



ENDEAVOR OPERATIONS PTY LTD

ENDEAVOR MINE



July 2019 MONTHLY ENVIRONMENTAL REPORT

Monthly Environmental Report

For Month Ending 31 July 2019

Name of Operation	Endeavor Mine
Name of Licensee	Endeavor Operations Pty Ltd
Environmental Protection Licence	No: 1301
Reporting Period Start Date	1 July 2019
Reporting End Date	31 July 2019
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1 INTRODUCTION

We at Endeavor Mine conduct systematic and periodic environmental monitoring of our operations 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 July 2019 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 July 2019. 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, stability of tailings structures, reporting of resources such as raw water usage and rehabilitation and post mining land use studies.

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 was the first use of data collected from site. This includes a change in format on how we present the data.

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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 July 2019 was 10.77 °C with a maximum temperature of 22.7 °C. Figure 1.1 shows the data in a daily graphical representation of averages for Air Temperature, Relative Humidity and Barometric Pressure. Figure 1.2 shows the Daily Maximum Air Temperature for July 2019.

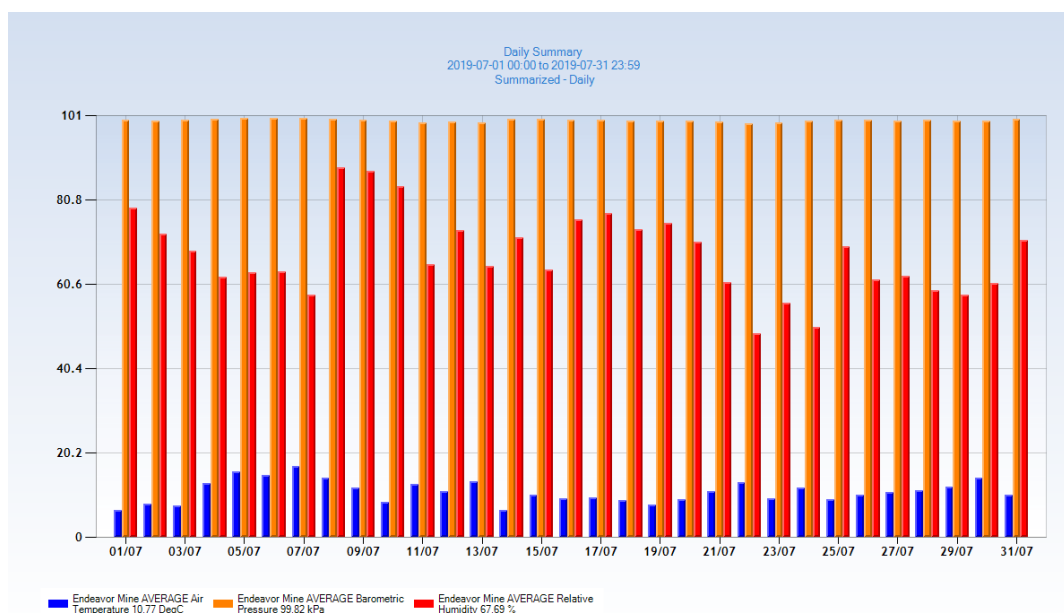


Figure 1.1: Monthly Temperature, Humidity and Barometric Pressure for July 2019

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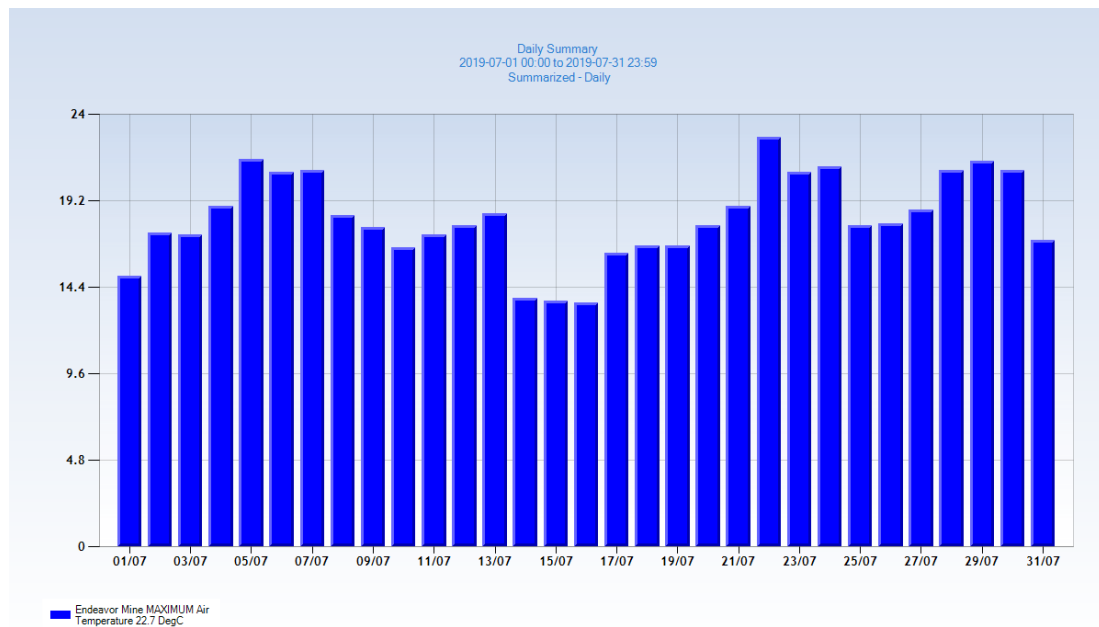


Figure 1.2: Daily Maximum Air Temperature for July 2019

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

Figure 1.3 shows the Maximum, Minimum and Average Wet Bulb temperature. All maximum measurements remained well under the 27.7 °C threshold and show surface Wet Bulb work conditions to be safe during July 2019.

