# SUSITNA
# HYDROELECTRIC PROJECT

FEDERAL ENERGY REGULATORY COMMISSION
PROJECT No. 7114

# HI-VOLUME AIR MONITORING PROGRAM
# INTERIM MONITORING AND QUALITY ASSURANCE REPORT

HARZA-EBASCO
SUSITNA JOINT VENTURE

FINAL REPORT
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Report by
Harza-Ebasco Susitna Joint Venture

Prepared for
Alaska Power Authority

Final Report
August 1984

NOTICE

ANY QUESTIONS OR COMMENTS CONCERNING
THIS REPORT SHOULD BE DIRECTED TO
THE ALASKA POWER AUTHORITY

## PREFACE

This report has been submitted by the Alaska Power Authority to the Alaska Department of Environmental Conservation. It presents the preliminary results of the monitoring program measuring the existing backround concentrations of total suspended particulates at the proposed Susitna Hydroelectric Project site, as required by the federal ambient monitoring requirements for Prevention of Significant Deterioration reviews.

SUSITNA HYDROELECTRIC PROJECT

HI-VOL AIR MONITORING PROGRAM

TABLE OF CONTENTS

## IST OF TABLES

## LIST OF FIGURES

# I. INTRODUCTION

The Alaska Power Authority (Power Authority) has proposed to construct the Susitna Hydroelectric Project. Estimates of air pollutant emissions during construction indicate that the emissions from the temporary diesel electric generators may be high enough to require submittal of a Permit to Construct with Prevention of Significant Deterioration (PSD) review to the Alaska Department of Environmental Conservation (ADEC). Section 18 AAC 50. 300(c)(1) of the Alaska Air Quality Control Regulations requires, as part of a PSD review, submittal of ambient air quality data for those pollutants which are present at the site in "significant" background concentrations. ADEC has indicated that because the Susitna project site is located far from any industrial emission sources, total suspended particulates (TSP) caused by natural windblown dust is the only significant air contaminant at the site (ADEC, 1984).

The monitoring program includes three consecutive reports to ADEC. The first report entitled "Initial Monitoring and Quality Assurance Report" was filed with ADEC in July 1984. This report "Data and Quality Assurance Progress Report" is the second report. The final report will be submitted in October 1984.

This report presents the preliminary results of the air quality monitoring program conducted at the Watana campsite for the period May 30, 1984 to August 10, 1984. This monitoring program was established to measure baseline values of total suspended particulates (TSP) with the field program initiated on May 29, 1984. Two monitoring locations were established, the first near the existing Watana field campsite, and the second at the Susitna River. Two collocated high volume samplers were located at the campsite and designated as Unit 1 (reporting) and Unit 2 (audit). A single high volume sampler was located at the river site and designated as Unit 3.

## II. MEASURED TSP CONCENTRATIONS

All of the hi-vol samplers were operated on a three-day schedule beginning on May 30, 1984. The collocated Units 1 and 2 were operated from midnight to midnight on the specified sampling days. Because Unit 3, located on the Susitna River, is accessible only by helicopter, it was operated from 10:00 A.M. on the designated sampling day to 10:00 A.M. the following day. Twenty-five samples were collected at Units 1 and 2. Twenty-two samples were collected at Unit 3.

Results of the program through August 10 are presented in Table 1. No values of over 10 ug/$m^3$ were recorded during the program. Individual samples range from a minimum value of 1.29 ug/$m^3$ recorded by Unit 1, to a maximum value of 7.99 ug/$m^3$ recorded by Unit 3. The geometric mean of all samples collected to date is 3.38 ug/$m^3$ for Unit 1, 3.33 ug/$m^3$ for Unit 2, and 4.76 ug/$m^3$ for Unit 3.

