APPENDIX 12
AIR QUALITY PLAN

GREENS CREEK MINING COMPANY

Updated: March 1995

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ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION AIR QUALITY CONTROL PERMIT TO OPERATE NO. 9211-AA013

- Memo, October 2, 1992
- Memo, December 7, 1992
- ADEC Air Quality Control Permit to Operate No. 9211-AA013

1.0 AIR QUALITY CONTROL PERMIT TO OPERATE

KGCMC's air emissions are mandated by the State of Alaska Department of Environmental Conservation (ADEC) Air Quality Control Permit to Operate No. 9211-AA013. ADEC has found the operation consistent with the requirements of the Clean Air Act and the Alaska Coastal Management Program (ACMP). Air quality source testing and modelling have been very positive with all sources showing no signs of significant impact.

Amendments were approved December 7, 1992 in support of a request for prime power generation fuel oil consumption to be averaged over a thirty (30) day period instead of a daily maximum. This change allowed KGCMC more flexibility in the seven (7) day per week, twenty-four (24) hour operation of the concentrator.

Source testing of prime power diesel-electric generators will occur in summer 1995 to meet the requirements of the Air Quality Control Permit to Operate (No. 9211-AA013). Refer to the Bibliography for source testing specifics and other references. Subsequent amendments may be required if the KGCMC operating plan requires additional power generating capacity.

1.1 SOURCE INVENTORY

SOURCE NUMBER	DESCRIPTION	CAPACITY
1.	Ruston Diesel-Electric Generator	2200 Kw
2.	Ruston Diesel-Electric Generator	2200 Kw
3.	Ruston Diesel-Electric Generator	2200 Kw
4.	Caterpillar Diesel-Electric Generator	1450 Kw
5.	Volcano Oil-fired Boiler	2.5 MMBtu/hr
6.	Lime Storage Tank	50 tons
7.	Backfill Plant Cement Storage Silo	180 tons
8.	Cummins/Ingersoll Model 600 Air Compressor (Emergency Use Only)	216 Horsepower @ 1800 RPM
9.	<Removed from Site>	
10.	1350 Mine Exhaust Adit	
11.	<Removed from Site>	

2.0 AIR QUALITY MONITORING PLAN

Kennecott Greens Creek Mining Company (KGCMC) has voluntarily implemented an ambient air quality program around the Hawk Inlet Marine Terminal Facility and the 920' Mine Site Complex. The purpose of the monitoring is to establish concentrations of suspended particulates and target metals. This data will be used to asses the project's effect on air quality.

KGCMC is presently working with Montgomery Watson Engineers Inc. (MWE) to implement new protocols and standards based on current Alaska Department of Environmental Conservation (ADEC) regulations. The program will include two (2) Total Suspended Particulate (TSP) samplers and a co-located pair of Ten Micron Particulate (PM10) samplers all running on a six day schedule. The data will be used for a potential Preservation of Significant Deterioration (PSD) review by ADEC. Final program submittals should be completed by mid April 1995.

KGCMC will continue to operate the Air Quality Monitoring Plan under the same protocols and regulations approved by ADEC in 1992.

2.1 BACKGROUND

Greens Creek Mine, located on Admiralty Island, Alaska, is an underground hardrock mine processing ore to concentrate silver, lead, zinc, and gold (see Figure 12.A.1). The mine site is located at an elevation of 920 feet bordering Greens Creek and adjacent to the main mine portal.

The concentrator processes up to 1,320 tons of ore per day using SAG (Semi-autogenous grinding) and Ball Mill crushing followed by flotation and concentrate dewatering. Several finished products are produced which contain 8-10 percent water by dry weight of solids with particle size being 95 percent finer than 75 microns. The two major potential sources of product emissions at the concentrator are the concentrate loadout and the tailings discharge areas. These products are loaded into covered trailers for transport to either the Hawk Inlet Concentrate Storage Facility(concentrate) or the Tailings Impoundment Facility (tailings).

