Dust Management Plan

Details			
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Reviewed:			
Reviewed:			

Revision schedule		
Rev. Number	**Date**	**Description**
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Contents

A. Introduction

This draft Dust Management Plan (DMP) has been prepared for the Barrytown Project (the Project) to control dust as part of the mining operation located at Barrytown flats, 5kms north of Barrytown on the West Coast of the South Island of New Zealand.

A.1 Purpose and objectives of the DMP

The DMP has been prepared to manage, mitigate, and monitor dust emissions during construction and mining. The DMP applies to all personnel on the Barrytown project site, including subcontractors and visitors.

The objective of the DMP is to detail the best practicable option to avoid dust nuisance being caused by construction and mining works and to mitigate any such effects should they occur.

The DMP identifies the following:

- Potential sources of dust that may be created during the mining project
- Sensitive receptors in the vicinity of identified potential sources of dust for targeted dust management
- Dust management and mitigation methods
- Monitoring methods
- Training of staff in relation to dust management; and
- Methods for managing complaints regarding discharges into air and keeping compliance records.

In preparing this DMP, information has been drawn from practical experience with the management of dust emissions from other mining projects, and from the Good Practice Guide for Assessing and Managing Dust, prepared by the Ministry for the Environment (November 2016), particularly Appendix 4 (Dust Management Plans).

This DMP will form part of the Appendix to the Annual Work Program for the Project and will bemonitored annually for effectiveness.

A.2 Review and updates to the DMP

This DMP is a live document that will be reviewed and updated during the sites operation to reflect significant changes associated with construction techniques, mitigation, monitoring results or the natural environment. A review process is described in Section 11 of this plan.

B. Resource Consent Requirements

5.0 Annual Work Programme

5.1	At least 20 working days prior to mining activities commencing and thereafter on or before the anniversary date of the commencement of these consents, the Consent Holder must submit a programme of work ("Annual Work Programme") for certification by the Consent Authorities detailing: The proposed works to be carried out over the next 12 months including: Equipment to be used; Areas of topsoil and overburden stripping and stockpile locations; New areas of land disturbance that will be mined; Access tracks; Drill/prospecting sites and other tracks to be constructed; and Any other site works within the consent area. The approximate open volume of the working pit at the start of the year including depth of excavations and the area of the working pit. The progressive rehabilitation works to be carried out over the next 12 months including: Areas of unrestored land (i.e. all land not finally topsoiled and revegetated) at the beginning of the new year; The area that will be fully rehabilitated during the forthcoming year; Maximum slope angles, bench heights and widths of recontoured ground, if applicable; and Rehabilitation method and technique including replacement of topsoil and vegetation cover. Description of measures to prevent adverse effects on natural waterbodies, including drainage works within the consent area, and the collection and treatment of site run-off before discharge to land. Measures that must be adopted to ensure soil conservation and slope stability are controlled; A description and analysis of any unexpected adverse effects that have arisen as a result of activities within the last 12 months, and the steps taken to address the adverse effect.

5.2	The following plans, reports and results of monitoring must also be submitted as part of the Annual Work Programme: A detailed plan or aerial photograph showing: The open working area at the start of the year; Proposed mine path for the forthcoming year including haul and access roads;

	Rehabilitated ground behind the open pit area; Location of existing and intended topsoil or overburden dumps and their dimensions; Location of natural waterbodies; Location of present and intended drainage works and settling ponds; and Any other site works within the consent area. A Site Specific Erosion and Sediment Control Plan in accordance with condition 23.0. Results of surface water quality, flow and water level monitoring from the previous 12 months in the form of an Annual Hydrological and Water Quality Report required by condition 26.7. Any proposed updates to Management Plans submitted in accordance with the respective conditions of consent. Results of dust monitoring from the previous 12 months required by Condition 28.5 for the previous 12 months.
5.3	The Consent Holder must provide the Consent Authorities with any further information, which the Consent Authorities may reasonably request after considering any Annual Work Programme. This information must be provided in a timely manner as required by the Consent Authorities.
6.0 Management Plans	
6.1	The Consent Holder shall operate the site in accordance with the following management plans: Noise Management Plan Avian Management Plan Wetland and Riparian Planting Plan Dust Management Plan Rehabilitation Plan Water Management, Monitoring and Mitigation Plan Erosion & Sediment Control Plan (collectively Management Plans)

