# DUST MANAGEMENT PLAN

| Version | Date | Description | Approved | Position |
|---|---|---|---|---|
| V1 | | | | |
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# Dust Management Plan

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# Dust Management Plan

## 1. INTRODUCTION

This plan has been developed to inform the resource consent application process and provide a guide to those that have submitted on the resource consent applications and the decision makers around what is expected to occur during the course of mining.

Processing will separate the mineral sands from the other material including gravels, finer sands and other strata. The reject material will be returned to the mining area for backfilling. Processing of material is a wet process. Therefore, HMC and the reject material are wet after processing, and remain so until HMC is removed from site or the reject material is returned to the mining void for rehabilitation.

It is anticipated that this plan be a live document and will be regularly updated during the life of mine and be submitted to the consent authorities along with any Annual Work Programme that may be required by the resource consent.

It is acknowledged that wind-borne dust is the pathway of greatest potential risk for spread of Th-bearing minerals. Effective management of dust is therefore effective management of radiation risk. In the instance that that monitoring required by Conditions of Consent 26.4 – 26.5 and 26.7 – 26.8 exceeds the limits identified in Conditions of Consent 26.6 or 26.8 this Dust Management Plan will be updated to incorporate management practices in accordance with the Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing Code of Practice and Safety Guide published by the Australian Radiation Protection and Nuclear Safety Agency.

This document sets out the Dust Management objectives and management methodologies that will be used during the life of the proposed mining operation.

## 2. PERMITTED ACTIVITIES

Consent has not been sought for the discharge of Dust, Permitted activities under the West Coast Regional Air Quality Plan are being relied on for any discharges of dust while undertaking mineral sand mining

The West Coast Regional Land Air Quality Plan has the following permitted activities that can be relied on for Dust Management purposes.

**West Coast Regional Council Air Quality Plan**

**Rule 3 - Stockpiling, Conveying and Handling**

Stockpiling, conveying and handling is a permitted activity if:-

a) There is no discharge of dust beyond the boundary of the subject property, and
b) Any discharge of odour is not noxious, dangerous, offensive or objectionable beyond the boundary of the subject property

**Rule 5 – Earthworks, Quarrying, Mining and Clean fill Operations**

It is a permitted activity if:-

a) Any discharge of smoke, dust, gas or odour is not noxious, dangerous, offensive or objectionable beyond the boundary of the subject property
b) In the case of public amenity areas, any discharge of smoke, dust, gas or odour is not offensive or objectional beyond the boundary or beyond 50m of the discharge, whichever is the lessor

Under permitted activities Rule 3, dust must not go beyond the boundaries for **stockpiling, conveying and**

**handling** the product. – At all times during these activities, the sand product will be moist or wet.

Under permitted activities Rule 5, dust must not be objectionable or offensive beyond the boundaries for **Earthworks, Quarrying, Mining.** To ensure this is met, dust deposition gauges will be used at site and any levels of dust exceeding 4 grams per square meter per 30 day period will be considered objectionable.

## 3. RESOURCE CONSENT REQUIREMENTS

| | |
|---|---|
| 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 Westland Mineral Sands Co Ltd, dated October 2023. |
| 27.2 | Vehicles shall not exceed 25 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.<br>*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*<br>*The frequency, intensity, duration, amount, effect and location of the suspended or particulate matter; and/or*<br>*Receipt of complaints from neighbours or the public: or*<br>*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.<br>*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. |

## 4. DUST MANAGEMENT OBJECTIVES

*The objective of the DMP is to detail the best practicable option to avoid offensive and objectionable dust being caused by the consented activity, and to avoid any adverse effects on adjacent properties, the Mahinapua Wetlands and Mahinapua Scenic Reserve.*

### 4.1. THE OBJECTIVE IS ACHIEVED BY CONSIDERING THE POTENTIAL AREA OF DUST GENERATION DETAILED IN SECTION 5 AND PUTTING IN PLACE MECHANISMS TO ADDRESS DUST GENERATION IN THOSE AREAS.GUIDING PRINCIPLES

The following principles will guide the management of proposed mining activities:

- Minimisation of disturbance
- Staged construction and disturbance
- Slope protection
- Protection of Sensitive Areas (wetlands and close neighbours)
- Selection of Appropriate Controls
- Monitoring Weather Forecasts
- Experience and training
- Plan evolution
- Assessment and adjustment of management measures

## 5. PROJECT OVERVIEW

Mining is proposed to be undertaken using hydraulic excavators and a dump trucks to remove Topsoil. The Topsoil will be stockpiled adjacent to mining operations for use in rehabilitation for the initial starter pit and along site boundaries as bunds used for Noise and Landscape mitigation.

Once mining has developed to a point where in-cut backfilling of tailings can occur, this will commence with the cessation of stockpiling occurring due to this change.

The area of disturbed area will be managed to a 22.54 ha limit for the active mining area. Progressive rehabilitation is proposed, with rehabilitation set to achieve a vegetative cover suitable for livestock grazing at the completion of mining.

