



ENDEAVOR OPERATIONS PTY LTD

ENDEAVOR MINE



DECEMBER 2018 MONTHLY ENVIRONMENTAL REPORT

Name of Operation	Endeavor Mine
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Name of Licensee	Endeavor Operations Pty Ltd
Environmental Protection Licence	No: 1301
Reporting Period Start Date	1 December 2018
Reporting End Date	31 December 2018
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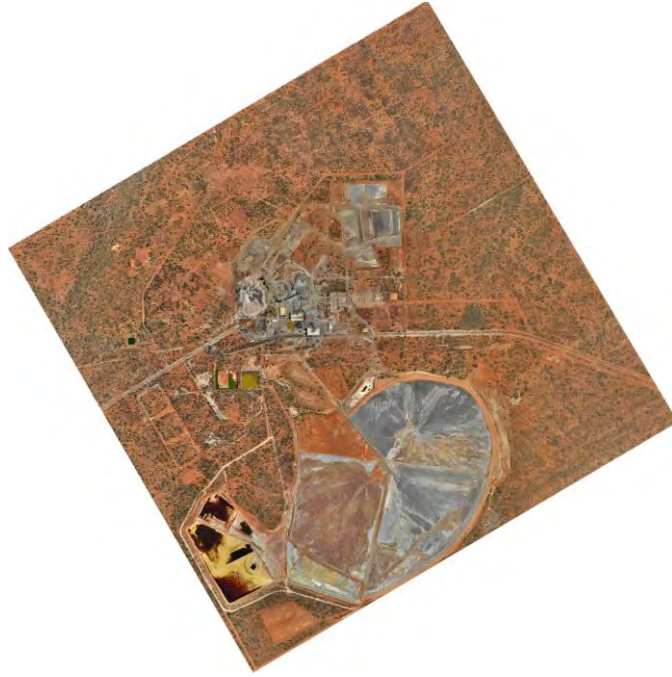
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1 INTRODUCTION

We at Endeavor Mine conduct systematic and periodic environmental monitoring to substantiate the effectiveness of our environmental controls which are in place to protect the environment, the health of our workers, our neighbours and the greater community. Welcome to the December 2018 Environmental Monitoring Report. This report has also been produced to satisfy our reporting obligations under the Protection of the Environment Operations Act 1997 (POEO Act), Mine Operational Plan (MOP) and EP Licence 1301 which requires for Endeavor Mine to publish or make pollution monitoring data available to members of the public. The report provides a summary of monthly environmental monitoring results for December 2018.

Endeavor Mine's environmental monitoring program includes the monitoring of contaminants to air, surface water and ground water at locations within or beyond mine site boundary. The program also involves the monitoring of noise (when required), the management of hazardous and non-hazardous waste, the deposition of tailings and reporting of resources such as raw water usage. All monitoring is conducted in accordance with regulatory requirements and the EOPL Annual Environmental Monitoring Plan. Samples are collected and handled in accordance and compliance with regulatory requirements and taken to laboratories accredited by the National Association of Testing Authorities (NATA) for analysis. The Report also compares the results against established internal and external targets and provides critical discussion on environmental issues and sustainability initiatives during the monitoring period.





1 Meteorology

The following section presents historical and current weather data for Cobar and the surrounding Shire. Endeavor has installed on site a high quality weather station to enable more accurate on site data to be downloaded and reported. The December Report will be the first use of data collected from site. This includes a change in format on how we present the data.

1.1 Air Temperature, Relative Humidity and Barometric Pressure

History

Cobar has a semi-arid climate with hot summers and cool to mild winters. Winter nights can be quite cold. Average monthly maximum temperatures tend to range from 13C to 20C in winter to between 28C to 39C in summer. Average monthly minimum temperatures range from 2C to 8C in winter to 14C to 24C in summer. The humidity in Cobar is low. During the summer the average relative humidity is about 30% in the afternoon and about 50% at 9am. In winter it is about 45% at 3pm, whilst it is about 75% at 9am.



1.1.1 Air Temperature, Relative Humidity and Barometric Pressure: Data and Discussion

The average air temperature for the Endeavor Mine for December 2018 was 28.74°C with a Maximum Temperature of 45.7 °C. Table 1.1 shows the average, high and low summaries for Air Temperature, Relative Humidity and Barometric Pressure. Figure 1.1 shows the data in a daily graphical representation.

Table 1.1: Monthly Temperature, Humidity and Barometric Pressure.

Weather Station	Date	AVERAGE Air Temperature - DegC	AVERAGE Barometric Pressure - kPa	AVERAGE Relative Humidity - %	MAXIMUM Air Temperature - DegC	MAXIMUM Barometric Pressure - kPa	MAXIMUM Relative Humidity - %	MINIMUM Air Temperature - DegC	MINIMUM Barometric Pressure - kPa	MINIMUM Relative Humidity - %
Endeavor Mine	2018-12	28.74	98.48	30.07	45.7	120	81.9	11.9	97.4	9

