



Mt Jackson J1 2025 Biodiversity Monitoring Report

**Prepared for Yilgarn Iron Pty Ltd
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Executive Summary

The Yilgarn Iron Ore Project comprise six individual mine sites (Koolyanobbing, Carina, Jackson Ranges, Mt Manning, Windarling and Parker Range), located between 50 km to 150 km from Southern Cross and around 15 km from Marvel Loch. State and Commonwealth approval conditions require annual monitoring of plant health and vegetation condition in native vegetation surrounding the Mt Jackson 1 mining operation (J1), with comparison to baseline data recorded in 2016. The 2025 monitoring program was conducted by Principal Botanists Dr Darren Brearley and Dr Jerome Bull and Ecologist Mr Thomas Mott between the 18th and 19th of November 2025. Vegetation condition and plant health was assessed within eleven 20 metre (m) by 20 m permanent monitoring plots.

Comparison between baseline and 2025 monitoring data showed that vegetation condition remained stable (excellent) at eight plots, improved (from excellent to pristine) at one plot, and declined (from excellent to very good) at two plots. In November 2025 vegetation condition ranged from very good to pristine and there were no threatening processes of immediate concern identified. This was supported by the continued absence of introduced plant species within all eleven monitoring plots in November 2025.

Monitoring of 85 permanently tagged plants within near mining plots (43 plants) and control plots (42 plants) confirmed a higher proportion of healthy plants occurred within the near mining plots in November 2025. The proportion of healthy plants within near mining plots in 2025 was also higher in comparison to the baseline assessment, with a lower proportion of healthy plants recorded in the control plots compared to the baseline assessment. It was concluded that the health of key structural plant species had not been impacted by mining operations at Mt Jackson J1.

In November 2025 5% of the plants assessed within the near mining plots and 2% of plants assessed within the control plots recorded visual evidence of 'slight dust' deposition on leaves. The 2025 levels were lower than the 2016 baseline assessment when slight dust deposition was recorded on 24% of plants within the near mining plots and 34% of plants within the control plots. The dust load recorded during the November 2025 monitoring event was very minimal, impacted a small proportion of the sample population, and was not expected to adversely affect plant physiology.

In November 2025 chlorophyll fluorescence averaged 0.78 (Fv/Fm) for both the near mining and control plots, which was higher than the baseline values for near mining plots (0.77) and control plots (0.74). This reflected that plants were under lower stress in 2025 compared to the baseline assessment.

Monitoring of the Priority 3 flora taxon *Stenanthemum newbeyi* confirmed the proportion of healthy plants and plants with 'slight dust' occurring on the leaves, and the average chlorophyll fluorescence index were all stable or showed a favorable trend for near mining plots in 2025 compared to the 2016 baseline assessment. The control plots recorded a decrease in the proportion of healthy plants in 2025 (22%) compared to the 2016 baseline assessment (67%), although there was no evidence of dust on any plants assessed in 2025 and the average chlorophyll fluorescence index was higher compared to the baseline assessment. It was concluded that mining operations at Mt Jackson J1 had not impacted plant health within the local population of *Stenanthemum newbeyi*.

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1.0 Preamble

The Yilgarn Iron Ore Project is located approximately 47 km north-east of Southern Cross in the Yilgarn Region of Western Australia (Figure 1). Operations are located within the local government area of Shire of Yilgarn and Shire of Menzies.

Cliffs Asia Pacific Iron Ore Pty Ltd (Cliffs) operated the mining operation from 1994 to 2018, with Mineral Resources Limited (MRL) and its wholly owned subsidiary Polaris Metals Pty Ltd (Polaris) purchasing the operations in mid-2018. Yilgarn Iron Investments Pty Ltd (YIPL) recently purchased the Yilgarn Iron Ore Project from MRL with mining re-commencing in October 2025. YIPL currently manages the sites of Koolyanobbing, Carina, Jackson Ranges, Mt Manning, Windarling and Parker Range, plus exploration targets.

While there has been no mining in the Mt Jackson area since 2022, existing conditions of State and Commonwealth approvals require YIPL to conduct annual monitoring and reporting of significant flora and native vegetation condition at Mt Jackson J1. of Commonwealth approvals.