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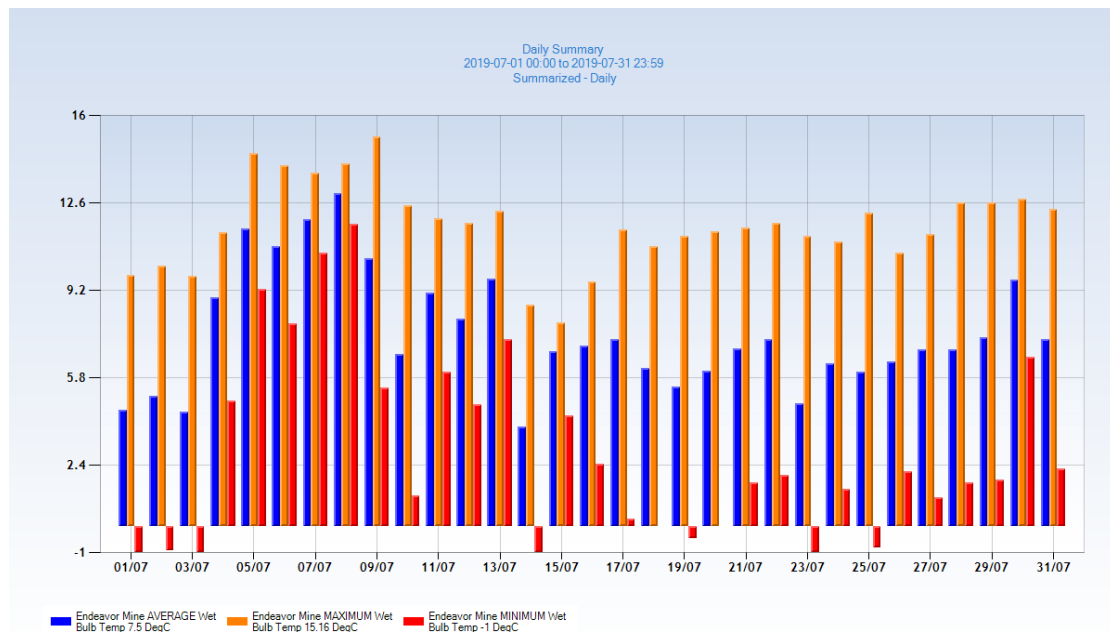


Figure 1.3: Daily Max, Min and Ave Wet Bulb Temperature Levels for July 2019

1.3 Black Globe Temperature

Black Globe Temperature is the temperature measured at a perfectly non-reflective black surface placed directly in the line of thermal radiation. Usually applied to the measurement of solar radiation temperatures at the earth's surface, to allow engineers and scientists to design equipment for exposure to high levels of solar radiation and heating, typically in desert climates such as the Middle East, the Sahara Desert, the Gobi Desert and Australia. Black Globe Temperature is also used to calculate Thermal Work Limits



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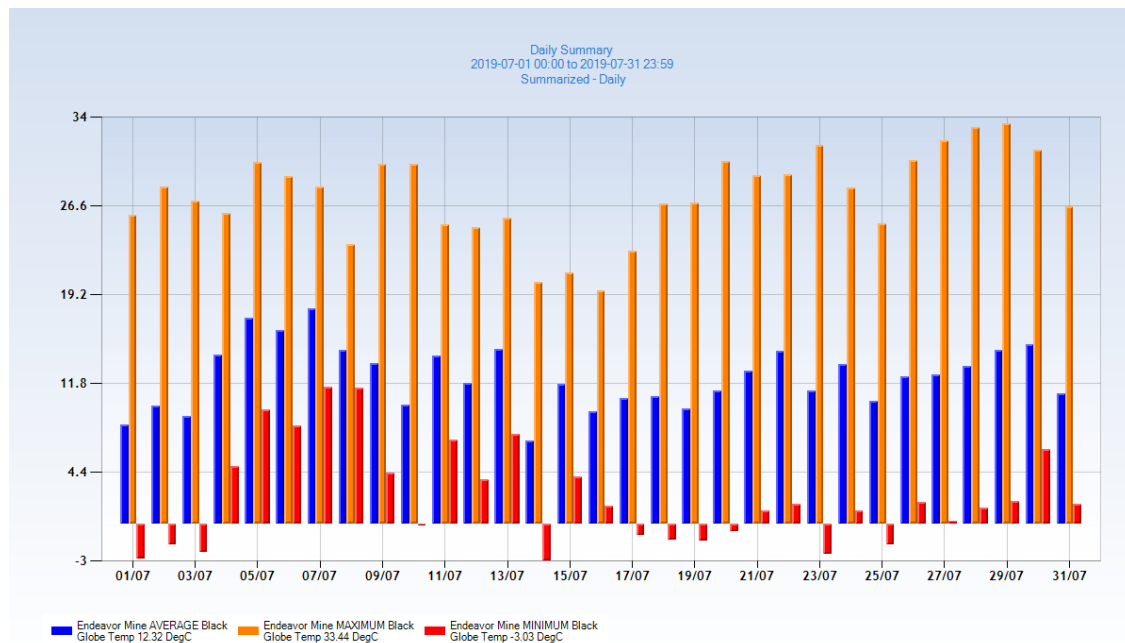


Figure 1.4: Min, Max and Ave Black Globe Temperature for July 2019

1.4 Thermal Work Limit

TWL is calculated using five environmental parameters – dry bulb, wet bulb and globe temperatures, with the addition of wind speed and atmospheric pressure. It also accommodates for clothing factors to arrive at a prediction of a safe maximum continuously sustainable metabolic rate (W/m²) for the conditions. TWL has been widely adopted and implemented in Australia's underground mining industry, resulting in a reduction in heat illness and lost production.

Thermal Work Limit - Working Zones

Control Interventions, Rest-Work and Rehydration Schedules

Working Zones	Interventions	Rehydration Schedule (per hr)	Work-rest Schedule (minutes)
Low Risk Unrestricted Zone TWL: 149 - 220 <	No limits on self-paced work ^a for educated, hydrated workers.	Light Work 600 ml - 1 Litre / hr	Safe for all continuous self-paced work ^a
Medium Risk Cautionary Zone TWL: 115 - 140	Cautionary zone indicates situations in which environmental conditions require additional precautions. <ul style="list-style-type: none"> Practicable Engineering control measures to reduce heat stress should be implemented e.g. provide shade, improve ventilation etc. Working alone to be avoided No unacclimatised person to work^a Ensure adequate fluid intakes appropriate for type of work 	Light Work 1 - 1.2 Litres / hr	Safe for continuous self-paced light work ^a
		Heavy Work > 1.2 Litres / hr *	Continuous paced work 45 work - 15 rest
High Risk Zone TWL: < 115	<ul style="list-style-type: none"> Strict Work/Rest cycling required No person to work alone No unacclimatised person to work^a High Risk induction required emphasising hydration and identifying signs of heat strain Provide personal water bottle (2 litre capacity) on-site at all times 	All Work > 1.2 Litres / hr *	Light work ^a 45 work - 15 rest Heavy work ^a 20 work - 40 rest