The Concentrate Storage Facility is located next to tidewater on the east shore of Hawk Inlet. It consists of a large enclosed concentrate storage warehouse and a conveyor-type shiploader. This shiploader has been identified as a potential emission source.

No baseline air quality data has been obtained for these areas, however, sampling began when production was started.

2.2 PROJECT DESCRIPTION

KGCMC air quality monitoring stations at both the 920' Mine Site and the Hawk Inlet Marine Terminal Facility are to evaluate ambient air from ongoing operations (see Figure 12.A.2 and 12.A.3). Monitoring stations are located on either side of the shiploader and 920' concentrator back slope with a precision pair co-located on the north side of the shiploader. These sites will monitor total suspended particulates (TSP) and PM_{10} (particulate matter less than 10 microns), with subsequent analysis for lead and zinc on the TSP filter matrix. A meteorological station at the site records wind speed, wind direction, and temperature, while a mercurial barometer is available near the concentrator for spot readings during sampling periods. A temperature recorder at the tailings impoundment is used to obtain readings during operation of the shiploader samplers.

The monitoring project is presently scheduled to run on the National Air Surveillance Schedule System. In addition, the shiploader samplers are run during periods when freighters are being loaded with concentrate.

3.0 PROJECT MANAGEMENT

3.1 ORGANIZATION

The monitoring project is being conducted by KGCMC to monitor air quality around their operations on Admiralty Island. Greens Creek has contracted with Montgomery Watson Engineers Inc., (MWE) to provide two TSP and two PM_{10} samplers. MWE provided site selection, installation (with consultation with the State of Alaska Air Quality Division), calibration, and maintenance of the sampling devices. KGCMC provides a technician to perform on-site operation. Laboratory work and data reduction is provided by MWA and a subcontracted laboratory. Results are submitted to the Greens Creek Air Program Manager on a quarterly basis. The responsibility tree is as follows:

3.2 RESPONSIBILITIES

Air Program Manager: In charge of monitoring project. Responsible for managing contract for KGCMC approves monitoring site selection. Decides if any major changes are needed in monitoring program.

Project Manager: Responsible for managing air monitoring contract for MWE and has overall responsibility for MWE's performance.

Project Supervisor: Responsible for site selection and installation. Drafts protocols for KGCMC personnel and ADEC approval process. Responsible for calibration and maintenance of the monitoring equipment and implementation of the Quality Assurance (QA) Plan. Ensures lab and field technicians and subcontractor lab complete jobs satisfactorily. Arranges for QA auditing.

Lab Technician: Responsible for filter preparation and weighing. Responsible for submitting filters to subcontractor lab. Aids in data reduction and reporting.

Environmental Personnel: Responsible for PC 208 software management, installation and removal of filters and obtaining temperature and pressure readings. Installs flow charts and sets sampler timers. Reports problems with samplers to Project Supervisor.

Subcontractor Lab: Responsible for performing metals analysis on filters.

4.0 SITE DESCRIPTION

4.1 LOCATION

The Greens Creek monitoring project includes two separate study areas. Two (2) TSP samplers and one PM_{10} sampler are located at the concentrator facility. The PM10 sampler will only be used while shiploading is in progress. The sites are approximately 25 miles south of Juneau on the west side of Admiralty Island.

4.2 CLIMATOLOGY

The west side of Admiralty Island is located in the maritime climactic zone of Southeast Alaska. This region is characterized by the following weather parameters:

Mean Annual Precipitation	80 *{110}*inches/year
Wet Days Per Year	125
Mean Annual Snowfall	90 inches/year
Mean January Minimum Temperature	24^{o} F
Mean January Maximum Temperature	32^{o} F
Mean July Minimum Temperature	48^{o} F
Mean July Maximum Temperature	62^{o} F
Mean Annual Temperature	42^{o} F
Seasonal Temperature Variation	14^{o} F
Diurnal Temperature Variation	11^{o} F
Mean Sea Level Pressure	759 mm