Onshore Environmental Consultants Pty Ltd (Onshore Environmental) was commissioned by YIPL to undertake annual biodiversity flora monitoring and reporting at Mt Jackson J1 (Figure 2), in accordance with the requirements of the Yilgarn Operations Flora and Vegetation Management Plan (MRL 2019).

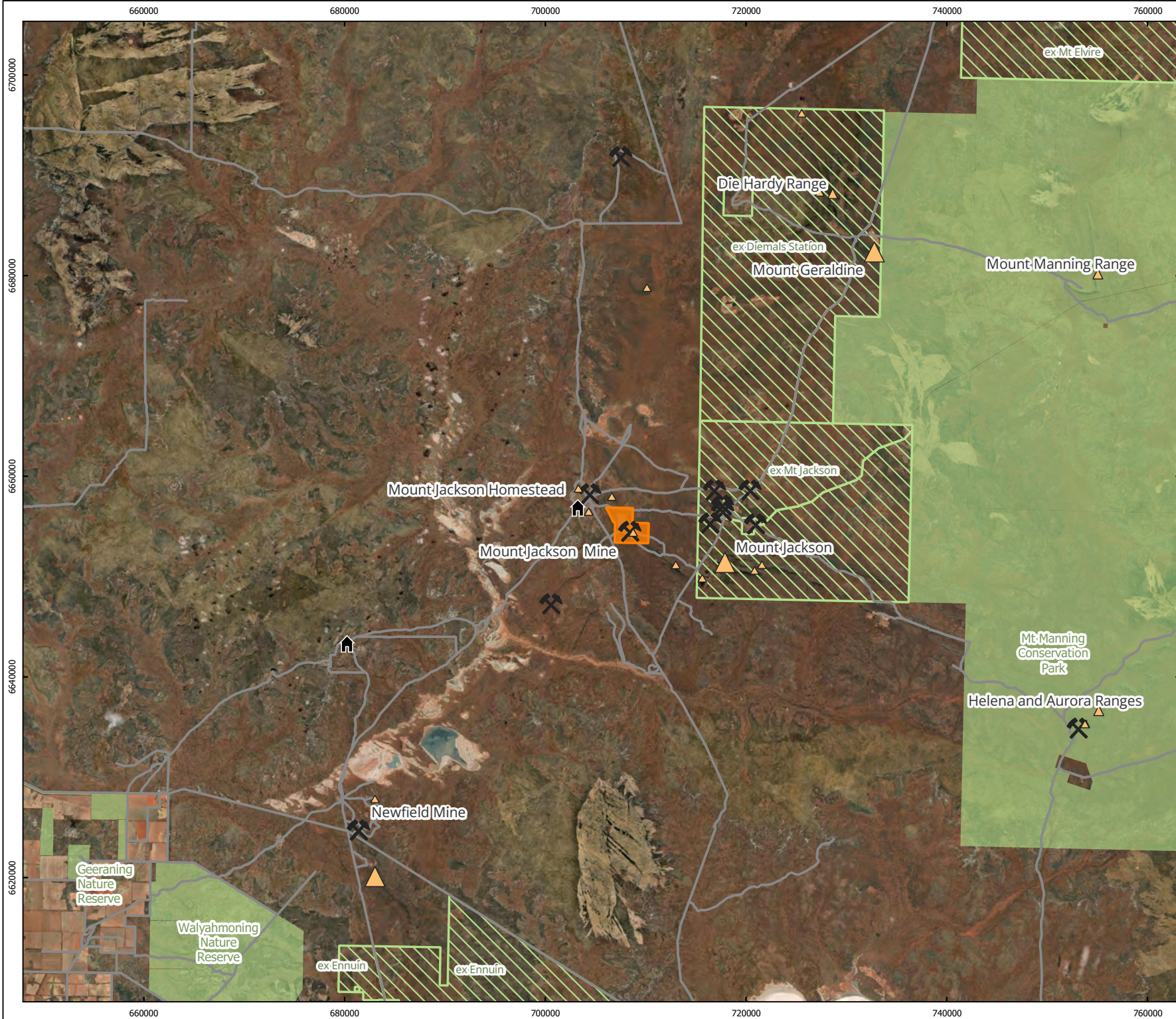
2.0 Objectives and Scope

The monitoring program (MRL 2019) was developed to determine if mining operations at Mt Jackson J1 were impacting on surrounding vegetation and flora condition.