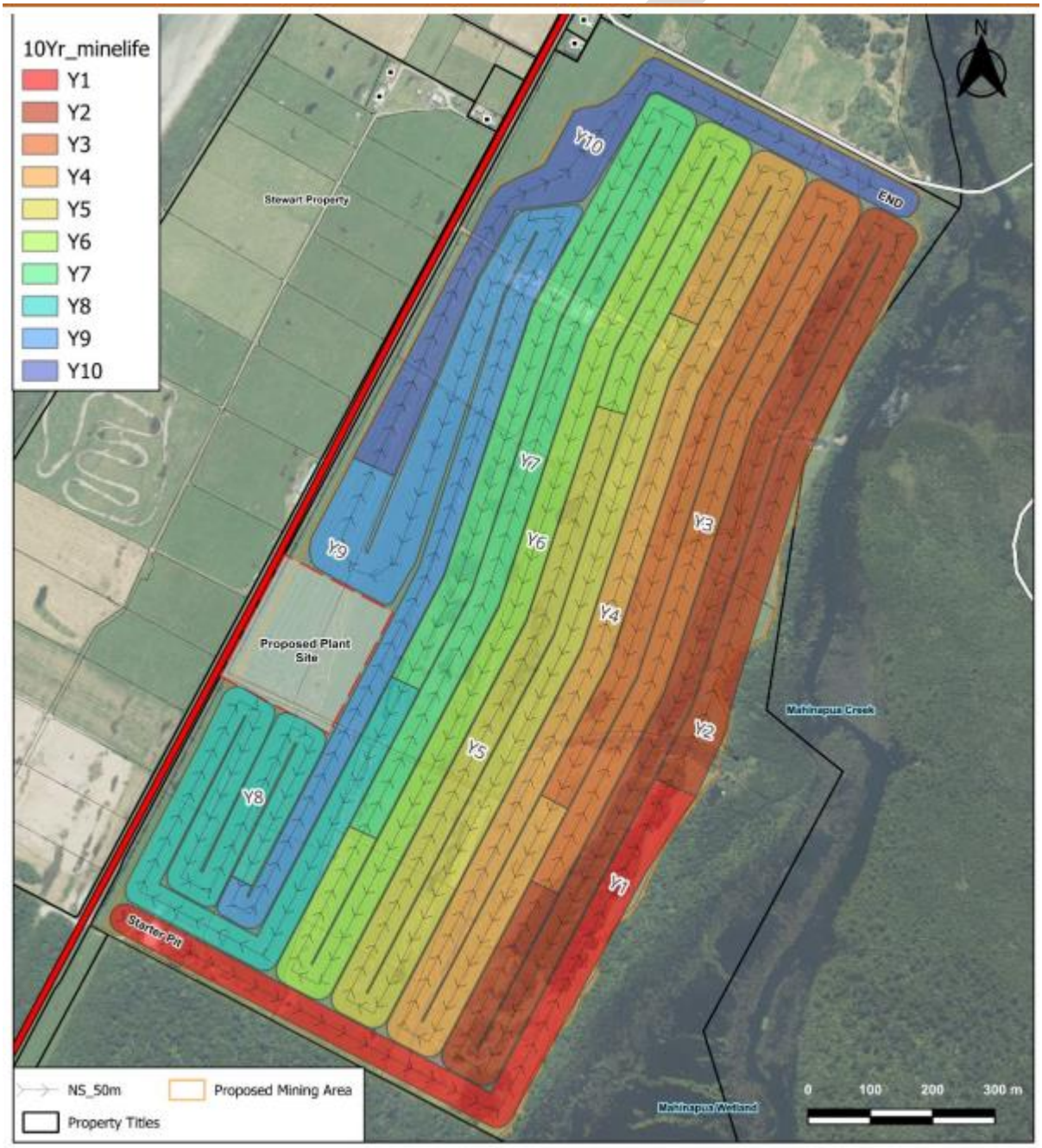
Opportunities for Dust Management issues to occur arise from the following activities:

- Earthworks
  - Topsoil stripping
  - Topsoil and tailings stockpiling
  - Mining – sand extraction
  - Mine development and pit progression
  - Mineral processing
  - Backfilling and rehabilitation
  - Feeding processing plant

- Transportation/logistics
  - Loading of road trucks
  - Entry and Egress of truck onto site
  - Movement of vehicles around site.

### 5.1. DRAFT MINE PLAN

Figure One is an overview of the application area and provides key locations in terms of plant location, proposed mine path.



## 5.2. DUST MANAGEMENT PLAN (DMP) - POTENTIAL AREAS OF DUST GENERATION

- Construction Activities
- Mining Activities (Soil and overburden removal, Excavation of mineral sands)
- Exposed dunes (in mining area after top & subsoil removal)
- Processing activities including stockpiling and ROM reclaim
- Truck Loading operations (HMC product)
- Vehicle movements on site
- Wind generated dust

## 5.3. CONSTRUCTION ACTIVITIES

Construction activities include the construction of access tracks and the processing plant area. These activities have the potential to cause dust and will be managed by using water as a dust suppressant on disturbed areas and re-establishing vegetation cover as soon as practicable to reduce unconsolidated surfaces and avoid dust nuisance on neighbouring properties.

The site access road from the state highway to carpark/ site operations, currently a farm access track will be formed and constructed to suit heavy vehicles. Once formed, the initial section from the state highway to approx. 20m beyond the site gate will be sealed, this will mitigate both dust and noise.

The road and carpark area will be treated with a polymer type road dust suppression or a Citrus based dust suppression agent such as Polo Citrus which is used in many quarries and mines.

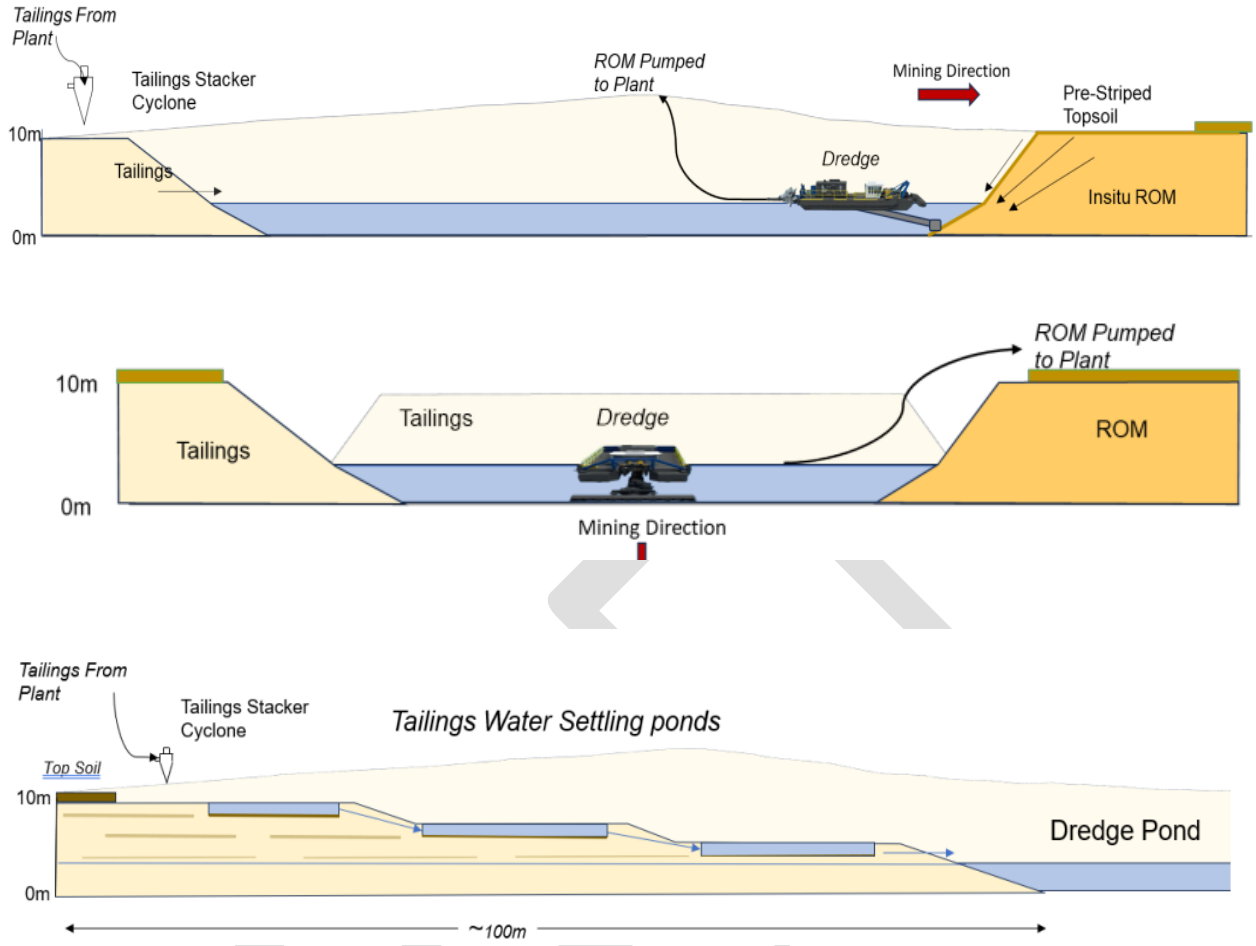
Water cart dust suppression can and will be used as required on any roads within the site. This water will be sourced from the well onsite. Should this not be available, water will be pumped from the operational water tanks and settling ponds.