6.2	The Consent Holder may amend the management plans at any time to take into account: Any positive measure/s to ensure the stated objectives of the management plans are achieved; Any required actions identified as a result of monitoring under these consents; and Any changes required to further reduce the potential for adverse effects as a result of actions identified in the Annual Work Programme. Where management plans require the input of an appropriately qualified person, any amendments to those management plans must also be undertaken by the appropriately qualified person. *Advice Note: Some management plans have ongoing annual review requirements which are required in order to avoid, remedy or mitigate effects. These specific review requirements are stipulated in the relevant conditions of this consent.*
6.3	Any amended Plans must be provided to the Consent Authorities within 20 working days of their review, for certification in accordance with Condition 6.1.
6.4	The Plans must not be amended in a way that contravenes the matters set out in the conditions for the respective Plans.
6.5	If the Consent Holder has not received a response from the Consent Authorities within one month of the date of submission of any reviewed management plan, the management plan must be deemed certified. If the response from the Consent Authorities is that they are not able to certify the management plan, the Consent Holder must consider any reasons and recommendations provided by the Consent Authorities, amend the management plan accordingly, and resubmit the management plan to the Consent Authorities.
6.6	A copy of the latest version of the Plans must be kept on site at all times and all key personnel must be made aware of the contents of each Plan and their responsibilities under each Plan.
6.7	Subject to any other conditions of these consents, all activities must be undertaken in accordance with the latest version of the Plans.
7.0 Method of Operations	
7.1	The mine boundaries must be clearly marked on the ground before any earthworks take place, with a 20m setback from the northern property boundary, the coastal

	lagoon and Collins Creek.
7.2	The maximum site disturbance must not exceed 8.0 hectares at any one time. *Advice note: The disturbed area includes the mine pit, water management infrastructure, processing plant area, active rehabilitation areas and the access road.*
7.3	The Consent Holder must strip soil material ahead of operations and stockpile it for progressive and final mine closure rehabilitation purposes. Stockpiled soil must be protected from erosion caused by water and wind as far as practicable.
7.4	The Consent Holder must not bury any topsoil or soil material suitable as a growing medium or remove it from the site.

Conditions to Apply to WCRC Air Discharge Permit	
27.0 Dust Management Plan	
27.1	The Consent Holder must operate the site in general accordance with the Dust Management Plan prepared by TiGa minerals and Metals, dated April 2023.
27.2	Vehicles shall not exceed 15 km/hr on site at all times to avoid dust generation.
28.0 Air Quality Management and Monitoring	
28.1	There shall be no offensive or objectionable discharge of dust into air from the minerals extraction, processing and loading operations that results in an adverse effect beyond the legal boundary of the site. *Advice note: For the purpose of Condition 28.1 the Consent Authority will consider an effect that is offensive or objectionable to have occurred if an Enforcement Officer of the Consent Authority deems it so having regard to* *The frequency, intensity, duration, amount, effect and location of the suspended or particulate matter; and/or* *Receipt of complaints from neighbours or the public: or* *Relevant written advice or a report from an Environmental Health Officer of a territorial authority or health authority.*
28.2	Prior to the commencement of site preparation activities, a meteorological station

	must be installed at the site with instruments capable of continuously monitoring, logging in real time and reporting agreed representative meteorological data for the site.
28.3	The consent holder shall install, operate and maintain two Dust Deposition Gauges in the locations shown in the Dust Management Plan. Dust recorded in the gauges shall not exceed a value 4g/m^2/30 days above background levels. *Advice note: Background levels are to be determined by data collected prior to the commencement date of this consent.*
28.4	If a breach of Condition 28.3 is detected, the consent holder shall notify the consent authority within two working days of the breach being detected. The consent holder shall investigate possible reasons for the breach and take all necessary steps to achieve compliance in the following 30 day period.

