



Dust Management

1 INTRODUCTION

Dust management is outlined in the following sections:

- 3 Depositional Dust Monitoring
- 4 Dust Suppression
- 5 Radiation Monitoring
- 6 Weather Station

2 DEFINITIONS

Critical Role Responsibilities

Responsibilities marked with an [®] are included in the Critical Role Responsibilities Register. Editors changing these responsibilities shall add the GL Systems & Risk as a Stakeholder to ensure the Role Responsibilities Register is updated to reflect the change.

3 DEPOSITIONAL DUST MONITORING

3.1 Objective

To describe the methodology to be used to conduct environmental dust monitoring using the sixteen static depositional dust sampling stations.[®]

3.2 Background

Condition A1(b) of the Cooljarloo Site Environmental Management Program requires dust monitoring to be conducted in accordance with the agreed Dust Management Plan (as set out within Attachment 2 of the Licence), AS2922-1987 and AS3580.10.1:2003. This procedure provides detail of the methodology used to comply with these requirements. It is worth noting that prior to 2004 the site licence required high volume dust sampling at lease boundary. Recently, this was replaced with depositional gauges placed both at the lease boundary and at strategic locations within the tenement area. The methodology for High Volume sampling has been retained purely as a historical reference and on the off chance that this will be undertaken in the future.

3.3 Procedure

3.3.1 Static Dust Monitoring Methodology

Dust levels at the lease boundary and critical point source areas such as the process waste pit are monitored continuously with dust deposition gauges. This data is presented in the Annual Environmental Report. The correlation of dust patterns with

Electronically Controlled Document – For The Latest Version Check The Intranet		
Doc No: C0785	Doc Level:	Page 1 of 12
Revision: 5	Owner: Joseph Chandler	Last Review Date: 15 Mar 2009



prevailing weather patterns and site activities allows for the continual improvement in dust management on site. Internal dust targets are set annually. Performance against internal targets is reported in the Annual Environmental Report.

The Environmental Officer shall ensure that monitoring is conducted according to the following procedure early each month:

1. Load boxes of MPL sample bottles (large brown glass bottles with CuSO₄ preservative), DI water, small step ladder, dust monitoring record book; spare rubber funnel guards, mobile phone and plan of dust gauge sampling locations into vehicle.
2. Visit each of the 16 gauges and carefully remove sample bottle using step ladder.
3. While the funnel is still in the bottle, rinse it into the bottle with DI water to transfer dust on the inside of the funnel into the sample bottle.
4. Write collection date and time on previous month's sample bottle and transfer lid from new bottles to these. Pack into foam boxes.
5. Rinse the funnel to ensure it is free of algae.
6. Write gauge identification, sample type (dust), date and time of setting up on bottle. Place rubber funnel guard on funnel and place bottle and then funnel back into the top of the sample station.
7. On return to office write down all details from sample bottles onto dust record sheets.
8. Fill out an MPL Chain of Custody sheet, photocopy and place on COC Forms file. Put original sheet in a small ziplock bag and then inside one of the boxes of samples. Seal up boxes with tape and address them to MPL, 16-18 Hayden Court, Myaree, 6154 .
9. Fill out a despatch form in the warehouse to send samples to MPL Laboratories via Executive Couriers.
10. The Environmental Officer will then enter data from MPL Laboratories into the Cooljarloo site environmental Excel spreadsheet at H:\Environment\4.5 Checking and Corrective Action\ 4.5.1 Monitoring and Measurement\ Dust

3.3.2 Hi Volume Dust Monitoring Methodology (Redundant)

The Environmental Coordinator shall ensure that monitoring be conducted according to the following procedure under worst case conditions in late February:

1. The Environmental Coordinator shall organise for the pre-calibrated High Volume Dust Sampler to be obtained from Chandala.
2. Dust shall be sampled for 24 hour periods at monitoring points around the lease boundary (Figure 11.1). The monitoring locations are marked in the field with a survey peg and a site name.