{The predominant wind directions in Hawk Inlet are either north or south according to conversations with float plane pilots. No wind speed data exists but the mean is assumed to be in the 5-10 knot range with higher speeds occurring during the fall and winter months.}

An air quality and meteorological data summary was performed by Air Sciences Inc. (Colorado) in May of 1993. Refer to the bibliography for data summary specifics and other references.
KGCMC has contracted with Air Sciences Inc. (Colorado) for a one (1) year agreement, beginning in

December 1994, to configure PC 208 software on both the Hawk Inlet Marine Terminal Facility and 920' Concentrator meteorological weather stations.

Preliminary observations suggest that the wind either flows from the east or west. Average wind speeds appear lower than Hawk Inlet. Better information will be available when the modeling project is complete.

4.3 SITE SELECTION

The Air Program Manager identified two (2) locations which KGCMC would like monitored. One was the Hawk Inlet Marine Terminal Facility and the other was the 920' Mine Site. A site visit was conducted by the Project Supervisor to determine the best locations for monitoring stations. Four sites were identified to take advantage of predominant wind flow patterns near the emission sources. Also, accessibility was important because power lines had to be run to each sampling site and operator safety was another issue that was given significance. The Air Program Manger approved the sites after consideration of these factors.

5.0 SITE INSTALLATION AND INSTRUMENTATION

5.1 PHYSICAL SITING

Two (2) sampling sites are located at Hawk Inlet on both sides of the shiploader terminal. The southern site is at the end of the pile-supported walkway which leads to the floating seaplane dock at an elevation of approximately 25 feet above MLLW. A 4 by 4 foot deck placed on the north side of the walkway provides unobstructed exposure to northerly air flows. The other site is located 50 feet north of the concentrate storage building at the top of the tidewater bank with an elevation of 30 feet above MLLW. Three co-located 4 by 4 foot platforms with deck heights of 4.5 feet above the ground surface provide unobstructed exposure to southerly air flows. Since the predominant wind direction is from the south, this location should be good for intercepting higher concentrations of suspended particles. This location may also capture airborne particulates from operations within the storage building (see Figure 12.A.2). The co-located precision TSP sampler set and a PM_{10} sampler will be at this location. North of this location is an abandoned fuel dock which may have offered better exposure, but the site was dismissed due to operator safety concerns.

Two sampling sites are located on each side of the concentrator. One site is a 4 by 4 foot platform locate atop the electrical switchgear that powers the pumps at the surface runoff holding pond. This site is located east of the tailings and concentrate loadout facilities at the 920' elevation which is the same as the portal access road and it is located south of the coarse ore stockpile and grizzly. The westerly prevailing wind direction makes this a good site location.

The other sampling site is located north of the concentrate loadout facility and northeast of the tailings discharge and coarse ore stockpile area at an elevation of approximately 980 feet. The two 4 foot by 4 foot platforms are approximately 4.5 feet above the ground, and will support a TSP and PM_{10} sampler

respectively. This site will take advantage of the south and southeasterly air flows. A westerly location may have captured more particulates, but no site could be found which would not interfere with mining operations (see Figure 12.A.3).

5.2 INSTRUMENTATION

Each TSP station is equipped with the following instrumentation:

One Sierra Anderson High Volume Air Sampler:
- Model GBM 2000V motor assembly
- Model G01557 variable flow controller or
- Model G312 mass flow controller/timer
- Filter holder housing with two filter cassettes
- High volume shelter with TSP gabled roof
- Dixon pressure chart recorder
- Model 302: Digital / timer / programmer

Each PM_{10} sampling station is equipped with the following instrumentation:

One Sierra Anderson volummetric flow controlled PM_{10} system:
- Model GBM 2000V motor assembly
- Model G01557 variable flow controller
- Filter holder housing with 2 filter cassettes
- Model 1200 size selective PM_{10} inlet
- Dixon pressure chart recorder
- Model 302 digital timer/programmer