**TABLE 1**
MEASURED TSP CONCENTRATIONS ($ug/m^3$)

| Date | Watana Campsite Samplers Unit 1 | Unit 2 | Percent Difference | Susitna River Unit 3 |
|---|---|---|---|---|
| 05/30/84 | Neg | Neg | - | - |
| 06/02/84 | Neg | 0.33* | - | - |
| 06/05/84 | Neg | Neg | - | - |
| 06/08/84 | 2.45* | Neg | - | 2.10* |
| 06/11/84 | 4.29* | 2.9* | 32.6 | 7.39* |
| 06/14/84 | 1.09* | 0.05* | 95.4 | 3.63* |
| 06/17/84 | Neg | Neg | - | 1.34* |
| 06/20/84 | 4.34 | 3.35 | 22.8 | 3.57 |
| 06/23/84 | 3.06 | 2.22 | 27.5 | 4.14 |
| 06/26/84 | 1.76 | 2.27 | -29.0 | 5.08 |
| 06/29/84 | 6.87 | 6.83 | 0.58 | 6.43 |
| 07/02/84 | 2.57 | 3.04 | -18.3 | 0.99 |
| 07/05/84 | 6.83 | 6.53 | 4.4 | 5.98 |
| 07/08/84 | 3.65 | 3.79 | -3.8 | 4.03 |
| 07/11/84 | 2.90 | 2.93 | -1.0 | 4.51 |
| 07/14/84 | 2.95 | 3.19 | -8.1 | 5.32 |
| 07/17/84 | 3.12 | 4.62 | -48.1 | 6.11 |
| 07/20/84 | 3.06 | 3.06 | 0 | 3.33 |
| 07/23/84 | 5.62 | 5.81 | -3.4 | 7.99 |
| 07/26/84 | 1.29 | 2.16 | -67.4 | 5.15 |
| 07/29/84 | 3.34 | 2.51 | 24.8 | 3.01 |
| 08/01/84 | 2.81 | 1.55 | 44.8 | 6.92 |
| 08/04/84 | 5.12 | 5.99 | -17.0 | 5.33 |
| 08/07/84 | 2.77 | 5.02 | -81.0 | 6.45 |
| 08/10/84 | Neg | 1.86 | - | 4.75 |
| Geometric Mean | 3.38 | 3.33 | - | 4.76 |

*Because of identified problems with processing of the filters, these concentrations have not been included in the geometric mean value.

## III. QUALITY ASSURANCE RESULTS

### A. DATA RECOVERY

During the period May 30, 1984 through August 10, 1984 a total of 72 hi-vol filter samples were collected. Of those samples, nine of the exposed filters showed "negative weights." The total data recovery during the period May 30, 1984 through August 10, 1984 was 88 percent. The data losses are summarized in Table 2. Most of the "negative weights" occurred at the start of the program. If data from the first four sampling days are not included in the data losses, then the overall project data recovery improves significantly, to 95 percent.

### B. HI-VOL PRECISION

The precision of the measured TSP concentration between the two collocated samplers at the campsite is shown in Figure 1. The precision of the two collocated samples often did not satisfy the ± 15 percent limit set by the federal guidelines (EPA 1980). However, considering the extremely low measured TSP concentrations to date, it is unreasonable to expect the precision to consistently be within that limit. When sampling very low particle concentrations with collocated hi-vols, relatively minor wind shifts and very minor difficulties during sampling and filter processing can cause apparently major precision problems.

### C. FILTER WEIGHING PRECISION

Ten percent of the new and exposed filters were redessicated and reweighed to confirm the precision of the filter processing. The results of the filter reweighing are shown in Figure 2. As shown in that figure, the reweight differences were all well within the ± 5.0 mg precision limit set by the federal guidelines (EPA 1979).

TABLE 2

SUMMARY OF DATA LOSSES

| Date | Type of Data | Remarks |
|---|---|---|
| 05/30/84<br>06/02/84<br>06/05/84<br>06/08/84 | Negative net particle weights on exposed filters. | The first set of filters were inadvertently not brushed to remove loose fibers before the initial weighing. |
| 06/17/84<br>08/10/84 | Negative net particle weights on exposed filters. | Reason for negative weight is not known. |

Note: Total data recovery from May 30, 1984 through August 10, 1984 = 89 percent.