Electronically Controlled Document – For The Latest Version Check The Intranet		
Doc No: C0785	Doc Level:	Page 2 of 12
Revision: 5	Owner: Joseph Chandler	Last Review Date: 15 Mar 2009



3. The Standard Operational Procedure for Dust Monitoring shall be conducted by the Environmental Coordinator. The procedure is as follows;

- Check fuel and oil in the unit.
- Unlock units cover plate.
- Set to **AUTO**.
- Fill out visit sheet, date, location and time.
- Set timer if required.
- Remove filter paper bracket holding device from top of unit.
- Place weighed filter paper carefully onto bracket with smooth side facing up, making sure paper is placed square in bracket.
- Put holding bracket back in machine, but do not tighten down (only tighten down holding bracket after machine has started otherwise filter paper will tear).
- Start Genset (note: fuel must be switched off while not running due to the large fuel holding capacity of the unit).
- Write down counter time and actual time eg. 750.54– time counter, 9.48am car clock or watch
- Once soft start has begun and flow meter reaches 70, the filter holding bracket must be tightened down. Secure unit, lock cover plate.
- After sampler has run for 24 hours, shut down Genset and turn off the fuel. Remove holding bracket containing filter paper to a safe work area.
- Remove filter paper carefully (use white cotton gloves and or tweezers).
- Place filter paper on plastic bag with dust side facing up and fold in half, and half again.
- Put folded filter paper in the plastic bag it came in with number and original weight, location details, time and date.
- Send filter paper to the Environmental Coordinator at Chandala for analysis.

4 **DUST SUPPRESSION** ®

4.1 Objective

To describe methods to be used to suppress dust emissions on site and comply with the DEC licence conditions.

Electronically Controlled Document – For The Latest Version Check The Intranet		
Doc No: C0785	Doc Level:	Page 3 of 12
Revision: 5	Owner: Joseph Chandler	Last Review Date: 15 Mar 2009



4.2 Background

Potential sources of dust at Cooljarloo include:

- Mining Operations including haul roads, overburden removal and ore mining (Dry Mining only)
- Topsoil stripping and placement
- Exposed areas including topsoil stockpiles, landformed areas and pre-stripping
- Process waste disposal and pits

The Cooljarloo dredge mining operation typically generates low levels of dust due to the wet nature of the mining operation. Slimes solar drying cells do not generate dust due to their wet nature, high clay content and low trafficability. Sand tailings also do not generate dust due to the absence of fine particles, however, such areas can experience sand creep if not managed (stabilised).

The Billinue Community, Brand Highway and Wongonderrah Road are sufficiently close enough to mining operations that, during adverse conditions and in the absence of effective management, either could be impacted by dust generated from mining operations.

The potential for direct environmental dust impacts such as vegetation smothering and land contamination are low. Potential dust, including dust from the black waste area is low in metals and essentially benign. The coarse rejects waste which is relatively high in radioactivity is immediately buried on receipt at the process waste pit and is not considered a potential source of dust. The dust likewise poses no problems from an occupational health viewpoint.

4.3 Objectives

- Effectively manage dust from operations.
- Monitor and report effectiveness of dust controls.

4.4 Performance Standards

- Airborne dust generated from mining operations does not cause any nuisance problems or result in complaints from the public or other stakeholders.
- No dust from process waste pits to be visible at 1km from Black Waste Pits.
- Visibility in pit and on haul roads to be maintained at greater than 50m.
- All dust monitoring is completed and reported in quarterly and annual reports.

Electronically Controlled Document – For The Latest Version Check The Intranet		
Doc No: C0785	Doc Level:	Page 4 of 12
Revision: 5	Owner: Joseph Chandler	Last Review Date: 15 Mar 2009



4.5 Management Measures

4.5.1 Mining dust control

The effective control of mining dust is essential to safe operations. Methods used for dust control include:

- All traffic on site is restricted established roads and tracks, and to a maximum speed of 80km/h on sealed roads and 40-60km/h on unsealed roads. Higher risk areas may have lower speed limits applied (eg HMC load-out areas 20km/h and process waste access road 40km/hr).
- Water trucks are used on haul roads and in the pit to minimise dust generation. A minimum four (4) water carts are available during the summer months (2 south, 1 north and 1 general) and three (3) during winter (1 south, 1 north and 1 general). An indicative base level watering regime is that areas will be watered at three (3) hourly intervals.
- The Mining Contractor Shift Supervisors monitor visible dust levels within their areas on a continual basis and implement dust control measures, such as mobilising additional water carts or halting operations as necessary, to ensure compliance with relevant performance standards.
- It is the responsibility of the Site Manager to ensure adequate watering capacity is available and employed for both the north and south mines and that the techniques used for the control of dust are adequate to meet performance measures. Additional techniques include, but are not limited to, chemical suppressants and fixed sprinkler systems.
- It is the responsibility of the mining contractor under supervision from Tiwest to effectively deploy water trucks and to employ other methods/techniques to ensure acceptable dust levels at all times.
- It is the responsibility of the Site Manager to shutdown in case of high wind or dust conditions

4.5.2 Dust from Topsoil Stripping and Placement

The preservation of topsoil resources is essential to ensure ultimate success of rehabilitation works. This requires stripping of topsoil during dry conditions to prevent compaction during stockpiling. It also reduces the risk of spread of *Phytophthora* species. As such, the generation of some dust during topsoil stripping is expected and accepted. However, to minimise the generation of excessive dust and loss of topsoil resource no stripping of topsoil will be undertaken during high wind conditions where there is potential for excessive dust generation (ie the topsoil is dry). In practice:

- The mining contractor Shift Supervisors monitor visible dust levels within their areas on a continual basis and shall cease topsoil stripping or placement as necessary, to ensure compliance with relevant performance standards.
- Application of water during topsoil stripping is not an option.