The Sierra Anderson high volume samplers are a certified reference device for determining ambient concentrations of total suspended particulates and PM_{10}. These systems consist of a 0.9 hp motor coupled to a precision volummetric flow or mass flow controller to maintain an actual flow rate of 1.13 m^3/minute over the sample period. Particles are collected on either glass microfiber filter (TSP) or quarts fiber (PM_{10}) media. Flow will be recorded on both a Dixon chart recorder and the PC 208 software. Sampling time is obtained from an elapse timer.

6.0 PROJECT SCHEDULES

6.1 SAMPLING FREQUENCY

Location	Monitoring Parameter	Data Collection Interval
Hawk Inlet	Total Suspended Particulates	24-hour sample/every 6th day and sample during shiploading
	Lead, Zinc	
	PM_{10}	
Mill Site	Total Suspended Particulates	24-hour sample/every 6th day
	Lead, Zinc	
	PM_{10}	

6.2 MAINTENANCE FREQUENCY

Monitoring Instrumentation	Maintenance Schedule
Total Suspended Particulates	As required
PM_{10}	As required
Meteorological Instruments	As required

Laboratory Equipment	Maintenance Schedule
Precision Balances	Yearly Manufacturer Service Contract
Atomic Absorption Spectrometer	Yearly Manufacturer Service Contract

6.3 CALIBRATION FREQUENCY

Monitoring Instrumentation	Calibration Schedule
Total Suspended Particles	One point check per month / recalibrates every quarter or as needed

Monitoring Instrumentation	Calibration Schedule
PM_{10}	One point check per month / recalibrates every quarter or as needed
Meteorological Instruments	Yearly

Laboratory Equipment	Calibration Schedule
Precision Balances	Before and after use
Atomic Absorption Spectrometer	Before and during use
Flow Rate Transfer Standard	Yearly
Timers	Quarterly
Relative Humidity Indicators	Every six months

6.4 REPORTS TO MANAGEMENT

Data reports for this project will be provided to the air program manager according to the following schedule:

Reports	Schedule
Project Status Evaluations	As needed: Verbal contact to discuss project status
Status Reports	Quarterly: Within 30 days of the end of each quarter, a compilation of collected data up to this point will be provided.
Executive Summary	Quarterly: Within 30 days of the end of each quarter, a Statistical Summary will be provided.

7.0 EQUIPMENT STANDARD OPERATING PROCEDURES

7.1 METHODS AND INSTRUMENT SELECTION

The methods and instrumentation selected for this monitoring project were obtained from a review of Ambient Air Specific Methods (EPA-600/4-77-027a, August 1977) and the Alaska Quality Assurance Manual for Ambient Air Quality Monitoring (July 1988).

7.2 OPERATION - FIELD AND LABORATORY

All operations are conducted following the guidelines established in the Alaska Quality Assurance Manual for Ambient Air Quality Monitoring. The following operational procedures will be used in the project:

TSP: State Quality Assurance Manual, Section 4.2
Lead: State Quality Assurance Manual, Section 4.4
Zinc: Modeled after Section 4.4
PM_{10}: State Quality Assurance Manual, Section 4.2

7.3 DATA ACQUISITION

TSP field data is recorded by the field technician, who also removes the exposed filters and forwards the field data and the filters to Montgomery Laboratories for equilibration and weighing. The TSP filters are then sent to a subcontractor laboratory for lead and zinc analysis after which the filters are returned to Montgomery Labs for storage.

8.0 QUALITY ASSURANCE PROCEDURES

8.1 QUALITY ASSURANCE OBJECTIVES

Montgomery Laboratories quality assurance objectives for this monitoring project are:

a. To provide reliable, useful data of known accuracy, precision, and completeness for the evaluation of air quality at the Greens Creek Mine.
b. To minimize the loss of air quality data due to system and equipment failures.
c. To utilize monitoring and analysis personnel with demonstrated operational proficiency.
d. To provide representative and comparable data of known precision and accuracy.
e. To establish the minimum requirements for documenting ambient air quality conditions.
f. To provide a safe work environment for all project personnel in accordance with good safety practices.