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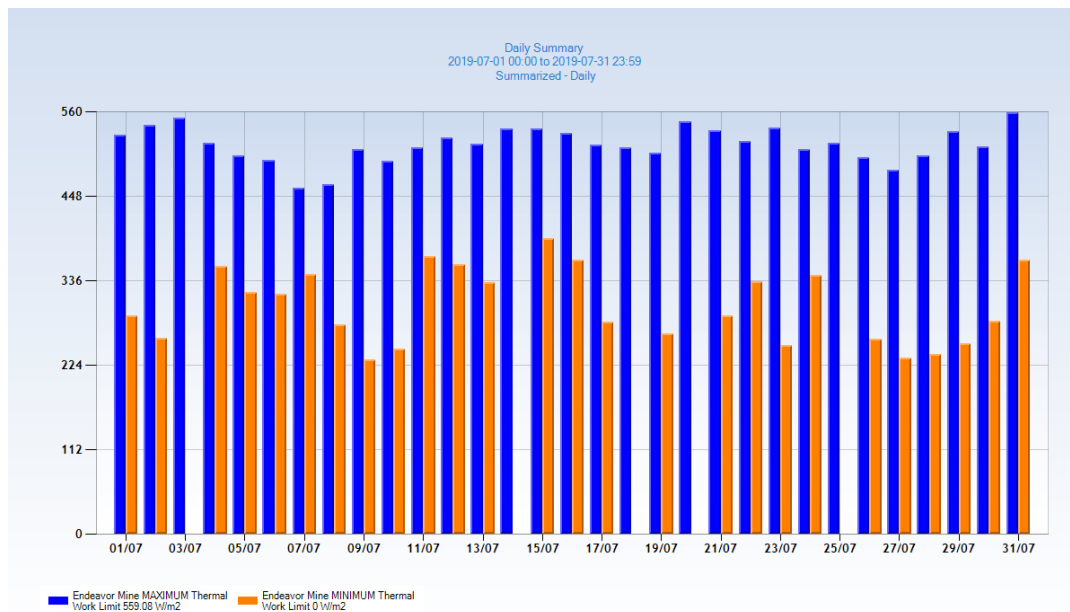


Figure 1.5: Thermal Work Limits: Maximum and Minimum Levels for July 2019

The lower the reading the more risk to human health. As shown in Figure 1.4, that during July 2019, the lowest score was 230.28 W/m² which is a low risk.

1.5 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 May, May and December, for example, the average rainfall is more than double the median rainfall.



1.5.1 Rainfall: Data and Discussion

There was 9.8 mm of rainfall at Endeavor Mine during July 2019 (Table 1.1). Year to Date (YTD) is shown in Table 1.2. Maximum daily rain was recorded on the 8th of July with 9.0 mm.

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Table 1.1: Rain Gauge Total for July 2019

Date	TOTAL Rain Gauge - mm	Date	TOTAL Rain Gauge - mm
1/07/2019	0	17/07/2019	0
2/07/2019	0	18/07/2019	0
3/07/2019	0.2	19/07/2019	0
4/07/2019	0	20/07/2019	0
5/07/2019	0	21/07/2019	0
6/07/2019	0	22/07/2019	0
7/07/2019	0.2	23/07/2019	0
8/07/2019	9	24/07/2019	0
9/07/2019	0	25/07/2019	0
10/07/2019	0.2	26/07/2019	0
11/07/2019	0.2	27/07/2019	0
12/07/2019	0	28/07/2019	0
13/07/2019	0	29/07/2019	0
14/07/2019	0	30/07/2019	0
15/07/2019	0	31/07/2019	0
16/07/2019	0		
Total July		9.8	

Table 1.2 and Figure 1.6 show the daily and total rainfall for July 2019 (9.8 mm) and YTD total. YTD for 2019 as of July 31, 2019 was 170.4 mm compared to 2018 of 9.8mm (as of July 2018). 0.2mm rainfall was recorded during July 2018.

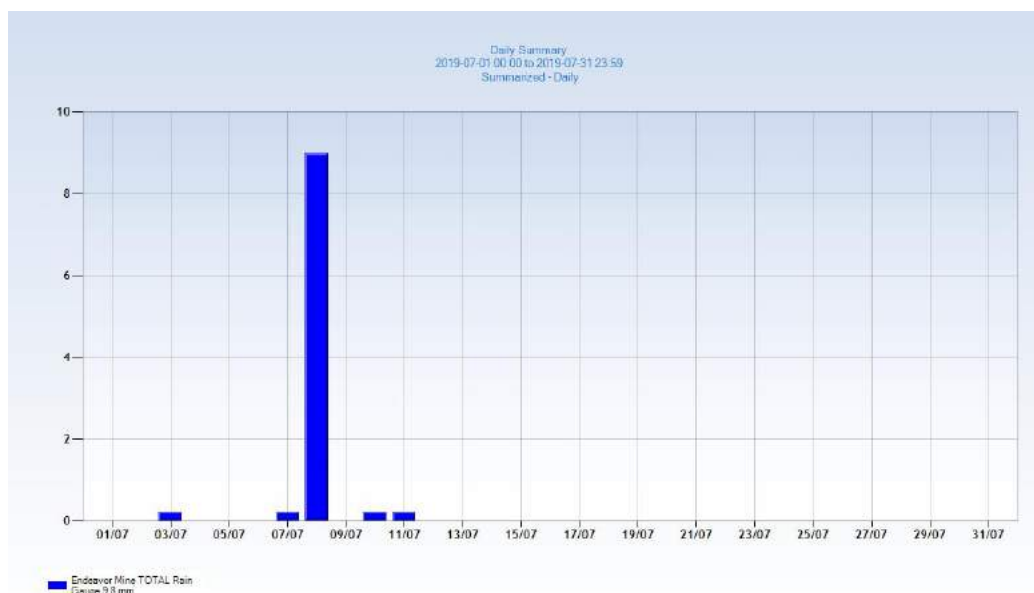


Figure 1.6: Rain Gauge Total for July 2019

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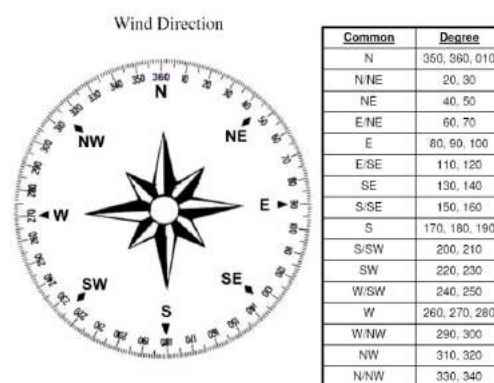
Table 1.2: YTD Rainfall for Cobar, NSW (01/01/2019 to 31/07/2019)