Electronically Controlled Document – For The Latest Version Check The Intranet		
Doc No: C0785	Doc Level:	Page 5 of 12
Revision: 5	Owner: Joseph Chandler	Last Review Date: 15 Mar 2009



- It is the responsibility of the Site Manager to ensure that the mining contractor ceases topsoil stripping and placement works during high wind events.

4.5.3 Process Waste Dust Control

A high degree of dust control is required in the process waste pit area to avoid unsightly black dust. This is achieved through:

- Sheeting waste pits with overburden to minimise the area of waste exposed at any point in time.
- Stabilisation of open areas with application of chemical stabilisers and/or planting cover crops.
- Active suppression of dust on working faces and haul roads by use of water trucks.
- It is the responsibility of the mining contract Supervisors to ensure that the minimum level of watering is applied to areas of the process waste pits and associated roads. They also monitor visible dust levels within the area and implement dust control measures as appropriate.
- It is the responsibility of the Site Manager to ensure that adequate watering capacity is available and employed for the process waste pits and that the techniques used for the control of dust are adequate to meet the performance measures. Additional techniques include, but are not limited to, chemical suppressants and fixed sprinkler systems.

4.5.4 Rehabilitation dust control

The progressive rehabilitation of open areas limits the potential for general dust. The effective control of dust in rehabilitation works is essential to prevent the loss of topsoil through wind erosion and sand creep. This is particularly important in areas close to the Brand Highway and Wongonderrah Road where dust could potentially create a traffic hazard and in disturbed areas adjacent to rehabilitation or undisturbed vegetation where sand creep could bury vegetation.

To minimise generation of dust from disturbed areas and rehabilitation:

- A combination of mulch, cover crops of oats and/or chemical stabilising agents is used to prevent wind erosion from exposed surfaces;
- An annual stabilisation plan is developed and implemented by the Environmental Coordinator – Rehabilitation. This addresses the stabilisation of rehabilitation areas, topsoil stockpiles and other areas with the use of stabilising agents such as mulch, oats cover crops, chemical stabilisers and hydromulch to assist in keeping levels of dust and erosion low.
- Traffic is restricted to established roads and tracks.

Electronically Controlled Document – For The Latest Version Check The Intranet		
Doc No: C0785	Doc Level:	Page 6 of 12
Revision: 5	Owner: Joseph Chandler	Last Review Date: 15 Mar 2009



5 RADIATION MONITORING

5.1 Objective

To describe the methodology for conducting background pre and post mining gamma surveys.

5.2 Procedure

5.2.1 Background Gamma Surveys

1. Bi-annual gamma surveys shall be carried out at the lease boundaries, VHM Stockpiles and Waste Pits using the "Radiation Alert ® Inspector" – Radiation Monitor (or an equivalent meter) to check that mining operations have no impact on background radiation levels. The Radiation Safety Officer is responsible for ensuring that the radiation monitor is calibrated annually against ¹³⁷Cs on the Australian Radiation Laboratory facility at the Radiation Health Section of the Health Department of Western Australia. These surveys shall be carried out in June and December by the Radiation Safety Officer(RSO) who is based at Chandala.
2. At each monitoring location the RSO must complete the following steps:
 - Leave the meter in its leather case.
 - Leave the top Timer switch on "Off".
 - Leave the upper switch on the face on "µSv/hr".
 - Switch the lower switch on the face to either "On" or "Audio".
 - Wait for the "Beep".
 - Take measurements approximately 1m from the ground.
 - Allow the meter sufficient time to stabilise before taking the reading.
 - Record the "Date / Monitoring Site Number / Your Initials and the reading in the "Field Radiation Log Book".
 - When reading has been recorded, return the lower switch to "Off".
 - On return to the office send a copy of the results to the Radiation Safety Officer at Chandala.

5.2.2 Pre & Post Mining Gamma

1. In October each year the Environmental Coordinator – Rehabilitation will arrange for a consultant to undertake grid gamma surveys over new proposed mining areas and completed rehabilitated areas to ensure that original baseline levels are maintained.
2. The Environmental Coordinator – Rehabilitation will provide the consultant with detailed maps of the required survey areas and showing safe access to each.