8.2 STANDARDS FOR PRECISION, ACCURACY, COMPLETENESS, REPRESENTATIVENESS, AND COMPARABILITY

The following standards adopted by the State of Alaska will be used in this project for evaluating the quality of air monitoring data:

a. Accuracy - TSP and PM_{10} manual sampling system data must fall within ±7 percent of the true value. Lead and zinc duplicate sample strip and Quality Control (QC) check standard analyses must be within ±15 percent of the original analysis.
b. Precision - TSP collocated samplers will be within ±15 percent of each other for values over 20 micrograms m^3 at standard temperature and pressure (STP).
c. Representativeness - Spatial and temporal data representativeness will be achieved by assuring that criteria are met for station siting as defined in federal guidance documents.
d. Comparability - Data comparability will be achieved by using equivalent methods, procedures and sampling instrumentation as in the State Local Ambient Monitoring System (SLAMS) monitoring program.
e. Completeness - This project will attempt for 90 percent data completeness. Minimum data completeness is 75 percent and any data which fails to meet this standard must be justified in writing to the air program manager.

8.3 INTERNAL QUALITY ASSURANCE CHECKS

Quality control checks for both laboratory and field activities follow guidelines established in the Alaska Quality Assurance Manual. At least the following assurance checks are performed.

a. TSP and PM_{10} - A valid, one-point calibration check on a monthly basis.
b. Atomic Absorption Device - EPA quality control samples will be analyzed to insure data validation at the 95 percent confidence interval. Reagent blanks and matrix spike duplicates will also be analyzed.

8.4 CALIBRATIONS

All instrumentation and equipment are calibrated according to procedures described in the State's Quality Assurance Manual. Calibration standards are traceable to NBS standards and verified when necessary on a yearly basis.

8.5 QUALITY ASSURANCE AUDITS

The auditor conducts a performance audit within 60 days of startup and on a semi-annual basis. The project manager will conduct a systems audit yearly. A yearly audit schedule identifies timing of these audits.

8.6 CORRECTIVE ACTION

Any equipment which fails a performance audit will be recalibrated and reaudited before being placed back in service. This will be accomplished as quickly as possible to prevent data loss.

9.0 DATA MANAGEMENT

9.1 REDUCTION

All data collected on this project are reduced by either Montgomery Labs - for TSP, PM_{10}, and air volumes, or the subcontractor - for lead, zinc and PM_{10} concentrations. Procedures will be in accordance with those specified in the State's Quality Assurance Manual. Any questions concerning the procedures should be directed to the Project Supervisor.

9.2 VALIDATION

Validation will use guidelines established in the State's Quality Assurance Manual to ensure reliable accurate, complete, representative, and comparable data.

9.3 REPORTING

a. As needed - Field Supervisor will contact Air Program Manager and Project Manager to discuss project. Topics discussed will be results, data quality, equipment status and any problems related to the project.

b. Quarterly - Air Program Manager will receive copy of a quarterly report by the 15th of the following month. This report will contain all TSP, lead, zinc and PM_{10} levels for each monitoring site and data used to calculate the levels. Any missing or invalidated data will be highlighted by a discussion.

c. Quarterly - An executive summary will be prepared by the Project Supervisor for the Air Program Manager on a quarterly basis. This report will provide a statistical summary of the collected data, a summary of all QA activities, and a discussion of operational or instrument problems.

10.0 BIBLIOGRAPHY

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ATTACHMENT A

FIGURES

ATTACHMENT B

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
AIR QUALITY CONTROL PERMIT TO OPERATE

PERMIT NO. 9211-AA013