Total data recovery from June 11, 1984 through August 10, 1984 = 95 percent.

PROJECT NAME Susitna Hydroelectric Proj. MEASUREMENT PERFORMED Watana Camp TSP Values MEASUREMENT UNITS $\mu g/m^3$

| DATE | | 5/30 | 6/2 | 6/5 | 6/8 | 6/11 | 6/14 | 6/17 | 6/20 | 6/23 | 6/26 | 6/29 | 7/2 | 7/5 | 7/8 | 7/11 | 7/14 | 7/17 | 7/20 | 7/23 | 7/26 | 7/29 | 8/1 | 8/4 | 8/7 | 8/10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MEASUREMENT $y_1$ | 1 | — | — | — | 2.45 | 4.29 | 1.09 | — | 4.34 | 3.06 | 1.76 | 6.87 | 2.57 | 6.83 | 3.65 | 2.90 | 2.95 | 3.12 | 3.06 | 5.62 | 1.29 | 3.34 | 2.81 | 5.12 | 2.17 | — |
| | 2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 3 | | | | | | | | | | | | | | | | | | | | | | | | | |
| MEASUREMENT $y_2$ | 1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 2 | — | 0.33 | — | — | 2.89 | 0.05 | — | 3.35 | 2.22 | 2.27 | 6.83 | 3.04 | 6.33 | 3.79 | 2.93 | 3.19 | 4.62 | 3.06 | 5.81 | 2.51 | 2.51 | 1.55 | 5.99 | 5.02 | 1.86 |
| | 3 | | | | | | | | | | | | | | | | | | | | | | | | | |
| $d_1$ | | — | — | — | — | +33 | +95 | — | +228 | +235 | -21.0 | +9.0 | +0.6 | +4.4 | -1.0 | -1.0 | -8.1 | -40 | 3 | -3.4 | -67 | +25 | +45 | -17 | -81 | — |

$d_1 = 100 \times (y_1 - y_2/y_1)$

+20 +10 0 -10 -20

15% 15% 15%

Comments (Correct Action, etc.)

Figure 1

X AND R CHART FOR TSP MEASUREMENTS

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| Filter No. | First Weighing (grams) | Second Weighing (grams) | Difference (mg) | Remarks |
|---|---|---|---|---|
| 5366-10 | 3.5319 | 3.5319 | 0 | Unexposed Filters |
| 5366-20 | 3.5271 | 3.5268 | -0.30 | Unexposed Filters |
| 5366-28 | 3.4427 | 3.4422 | -0.50 | Unexposed Filters |
| 5366-38 | 3.4500 | 3.4498 | -0.20 | Unexposed Filters |
| 5366-55 | 3.5187 | 3.5179 | -0.80 | Unexposed Filters |
| 5366-66 | 3.4803 | 3.4799 | -0.40 | Unexposed Filters |
| 5366-32 | 3.4731 | 3.4730 | -0.1 | Exposed Filters |
| 5366-46 | 3.5015 | 3.5012 | -0.3 | Exposed Filters |
| 5366-48 | 3.5089 | 3.5099 | +1.0 | Exposed Filters |
| 5366-82 | 3.4859 | 3.4862 | +0.3 | Exposed Filters |
| 5366-66 | 3.4842 | 3.4841 | -0.1 | Exposed Filters |
| 5366-65 | 3.5057 | 3.5054 | -0.3 | Exposed Filters |
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Figure 2

LABORATORY QUALITY ASSURANCE LOG

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## D. IN-FIELD HI-VOL FLOW RATE CHECKS

The measured hi-vol flow rate using the Kurz Model 341 electronic flowmeter was periodically checked against the same flow rate using a standard critical orifice "top hat" flowmeter. The results of those flow rate checks are shown in Figure 3. The two measured flow rates were within the ±7 percent limits allowed under the federal guidelines (EPA 1979), except on July 31, 1984 when the flow rate check had to be conducted during a windy period, under conditions where the "top hat" flowmeters are recognized to give unreliable results.