## 5.4. MINING ACTIVITIES

Mining activities include:-

- Power generation (gen sets)
- Mobile equipment operation
- Top & sub soil removal
- Mining of Run of Mine (ROM) sand
- Placement of tailing and slimes and land rehabilitation.

Mining will occur systematically from South to North as outlined below.




**Power Generation**

Electrical supply to the site will be 6mva from the main transmission line along SH6.

**Mobile Mining Equipment**

All mobile mining equipment will be new as outlined below:

| Type | Model | Number |
|---|---|---|
| Dredge | 7012 HP Versi-Dredge | 1 |
| Dozer | Cat D6 LGP | 1 |
| 40t Excavator | Volvo EC380 | 1 |
| 20t Excavator | Volvo EC220 | 1 |
| Mini Excavator | | 1 |
| Articulated trucks (Two operating at one time.) | Volvo A40D | 2 |

| | | |
|---|---|---|
| Grader or similar | Cat 120 | 1 |
| Product loader –or similar. | Volvo L150 | 2 |
| Product loader | IT62 | 1 |
| Field vibrating screen | | 1 |
| Integrated Tool Carrier loader for site servicing of pipelines and service corridors | IT960 IT | 1 |
| Field booster pumps on rom feed slurry and tailings return. | Electric 6/4 warman pumps | Varies depending on distance |



**Topsoil (and sub soil) removal**

During removal of topsoil and sub soil, minimal dust is expected due to the moist nature of both materials. Topsoil will be removed in small batches to ensure minimal exposed sand. Initially topsoil will be stockpiled in the temporary out of pit dump until rehabilitation commences in the mining pit. Once rehabilitation starts on the mining pit, topsoil will be stripped off and taken to directly to rehabilitation areas where it will be placed, compacted and re-grassed.

**ROM Sand**

Typically, the sand has an inherent moisture content which will limit dust generation during normal excavation activities. As mining of the ROM sand progresses the sand may reduce in moisture content in period of dry weather. Any areas of the mine that are drying will be watered down by use of a water truck. Water will be sourced from the mining void.

In the lower levels of the pit, the natural water table will sit below the mining base and thus this will keep the sand damp. Adding water to the ROM sand is advantageous to the processing stage (see processing activities).

**Tailings**

Once the ROM sand has been processed, the tailing (or sand less the HMC) will be returned to the mining area. All tailings are produced wet and as such have a higher moisture content than raw sand. These tailings will be pumped back to the mining void, tailings will be co-disposed with slimes (see Slimes section). As new tailings are placed on previously deposited tailings, this ensures this area always remains damp and dust controlled. If needed the water cart can be used to keep the tailings within the rehabilitation area moist.

**Slimes (or fine material)**

The term slimes are a by-product from the processing of the RAW sand. As the sand is washed or treated through the trommel and spirals, the fine material within the RAW sand which includes sand, clays,

topsoil, subsoil and vegetation matter is separated and directed to the clarifier tank. This in effect removes any fine material from the RAW sand and keeps in in suspension within the clarifier and final deposition of these slimes. The estimated average slime content in the ROM is approximately 7.5% based on historic drilling.

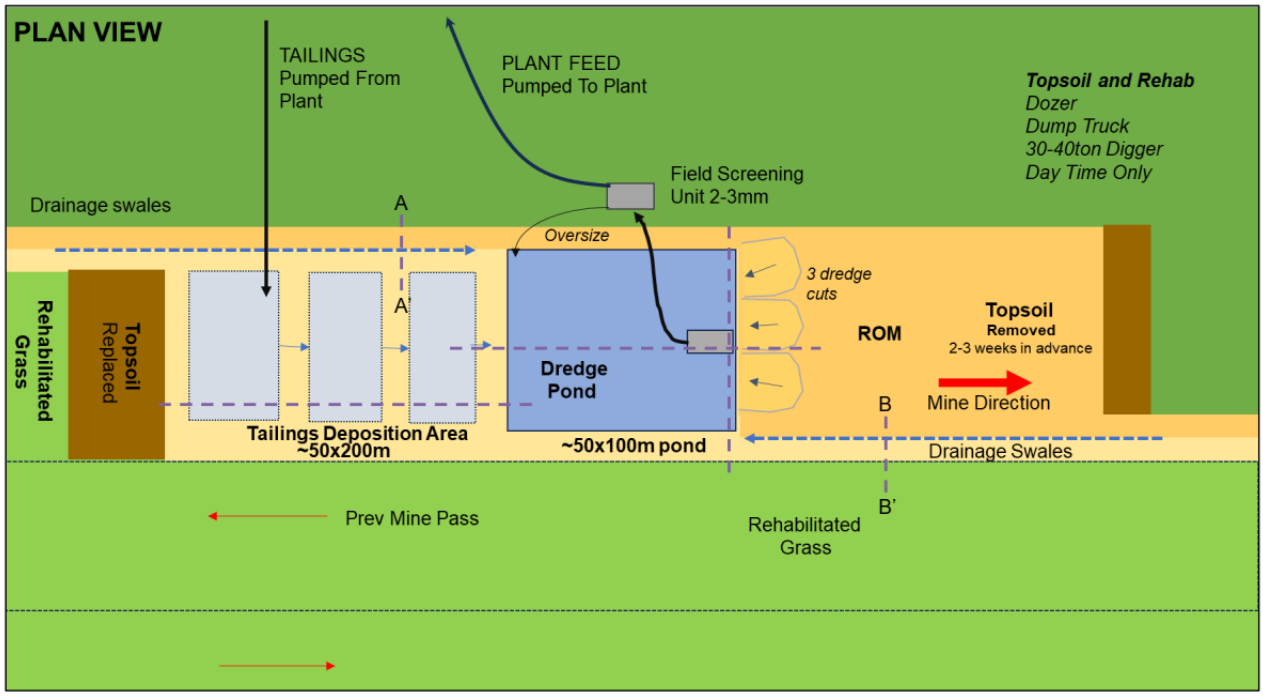
The slimes are deposed within the rehabilitation areas of the mine. They are always wet and mixed with the tailings.