Jan 2019	Feb 2019	March 2019	April 2019	May 2019	June 2019	July 2019	Aug 2019	Sept 2019	Oct 2019	Nov 2019	Dec 2019	YTD
19 mm	34.2mm	18.2mm	75.2mm	13.2mm	0.8mm	9.8mm	0mm	0mm	0mm	0mm	0mm	170.4mm

1.6 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.



1.6.1 Wind Speed and Wind Gusts: Data and Discussion

As shown in Figure 1.7, the average wind speed for July 2019 was 6.04km/h with a maximum wind speed of 31.1 km/h and a maximum wind gust of 40.2 km/h.

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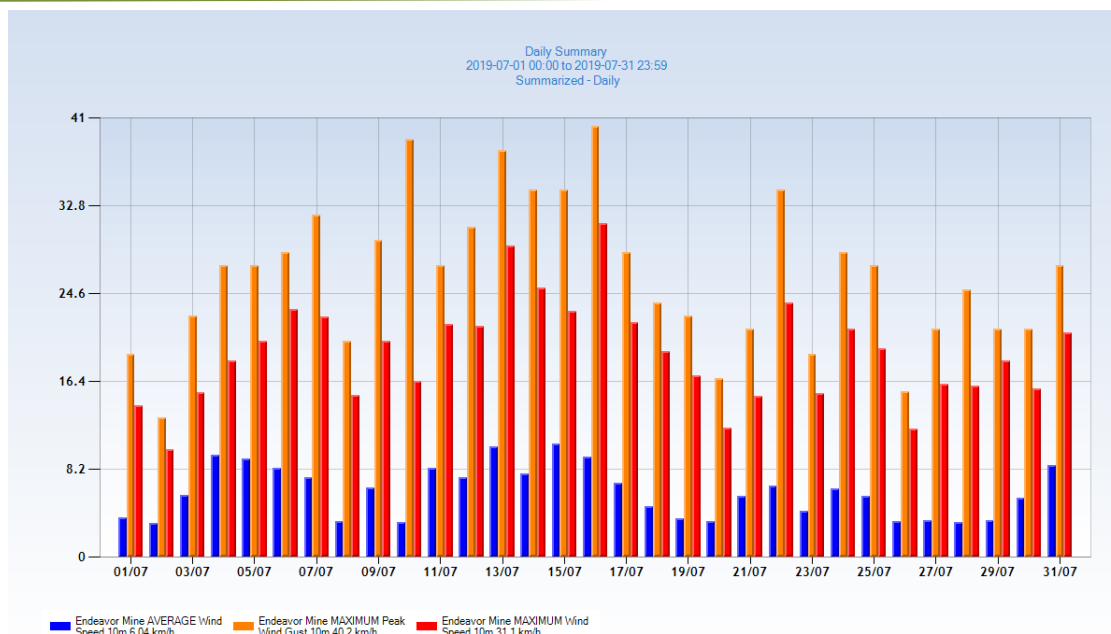


Figure 1.7: Average Wind Speed, Maximum Wind Speed and Maximum Wind Gusts for July 2019

1.6.2 Wind Direction: Data and Discussion

With decreasing air temperatures, wind patterns became more orientated blowing from the South/South West (SSW) and South (S). Figure 1.8 illustrates the Wind Rose for the Endeavor Mine for July 2019.

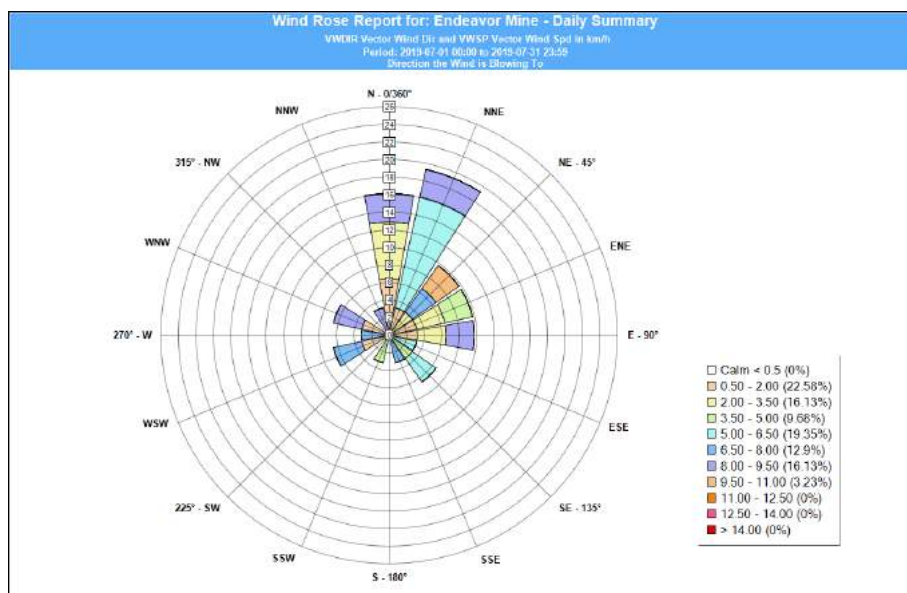


Figure 1.8: Wind Rose for the Endeavor Mine for July 2019

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1.7 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.