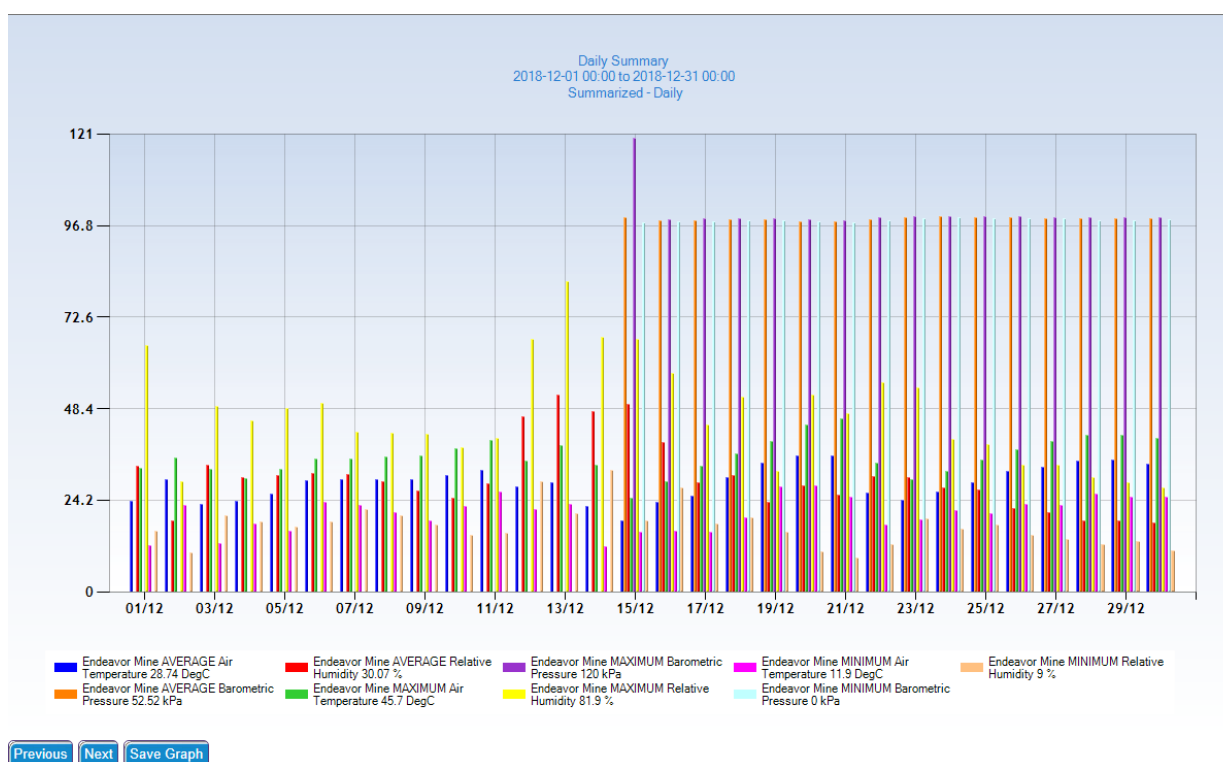


Figure 1.1: Monthly Temperature, Humidity and Barometric Pressure

1.2 Wet Bulb Temperature

The **wet-bulb temperature** is the steady-state temperature reached by a small amount of liquid evaporating into a large amount of unsaturated gas-vapour mixture. Humans and many mammals have an internal body temperature of approximately 98.6 degrees Fahrenheit (37 Degrees Celsius) and cannot tolerate a wet-bulb temp's above 35 Degrees Celsius for longer than six hours.

Humans cool themselves through their skin. Internal heat can dissipate when the external temperature is cooler than internal body temperature. But when the external wet-bulb temperature is 35 degrees or above, the body can't cool itself and begins to experience hyperthermia.

Extended hyperthermia is associated with ill health and eventually death. The Endeavor Weather Station has the measurement for Wet Bulb Temperature for surface conditions. Use the scale to the right as a scale as a guide for exposure and water intake.

Heat Stress Category (WBGT)	Moderate Work		Hard Work	
	Work/Rest Cycle	Water Intake Per Hour	Work/Rest Cycle	Water Intake Per Hour
White ≤76.9°F (≤24.9°C)	60/15 MINUTES	300 ml (1/3 qt)	40/20 MINUTES	500 ml (1/2 qt)
Green 77-81.9°F (25-27.7°C)	60/15 MINUTES	750 ml (3/4 qt)	40/20 MINUTES	1000 ml (1 qt)
Yellow 82-84.9°F (27.8-29.4°C)	40/20 MINUTES	1000 ml (1 qt)	30/30 MINUTES	1000 ml (1 qt)
Red 85-88.9°F (29.5-31.6°C)	30/30 MINUTES	1000 ml (1 qt)	Exercise is forbidden. Very high risk for heat casualties.	
Black ≥89°F (≥31.7°C)	Exercise is forbidden. Very high risk for heat casualties.			

1.2.1 Wet Bulb Temperature: Data and Discussion

As found in the previous section (Solar Radiation), the data for the first 14 days was missing due to an upgrade of the station. Nevertheless, the data demonstrates a maximum wet bulb temperature well below the threshold level of 27°C (Table 1.2Error! Reference source not found. and Figure 1.2). However due to the result of high levels of solar radiation, precaution during strenuous activity should be observed.

Table 1.2: Wet Bulb Temperature Data for December 2018.

Weather Station	Date	AVERAGE Wet Bulb Temp	MAXIMUM Wet Bulb Temp	MINIMUM Wet Bulb Temp
Endeavor Mine	2018-12-01	0	0	0
Endeavor Mine	2018-12-02	0	0	0
Endeavor Mine	2018-12-03	0	0	0
Endeavor Mine	2018-12-04	0	0	0
Endeavor Mine	2018-12-05	0	0	0
Endeavor Mine	2018-12-06	0	0	0
Endeavor Mine	2018-12-07	0	0	0
Endeavor Mine	2018-12-08	0	0	0
Endeavor Mine	2018-12-09	0	0	0
Endeavor Mine	2018-12-10	0	0	0
Endeavor Mine	2018-12-11	0	0	0
Endeavor Mine	2018-12-12	0	0	0
Endeavor Mine	2018-12-13	0	0	0
Endeavor Mine	2018-12-14	0	0	0
Endeavor Mine	2018-12-15	12.22	14.45	11.19
Endeavor Mine	2018-12-16	14.7	16.79	11.12
Endeavor Mine	2018-12-17	13.94	17.52	9.2
Endeavor Mine	2018-12-18	17.71	19.54	13.38
Endeavor Mine	2018-12-19	18.82	20.55	16.59
Endeavor Mine	2018-12-20	20.67	23.09	16.55
Endeavor Mine	2018-12-21	19.85	21.94	16.85
Endeavor Mine	2018-12-22	14.72	19.14	11.78
Endeavor Mine	2018-12-23	13.54	15.65	10.78
Endeavor Mine	2018-12-24	14.59	16.73	11.9
Endeavor Mine	2018-12-25	16.04	18.27	12.41
Endeavor Mine	2018-12-26	16.94	18.85	13.55
Endeavor Mine	2018-12-27	17.39	19.72	13.29
Endeavor Mine	2018-12-28	17.8	20.22	14.79
Endeavor Mine	2018-12-29	17.91	20.64	13.97
Endeavor Mine	2018-12-30	17.18	19.84	13.04