Electronically Controlled Document – For The Latest Version Check The Intranet		
Doc No: C0785	Doc Level:	Page 7 of 12
Revision: 5	Owner: Joseph Chandler	Last Review Date: 15 Mar 2009



3. The consultant will conduct surveys on foot of the areas, recording readings on a grid (approximately 100m x 100m) to ensure that at least 25 readings are taken on each area.
4. The consultant will provide the Rehabilitation Coordinator with a report of the survey methodology and results by 30 November. The Rehabilitation Coordinator will forward a copy of the report to the Radiation Safety Officer at Chandala promptly.
5. The Environmental Coordinator – Rehabilitation will maintain a map register of areas that have been surveyed and areas requiring survey on the site GIS.
6. Results of all Radiation surveys will be maintained on a database by the Radiation Safety Officer at Chandala and reported annually to the Department of Industry and Resources / Department of Consumer and Employment Protection via the Annual Radiation Report.

6 WEATHER STATION

6.1 Objective

This module describes the procedures required to monitor and maintain the Weather Station located at Cooljarloo.®

6.2 Background

The meteorological recording station (weather station) continuously measures and records the environmental variables described in Table 1.

The weather station incorporates a Data Logger in a weatherproof container, mounted on a ten metre high folding instrument tower. Records are collected for wind speed, wind direction, rainfall, air and ground temperature, relative humidity and solar radiation. The weather station is located approximately 300m north on North Mine Access Rd, on the left side.

Table 1: Meteorological data recorded and recording parameters at the weather station

Variable	Transducer Type	Transducer Location
Wind speed	Cup Anemometer	10 m tower
Wind direction	Vane	10 m tower
Rainfall	Tipping Bucket	Ground level 2 m from tower
Air temperature	Solid State	10 m tower
Ground temperature	Solid State	Buried 5 cm below tower
Relative humidity		10 m tower
Solar radiation	Flat Silicon Cell	10 m tower

Electronically Controlled Document – For The Latest Version Check The Intranet		
Doc No: C0785	Doc Level:	Page 8 of 12
Revision: 5	Owner: Joseph Chandler	Last Review Date: 15 Mar 2009

The data logger records 10 minute averages for all of the measured environmental variables, however it has the capability to provide hourly and daily averages of the recorded data. At 10 minute recording intensity the logger has a memory life of 5.5 days. The weather station has a sole purpose solar radiation energy cell mounted on the instrument tower. The data is downloaded from the environment office via a cellular telephone modem but can also be downloaded from the logger directly using a portable computer. Cooljarloo utilises the services of an independent meteorological consultant to ensure the quality of all data collected. Consultant details are as follows:

Vlado Raich
Raich and Associates.
2 Arnold Crescent
North Lake WA 6163
Mobile: 0408 930 448
Office: (80) 9337 5696

6.3 Procedure

6.3.1 *Annual Maintenance* ®

The Environmental Officer will ensure the following procedure is performed by the site meteorology consultant on a quarterly basis.

The Environmental Officer will maintain a log book to record the functioning, problems and other pertinent information regarding the weather station.

- Lower the tilting tower and check the operation of the wind speed and wind direction instruments. The rotation of the wind speed cups and the wind direction vane should be smooth and resistance free. If possible, carry out this work in light winds. If this is not practical, the wind speed cups and the wind direction vane would need to be removed to assess the condition of these sensors. In such circumstances, care needs to be taken to ensure that the wind direction vane is correctly aligned after the checking procedure (see manual for alignment instructions);
- clean all surfaces with a damp cloth including the solar radiation sensor;
- raise the tilting tower;
- open the rainfall gauge and check that the unit is level and free from obstruction and that the buckets tip freely;
- carry out the monthly maintenance procedure; and
- check all cables (sensors & power) for damage.

The weather station log book (located in Environmental Officer's office. Spare inspection forms are located at H:\Environment\4.5 Checking and Corrective Action\4.5.1 Monitoring and measurement\Meteorology\Weather Station Inspection Form.xls) must be filled in and signed at each visit. If problems are noted during an inspection of the weather station, especially low battery voltages or problems with the solar panel or logger, the Environmental Officer will contact the site meteorology consultant.

Electronically Controlled Document – For The Latest Version Check The Intranet		
Doc No: C0785	Doc Level:	Page 9 of 12
Revision: 5	Owner: Joseph Chandler	Last Review Date: 15 Mar 2009



6.3.2 Downloading the Logger

The logger is downloaded remotely from the office via the GSM cellular modem. If there are issues with this download contact the site meteorology consultant to fix download issues .