## E. QUALITY ASSURANCE AUDIT

An independent quality assurance audit was conducted on July 31, 1984, in accordance with the QA procedures described in the "Initial Monitoring and Quality Assurance Report." The audit was conducted by Jean Marx of the Harza-Ebasco Susitna Joint Venture. The evaluation form that was used during the audit is shown in Figure 4. The following aspects were considered during the audit:

- Laboratory procedures;
- Hi-vol operations; and
- Hi-vol flow rate check.

The electronic flowmeter and "top hat" flowmeter that are used at the site were both checked against a separate "top hat" calibrator that was brought to the site for the audit. The results of that independent flow rate check are shown in Figure 5. In accordance with the flow rate calibration procedures described in the "Initial Monitoring and Quality Assurance Report", the Kurz electronic flowmeter is being recertified by the manufacturer.

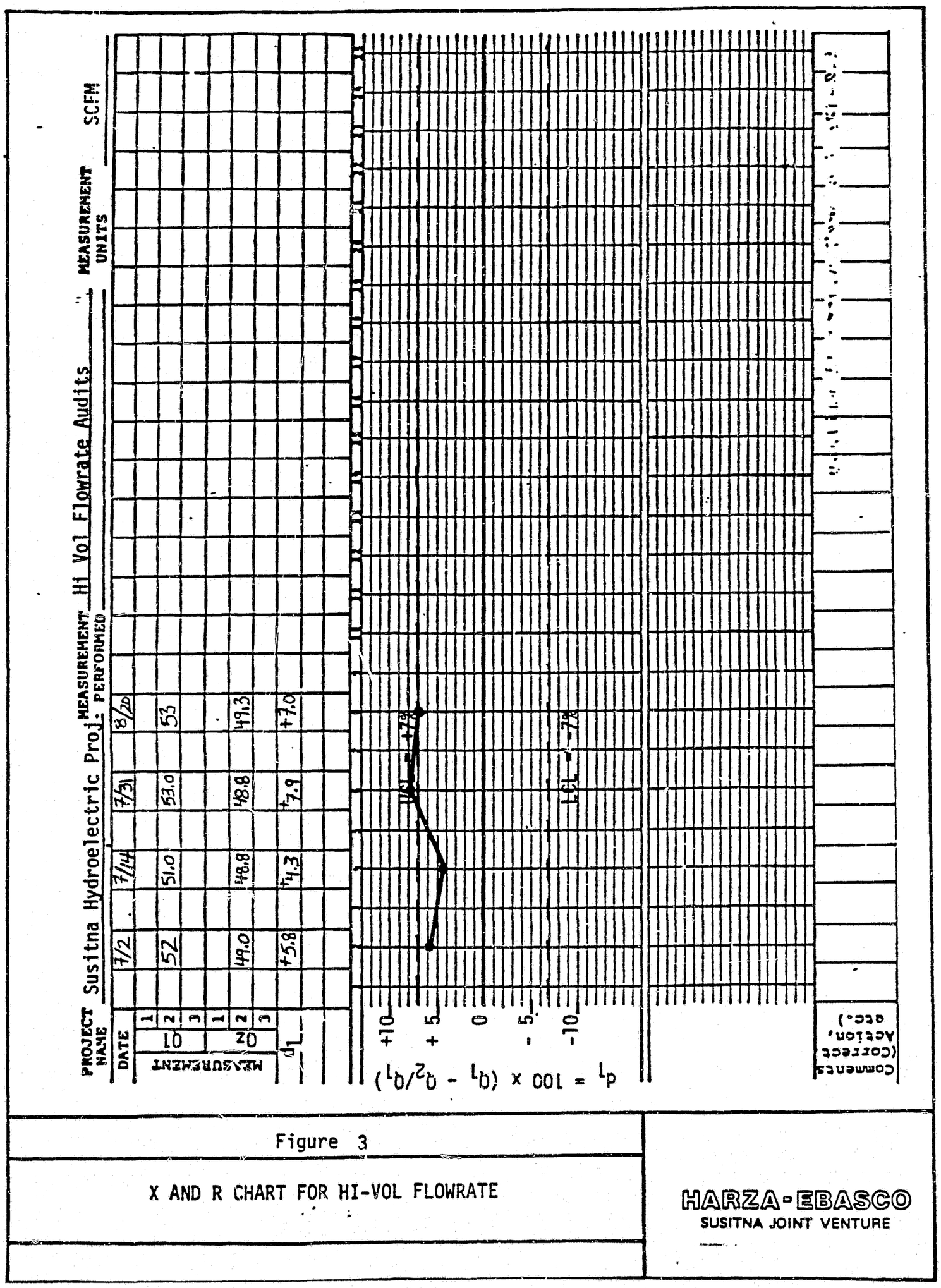


Figure 3

X AND R CHART FOR HI-VOL FLOWRATE

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1. What type of hi-vol samplers are used in the network?
General Metal Works : Model 2000 units

2. How often are the samplers run? (a) daily (b) once every 6 days (c) once every 12 days (d) other every three days

3. What type of filter and how many are being used? _____
Glass fiber: 2 ea. sampler (one blank; one weighed)

4. Are there any preexposure checks for pin holes or imperfections run on the filters? Yes at the lab and visually in the field

5. What is the collection efficiency for your filters? _____

6. What is the calibration procedure for the hi-vol sampler?
Flowrates measured before and after 24-hr sampling period *

7. Which statement most closely estimates the frequency of flow rate calibration? (a) once when purchased (b) once when purchased, then after every sampler modification (c) when purchased, then at regular intervals thereafter C

8. Are flow rates measured before and after the sampling period? Yes X No _____

9. Is there a log book for each sampler for recording flows and times? Yes X No _____