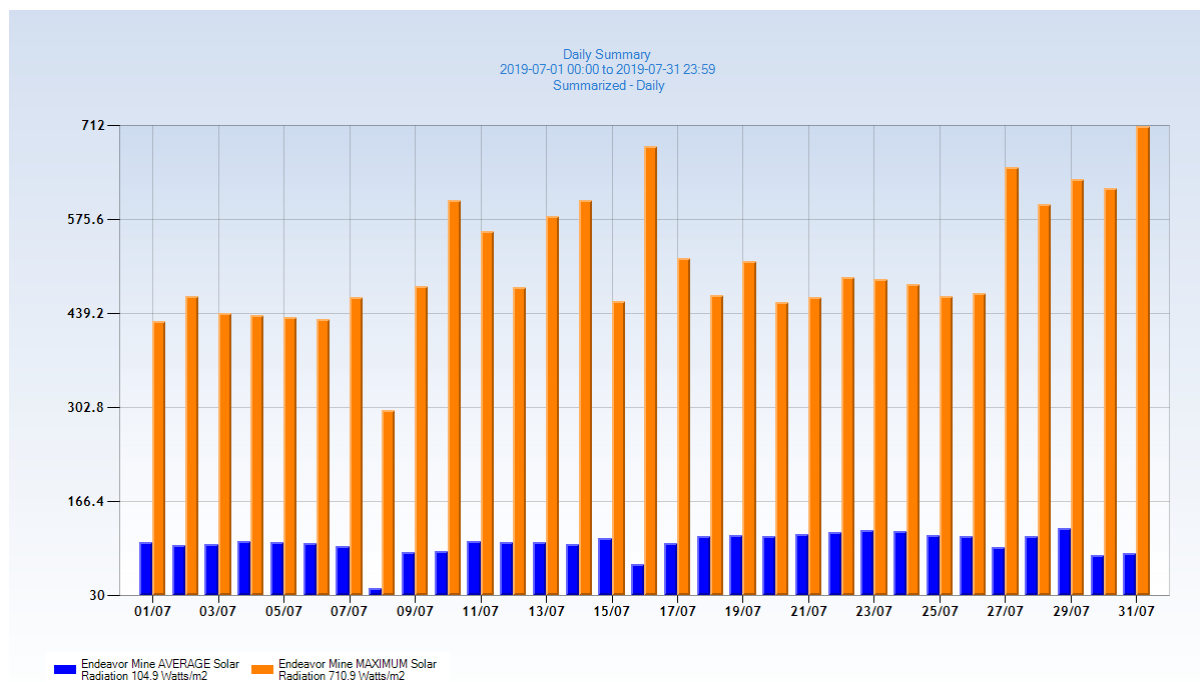
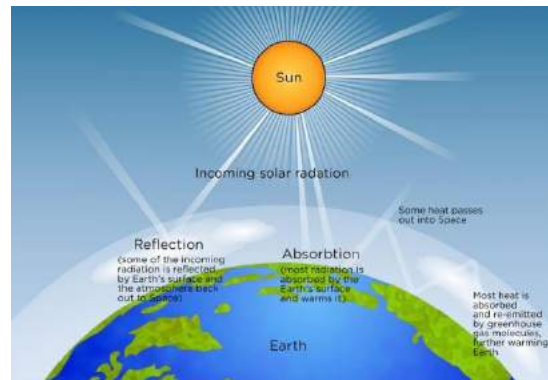


Figure 1.9: Daily Solar Radiation Levels (Ave and Max) July 2019

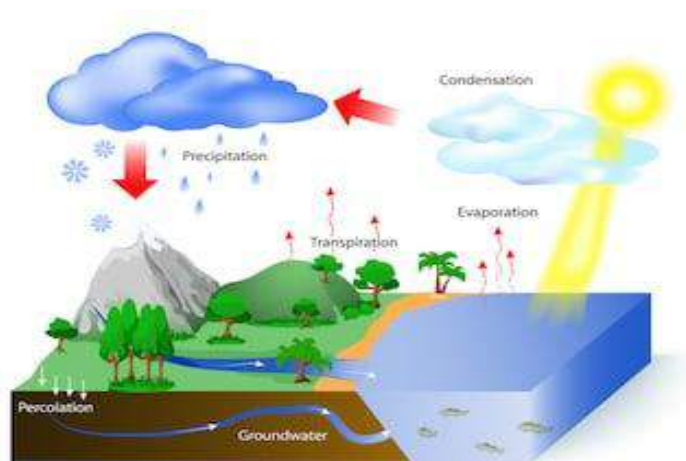
1.7.1 Solar Radiation: Data and Discussion

The Maximum Solar Radiation measurement was 710.9 Watts/m² (Figure 1.9), which was higher than June 2019.

1.8 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.



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1.8.1 Rate of Evaporation: Data and Discussion

As shown in Table 1.3 and Figure 1.10, evaporation rates are similar to the evaporation rates obtained for June, as similar values of temperature, humidity and solar radiation were obtained. The Highest evaporation was observed on the 22nd of July with a rate of 2.2mm. Total evaporation for July was 47.81mm. Historically, a reduction in evaporation coincides with a reduction in rainfall. Evaporation is a critical tool in the management of tailings supernatant.

Table 1.3: Total Daily Evaporation Rates for July 2019

Date	TOTAL Daily Evaporation - mm	Date	TOTAL Daily Evaporation - mm
1/07/2019	1.18	17/07/2019	1.32
2/07/2019	1.17	18/07/2019	1.4
3/07/2019	1.4	19/07/2019	1.37
4/07/2019	1.94	20/07/2019	1.41
5/07/2019	2.05	21/07/2019	1.6
6/07/2019	1.8	22/07/2019	2.2
7/07/2019	1.85	23/07/2019	1.78
8/07/2019	0.59	24/07/2019	2.12
9/07/2019	1.14	25/07/2019	1.6
10/07/2019	1.08	26/07/2019	1.5
11/07/2019	1.62	27/07/2019	1.47
12/07/2019	1.61	28/07/2019	1.7
13/07/2019	1.94	29/07/2019	1.89
14/07/2019	1.37	30/07/2019	1.53
15/07/2019	1.69	31/07/2019	1.42
16/07/2019	1.07		
Total evaporation July 2019			47.81