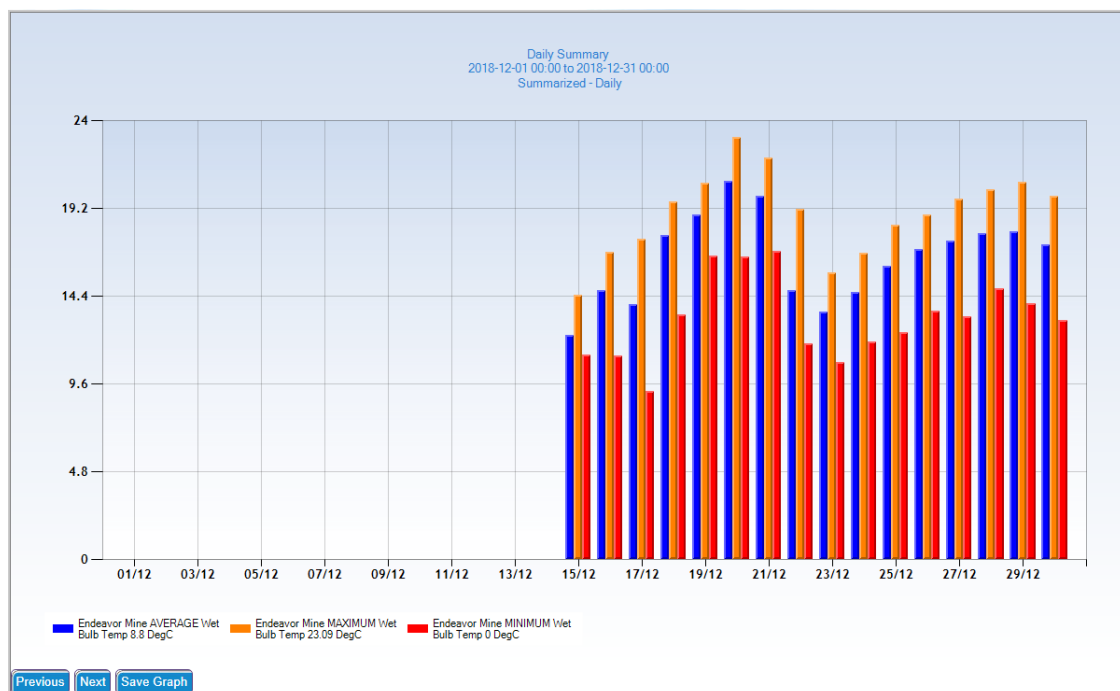


Figure 1.2: Daily Wet Bulb Temperature Levels (15/12/2018 to 31/12/2018)

1.3 Rainfall

History

On average, rainfall in the Cobar region tends to be uniformly distributed throughout the year, with a median annual rainfall of 390-400mm. The average monthly rainfall is 33mm. The rainfall is however extremely variable, and this is particularly so in late summer and early spring when the highest observed falls have been in excess of 200mm in any one month. This results in the average monthly rainfall being greatly in excess of the median monthly rainfall for some months. In January, February and December, for example, the average rainfall is more than double the median rainfall.



1.3.1 Rainfall: Data and Discussion

There was 2.2 mm of rainfall at Endeavor Mine during December 2018 (Table 1.3). Year to Date (YTD) is shown in Table 1.4

Table 1.3: Rain Gauge Total for December 2018

Weather Station	Date	<u>TOTAL Rain Gauge - mm</u>
Endeavor Mine	2018-12	2.2

Table 1.4: YTD Rainfall for Cobar, NSW: January to December 2018

Jan 2018	Feb 2018	March 2018	April 2018	June 2018	July 2018	Aug 2018	Sept 2018	Oct 2018	Nov 2018	Dec 2018	YTD
6.2mm	0.2mm	0.0mm	0.4mm	1.4mm	0.2mm	9.8mm	3.0 mm	38.8mm	55.0mm	2.2 mm	117.4mm

Rainfall Statistics show the total for 2018 to be approximately a third of the expected average annual rainfall of 390mm per year.

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1.4 Wind

History

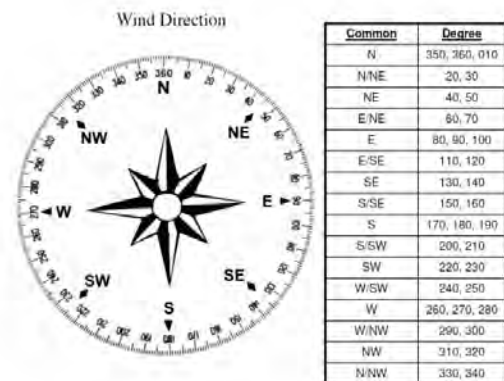
Wind can play a critical role in a site's environmental performance, particularly with dust deposition and noise depending on wind direction.

Wind direction is reported by the direction from which it originates. For example, a northerly wind blows from the north to the south.

Wind direction is usually reported in cardinal directions or in azimuth degrees. Wind direction is measured in degrees clockwise from due north. The predominant wind direction for the Cobar region is East or North East, but will come from the North occasionally West during the hotter periods.

Forecasts of wind speed and direction are the average of these gusts and lulls, measured over a 10-minute period at a height of 10 metres above sea level.

Peak Wind is defined as, "The highest wind speed observed at the station" during a given 24-hour period of time". This is a measurement of a burst or a gust of wind that one feels over a very short period of time. In the case of the peak wind, the very short period of time is usually three seconds.



1.4.1 Wind Speed and Wind Gusts: Data and Discussion

As shown in Table 1.5, the average wind speed for December 2018 was 10.04km/h with a maximum speed of 39.8 km/h and a maximum wind gust was 71km/h.

Table 1.5: Wind Speed and Peak Gusts

Weather Station	Date	AVERAGE Wind Speed 10m - km/h	MAXIMUM Peak Wind Gust 10m - km/h	MAXIMUM Wind Speed 10m - km/h
Endeavor Mine	2018-12	10.04	71	39.8

1.4.2 Wind Direction: Data and Discussion

As air temperatures have increase, wind patterns have become more sporadic with the predominate wind coming from South East (SE) and South /South East (S/SE). This is represented in and is measured in degrees. Figure 1.3 demonstrates the Wind Rose for the Endeavor Mine for December 2018.

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Table 1.6: Wind Direction Vector for December 2018