C. Sources of Dust

The main construction activities that may generate dust are as follows:

- Earthmoving activities, such as creating bunds, site levelling and material transfer, excavation, and trenching;
- Clearing of pasture and topsoil;
- Load and haul operations;
- Vehicle movement on unsealed road and tracks;
- Wind erosion of exposed areas and stockpiles.

A dust and contaminant control program will then be implemented and monitored for effectiveness. The risk assessment will consider:

- Health exposure risks to silica, asbestiform minerals and other inspirable contaminants
- Potential risks to flora and fauna, heritage sites, surface water ways, building infrastructure and the community
- Ongoing operational costs for dust and contaminant suppression strategies

A documented review of the workplace survey and risk assessment will occur on a scheduled three-monthly basis, or more frequently where new work fronts or changes to existing mine plans occur. Risk assessment controls will be assessed to ensure their ongoing validity and effectiveness.
Changes to dust & contaminant control strategies will be introduced through a formal documented change management process.

Areas of the operations identified as being high risk for the generation of dust will be included in daily shift plans to ensure they are attended to on throughout the course of the shift

The processing plant in this resource consent application is a completely wet process and as such will not generate any dust in the production of the heavy mineral concentrate. Heavy mineral concentrate stockpiles have been enclosed within buildings to ensure dust is minimised.

3 Background monitoring results

Dust monitors from SGS Westport were placed on the resource consent area and left in situ for a month after which the monitors were collected and the dust collected by the monitors was analyzed by SGS. The results of the dust monitoring is shown in the table below:

Sample ID	Laboratory Id	EGA-ISO4222-2 Install Date	EGA-ISO4222-2 Collect Date	EGA-ISO4222-2 Sampling Period DAYS	EGA-ISO4222-2 TotalInsol Solids MG LOR5.00
Cowans DM 1	WP23-11550-001	16/11/2022	21/12//2022	36	<5
Cowans DM 2	WP23-11550-002	16/11/2022	214/12/2022	36	<5
Cowans DM 1	WP23-11550-001	22/12/2022	17/01/2023	26	10
Cowans DM 2	WP23-11550-	22/12/2022	17/01/2023	26	14

	002				
Barrytown DM!	WP23-1183.001	16/02/2023	22/03/2023	34	13
Barrytown DM2	WP23-11831..002	16/02/2023	22/03/2023	34	13

The total rainfall recorded during the above sampling periods is as shown in the table below:

Station	Date	Amount (mm)	Deficit (mm)	Period per day (Hrs)	Frequency
23934	16/11/2022 – 21/12/2022	315.2	372.7	24	D
23934	22/12/22 - 17/01/2023	66.8	1608	24	D
23934	16/02/2023 -22/02/2023	307.8	1461.7	24	D

4 Dust Mobilsation

Dust can be created on site from a number of activities. But only certain conditions will result in dust becoming or remaining airborne and transported around the site or off site.

The three different types of dust movement are described below.

Creep – (wind of approx. 16km/h)

The largest, heaviest, particles remain stable or creep along the soil surface. Generally they do not travel very far.

Saltation – (Wind of approx. 21km/h)

The medium sized particles account for 50-80% of soil movement, through a process known as saltation. Wind causes medium sized particles to vibrate, then bounce from the soil surface. Too big to remain suspended they are carried short distances (1m -10m), they fall to earth and dislodge other particles that repeat the process in a snowballing effect. This creates soil avalanches - thick soil clouds up to two metres deep moving down wind.

Suspension – (Wind above 21.6km/h)

The smallest particles are picked up and suspended in the wind, causing very visible dust clouds.

5 Sensitive receptors

Works will occur on farmland but sensitive receptors to dust emissions during construction will include residential houses and sensitive ecosystems.

Native vegetation, coastal marine area, wetlands, and surface water ways near the Project area should be treated as sensitive to dust, and dust is to be avoided. Activities are to be set back from these areas by a minimum of 20m.