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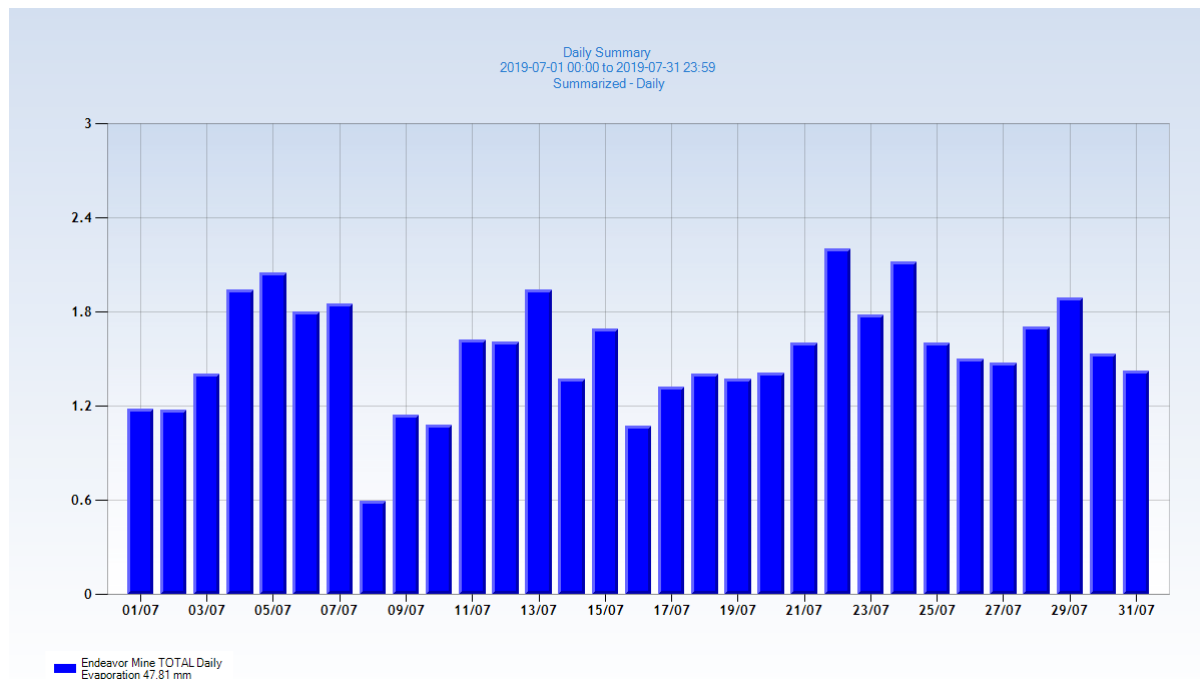


Figure 1.10: Daily Evaporation Rates for July 2019.

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 operating mine site (DDG 5). EP Licence 1301 does not set limits for dust deposition. However, these results are compared to 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 on a annual average. Table 3.1 describes the Pollutant, Units of Measure, Monitoring Frequency and Method of Sampling.

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Table 3.1: Endeavor Mine Air Monitoring Requirements

Point ID	Pollutant	Unit of measure	Frequency	Sampling Method
1	Particulates - Deposited matter	grams per square metre per month	Monthly	AM-19
2	Particulates - Deposited matter	grams per square metre per month	Monthly	AM-19
3	Particulates - Deposited matter	grams per square metre per month	Monthly	AM-19
4	Particulates - Deposited matter	grams per square metre per month	Monthly	AM-19
5	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.



Figure 3.1: Endeavor Mine Dust Monitoring Locations

3.3 Dust Monitoring Data and Discussion

During the month of July due to a reduction in the workforce and a cut in the production in the Endeavor Mine, the company went through a restructuring. During this period no dust analysis was done. The results for this month are to be presented in future monthly reports.

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 is found 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 4.1 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: EPA Monitoring Stations

EPA ID	Type of monitoring point	Location description
9	Groundwater monitoring point	PZ Labeled as BH02
10	Groundwater monitoring point	PZ Labeled as BH02B
11	Groundwater monitoring point	PZ Labeled as BH03
12	Groundwater monitoring point	PZ Labeled as BH06
13	Groundwater monitoring point	PZ Labeled as BH08A
14	Groundwater monitoring point	PZ Labeled as BH09
15	Groundwater monitoring point	PZ Labeled as BH10
16	Groundwater monitoring point	PZ Labeled as BH10B
17	Groundwater monitoring point	PZ Labeled as BH12B
18	Groundwater monitoring point	PZ Labeled as BH14
19	Groundwater monitoring point	PZ Labeled as BH15
20	Groundwater monitoring point	PZ Labeled as BH16
25	Groundwater monitoring point	PZ Labeled as BH13

Table 4.2: EPA Monitoring Stations

Pollutant	Unit of measure	Frequency	Sampling method
Arsenic	milligrams per litre	Quarterly	Representative sample
Cadmium	milligrams per litre	Quarterly	Representative sample
Calcium	milligrams per litre	Quarterly	Representative sample
Chloride	milligrams per litre	Quarterly	Representative sample
Copper	milligrams per litre	Quarterly	Representative sample
Cyanide (total)	milligrams per litre	Quarterly	Representative sample
Electrical conductivity	milligrams per litre	Quarterly	Representative sample
Iron	milligrams per litre	Quarterly	Representative sample
Lead	milligrams per litre	Quarterly	Representative sample
Magnesium	milligrams per litre	Quarterly	Representative sample
Manganese	milligrams per litre	Quarterly	Representative sample
Mercury	milligrams per litre	Quarterly	Representative sample
pH	pH	Quarterly	Representative sample
Potassium	milligrams per litre	Quarterly	Representative sample
Sodium	milligrams per litre	Quarterly	Representative sample
Standing water level	metres	Quarterly	Representative sample
Sulfate	milligrams per litre	Quarterly	Representative sample
Total dissolved solids	milligrams per litre	Quarterly	Representative sample
Zinc	milligrams per litre	Quarterly	Representative sample

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Figure 4.1: Location of the Piezometer Monitoring Locations

4.2 Monitoring Results Discussion

No Groundwater monitoring was undertaken during July. Next Quarterly Monitoring is planned for September 2019.

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 (when possible) (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).

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

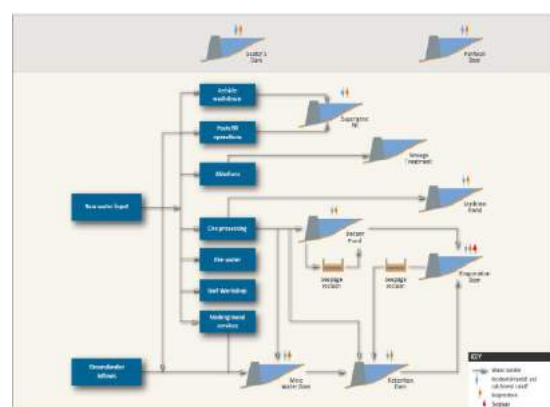
Due to the drought and low rainfall, it is difficult to access water in most of the dams with the exception of the Retention Dam. Access to the water's edge is hazardous. If rain occurs during future months samples will be taken, if possible.