**Topsoil (and sub soil) replacement**

Once the tailings reach their planned profile, sub soils then topsoils, stripped in advance of mining will be deposited onto these tailings and rehabilitation of this land will commence, as these soils will be removed and placed at the same time, the ability for these soils to dry out is minimal, if required, the soils can be wetted during removal and placement during periods of low rainfall.

## 5.5. EXPOSED AREAS

As Mining progresses topsoil and sub soil is first stripped from area to provide access to the ROM sand as shown in the drawing below:




This can expose sand prior to mining. Stripping of soils in this area will be kept to a minimum and only be removed just prior to mining these areas, thus keeping the mining footprint as small as possible. Similarly, replacement of soils on returned tailings should occur as soon as practical once this area is stable for heavy vehicle soil placement.

Setbacks are being utilized between the mining area and sensitive receptors. These are outlined below

- 10m setback from the northern and southern property boundaries
- 20m setback from the western boundary which is 30m from the edge of SH6 tarseal

- 85m setback from the NW corner near adjacent residents
- Edge of the vegetation and to property boundary along the eastern boundary.

### 5.6. PROCESSING ACTIVITIES.

The Heavy Mineral Concentrate (HMC) will be produced by gravity separation of the ROM sand through a process of trommel sizing and spiral separation to produce three products, HMC, Tailings and Slimes.

As the process uses water as the principal medium of the gravity separation processing, and there is no crushing of any material in the process, dust generation during processing will not occur; the final products (HMC and Tailings) will have 10% moisture by weight (10% W/W) and slimes will be a maximum 35% W/W. The HMC product is initially formed into a cone stockpile by deposition from the HMC cyclone, the inherent water which is approximately 4-6l/sec will slowly drain into the base. This stockpile will be occasionally moved to the adjacent truck loading area and will be formed into a stockpile ready for loading and dispatch from site. This stockpile will have dust suppression sprays as needed.

The tailings will initially be deposited into a cone stockpile from the tail's cyclone and then 'backloaded' into ROM truck to deposit onto the temporary tail's storage area. Due to the planed prompt movement of these products, they will not dry out and not create any dust.

Stockpiling of HMC on site will be limited to five days maximum production.

Slimes will be managed by way of a clarifier tank, with the slimes being drawn to the underside outlet where the thickened slimes will be pumped direct to the mining area to be co-disposed along with the tailings. Clean water from this tank will either be returned to the main water storage tank or used for site dust suppression or wetting.

During times of high winds (over 21.6km/hr based on NIWA Hokitika Airport weather station), the HMC stockpile will be inspected hourly by the processing operators and dust suppression adjusted as required to ensure the HMC remains damp and is not generating air bound particulates.

### 5.7. TRUCK LOADING OPERATIONS

Truck loading will be done by Front End Loader to the truck and trailer units.

All trucks will access the mine site via the access road from the State highway. This site access road from the State Highway to approx. 20m beyond the access gate will be sealed with a 8m sealed width.

All unsealed roads within the mine activities will have dust suppression water and sealants applied when conditions require such as dry periods or wind.

All truck and trailers transporting HMS product from site must undertake the following before leaving the plant/ loading area:-

- Covers to the truck and trailer load to be applied and secured
- Tail doors/ hatches to be closed and pinned/ locked
- Excess spillage from loading to be removed from trucks/ trailers, mud guards and drawbars
- Drivers should check wheels to ensure no build-up of material between dual wheels or inside of rims

Should a vehicle operator notice dust is being generated by their vehicle movement, reduce speed and report this to the site supervisor/ manager.

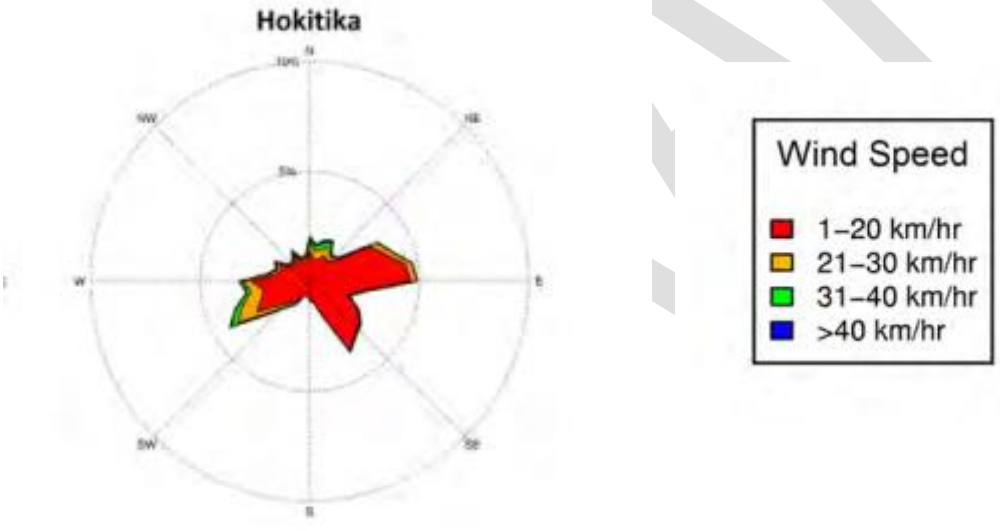
### 5.8. VEHICLE MOVEMENTS ON SITE (OTHER)

Other vehicle movements on site will be limited to employees, contractors and visitors coming to site in private light vehicles and delivery drivers. All light vehicles will park in a designated area close to the site office to minimise movements on site. They will not enter any working areas. Speed limits will be in place and water cart dust suppression will be applied to any road during dry and/ or windy conditions. Dust control generated by vehicles is part of the Traffic Management Plan (TMP).

### 5.9. WIND GENERATED DUST.

The site is surrounded by farmland, native vegetation and wetlands. Topsoils and exposed sand that can then be affected by wind. Data from the NIWA based on Cape Foulwind data shows that prevailing wind is from the South West around to the North East. This means as that there are large areas of grassed land between mining activities between and receptors in the north (both neighbours and Wetlands) for the majority of the mine duration.

Progressive Rehabilitation will be undertaken so that disturbed areas are re-grassed as soon as practical to minimise the area of disturbance.




