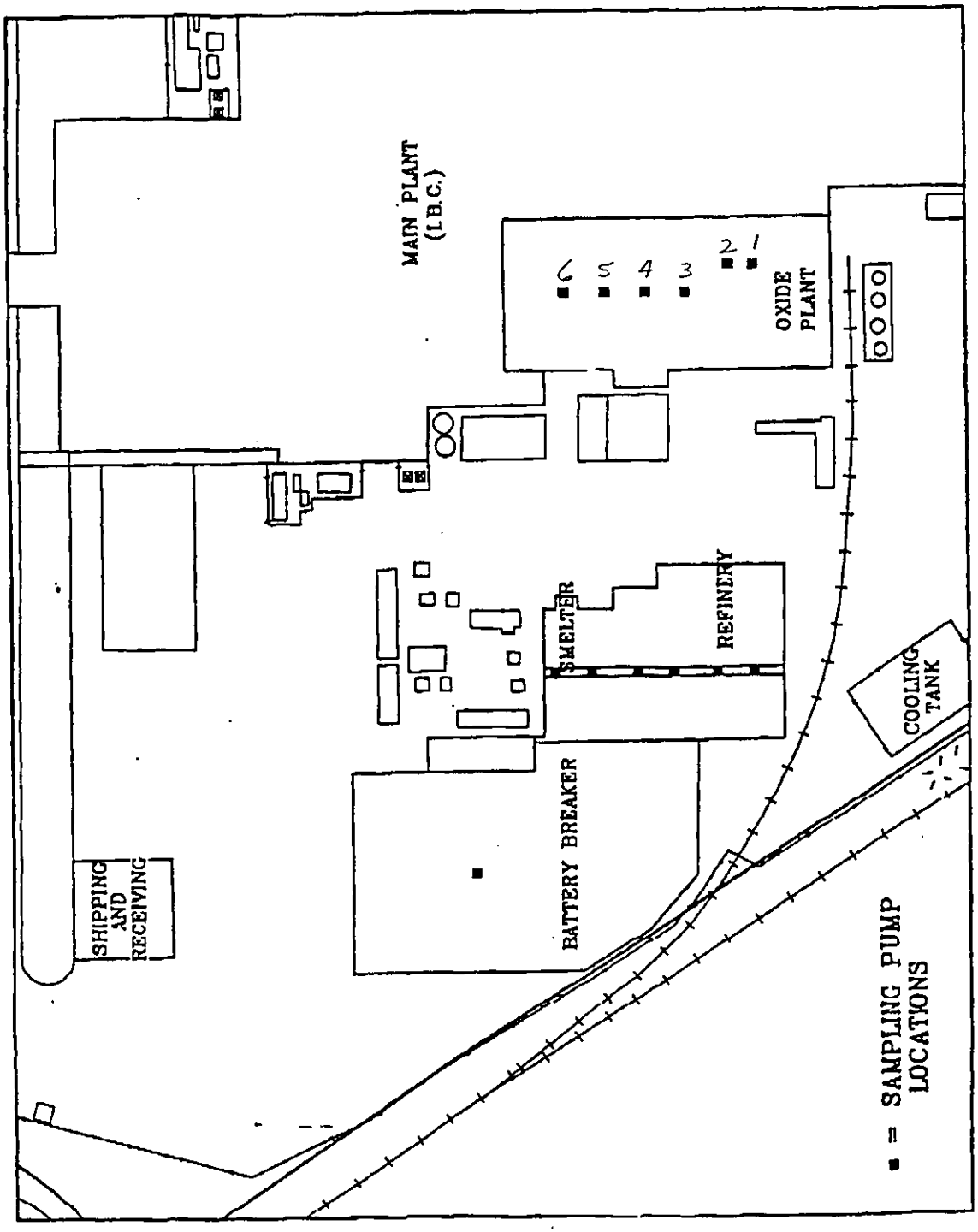
FIGURE 3



31 MARCH 1992

FIGURE 1

SAMPLING PUMP LOCATIONS



31 MARCH 1992

491-128 1-1 03-18-92 JIO

3/31/92

Time	Wind Speed	Wind Direction	Barometric Pressure
8 AM	5-16 mph	270° - 330°	30.00
9 AM	3-12	270° - 330°	30.03
10 AM	3-10	330° - 360°	30.04
11 AM	3-15	330° - 360°	30.05
12 AM	4-13	300° - 330°	30.05
1 PM	5-12	330° - 360°	30.04
2 PM	4-11	270° - 360°	30.00
3 PM	5-15	300° - 360°	29.98
4 PM	5-10	360°	29.96

