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Black Mountain Mining

BMC-HSE-ENV-SOP-0028 Air Quality Monitoring

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BMM-HSE-ENV-SOP-0027	BMC-HSE-ENV-SOP-0028	Standard Operating Procedure	Approved
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10.0	Internal (C3)	ISO 14001	Catharina Kotze

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Table of Contents

1. PURPOSE.

Black Mountain's Standard Procedures (SOP's) shall be written in a clear concise manner, communicated to all employees and applied accordingly. The objective of the procedure is to determine levels of fall-out dust emissions by monitoring and assessing activities. Monitor Greenhouse gas emissions utilising the Anova Footprint Model.

2. SCOPE.

This procedure applies to dust monitoring at Black Mountain Complex (Black Mountain and Gamsberg Operations).

3. DEFINITIONS AND ABBREVIATIONS.

The following abbreviations and definitions are relevant to this procedure:

SO: Sulphur Dioxide

Samplers: Equipment used to collect fallout dust or airborne gases

µg/m²: Micrograms per square meter or air.

CO_2: Carbon Dioxide

GHG: Greenhouse Gas

4. STANDARDS AND RULES.

For underground Airborne pollutants see Code of Practice: *Airborne Pollutants.*

4.1 Measurement of Sulphur Dioxide

To assess the potential hazards and risks associated with $SO_{2,}$ due to the mine activities that may affects ambient air. SO_2 is given off as a by-product from the concentrator process and is toxic in high concentrations. The limit of SO_2 in the general atmosphere is 50 µg/m³ measured over an annual basis. The measurement of SO_2 in µg/m³ is the internationally preferred means of measurement.

Levels of SO_2 during the daily process will vary. Thus, it is necessary to measure an average concentration over a long period such as one month. This will give clear indications of the true levels of SO_2 in the atmosphere. "Passive samplers' are used to measure SO2 levels. Previous measurements taken over a 30-day period on an annual basis level of SO_2 have been below the national limit indicating, at this stage, no further expansion of the siting of the samplers. Should levels increase above the limit, the metallurgical department will then adopt measures to lower the SO2 levels and the samplers will then be placed further afield to determine the extent of the pollution. Monitoring on a quarterly basis will then be undertaken.

Should it be noted that any sampling point returns analyses above the legal limit, this information will be used to log an Environmental Non-Conformance on the Environmental Incident / Non-Conformance Report, according to Procedure BMC-HSE-ENV-0041: *Environmental Incidents and Non-Conformances.*

The results of the analyses are monitored and controlled by the Plant Manager.

4.2 Measurement and reporting of CO2

The calculation of CO2 emitted is calculated on the footprint model at the end of each month by the environmental team. Diesel and explosives used underground and at surface is exported from the SAP system and a factor is applied to calculate the tonnes used. Electricity used is received from the financial department as reflected on the Eskom bill and subdivided into the area utilised. The volumes of gasses utilise during each month is recorded but not reported in the intensity figure on a monthly basis. Lime utilised in the processing of ore is also reported on a monthly basis. Only resources used during the extraction and processing of ore is used during the calculation. The volumes of gasses utilise during each month is recorded but not reported in the intensity figure on a monthly basis. The gigajoules utilised during production, for the above resources, is then reported to the Vedanta head office.

The results of the analyses are monitored and controlled by the Environmental Manager.

4.3 Fallout Dust monitoring

The following is a list of essential equipment required for the collection of fall-out dust samples. It should be ensured that all items listed below have been packed when departing for the site.

- Field logbook / sheet
- Pens/permanent marker
- Keys for locked gates
- Deionised distilled water (2 litres for each bucket)
- Bleach (20-30 ml for each bucket)
- Enough plastic sampling containers (buckets)
- Lids for the removal buckets

4.3.1 Sampling frequency and duration

The dust-sampling period shall be of every third month for a duration of 30 days ± 2 days for Black Mountain Mine and every 30 days ± 2 days for Gamsberg Mine.

The sample buckets must be changed according to the schedule that is drawn up by the Environmental officer.

No sample preservation is required other than ensuring that the buckets are sealed immediately on site after the buckets are removed from the stands.

The contents of the sample buckets are then filtered onto filter paper, by the environmental officer. The filters are then packed and couriered to the Dustwatch laboratory for analysis.

The filters must be dispatched within a month of measurement on a monthly basis.

Results are normalized to a daily or thirty-day period.

4.3.2 Sampling

Preparation before sampling

Thoroughly rinse the containers and lids using detergent solution.

Rinse the containers and lids twice with water.

The containers and lids must be air-dried.

Each point has a set of two containers, where one is installed, and the second one is used as a replacement container at the end of each sampling period.

The cleaned replacement containers must be closed prior to departing for the field.