Weather Station	Date	VWDIR Vector Wind Dir - Degr
Endeavor Mine	2018-12	143.97

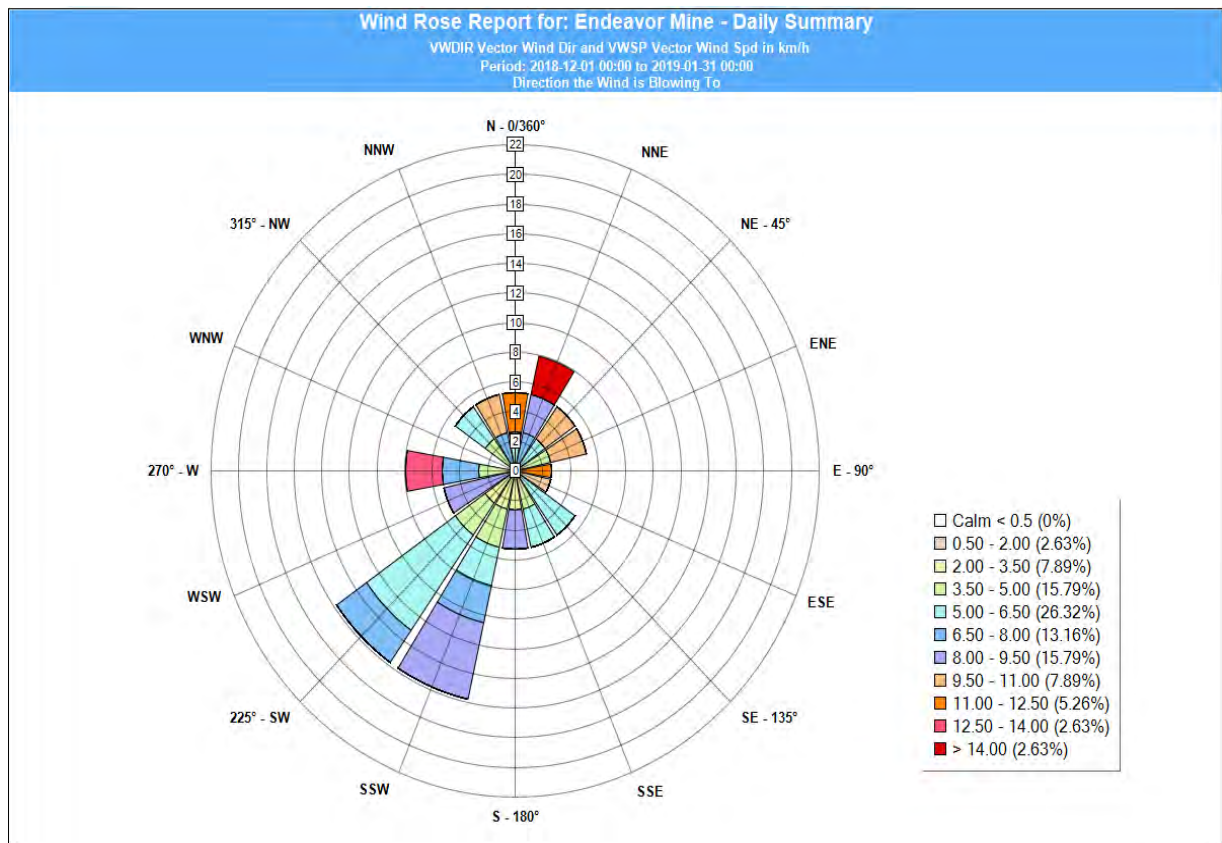
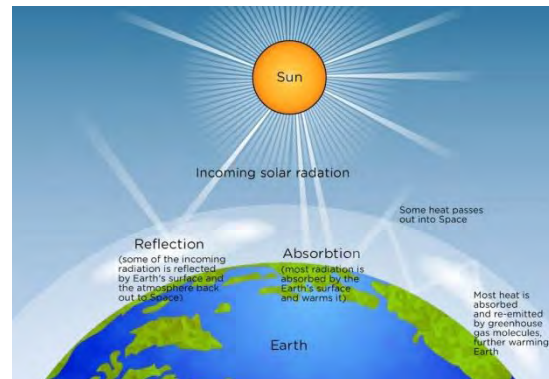


Figure 1.3: Wind Rose for the Endeavor Mine for December 2018

1.5 Solar Radiation

History

Solar radiation is radiant energy emitted by the sun, particularly electromagnetic energy. About half of the radiation is in the visible short-wave part of the electromagnetic spectrum. The other half is mostly in the near-infrared part, with some in the ultraviolet part of the spectrum. The Sun releases an estimated 384.6 yotta watts of energy in the form of light and other forms of radiation. We are able to survive on Earth because the energy is spread over the area of a sphere with a radius of approximately 93,000,000 miles. At the Earth's surface, the energy density is reduced to approximately 1,000 W/m² for a surface perpendicular to the Sun's rays at sea level on a clear day. There is well established evidence that exposure to ultraviolet radiation (UVR) from the sun can lead to skin cancer and eye damage. For best protection use a combination of sun protection measures.



1.5.1 Solar Radiation: Data and Discussion

The Maximum Solar Radiation measurement was 1522.6 Watts/m² (Table 1.7), making it a must for PPE and reducing direct exposure. The average for December is low as a result of the data being available for half the month. However, the risk to employees working directly exposed during the hotter parts of the day is significant as shown in the maximum exposure levels. Figure 1.4 shows daily averages and maximum levels. The data collection for solar radiation commenced on the 15th of December and was part of an upgrade to the system which also allowed the analysis and representation of Wet Bulb Temperature statistics. As shown by the data, all days were well in exceedance of the 1000 Watts/m² level used as the norm.

Table 1.7: Solar Radiation Data for December 2018

Weather Station	Date	AVERAGE Solar Radiation - Watts/m ²	MAXIMUM Solar Radiation - Watts/m ²
Endeavor Mine	2018-12	171.84	1522.6

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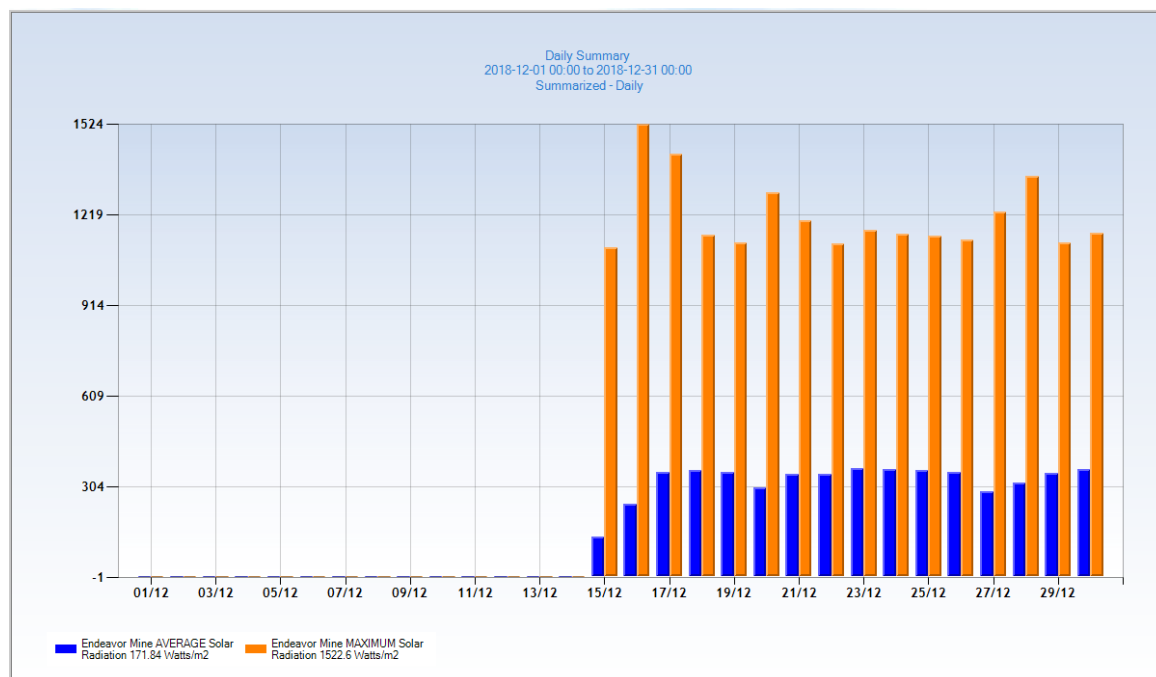
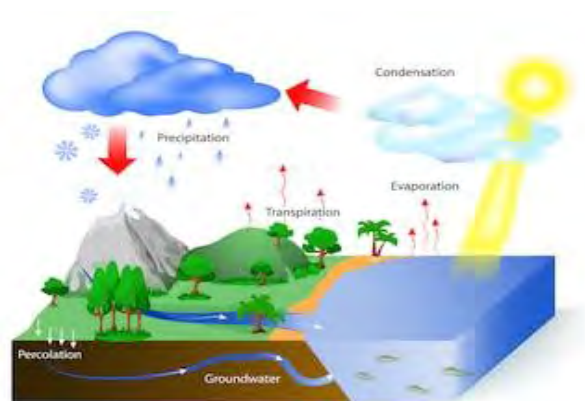