The following download procedure must be completed fortnightly after 9 am. Lack of memory storage capacity can become an issue if download is not carried out within a three week period.

6.3.2.1 At the office

- Download is carried out in Environmental Officer's Office to access a telephone (analogue) port.
- Select the "Start4.EXE" from directory H:\Environment\4.5 Checking and Corrective action\4.5.1 Monitoring and Measurement\Meteorology\Start 4
- A Dos window will appear, select escape to reach the main menu.
- Initiate the modem to modem connection by selecting the "Telephone Dial up" option from the menu.
- Enter the Communication Speed of 9600 baud and Communication Port #4. The computer will configure the office modem and then ask for the telephone number of the weather station modem.
- Type "**T0408195612**" and press Enter.
- Once the connection is established (typically takes 30 to 40 seconds) you will be prompted to press the Escape key to enable you to talk to the station as if you had a direct cable connection.
- Press the "Escape" key.

6.3.2.2 Downloading Data

- Select "Collect Data from EASIDATA".
- Select "All spreadsheets".
- Select "O" to download data from the end of the previous download session.
- Press F10 to use the file autaname feature.
- Type "TC" for the prefix (Tiwest Cataby).
- Select enter
- Select enter
- When the computer reads "Data transfer complete", select "U" to update EASIDATA's "last read" time to now.
- Select "ESC" to return to the main menu.
- Select "ESC" to exit from program.

Electronically Controlled Document – For The Latest Version Check The Intranet		
Doc No: C0785	Doc Level:	Page 10 of 12
Revision: 5	Owner: Joseph Chandler	Last Review Date: 15 Mar 2009



6.3.2.3 File Management

- Open Explorer
- Open the "start4" directory on H:\Environment\4.5 Checking and Corrective action\4.5.1 Monitoring and Measurement\Meteorology\Start 4 and scroll down to the 4 files starting with "TC" and followed by the download date (DM extensions 1 to 4).
- On each file (DM 1 to 4) individually, select "open with\ excel" save the files (comma delimited/csv). Each file is to be saved on the network drive H:\Environment\4.5 Checking and Corrective action\4.5.1 Monitoring and Measurement\Meteorology\((year)\Raw Data. To name the excel files, leave the TC(date) and put the letter A to D at the end depending on whether it is DM1 to 4 respectively. For example, if the raw data file is labelled "TC101007.DM1" the excel file will be named "TC101007A.xls" and so on.
- Open H:\Environment\4.5 Checking and Corrective action\4.5.1 Monitoring and Measurement\Meteorology\((year)\Worked Data\((Current quarter). The spreadsheet will contain 4 worksheets "DM1" to "DM4". Copy and paste each of the new data sets into its corresponding worksheet in this document.
- Copy and paste the updated data into the appropriate DM worksheet.
- Advise the Environment Group Leader of the updated information and upload daily data to the intranet by cutting and pasting into Y:Web_Enviro\Data\Monthly Rainfall.xls.
- Update the "Summary" worksheet on the intranet xls and check graphs.
- All data will be kept for three years and then archived.

6.3.2.4 Other Information

General Notes

- From DM1 and DM3 files the production of monthly weather report is generated. The generation of the monthly report is done as follows:
- DM1 file = daily data as at 9am
- DM2 file = 1 hour data
- DM3 file = 10 minute data
- DM4 file = rainfall data

Temperature

- 9am = DM3 - average temp at 9am
- 3pm = DM3 - average temp at 3pm
- Max = DM1 - max temp to 9am

Electronically Controlled Document – For The Latest Version Check The Intranet		
Doc No: C0785	Doc Level:	Page 11 of 12
Revision: 5	Owner: Joseph Chandler	Last Review Date: 15 Mar 2009



- Min = DM1 - min temp to 9am
- Ave = DM1 - ave temp to 9am

Relative Humidity

- 9am = DM3 - ave RH at 9am
- 3pm = DM3 - ave RH at 3pm
- Ave = DM1 - ave RH at 9am

24 Hour Rain

- Rain = DM1 - total rain to 9am

Wind

- 9am dirn = DM3 dirn at 9am
- 9am speed = DM3 ave windspeed at 9am
- 3pm dirn = DM3 dirn at 3pm
- 3pm speed = DM3 ave windspeed at 3pm
- Ave speed = DM1 ave to 9am
- Max gust dirn = DM1 ave wind dirn
- Max gust = DM1 ave windspeed

Electronically Controlled Document – For The Latest Version Check The Intranet		
Doc No: C0785	Doc Level:	Page 12 of 12
Revision: 5	Owner: Joseph Chandler	Last Review Date: 15 Mar 2009