6 Management procedures and mitigation measures

a. Overview

The overall approach to dust management for the Project is primarily based on visual monitoring, combined with good management of the processing plant and mine areas and a quick response to triggers in Table 4.2 and complaints received. Taking a proactive approach to dust management will help avoid significant dust emissions or, if dust emissions occur, help mitigate any adverse effects. Additional controls are set out in the Monitoring and Mitigation Plan.

b. General dust management measures

The dust management measures outlined in Table 4.1 will be used as applicable across the Project depending on the activity undertaken, weather conditions, and proximity to sensitive receptors. Additional methods may be found to be effective and implemented during construction.

Table 4.1: Dust management measures

Source of Dust	Control
General mitigation measures	• Site personnel trained in dust management controls. • Monitoring of site conditions (weather/soil conditions) to anticipate and prevent dust effects. • Limiting operations which have the potential to cause high dust during high wind events. • Use of water cart and sprays to keep surfaces damp as required near sensitive receptors. A critical part of this control measure is identification of a sufficient water supply at the site for this purpose with adequate volume. .
Earthworks Activities	• Drop heights of materials to be minimized to reduce dust generation. • Monitoring and managing of earthworks activities to limit dust generation during dry or windy weather conditions in accordance with Section 5 below. • Vegetation clearing will be minimized and areas no longer required will be stabilized and progressively rehabilitated as soon as is reasonably possible within the mine's operations. • The removal of vegetation and topsoil will be controlled and limited to the amount necessary for mining operations. • Soil disturbance during unfavorable meteorological conditions (such as high wind speed events) will be avoided if dust emissions cannot be controlled.
Stockpiles outside buildings (including material placement and removal)	• Making sure stockpiles exist for the shortest possible time. • Stockpiles are positioned as far as practical away from sensitive receptors. • Limiting the height and slope of stockpiles to reduce wind entrainment. • Surfaces of stockpiles to be kept damp to reduce dust emissions (e.g., through wet suppression systems) or covered or stabilized to reduce dust generation in areas adjacent to sensitive receptors.
Unpaved surfaces,such as haul roads and processing plant area	• Unsealed surfaces kept damp to reduce dust emissions in areas near sensitive receptors (e.g. by use of water carts and using water trucks fitted with pumps and sprays to dampen the roads sufficiently enough to suppress dust). • Where practical, compact unconsolidated surfaces to minimize dust. • Stabilization of surfaces when works are completed by grassing, or sealing surfaces to reduce dust emissions.

Sealed surfaces	• Clean excess dirt from vehicle tyres prior to leaving the site and driving onto sealed roads to reduce tracking of soils and re-entrainment of dust.
Vehicle movements	• 15 km vehicle speed limits on unsealed surfaces in areas near sensitive receptors. • Reducing transportation of dust through regular cleaning of vehicles including wheels at site entrance. • Covering truck loads.
Material handling and loading	• Minimising drop height

Contingency measures

A range of standard dust controls will be used to manage and mitigate the effects of discharges of dust during construction and mining. Additional mitigation may also be required in the event that:

- Monitoring indicates that significant dust emissions are occurring;
- Weather conditions are changing such that dust emissions are more likely; and / or
- Complaints are received regarding dust.

If the available mitigation methods are unsuccessful in controlling dust emissions and cause adverse effects on receptors beyond the Project boundary, the activities causing the discharge shall be suspended until adequate mitigation can be put in place.

Proposed contingency measures are outlined in Table 4.2.

Table 4.2: Contingency measures

Source of Dust	Control
Dust discharges cause deposition at sensitive receptors	• Stop activities that are generating dust until mitigation isreviewed and additional mitigation is in place. • Report to Environmental Superintendent to initiate an investigation and any remedial action as necessary.
Equipment Malfunction i.e. breakdown of water cart / sprays	• Assess rainfall and wind forecasts, stop work if forecastconditions are particularly dry or windy. • Repair water cart/sprays as soon as practicable.
Forecast high winds Wind speed above 20km/h	• Limit the activities that generate dust downwind of sensitive activities. • Additional visual inspection of exposed areas and activities. • Assess the need for additional controls such as increased water application rates.
Visible dust discharges from stockpiles / areas of uncovered soil	• Dampen stockpile or exposed area of soil. • Cover or stabilize area to reduce dust generation.