Windrose showing typical directions in February (typically the driest month of the year) relative to the mine site.

Mean annual wind direction and speeds.

# Dust Management Plan

The mean monthly (11.7km/h) and annual wind speeds for Hokitika is 11 km/h shown in the table below, this is below the speed required for dust to become airborne and suspended.

*Table 1. Mean monthly and annual wind speed (km/hr) for selected West Coast locations, from all available data.*

| Location | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Ann |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Westport | 13.8 | 12.8 | 12.4 | 12.2 | 12.5 | 13.2 | 12.9 | 12.9 | 14.9 | 16.0 | 15.6 | 14.7 | 13.7 |
| Greymouth | 13.5 | 11.1 | 12.0 | 13.4 | 13.6 | 14.5 | 14.7 | 12.7 | 14.0 | 14.5 | 13.7 | 12.7 | 13.4 |
| Hokitika | 11.7 | 10.5 | 10.3 | 9.8 | 9.9 | 10.1 | 9.6 | 10.2 | 11.7 | 13.2 | 12.9 | 12.2 | 11.0 |
| Haast | 9.2 | 8.4 | 8.9 | 9.5 | 10.7 | 11.1 | 11.6 | 10.7 | 11.0 | 11.8 | 11.2 | 10.1 | 10.3 |
| Franz Josef | 8.5 | 7.8 | 7.4 | 7.4 | 7.2 | 7.3 | 7.2 | 7.3 | 8.3 | 8.5 | 8.4 | 8.4 | 7.8 |
| Reefton | 6.6 | 5.8 | 5.4 | 4.8 | 4.4 | 4.1 | 3.9 | 5.0 | 6.0 | 6.5 | 6.6 | 6.5 | 5.4 |

Wind can exceed 30km/h at Hokitika and this occurs throughout the year as is shown in the table below at an average of 2-3 days per month. Due to the size distribution of the sand particles, this will only carry sand particles short distances due to their mass and will not be carried over the site boundary.

Mining of the RAW sand and traffic movements can disturb sand, but certain wind conditions are required for this to become airborne.

Sand will move by wind and there are three types of wind generated sand movements:-

- At approximately 16km/h wind can move all sand along the ground in a process known as *Surface Creep or Reptation*, this is simply 'rolling or sliding' the sand particles slowly along the ground and can be enhanced/ or retarded by slopes. Larger particles (1.1mm – 2mm+) only creep regardless of wind velocity. Less than 1% of the sand is in this category

- Once wind speed reaches 21km/h the sand particles 500 micron to 1.1mm travel only short distances along the ground in short bounds, in a process known as *Saltation,* and depending on the size (and mass, given that sand is approximately 2000 time the mass of the atmosphere) of each particle, this determines how far these will move in each bound. Typically, all sand particles only move a short distance before falling back to earth and bumping into other sand particles. Approx. 90% do not reach a height of 30cm and move between 0.5 – 1m along the ground. Sand in the size range 5-500 microns, can be moved both further and higher but is proportional to wind speed and sand sizes. This is known as the *Avalanche effect,* with sand carried short distances (1-10m) before falling back to earth.

- Airborne sand requires a wind speed in excess of 21.6km/h, the sand to be at a height above the ground greater than 30cm and the particle size to be less than 5 microns (dust), this is known as *Suspension,* and can carry dust great distances. Based on size analysis of the sand and HMC product, there is no particles less than 50 microns.

## 6. PARTICLE SIZE ANALYSIS.

A particle size analysis of the Mananui ore was completed on a bulk sample processed at Mineral Technology during processing test work for plant design. The 20ton sample was screened to remove trommel oversize (+3mm), screen oversize (+1mm) and Slimes prior to mineral separation (as per below diagram).

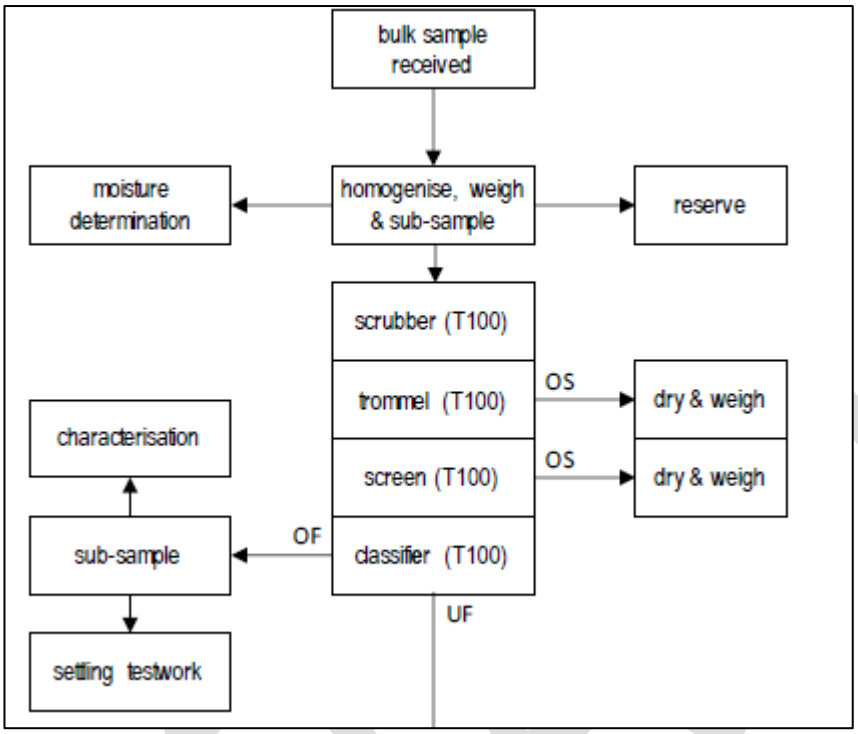



*Figure 1 Feed Preparation Flow Diagram*

The ore feed preparation results as per the below Table 1. The sand fraction represents 96.5% of the mass. This classifier underflow or the "sand" fraction was characterised by grain size analysis (Table 2) and assay by density analysis (Table 3).