Figure 1.4: Daily Solar Radiation Levels (15/12/2018 to 31/12/2018)

1.6 Rate of Evaporation

The Measurement of Evaporation Rate is defined as the amount of water which evaporates from an open pan called a Class A pan. The rate of evaporation depends on factors such as cloudiness, air temperature and wind speed. It is measured in millimetres of fluid evaporated per hour.

The mean evaporation rate for the Endeavor Mine is 1953mm – 6 times the annual rainfall.



1.6.1 Rate of Evaporation: Data and Discussion

As shown in Table 1.8 and Figure 1.5, evaporation rates were significant due to higher than normal temperatures. The Highest evaporation was observed on 18th of December with a rate of 23.16mm. Evaporation is a critical tool in the management of tailings supernatant.

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Table 1.8: Total Daily Evaporation Rates for December 2018

Weather Station	Date	TOTAL Daily Evaporation - mm
Endeavor Mine	2018-12-01	2.51
Endeavor Mine	2018-12-02	3.16
Endeavor Mine	2018-12-03	3.42
Endeavor Mine	2018-12-04	2.87
Endeavor Mine	2018-12-05	3.3
Endeavor Mine	2018-12-06	3.23
Endeavor Mine	2018-12-07	3.27
Endeavor Mine	2018-12-08	3
Endeavor Mine	2018-12-09	2.88
Endeavor Mine	2018-12-10	2.47
Endeavor Mine	2018-12-11	4.58
Endeavor Mine	2018-12-12	3.87
Endeavor Mine	2018-12-13	2.82
Endeavor Mine	2018-12-14	3.5
Endeavor Mine	2018-12-15	7.37
Endeavor Mine	2018-12-16	14.79
Endeavor Mine	2018-12-17	17.1
Endeavor Mine	2018-12-18	23.16
Endeavor Mine	2018-12-19	10.3
Endeavor Mine	2018-12-20	8.53
Endeavor Mine	2018-12-21	12.07
Endeavor Mine	2018-12-22	9.4
Endeavor Mine	2018-12-23	8.01
Endeavor Mine	2018-12-24	7.59
Endeavor Mine	2018-12-25	7.17
Endeavor Mine	2018-12-26	7.7
Endeavor Mine	2018-12-27	6.62
Endeavor Mine	2018-12-28	7.77
Endeavor Mine	2018-12-29	9.5
Endeavor Mine	2018-12-30	9.19

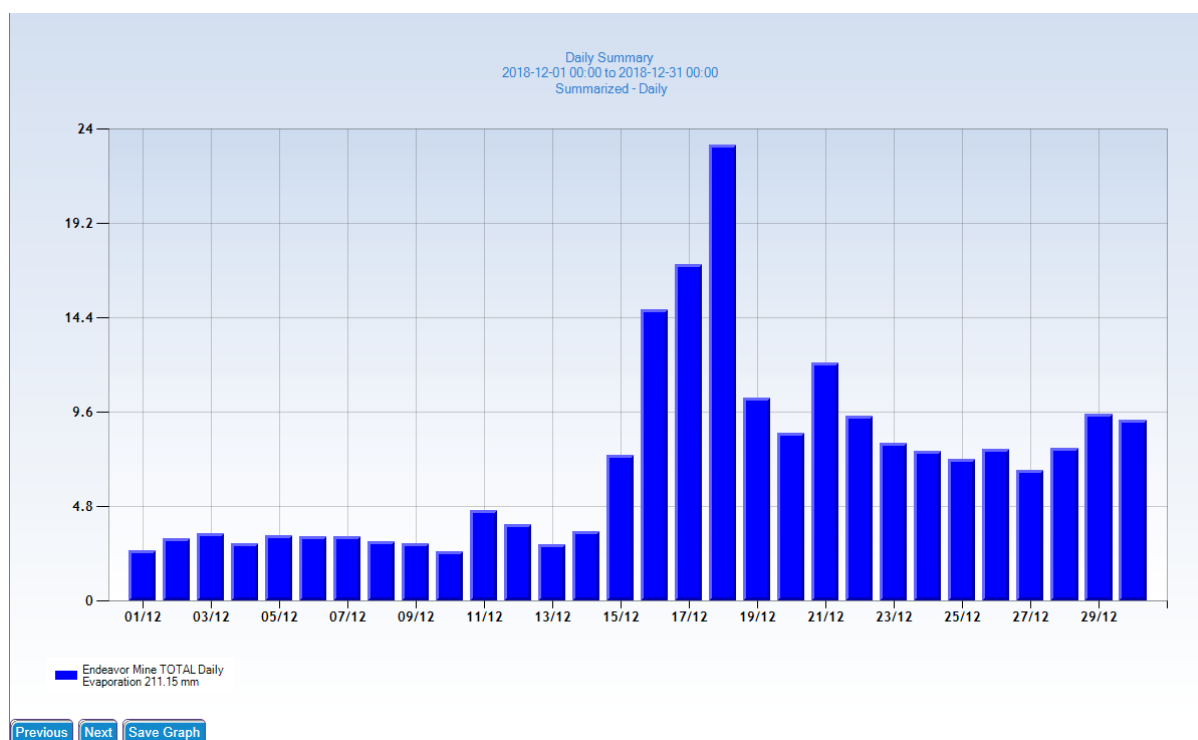


Figure 1.5: Daily Evaporation Rates for December 2018.