Sample collection

Label the replacement bucket, with the correct number (e.g. AGG A1) corresponding to the monitoring site number.

Set out the new bucket in the sampling stand, into the bucket holder and secure the bucket to the holder using the security clamps and key-alike lock.

Record the date and identification number of the new sample bucket installed and the bucket being replaced in the field log sheet (See Appendices 1).

The date and time of submission to the laboratory must be recorded.

On the field log sheet record the date and time that the bucket was installed and the bucket number.

After 30 (±2) days collect the sample and record the date and time and the bucket number on the sampling schedule.

Replacement:

Remove the sample bucket from the sample stand.

The bucket has already been marked, if the label has been spoiled remark the bucket.

Do not discard any water present in the sample buckets when it is picked up from the site.

If the removal sample bucket is empty refill with 500mL distilled water, no bleach is added.

Reseal immediately with lid and take the buckets on-site to the environmental lab and courier filters to the Dustwatch lab for analysis.

If sufficient rain has fallen at a site and it is likely that the container was filled with water to the extent that it had overflowed, the sample should not be discarded rather close the bucket and take it to the lab.

Replace with new sample bucket. Follow procedure for sample collection.

4.3.3 Filtering Method

Filtering will be done on site before sending filtered sample with courier to external credited laboratory for analysis.

The following is a list of essential equipment required for the filtering process are as followed:

- Filter paper
- 10 Holder Water filtering train (Tray)
- Vacuum Pump
- Glass vacuum flask
- Clamp's
- Glass Filter paper holder
- Small Strainer
- Squeeze plastic water bottle
- Small forceps
- Pencil

4.3.4 Filtering process

The exposed buckets when return to the laboratory should be rinse with deionised water to removed residue from the sides of the buckets. The buckets contents should be filter through a coarse (> 1 mm) filter to remove insects and other coarse organic compounds.

- Remove lids from collected buckets and fill the buckets with 500 ml distilled/ deionised water.
- Number the filter paper container with a pencil according to the Id on buckets collected.
- Set up instruments by connecting 10 Holder Water filtering train (Tray) with the vacuum pump.
- Insert glass filter paper holder into the tray
- Place filter papers with a small clamp on top.
- Put glass vacuum flask onto and use the clamps to hold in place.
- Pour water from the first bucket through small strainer until bucket are clean of dust.
- Filtered through a pre — weighed paper to remove the insoluble fraction or dust fallout.

- Use the squeeze plastic water bottle to clean bucket from all dust.
- In addition, continued to the next.
- When filtered thorough, close pump and remove filter paper with small forceps.
- Put back in open filter container and allow drying before closing.

This residue and filter are gravimetrically analysing to determine the weight of the insoluble fraction (dust fallout).

4.3.5 Data Analysis

Reports returned from the external laboratory should be examined for significant rises of dust levels and action levels. If the action level is exceeded a non-conformance should be logged according to SSD-ENV-SOP-041: Environmental incident and non-conformance and investigated.

5. RESPONSIBILITY.

The environmental officer shall implement and maintain this document. Department Heads shall ensure that this standard procedure is applied with due diligence. Deviations from this standard procedure shall be affected via approved “Deviations from Standard” documentation.

Should additionally precautions, due to special circumstances unique to that Department/Section, over-and-above the requirements of the Procedure be necessary, then the Department Head shall ensure that, in consultation with the relevant specialists, such requirements are specified in writing, conveyed over to the end users and recorded as such.

6. REVISION HISTORY

Revision 7 of SSD-ENV-STD-028 - "Air Quality Monitoring" dated 30 May 2019

- Scope updated to include all dust monitoring at BMM
- Inclusion of data analysis

Revision 8 of SSD-ENV-SOP-028 - "Air Quality Monitoring" dated March 2021.

- Updated Black Mountain Logo to Black Mountain Complex
- Document reference from SSD-ENV-STD to SSD-ENV-SOP
- Updated scope and purpose by:
    - Include Filtering Method, section 4.1.3
    - Include Filtering process, section 4.1.4
- Update signature field.

Revision 9 of SSD-ENV-SOP-028 - "Air Quality Monitoring" dated March 2022

- Changes made to Measurement of Sulphur Dioxide
- Fallout Dust Sampling frequency and duration
- Frequency change made to Black Mountain Schedule (once a quarter)

Revision 10 of BMC-HSE-ENV-SOP-0028 - "Air Quality Monitoring" dated March 2022

- Update document reference to align with BMM document control

- Update section 4.3.2 to remove water used during sampling.

7. REVIEW AND APPROVAL

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Pieter David Venter (Environmental Manager | BMM) TimeStamp: 2025/06/26 2:58:34 PM ||

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This document was approved (in sequence) by the individuals above using electronic approval in our Document Control System.

Final approval status: Approved

Approvals were done electronically.