*Table 1 Feed Preparation Mass Balance*

| stream | mass % | | HM | garnet | $TiO_2$ | $Fe_2O_3$ | $SiO_2$ | $Al_2O_3$ | MgO | MnO | $ZrO_2$ | $P_2O_5$ | U | Th | $SO_3$ | CaO | $K_2O$ | $LOI_{1000}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | stage | feed | % | % | % | % | % | % | % | % | % | % | ppm | ppm | % | % | % | % |
| Oversize | 0.2 | 0.2 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Slimes | 3.3 | 3.3 | n/a | n/a | 1.80 | 11.2 | 47.4 | 17.1 | 1.82 | 0.34 | 0.02 | 1.08 | <10 | 31 | 0.12 | 1.88 | 2.17 | 13.3 |
| Sand | 96.5 | 96.5 | 34.1 | 15.6 | 4.47 | 11.0 | 68.2 | 9.26 | 0.91 | 0.94 | 0.05 | 0.11 | 10 | 13 | <0.01 | 2.90 | 0.76 | 0.1 |
| Total | 100.0 | 100.0 | 32.9 | 15.0 | 4.38 | 11.0 | 67.5 | 9.52 | 0.94 | 0.92 | 0.05 | 0.14 | <10 | 14 | <0.01 | 2.87 | 0.81 | 0.5 |

The size distribution in Table 2 below a typical distribution of classified alluvial sand with 85% of the mass between 150um and 500um. The average particle size (d50) was calculated to be 263um or medium sand. The density distribution of the classifier underflow shown in Table 3 below shows the content of heavy mineral, HM (>2.85sg) to be 34%. 65% of the mass reported to -2.85sg fraction which would be principally free quartz and feldspar while the mass in the +2.85-3.3sg range was later identified to be mostly amphibole both end up as tailings deposited back into the mining void..

*Table 2: Size Distribution of Classifier Underflow "Sand" fraction*

| size | | % wt retained | cum % wt retained | cum. % wt passing |
|---|---|---|---|---|
| microns | US mesh | | | |
| 1000 | 18 | 0.4 | 0.4 | 99.6 |
| 500 | 35 | 7.6 | 8.0 | 92.0 |
| 300 | 50 | 28.8 | 36.8 | 63.2 |
| 250 | 60 | 17.8 | 54.6 | 45.4 |
| 212 | 70 | 16.0 | 70.6 | 29.4 |
| 180 | 80 | 13.9 | 84.5 | 15.5 |
| 150 | 100 | 9.1 | 93.5 | 6.5 |
| 106 | 140 | 5.0 | 98.5 | 1.5 |
| 75 | 200 | 0.5 | 98.9 | 1.1 |
| 45 | 325 | 0.2 | 99.2 | 0.8 |
| 0 | 0 | 0.8 | 100.0 | 0.0 |
| total | | 100.0 | - | - |
| d50 (um): | 263 | | | |

*Table 3: Assay by Density Analysis of Classifier Underflow "Sand Fraction"*

| SG fraction | % wt | $TiO_2$ | $Fe_2O_3$ | $SiO_2$ | $Al_2O_3$ | MgO | MnO | $ZrO_2$ | $P_2O_5$ | U | Th | $SO_3$ | CaO | $K_2O$ | $LOI_{1000}$ | garnet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -2.85 | 65.8 | 0.21 | 1.60 | 88.0 | 5.82 | 0.63 | 0.02 | 0.02 | 0.07 | <10 | <10 | 0.01 | 0.76 | 0.83 | 0.9 | 0 |
| +2.85 -3.3 | 6.9 | 2.75 | 9.11 | 47.5 | 19.7 | 2.82 | 0.20 | 0.06 | 0.35 | 20 | 66 | <0.01 | 10.6 | 2.50 | 2.9 | 0 |
| +3.3 -3.6 | 1.3 | 15.2 | 12.2 | 35.6 | 14.6 | 0.81 | 0.77 | 0.09 | 0.23 | 28 | 676 | <0.01 | 16.8 | 0.44 | 0.0 | 0 |
| +3.6 -4.05 | 12.5 | 2.12 | 28.7 | 36.7 | 19.7 | 1.27 | 4.69 | 0.05 | 0.16 | 16 | 64 | <0.01 | 8.31 | 0.07 | -1.6 | 80 |
| +4.05 | 13.5 | 26.6 | 40.9 | 18.6 | 10.1 | 0.85 | 2.33 | 0.22 | 0.16 | 10 | 35 | <0.01 | 3.42 | 0.16 | -3.2 | 35 |
| total | 100.0 | 4.37 | 10.9 | 68.7 | 9.21 | 0.89 | 0.94 | 0.05 | 0.11 | <10 | 26 | 0.01 | 2.95 | 0.76 | 0.1 | 15 |

The mass of classifier overflow (slimes) was calculated as the difference between the bulk start weight and the sum of the other streams produced in the feed preparation processing. Due to inherent uncertainty in the sampling, the proportion of classifier overflow is estimated to be 3.3% ±0.2%. The sub-sample of classifier overflow collected by the auto sampler was consolidated and further sub-samples extracted for characterisation - assay by size analysis (Table 4) and quantitative XRD analysis at Bureau Veritas (Table 5).