2 Monitoring Requirements

The Importance of Monitoring

Increasingly, mining companies are coming under pressure to improve their environmental, social and financial performance. The challenges stem from fluctuating stakeholder demands and shifting commodity prices. To many, keeping production costs down is a top priority to ensure profit margin are maintained. But it is much more than that.

Endeavor Mine has found by implementing more accurate and efficient environmental monitoring as part of their operational culture and practices, it has produced significant and positive impacts on overall performance. By truly understanding what is happening across the operation, more informed and sustainable decisions can be made about the business.



3 Dust Monitoring

Air quality aspects and impacts associated with site operations are managed in accordance with the Air Quality Management Plan (END-PLN-ENV-006) and the requirements detailed in NSW EP Licence 1301.

The Endeavor Mine is located 47km from the nearest town (Cobar) and 4.5km away from its nearest sensitive receptor (residential property). Therefore, dust deposition at these potential sensitive receptors is considered a low environmental risk.

Nevertheless, dust deposition on and beyond the boundary of the lease has the potential to cause environmental harm. Therefore Endeavor Mine manages airborne contaminants on site through the use of water sprays and a water trucks with depositional dust monitoring stations strategically located along the boundary of ML158/159/160/161 to measure performance.



3.1 Dust Monitoring Methodology and Limits

The Endeavor Mine Dust Monitoring Program measures dust deposition rates on a monthly basis at the main mining lease boundary (4 locations) and at a background location located 11km from the

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operating mine site (DDG 5). EP Licence 1301 does not set limits for dust deposition. The results are however assessed against the recommended limits outlined in *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW 2005*. This guidance document recommends that the deposition rate for total insoluble matter when expressed as a 12 month rolling average should not exceed 4 g/m²/month and that site activities should not generate dust emissions which result in a dust deposition rate greater than 2 g/m²/month above background levels. Table 3.1 describes the Pollutant, Units of Measure, Monitoring Frequency and Method of Sampling.

Table 3.1: Endeavor Mine Air Monitoring Requirements

POINT 1

Pollutant	Units of measure	Frequency	Sampling Method
Particulates - Deposited Matter	grams per square metre per month	Monthly	AM-19

POINT 2

Pollutant	Units of measure	Frequency	Sampling Method
Particulates - Deposited Matter	grams per square metre per month	Monthly	AM-19

POINT 3

Pollutant	Units of measure	Frequency	Sampling Method
Particulates - Deposited Matter	grams per square metre per month	Monthly	AM-19

POINT 4

Pollutant	Units of measure	Frequency	Sampling Method
Particulates - Deposited Matter	grams per square metre per month	Monthly	AM-19

POINT 5

Pollutant	Units of measure	Frequency	Sampling Method
Particulates - Deposited Matter	grams per square metre per month	Monthly	AM-19

3.2 Monitoring Locations

As shown in the satellite image (Figure 3.1), there are 5 dust monitoring locations on the boundary of the lease, with one located 11kms from the site at the turnoff to the Mine site near the Louth Road. This station was positioned to establish background levels.

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Figure 3.1: Endeavor Mine Dust Monitoring Locations

3.3 Dust Monitoring Data and Discussion

Table 3.2 shows the results of Monitoring for December 2018.

Table 3.2: Dust Monitoring Results for December 2018

Monitoring Location		DG1	DG2	DG3	DG4	DG5
Date / Sample Collected		7/01/2019	7/01/2019	7/01/2019	7/01/2019	7/01/2019
Dissolved Metals by ICP-MS						
Lead (Dissolved)	7439-92-1 mg/L	0.003	0.001	0.061	0.006	<0.001
Total Soluble Matter	g/m ² .month	0.7	0.6	0.9	3.5	0.9
Total Insoluble Matter	g/m ² .month	6.1	5.5	4.6	4.8	6.1

As shown in Table 3.2, the results for Soluble Matter (TSM) and Insoluble Matter (TIM). Results for TIM were slightly above the guideline limit of 4 g/m²/month as set in the *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW 2005*. The result was attributed

to dry conditions with stronger winds and dust storm activity. Pb levels were again well within established guidelines.

4 Groundwater Monitoring

Deep and Shallow Aquifers

Deep regional groundwater flows to the south west, conforming to the structural dip of the underlying sedimentary rocks. Groundwater inflow into the mine is observed at a depth range of between 60 to 80 m below ground surface. A shallow, perched aquifer occurs in the vicinity of the Central Tailings Discharge CTD between approximately 0.5 to 13 m below ground surface. This aquifer is recharged by rainfall and seepage water from the operational TSF via a permeable gravelly soil layer in the area.



A review of groundwater characteristics undertaken by consultants Environmental Earth Sciences (EES) in 2013 indicates there is no interface between the shallow perched water and the deep regional aquifer.

Ground Water Quality

Groundwater quality at the mine is generally poor due to the high salinity. The water has been sampled by NSW Water Conservation and Irrigation for the original Environmental Impact Statement (EIS) could be considered "brackish" and was found to have an electrical conductivity (EC) of 26,000 $\mu\text{S}/\text{cm}$ (sea water is approximately 30,000 $\mu\text{S}/\text{cm}$). Further, it was noted that the water was not suitable for stock, domestic or farm use. Potential contamination of the groundwater would be of low risk due to the naturally poor quality of the water.



4.1 Monitoring Locations

Endeavor Mine's groundwater monitoring locations are concentrated around the perimeter of the Central Tailings Discharge (CTD) and the Sector 5 Tailings Storage Facility (CTF), while surface water monitoring locations are focused on water storages that could potentially discharge to environment during a major rain or storm event. Table 4.1 describes the monitoring stations where Figure 2 shows the locations of the piezometers. Depending on availability of water or flow, unfortunately on some occasions, piezometers cannot be monitored as a result of being dry.