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 July 2019. Due to the ongoing and severe drought conditions, Endeavor has commenced a program to source water from other potential sources.

Table 6.1: Raw Water Use for July 2019

Date	YTD (KL)	Usage (KL) for July 2019
31/07/2019	412,667	50060

7 Noise Management

Environmental Noise is the propagation of noise with harmful impact on the activity of human or animal life. According to the WHO, sound levels less than 70dB are not damaging to living organisms, regardless of how long or consistent the exposure. Exposure for more than 8 hours to constant noise beyond 85dB is deemed hazardous. A “Nuisance” noise is a noteworthy and unreasonable amount of sound from neighbouring properties or 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 July 2019. 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 July 2019

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

During July 2019, EOPL continues with the implementation and waste management described in previous reports, no further actions have been implemented during this month.

9 Tailings Deposition

History

Tailings (also known as tails or residue) are the material left over after the process of separating the valuable fraction from the uneconomic fraction (waste) of the ore. Tailings are distinct from overburden or 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 require an engineered storage and capacity to safely house them, Depending on the nature of the ore or the type of 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

Table 9.1 shows the volumes of tailings deposited for July 2019. All tailings were deposited in the CTD TSF. Tailings were deposited in Sector 2/3.

Table 9.1: Tailings Deposition for July 2019

	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
July 2019	15470	17784	0	0	169570

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 July 2019, 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.

10.1 Discussion

There were no visible signs of seepage in the interception trench at all sections of outside of the external embankment during July 2019. A series of Piezometers installed along the perimeter of the external embankment are monitored regularly to determine any potential seepage through the embankment. The Piezometer "Lift03", was monitored and it was dry, no presence of water detected.

11 Waste Rock Management

History

The primary and most prevalent waste generated by many operations is waste rock or overburden. Waste Rock consists of the rock and target minerals in concentrations too low for economic recovery. This is generally not the case for an underground mine like Endeavor. In most cases, the rock is disposed of underground to backfill voids.

EOPL has been diligently working to maximise its mineral resource to extend its current mine life beyond 2023. This exploration program is critical to the future of Endeavor Mine's shareholders, employees, contractors, the township of Cobar and all those who provide direct and indirect support to the operations. Exploration drilling has indicated that the mine ore body is available at depth and requires further investigative drilling for confirmation. For this to occur, an extension to the mine decline (main access pathway) is required to access this potential ore body. As a result, waste rock is produced. But due to the volumes involved, there is a need to temporarily stockpile the waste rock on the surface. Currently the storage of waste rock is allowed in specified locations above ground and is currently approved under the MOP 2017-2020. Due to the quality of this waste rock, much of it may have a beneficial use in the long term or post mining land use.



11.1 Waste Rock Storage: Data and Discussion.

The storage of waste rock is within the catchment of the Sector 5 TSF. The material is placed on oversized tails and was assessed for geotechnical stability. The bottom up building approach is being applied in the construction which allows for the base batter of 5 metres and any change in volume will impact the top bench, which can be easily reshaped (Figure 11.1). Due to the nature of the tailings base, a layered approach was used as recommended by Golder Associates Pty. Ltd.

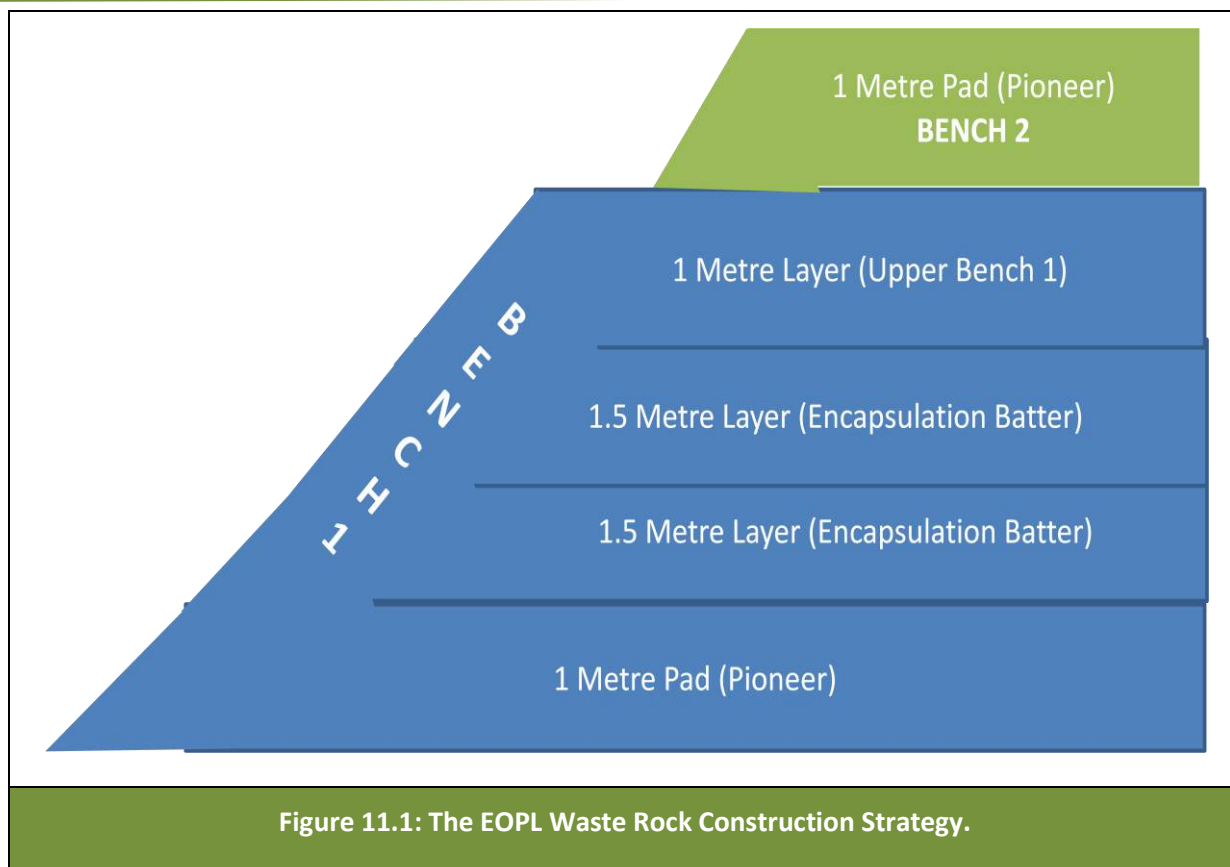


Figure 11.1: The EOPL Waste Rock Construction Strategy.