7 Dust inspections and meteorological monitoring

Visual monitoring of dust across all construction areas will be undertaken on a daily basis, or more frequently if conditions change.

Weather forecasts should also be checked daily (wind speed, wind direction and rainfall) from the installed meterological weather station installed onsite to implement the appropriate dust controls.

Table 5.1 below outlines the visual dust monitoring program to be implemented during construction. A daily log shall be kept of dust inspections and weather observations as set out in Appendix A.

Table 5.1: Dust inspection program

Monitoring Activities	Frequency
Check weather forecasts for strong winds and rainfall to plan appropriatedust management response (7-day forecasts available on www.metvuw.co.nz).	Daily
Inspect land adjacent to the site, surface water bodies and wetland areas and associated vegetation, and adjoining SH6 forthe presence of dust deposits caused by Project.	Daily
Observe weather conditions, wind via observations and data outputs fromweather stations and presence of rain.	Daily and as conditions

	change
Inspect all unsealed surfaces for dampness and to ensure that surface exposure is minimized, check for visible clouds being generated on site orcarried off site.	Daily and as conditions change
Inspect stockpiles to ensure enclosure, covering, stabilization or dampness.Ensure stockpile height appropriately stabilized.	Daily and as conditions change
Inspect dust generating activities to ensure dustemissions are effectively controlled.	Daily and as new activities commence
Inspect watering systems (sprays and water carts) to ensure equipment ismaintained and functioning to effectively dampen exposed areas.	Weekly
Additional visual monitoring of dust generating activities and water application rate.	In winds over 5 m/s
Ensure site windbreak fences, if used, are intact.	Weekly

8 DUST SAMPLING PROCESS

The following diagram summarizes the dust monitoring process

Step 1
Conduct a Risk Assessment

The risk assessment will identify any airborne contaminants and personnel at risk of exposure to the contaminants

Step 2
Complete the Workforce Survey

Workforce surveys must be conducted within the first 12 months of operation
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Step 3
Complete sampling

Health & Safety Officer to coordinate sampling using Certified Occupational Hygienist

Step 4
Sample Results

Sample results will be documented in the Dust Monitoring Register

6.1 Sample Results

Sample results will be documented in the Dust Monitoring Register and maintained in the Barrytown Management System by the HSEQ team.
Where sample analysis reports levels outside the acceptable limits will provide advice to the HSEQ Manager and Project Manager on the appropriate response with consideration to;

- What has been analyzed;
- The analysis levels reported; and
- Response recommendations to ensure the health and safety of personnel exposed to the airborne contaminant.

The Project Manager and HSEQ Manager will ensure that an appropriate response to levels exceeding those recommended is implemented. This may include:

- Re-testing
- Reviewing existing dust and fiber control measures;
- Implementing controls where existing controls are not adequate;
- Implement an awareness program for personnel who perform tasks in the area where exceedances occurred

6.2 Exceedance Reporting

Where an exposure standard has been exceeded, the Project Manager is to submit a report to NZPAM that details the:

- Contaminant type
- The contaminant exposure limits
- Recorded sample exposure
- Investigation undertaken; and
- The controls implemented to minimize further exposure to the contaminant.

9 Complaints

A record of complaints and remedial actions will be kept and provided to the West Coast Regional Council on request. Complaints are to be addressed as soon as reasonably practicable.

10 Roles and responsibilities

Table 7.1: Roles and responsibilities

Role	Responsibility
Mining Superintendent **Plant Superintendent**	• Identify the resources and equipment required for the management of dust • Ensure supervisors are aware of the DMP and operations are performed in accordance with it; • Incorporate dust management strategies into project mine planning; • Ensure the effective implementation and ongoing review of the DMP for continuous improvement.