*Table 4 Assay by Size Analysis of Classifier Overflow "Slimes"*

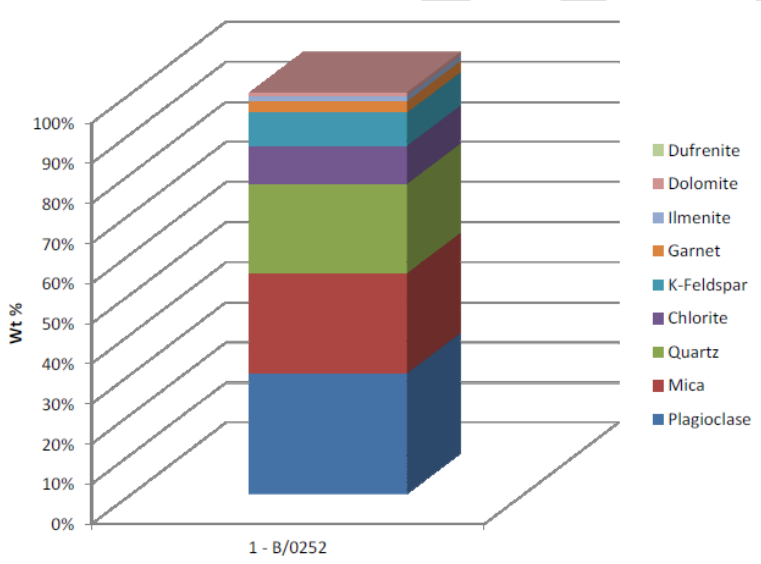
| size retained | | % wt | cum % wt | passing % | $TiO_2$ | $Fe_2O_3$ | $SiO_2$ | $Al_2O_3$ | MgO | MnO | $P_2O_5$ | U | Th | $V_2O_5$ | $SO_3$ | CaO | $K_2O$ | $LOI_{1000}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| microns | US mesh | | | | % | % | % | % | % | % | % | ppm | ppm | % | % | % | % | % |
| 106 | 150 | 0.9 | 0.9 | 99.1 | 5.14 | 11.7 | 62.9 | 9.72 | 1.08 | 0.93 | 0.17 | <10 | 33 | 0.02 | 0.04 | 2.69 | 0.91 | 3.9 |
| 75 | 200 | 0.4 | 1.3 | 98.7 | 1.64 | 10.0 | 48.3 | 16.0 | 3.24 | 0.43 | 0.54 | <10 | 42 | 0.02 | 0.10 | 1.18 | 2.37 | 14.6 |
| 45 | 325 | 1.6 | 2.9 | 97.1 | 1.03 | 9.13 | 54.9 | 17.5 | 3.54 | 0.21 | 0.23 | <10 | 24 | 0.02 | 0.04 | 1.15 | 2.84 | 7.8 |
| 20 | 700 | 11.0 | 13.9 | 86.1 | 0.84 | 5.29 | 67.9 | 14.8 | 1.82 | 0.14 | 0.14 | <10 | 19 | 0.01 | <0.01 | 1.81 | 1.82 | 2.8 |
| 14 | 900 | 25.3 | 39.3 | 60.7 | 2.22 | 5.25 | 69.6 | 12.9 | 0.54 | 0.30 | 0.23 | 28 | <10 | 0.01 | <0.01 | 3.38 | 0.61 | 1.1 |
| 10 | 1150 | 22.1 | 61.4 | 38.6 | 1.55 | 5.26 | 66.8 | 14.8 | 1.21 | 0.19 | 0.17 | 25 | 18 | 0.01 | <0.01 | 2.53 | 1.57 | 1.8 |
| -10 | -1150 | 38.6 | 100.0 | 0.0 | 1.99 | 10.6 | 49.8 | 16.9 | 1.64 | 0.35 | 0.93 | <10 | 28 | 0.02 | 0.09 | 2.10 | 2.16 | 10.3 |
| total | | 100.0 | - | - | 1.83 | 7.46 | 60.8 | 15.1 | 1.32 | 0.28 | 0.48 | 13 | 18 | 0.01 | 0.04 | 2.47 | 1.60 | 5.2 |
| d50 (µm) | | 12 | - | - | | | | | | | | | | | | | | |

The size distribution in Table 4 above shows 86% of the mass was finer than 20um. The average particle size (d50) was calculated to be 12um. In the size distribution the cut sizes of 20um and above were achieved by screening

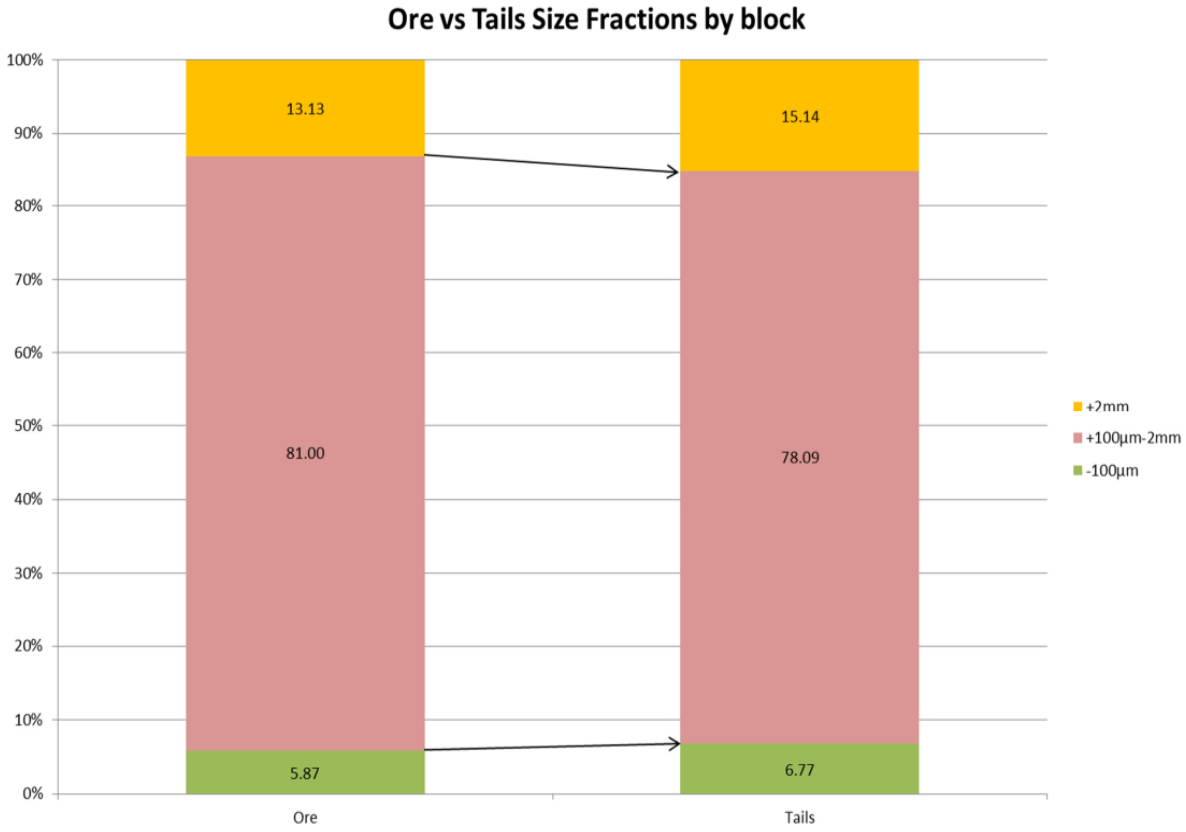
while the cut sizes below 20um were hydraulic cuts (specified at a specific gravity of 2.65) by cyclosizer method. The report from XRD analysis of the classifier overflow "slimes" shows. The major identified species were plagioclase, mica and quartz (accounting for 77% of the total mass). Minimal clay minerals were detected although it is expected that areas of the ore body does contain higher levels of slimes contain clay minerals.