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Table 4.1: Table 5: EPA Monitoring Stations

8	Discharge to tailings dam	Discharge to tailings dam	End of tailings line pipe that discharges "Sector Five" tailing dam as shown on map titled "Sector 5-tailing facility" and submitted to the DEC in document BTF 9027.
9	Groundwater monitoring Point		Piezometer labelled as "BH02" on map titled "Statutory Groundwater Monitoring Locations" received by the EPA on 12/12/14 (DOC14/317060).
10	Groundwater Monitoring Point		Piezometer labelled as "BH02B" on map titled "Statutory Groundwater Monitoring Locations" received by the EPA on 12/12/14 (DOC14/317060).
11	Groundwater Monitoring Point		Piezometer labelled as "BH03" on map titled "Statutory Groundwater Monitoring Locations" received by the EPA on 12/12/14 (DOC14/317060).
12	Groundwater Monitoring Point		Piezometer labelled as "BH06" on map titled "Statutory Groundwater Monitoring Locations" received by the EPA on 12/12/14 (DOC14/317060).
13	Groundwater Monitoring Point		Piezometer labelled as "BH08A" on map titled "Statutory Groundwater Monitoring Locations" received by the EPA on 12/12/14 (DOC14/317060).
14	Groundwater Monitoring Point		Piezometer labelled as "BH09" on map titled "Statutory Groundwater Monitoring Locations" received by the EPA on 12/12/14 (DOC14/317060).
15	Groundwater Monitoring Point		Piezometer labelled as "BH10" on map titled "Statutory Groundwater Monitoring Locations" received by the EPA on 12/12/14 (DOC14/317060).
16	Groundwater Monitoring Point		Piezometer labelled as "BH10B" on map titled "Statutory Groundwater Monitoring Locations" received by the EPA on 12/12/14 (DOC14/317060).
17	Groundwater Monitoring Point		Piezometer labelled as "BH12B" on map titled "Statutory Groundwater Monitoring Locations" received by the EPA on 12/12/14 (DOC14/317060).
18	Groundwater Monitoring Point		Piezometer labelled as "BH14" on map titled "Statutory Groundwater Monitoring Locations" received by the EPA on 12/12/14 (DOC14/317060).

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Table 4.1: Table 5: EPA Monitoring Stations

19	Groundwater Monitoring Point	Piezometer labelled as "BH15" on map titled "Statutory Groundwater Monitoring Locations" received by the EPA on 12/12/14 (DOC14/317060).
20	Groundwater Monitoring Point	Piezometer labelled as "BH16" on map titled "Statutory Groundwater Monitoring Locations" received by the EPA on 12/12/14 (DOC14/317060).
25	Groundwater Monitoring	Piezometer labelled as "BH13" on map titled "Statutory Groundwater Monitoring Locations" received by the EPA on 12/12/14.



Figure 4.1: : Location of the Piezometer Monitoring Locations

4.2 Groundwater Monitoring: Data and Discussion

No Groundwater Piezometers were sampled during December. Although sampling was planned, but due to technical issues with monitoring equipment and the extreme heat during this period, it was decided to abandon sampling until January 2019. This sampling will act as the 4th Quarter 2018. .

5 Surface Water

History

Surface water is categorised in two the following categories:

Clean Water: *Water that has not been degraded by contact with mine operations and is of a suitable quality for release to the off lease receiving environment. Clean water includes: Raw Water, Potable Water, and Clean Stormwater. However in an arid and water starved environment like the Cobar Shire, water is reused and recycled at every opportunity.*

Contaminated Water: *Water containing potential contaminants or pollutants and not fit for discharge, water that has had contact mining and ore processing operations. Contaminated water includes: Process Water, Tailings Supernatant, Mine Water, and Contaminated Stormwater.*



5.1 Monitoring Methodology

Although not part of the legislative commitments, Endeavor monitors surface waters on the lease as part of its internal and operational commitment. The site does not release any water directly into the environment. It operates with a closed circuit. However Endeavor remains vigilant in understanding the risks associated of impacted surface water. The main surface water monitoring point is the Evaporation Pond which is measured monthly (Volumes and pH) and biannually along with all other site dams for pH, electrical conductivity (EC), total dissolved solids (TDS), Cations (Ca, Mg, Na, K, ionic balance), Anions (SO₄, Cl, alkalinity, flouride), Cyanide (total) and dissolved metals (As, Cd, Cr, Cu, Pb, Ni, Mn, Zn, Al, Fe, Se, Hg). Water in the Supergene Pit and Pontoon Dam could not be sampled due to a lack of water and unsafe access to any surface water.

5.2 Monitoring Locations

Figure 5.1 shows the location of the surface water dams on site that are monitored for water quality bi-annually.



Figure 5.1: The Endeavor Mine: Main Water Storages

5.3 Surface Water: Data and Discussion

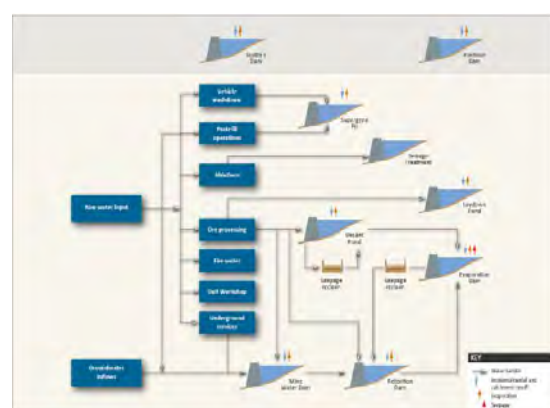
Due to the drought, it is difficult to access most of the dams with the exception of the Retention Dam. Access to the water is making access too dangerous. If rain occurs during January and it is safe, samples will be collected.

6 Raw Water Usage

History

The Cobar Water Board supplies raw water to the Endeavor Mine via a pipeline along the rail corridor. This water is sourced from Burrendong Dam (right) via a system of open channels, weirs and pipelines. Endeavor Mine currently holds a high security license for 1,280 ML per annum, with average usage being 58,000KL per month. Supply of this water is controlled by the Cobar Water Board. The licensed volume of water is generally sufficient to support mining operations. If required, an above allocation water purchase can be made through the CWB depending on the level of drought and/or water restrictions placed on the area.

Raw water is reticulated across site for use as make up water for the Retention Dam (process water) and for “clean water” uses such as vehicle and equipment wash down and dust suppression. Raw water is initially stored in 5ML holding tank from where it is distributed to either: the raw water system, the potable water treatment plant or the fire water reticulation system.



6.1 Monitoring Methodology

Joint readings by personnel from Endeavor Mine Environmental Department and the Cobar Shire Council are conducted monthly.

6.2 Raw Water: Data and Discussion

Table 6.1 shows water usage year to date usage as well as usage for December 2018. Less water was used during December compared to previous months as a result of an interruption to the paste fill operations and planned maintenance shutdowns.

Table 6.1: Raw Water Use for December 2018

Date	YTD (KL)	Usage (KL) for December 2018
31/12/2018	978,210	97,487

7 Noise Management

Environmental noise is the propagation of noise with harmful impact on the activity of human or animal life. According to the World Health Organization, sound levels less than 70 dB are not damaging to living organisms, regardless of how long or consistent the exposure is. Exposure for more than 8 hours to constant noise beyond 85 dB is deemed hazardous. A “Nuisance” Noise is a noteworthy and unreasonable amount of sound from neighbouring premises.