APPENDIX C

EMISSION RATE CALCULATIONS

LAKE ENGINEERING, INC.
35 GLENLAKE PARKWAY, SUITE 500
ATLANTA, GEORGIA 30328
(404) 395-0484

CLIENT NAME: GNB INCORPORATED
PROJECT NO: 491-1122
COMPUTED BY: RSK
CHECKED BY: JAP

DETAIL NUMBER: App. C
PAGE NUMBER: 1 OF 2
DATE COMPUTED: 4/3/92
DATE CHECKED: 4/10/92

SMELTER AND OXIDE BUILDING FUGITIVE EMISSION ESTIMATE

DATA:

SMELTER BLDG.

TESTS 3/27/92 (TWO IDENTIFIED PUFFS)

PUMP	Pb ($\mu g/m^3$)	AREA ft^2	VEL. fpm	acfm	T °F	scfm	Pb lb/hr	
1	575.5	40	360	14,400	91	13,850	0.0298	0.0507 FURNACE
2	302.1	40	480	19,200	91	18,470	0.0209	
3	151.0	33.75	270	9113	83	8895	0.00503	
4	86.0	33.75	357	12,050	83	11760	0.00379	0.0135 REFINERY
5	21.9	48.75	270	13,160	83	12840	0.00105	
6	73.1	48.75	260	12,690	83	12390	0.00362	
7	161.5							
8	14.1							
9	91.2							

89 $\mu g/m^3$ FOR BREAKER FANS
2 ea. @ 26,000 scfm
0.00866 lb/hr Pb ea
⇒ 0.0173 lb/hr TOTAL

Σ = 0.064 lb/hr Pb

0.0813 lb/hr Pb

TESTS 3/29/92 (NO UPSETS)

PUMP	Pb ($\mu g/m^3$)	AREA ft^2	VEL fpm	acfm	T °F	scfm	Pb (lb/hr)	
1	266	40	357	14280	91	13736	0.0137	0.0226 FURNACE
2	185	40	333	13320	91	12812	0.0089	
3	185	33.75	257	8674	99	8374	0.0058	
4	18	33.75	330	11138	89	10753	0.00072	0.012 REFINERY
5	70	48.75	287	13991	89	13507	0.0035	
6	37	48.75	317	15454	89	14919	0.0021	
7	47							
8	76							
9	52							

58 $\mu g/m^3$ FOR BREAKER FANS
2 ea. @ 26,000 scfm
0.0057 lb/hr Pb ea
0.0114 lb/hr TOTAL

Σ = 0.035 lb/hr Pb

0.046 lb/hr Pb

LAKE ENGINEERING, INC.
35 GLENLAKE PARKWAY, SUITE 500
ATLANTA, GEORGIA 30328
(404) 395-0484

CLIENT NAME: GNB INCORPORATED
PROJECT NO: 491.1122
COMPUTED BY: RSK
CHECKED BY: JAP

DETAIL NUMBER: APP. C
PAGE NUMBER: 2 OF 2
DATE COMPUTED: 4/9/92
DATE CHECKED: 4/10/92

OXIDE BLDG.

TEST 3/31/92

PUMP	Pb(ug/m³)	AREA ft²	VEL fpm	acfm	T °F	scfm	pb (lb/hr)
1	186	5.2	360	1872	98	1778	0.00124
2	185	5.2	353	1836	98	1744	0.00121
3	152	11.6	93	1090	106	1011	0.00058
4	245	11.6	133	1543	106	1445	0.00133
5	100	11.6	150	1740	106	1629	0.0006
6	151	11.6	147	1705	106	1597	0.0009

0.0059 lb/hr Pb

SEPTEMBER 1991
MODEL PREVIOUSLY USED:

FURNACE FUGITIVES	(2)	0.12	lb/hr
OXIDE BUILDING	(2)	0.0038	lb/hr
REFINERY FUGITIVES	(2)	0.016	lb/hr
BREAKER FANS	(2)	0.01	lb/hr (@ each)

COMPARISON

UNIT	SEPT. 91 MODEL lb/hr	3/27/92 lb/hr	3/29/92 lb/hr	AVG 3/92 lb/hr	3/31/92 lb/hr
FURNACES	0.12	0.0507	0.0226	0.037	
BREAKER	0.02	0.0173	0.0114	0.014	
REFINERY	0.016	0.0135	0.012	0.013	
OXIDE	0.0038				0.0059