Line Management	• Implement the DMP; • Ensuring personnel under their control are trained in, aware of and abide to the requirements of the DMP; • Undertake daily inspections to identify and control potential sources of dust • Be responsible to ensure any proposed changes to the work environment comply with the DMP through a formal change management process.
All Personnel	• Comply with the provisions of the DMP • Proactively assist in the application of strategies to prevent dust • Participate in dust and other contaminant health monitoring programs as directed.
Health & Safety Superintendent	• Dust Monitoring sample results are reported to the Mine Manager and recorded in the dust monitoring register.
Environmental Superintendent	• Environmental training (see section 8 below) • Review and updating DMP annually • Reporting to site management and Councils • Management of complaints.

11 Training

Environmental training for all staff will be undertaken as part of the site induction program prior to the commencement of work on the mine site. The environmental induction and training will include the following information specific to the DMP:

- Information about the activities and stages of construction or mining that may cause dust
- Consent requirements;
- Complaints management procedures;
- Dust management procedures;
- The requirement to participate in dust minimization strategies;
- Dust monitoring and reporting of incidents.

Personnel carrying out duties specific to dust management and monitoring will be specifically trained in relation to their roles and responsibilities in addition to the project induction.

10 Reporting

The procedures for recording daily dust inspections are as follows:

- The mining superintendent or duty manager will fill out a daily dust inspection log form (Attachment A) each day and maintain the record on site.
- The following information will be recorded:
    - Any dust control equipment malfunctions and any remedial action(s) taken;

- Results of the visual inspections of dust emissions;
- General weather conditions during the day (i.e. windy, calm, warm, rain, etc.);
- The frequency of watercart and/or water sprinkling system use; and
- The date and signature of the person entering the information.

11 Review

a. Review process

A review of the DMP will be undertaken at least annually by the Site Management team. The review will take into consideration:

- Compliance with the DMP and consent conditions;
- Any significant changes to mining activities or methods;
- Key changes to roles and responsibilities within the management team.
- Results of inspections, monitoring and reporting procedures associated with the management of dust.'
- Any comments from the West Coast Regional Council or Grey District Council;
- Any complaints received and remedial actions.

The outcomes of this review will be provided to West Coast Regional Council.

Where the DMP is updated as part of a review, the on-site version shall also be updated.

b. Reasonable amendment

In accordance with the consent conditions, reasonable amendments may be made to the finalized DMP at any time. Reasonable amendment is any amendment where the adverse environmental effect arising from the amendment is the same or less than the effect anticipated in the final DMP.

Any changes to the DMP shall remain consistent with the overall intent of the original version of the finalized DMP, as described in the relevant consent condition.

12 DUST MONITORING

Individual dust monitoring will be undertaken in accordance to legislation. As a minimum, a sampling program will be conducted yearly or as required by changes to operations.

Monitoring will only be conducted by an authorized and competent person. Monitoring results will be submitted to the Health and Safety Superintendent for recording in the register.

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Attachment A: Dust and Radiation Monitoring Locations (baseline)

Attachment B: Daily dust inspection log

Date: ……... **Time:** ……

Inspection by………

Current Weather Condition (e.g. sunny, cloudy, rain):
……

Wind Direction / Strength (e.g. strong, moderate, light, still)
……

Area(s) Inspected:
.....

SCOPE OF INSPECTION	Circle the relevant item	COMMENTS
Is there visible dust from site work activities, stockpiles, earthworks areas or haul roads?	Y N N/A	
Are haul roads visibly dry and need spraying with water truck?	Y N N/A	
Are any exposed earthworks or stockpile areasvisibly dry and need water spray?	Y N N/A	
Stockpile heights Dampened Stockpiles covered/stabilized where needed?	Y N N/A Y N N/A	
Are there any signs of dust going off site as a result of site activities? Land adjacent to the site to be inspected (including vegetation, residential properties and cars), and adjoining SH6 for the presence of dust deposits.	Y N N/A	
If wind speeds are strong are additional inspection and mitigation measures being put in place? (e.g. increase water application, restrictions on dusty activities)	Y N N/A	
Are watering systems (e.g. water carts, wheel wash) operating effectively to minimize dust?	Y N N/A	
Are trucks covered before entering or leaving the site?	Y N N/A	