This involves the footprint being covered with a 1 Metre “pioneer” layer or pad. This provides an even coverage and place less point pressure on the in situ tails. Once in place, the next 1.5m encapsulation batter will be constructed to create the second level of the batter around the perimeter to encase any problematic material identified. This material will be encapsulated and capped using the 1.5metre 3rd level. The upper level will be compacted using heavy machinery prior to the laying of the pioneer pad for Bench 2.

The initial placement of rock was done using a method of paddock dumping, spreading and compacting to create a 1 metre impervious barrier or “Pioneer” layer. This is Layer 1. The material will be pushed to the south and south east (Figure 11.2). The edge of the dump is designed to end 2 meters inside the fence line. Drainage and windrows will be constructed on the outer edge and will be designed to run water back into an exterior toe drain. Once the layer covers the designed footprint, the next layer (Layer 2) will follow the process. It is expected that the finalisation of the waste rock placement will be in the 3rd quarter 2019. Following on the Waste rock placement described before from the end of July 2019 the waste rock placement will continue accordingly to the description in Figure 11.3.

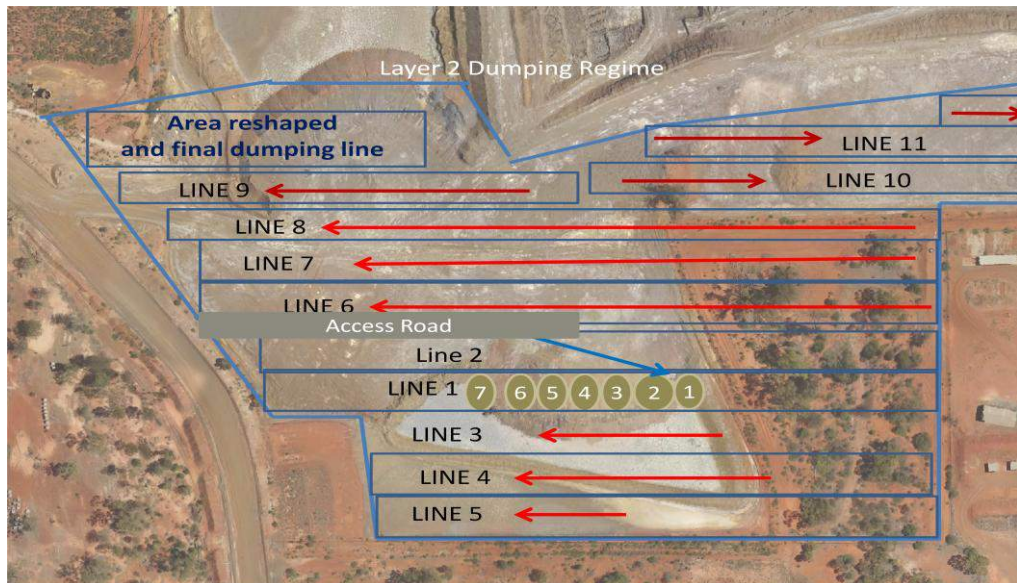


Figure 11.2: Waste rock placement plan

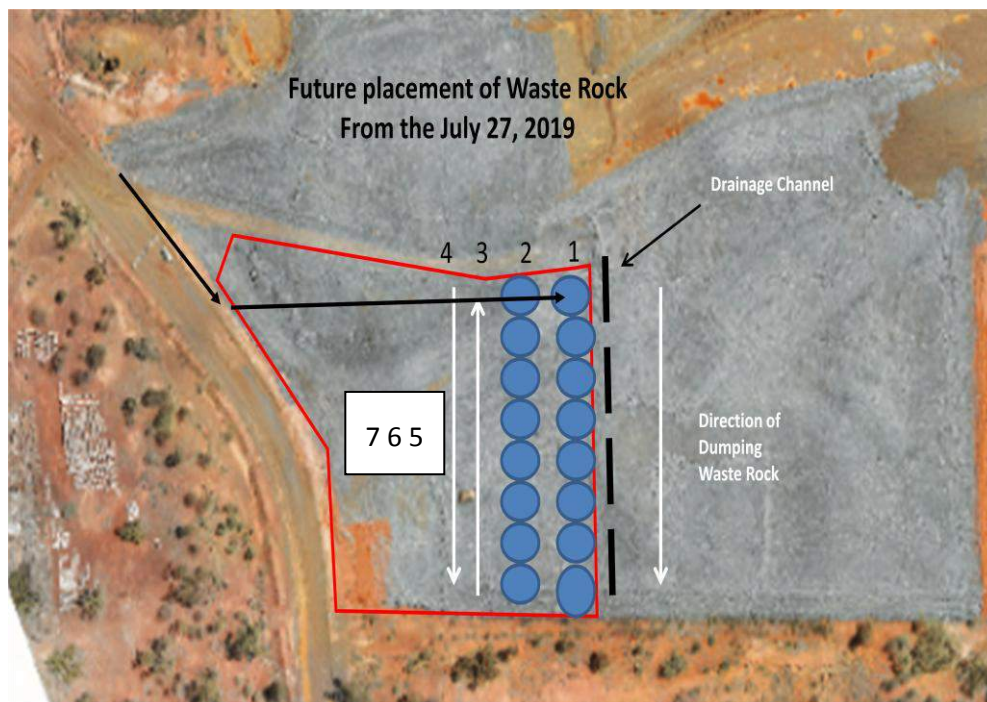


Figure 11.3: Waste rock placement plan for July and August 2019

12 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.



12.1 Discussion

Endeavor Mine has commenced Phase 1 of a program exploring scientifically feasible options for a final land form solutions for the Central Tailings Discharge Tailings Storage Facility (CTD TSF) and the Sector 5 TSF. This involves in-lab trials for biological analysis and bio-weathering techniques at the Centre for Sustainable Mining at the University of Queensland.

13 Complaints Hotline

Endeavor Mine has established a complaints hotline for members of the Public to voice any concerns they 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.