Endeavor Operations has never received a noise complaint from its neighbours. The closest sensitive receptor (neighbouring property) is Poon Boon Station, which is located 4.5 kms away from operations and has never reported a complaint for noise, dust, vibration or visual amenity. The predominant wind direction is from the east to north-east, therefore; the greatest potential noise risk is for ‘Bundella’, 11.8 km from the mine. Again, no complaints have been registered.

7.1 Noise and Vibration Assessment

If a noise complaint is registered, Endeavor Mine will identify the acoustic values where a potential source is emanating as well as determine background levels at the nearest sensitive receptor (nearest Property).

Acoustic values to be measured and considered include:

- Health and biodiversity of ecosystems;
- Human health and wellbeing, including ensuring a suitable acoustic environment for individuals to sleep, study or learn, and be involved in recreation, including relaxation and conversation; and
- The amenity of the community.

The noise and vibration assessment will involve the identification of a baseline noise environment, modelling of potential noise sources and assessment of potential impacts associated with the operation. Any impact assessment will be based on likely sources including indicative operating equipment.

7.1.1 Neighbours (Sensitive Receptor)

A sensitive receptor is considered to be a location in the vicinity of the operation, where noise December affect the amenity of the land use.

7.1.2 Noise Management Plan

Based on the results of the assessment, a noise management plan is in place to address how plan activities will be carried out, according to best practice noise management principles.

Best-practice noise management principles include:

- Noise impact assessments and emission calculations;
- Administration of activities;
- Stakeholder engagement;
- Adoption of noise attenuating technologies for plant and equipment (if practicable);
- Minimising background creep; and
- Containing and minimising variable noise;

7.2 Monitoring Locations

Potential Monitoring locations will include neighbouring properties. Figure 7.1 shows the location of the neighbouring properties.



Figure 7.1: Closest Neighbours to Endeavor Mine

7.3 Noise Monitoring: Data and Discussion

No noise complaints were registered during December 2018. The Noise Management Action Plan was not activated. Year to date, Endeavor Mine has received no complaints regarding noise or any other nuisance issue.

8 Waste Management

Endeavor Mine has developed and implemented a Waste Management Plan to provide a framework for managing process and non-process wastes, both liquid and solid, excluding waste rock, overburden and tailings. Detailed internal procedures are used to support both the operation and maintenance of the waste. The primary objectives are to:

- *Reduce potential health and environmental risks associated with waste generation and disposal;*
- *Promote the efficient use and conservation of resources, reduce the need for waste treatment facilities and reduce the requirement for raw materials;*
- *Minimise the use of hazardous materials and seek safer alternative materials where possible; and*
- *Comply with statutory requirements, specifically the conditions set out in Environmental Protection Licence 1301 and site Mining Leases and other statutory requirements.*



As stated in EP1301, Endeavor Mine “must not cause, permit or allow any waste to be received at the premises, except the wastes expressly meeting the definition as stated in its License”. Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled “Activity” in the Table 8.1. Any waste received at Endeavor Mine is subject to the limits or conditions.

Monthly Environmental Report

For Month Ending 31 December 2018

Code	Waste	Description	Activity	Other Limits
NA	General or Specific exempted waste	Waste that meets all the conditions of a resource recovery exemption under Clause 51A of the Protection of the Environment Operations (Waste) Regulation 2005	As specified in each particular resource recovery exemption	NA
NA	Waste	Any waste received on site that is below licensing thresholds in Schedule 1 of the POEO Act, as in force from time to time	-	NA

Table 8.1: Requirements for the Storage and Handling of Waste under EP 1301.

8.1 Waste Management: Data and Discussion

In January 2019, EOPL will recommence its scrap steel removal program as well as a site wide waste reduction program with a focus on regulated wastes.

9 Tailings Deposition

History

Tailings (also known as “tails” or “residue” is the material left over after the process of separating the valuable fraction from the uneconomic fraction (waste) of ore. Tailings are distinct from overburden, which is the waste rock or other material that overlies an ore or mineral body and is displaced during mining without being processed.

The volumes of tailings can be large, and required engineered storage and capacity to safely house them. Depending on the nature of the ore or the type of chemicals used in the extraction process, tailings can have the potential to harm the environment unless they are deposited and managed correctly.



The reporting of monthly tailings deposition is a legislative requirement as part of EP 1301.

9.1 Tailings Deposition: Data and Discussion

Error! Reference source not found. shows the volumes of tailings deposited for December 2018. All tailings were deposited in the CTD TSF.

Table 9.1: Tailings Deposition for December 2018

Environment Protection Licence Monitoring Point 7		Environment Protection Licence Monitoring Point 8		
Volume of tailings deposited (m ³)	Mass of tailing solids deposited (DMT)	Volume of tailings deposited (KL)	Mass of tailing solids deposited (DMT)	Mass of tailing solids deposited (DMT) YTD
December 2018	42,058	55,349	0	0
				564,888

10 Tailings Dam Surveillance

Endeavor Mine undertake daily and weekly surveillance of the CTD TSF for signs of anomalies to tailings deposition, the freeboard, interception trenches, slope stability and erosion. During December 2018, there were no visible signs of leaching, seepage or cracks in the external embankment of the CTD TSF.

Introduction of the central discharge platform (Eyebolt) has allowed for a more even distribution of slurry and more even beaching of tails. Standing water levels are measured for the presence of water in and around walls as well quarterly groundwater sampling and analysis.

Monthly Tailings Dam management Meetings are held to discuss any issues arising from inspections as well as discuss current and future works and projects. Minutes are kept and provided to Regulatory Authorities on request.

11 Rehabilitation and Research

As the majority of the site will remain active for the life of the mine, only limited progressive rehabilitation is possible.

However extensive planning and research into the rehabilitation of facilities such as the tailings dams are planned.

There are several significant projects being explored:

- *High Density Hard Pan Capping; and*
- *Sustainable Development in Post Mining Land Use (PMLU); and*
- *Investigation into Pb speciation and Pb tolerant species.*

Endeavor Mine are currently in discussion with industry experts to look at collaborative research into sustainable final and post mining landforms.



12 Complaints Hotline

Endeavor Mine has established a complaints hotline for members of the Public to voice any concerns they December have with Endeavor Mine activities. The phone number to call is (02) 68306475 or email on enquiries@endeavor.com.au. The number can be called 24 hours a day / 7 days a week. Endeavor will investigate any complaint and take immediate action if the complaint is validated.