10. Are filters conditioned before initial and final weighings? yes If so, for how long? 24 hrs At what percentage humidity? dessicator - heated < 1% humidity

11. Is the balance checked periodically? yes If so, how often? daily - internal std With which standard weights? electronic with its own electronic calibration

12. How often are the hi-vol filters weighed? twice then every 10-24 checked through pre/post How are the data from these weighings handled?
data sheets are kept on file at the lab

13. Are all weighings and serials numbers of filters kept in a log book at the laboratory? data sheets on file

14. What is the approximate time delay between sample collection and the final weighing? 6-9 days

* Kurz Model 341 calibration unit

Jean A. Renard

Figure 4

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HI-VOL PROJECT AUDIT CHECKLIST
APPENDIX A

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Hi-Vol Flowrate Audit Form

Figure 5

| Date | Ambient Temperature $T_a$ | | Barometric Pressure $P_a$ (mmHg) | Manometer $\Delta H$ (inches $H_2O$) | Calculated Orifice Flowrate $Q_s$ | | Electronic Flowmeter $Q_M$ $ft^3/min$ | Flowrate Deviation (%) | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | $^oF$ | $^oK$ | | | $m^3/min$ | $ft^3/min$ | | | |
| | | | | | | | | | |
| 7/31/84 Reporting Flowmeter | 14°C | 287 | 763 | 7.5 | | 48.8 | 53.0 | +7.9 | Audit had to be conducted during gusty weather conditions |
| | | | | | | | | | |
| 7/31/84 Audit Flowmeter | 14°C | 287 | 763 | 7.4 | | 48.5 | 53.0 | +8.5 | |
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$^oK = {}^oC + 273$

mmHg = 25.4 x (in.Hg)

$ft^3/min = 35.3 \times m^3/min$

Flow Deviation = $100 \times (Q_m - Q_s)/Q_m$

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## REFERENCES


Alaska DEC. Letter from Leonard Verrelli to Jon Ferguson of the Alaska Power Authority, June 8, 1984.

EPA. 1979. Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II - Ambient Air Specific Methods. Section 2.2., Reference Method for the Determination of Suspended Particulates. EPA-600/4-77-027a. Revised July 1979.

EPA. 1980. Ambient Monitoring Guidelines for Prevention of Significant Deterioration. EPA-450/4-80-102.