*Table 5 Quantitative XRD Results Bureau Veritas*

| | Composition | 1 - B/0252 |
|---|---|---|
| Plagioclase[1] | $NaAlSi_3O_8 – CaAl_2Si_2O_8$ | 30 |
| Mica[2] | $X_2Y_{4-6}Z_8O_{20}(OH,F)_4$ | 25 |
| Quartz | $SiO_2$ | 22 |
| Chlorite[3] | $(X_5Al)(AlSi_3)O_{10}(OH)_8$ | 10 |
| K-Feldspar[4] | $KAlSi_3O_8$ | 8 |
| Garnet[5] | $X_3Z_2(SiO_4)_3$ | 3 |
| Ilmenite | FeTiO | 1 |
| Dolomite | $CaMg(CO_3)_2$ | 1 |
| Dufrenite[6] | $Fe^{2+}Fe^{3+}{}_4(PO_4)_3(OH)_5{\cdot}2(H_2O)$ | Tr |

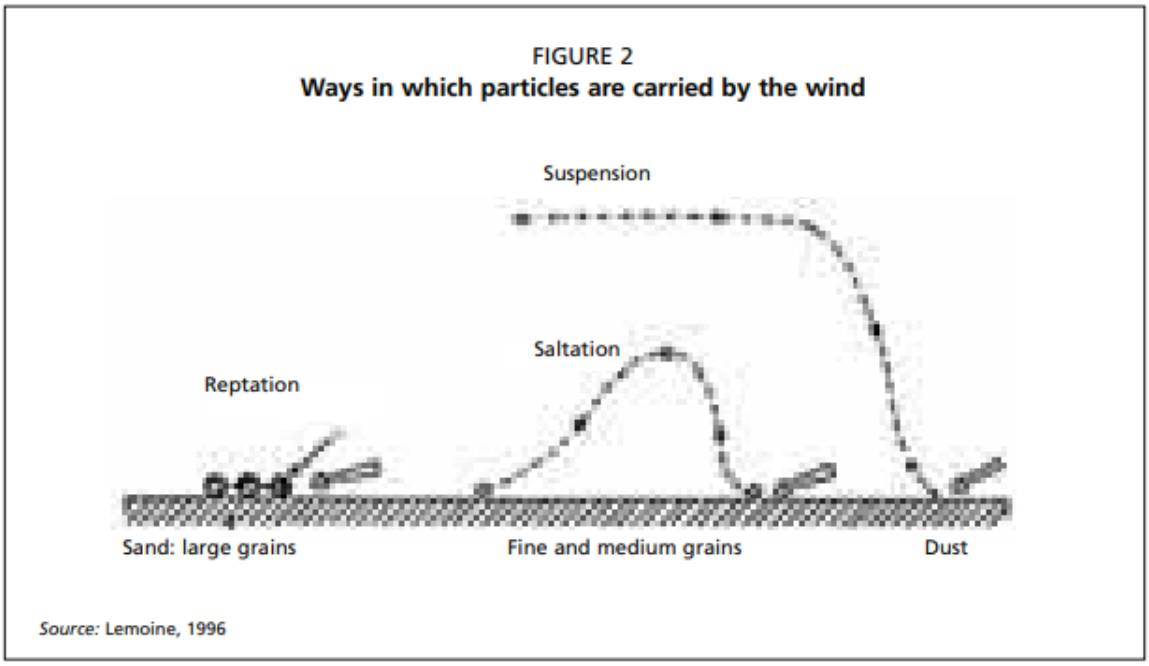



Based drilling samples obtained for the site, a size breakdown of the HMC product, ROM and quartz/tailings is as figure 2:- These show a similar breakdown of size from both RAW sand and finished product indicating that the process does not target specific size particles of sand.




These show a similar breakdown of size from both RAW sand and finished product indicating that the process does not target specific size particles of sand.

Based on this information, although there is potential for localised airborne sand to be generated at site, it will not become suspended due to the size and mass of particles. (See Fig below).




Controls of this will be by one or more of the following methods undertaken either directly or in conjunction with the land user (leased farmland):-

- Maintain good vegetation being grass for grazing.
- Maintain existing trees and if possible, plant addition trees in exposed areas.
- Maintenance and regular inspections of all mining areas and roads including farm access roads with the use of the water truck to dampen surfaces where traffic operates, or sand erosion may occur.
- Placement of wet tailings or sediments from Silt and Settling ponds as a wet slurry to dampen exposed areas
- Rehabilitation of any exposed tailing as soon as practical with soils and then grassed.
- Reviewing of Weather Forecasts (NIWA Hokitika) to inform decisions on employing dust management techniques.
- Regular inspections for processing plant stockpiles, including more frequently for high winds (over 21.6km/hr in accordance with NIWA Hokitika weather station data) – i.e. every hour.

## 7. DUST MONITORING

Dust Deposition Gauges (DDG) will be positioned at four locations on site, close to the boundaries at each of North, South, East and West boundary locations. Radiation monitoring devices will also be installed in the vicinity of the DDGs in accordance with Conditions of Consent.

# Dust Management Plan

The plan in Appendix 1 shows the initial locations of these four DDGs. As mining progresses northward, the location of DDGs will move as required to ensure that the samples will capture any dust generation of the active mining operation based on prevailing wind conditions.

The use of an independent laboratory to uplift, replace and sample and report on the contents will be used to undertake monthly sample analysis. This analysis will inform management practises onsite as outlined in the trigger response plan below.

A TARP (Trigger Action Response Plan) will be implemented.

**Nine Mine Project Dust TARP**

| | Normal | Level 1 | Level 2 |
|---|---|---|---|
| Dust Deposition Gauge Results | 0 - 2g/m2/30 days | 2 - 3.9g/m2/30 days | >4g/m2/30 days |
| Level of Response | NIL REQUIRED | INFORM ALLUVIAL MINE MANAGER IMMEDIATELY. INVESTIGATE REASONS FOR DUST LEVEL ELEVATIONS. APPLY FURTHER CONTROLS | REPORT TO GENERAL MANAGER. REPORT TO BDC/ WCRC. STOP OPERATIONS UNTIL SOURCE OF DUST HAS BEEN CONTROLLED. UNDERTAKE INCIDENT INVESTIGATION |

Results are based on values Above background dust levels in those respective areas.

**DEFINITIONS**

| | |
|---|---|
| **General Manager Operations** | An employee of Westland Mineral Sands Co Ltd who is responsible for the whole of business operations |
| **Alluvial Mine Manager** | An employee or contractor that has been deemed competent and has been authorised by the Project Manager to manage the TMP. The General Manager has the authority to fulfil the duties as the Alluvial Mine Manager in that person's absence. |
| **Noxious** | Harmful or unwholesome |
| **Dangerous** | Involving or causing exposure to harm |
| **Offensive** | Giving or meant or likely to cause offence… disgusting, repulsive, foul smelling, nauseous |
| **Objectionable** | Open to objection, unpleasant, offensive |

**REFERENCES**

Fighting Sand Encroachment: lessons from Mauritania (FAO. Org)
Desert Sand Dune Geology – Walter Feller
The Climate and Weather of the West Coast – NIWA 2016
Ministry for the Environment. 2016. Good Practice Guide for Assessing and Managing Dust. Wellington:
Applied Conveyor & Polymers Ltd – Polo Citrus Dust Suppression

# Dust Management Plan

## 1. APPENDIX 1

Site plan showing locations of Dust Deposition Gauges (DDGs) and radiation monitoring devices.

# Dust Management Plan