The aim of the monitoring program was to assess vegetation condition and plant health for selected flora species (including Priority Flora) within six permanent plots located near the mining operations (hereafter referred to as 'near mining plots') and five control plots (distanced from the mining operations).

The specific objectives of the annual biodiversity monitoring at Mt Jackson J1 were to:

- Meet the existing conditions of the State and Commonwealth approvals;
- Complete the monitoring actions related to Ministerial Statement 982 as described in the Yilgarn Operations Flora and Vegetation Management Plan (MRL 2019);
- Prepare a report in accordance with the requirements of Ministerial Statement 982, as described in the Flora and Vegetation Management Plan (MRL 2019); and
- Support the Annual Compliance Reporting under Ministerial Statement 982.



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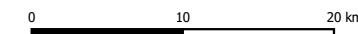
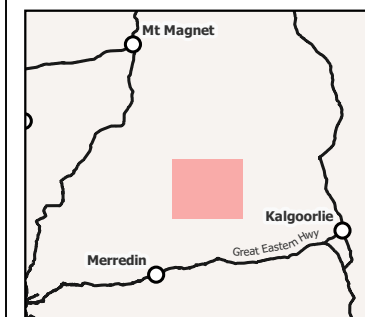
Figure 1: Location of the Mt Jackson 1 Project Area

Legend

- Project Area
- DBCA Managed Lands
- Former leasehold proposed for conservation

Roads

- Minor Roads/Tracks



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Document Control

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Data sources: Data WA - ESRI Satellite	





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**Figure 2: Location of
monitoring plots at Mt
Jackson 1 (J1)**

Legend

■ Monitoring Plots



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3.0 Background

3.1 Project Location

The Yilgarn Iron Ore Project spans the Coolgardie and Southern Cross IBRA subregions of the Interim Biogeographic Regionalisation of Australia (IBRA), within the local government authority Shires of Yilgarn and Menzies. The sites of Koolyanobbing, Carina, Jackson Ranges, Mt Manning, Windarling and Parker Range are located between 50-150 km from Southern Cross, with Parker Range approximately 15 km from Marvel Loch. Mt Jackson is situated approximately 110 km north north-west of Southern Cross (Figure 1). The location of the Mt Jackson J1 monitoring and control sites are provided in Figure 2.

3.2 Climate

The Southern Cross subregion is described as an arid to semi-arid warm Mediterranean climate, receiving on average between 250-300 mm of annual rainfall, predominantly during winter months (Cowan *et al.* 2001). The closest Bureau of Meteorology (BoM) weather station that provides continuous reliable temperature and rainfall data is the Southern Cross Airfield (station number 12320), situated approximately 120 km south of Mt Jackson.

According to BoM (2025), the long-term mean annual rainfall for the Southern Cross Airfield is 299.3 mm. Comparison with the long-term mean rainfall data, showed that two of three winter months for 2025 (June and July) received below average rainfall, with August receiving almost three times the long term average monthly total (111.2 mm). In the lead up to the November 2025 monitoring program, September was slightly above the long-term average, October was slightly below the long-term average, and November was well above the long term average (Figure 3). Rainfall for 2025 contributed to good seasonal conditions during the November 2025 monitoring program.

The long-term mean maximum annual temperature was 26°C at the Southern Cross Airfield (BoM 2025). During the period of December 2024 to November 2025, the highest mean maximum monthly temperature (38.3°C) was recorded in January (lowest in July at 16.2°C), with the lowest mean minimum monthly temperature (3.6°C) recorded in July (highest in January at 20.8°C) (Figure 4). The summer months between December 2024 and February 2025 were 2.3°C warmer than the long-term average over the same period. A slight increase for the same datasets was also noted for autumn (1.2°C), while the winter months recorded the same average temperature as the long-term average (17.8°C). The BoM (2025) data further showed that in the two spring months leading up to the monitoring program (September and October), the mean maximum temperature was the same as the long-term average (24.4°C).

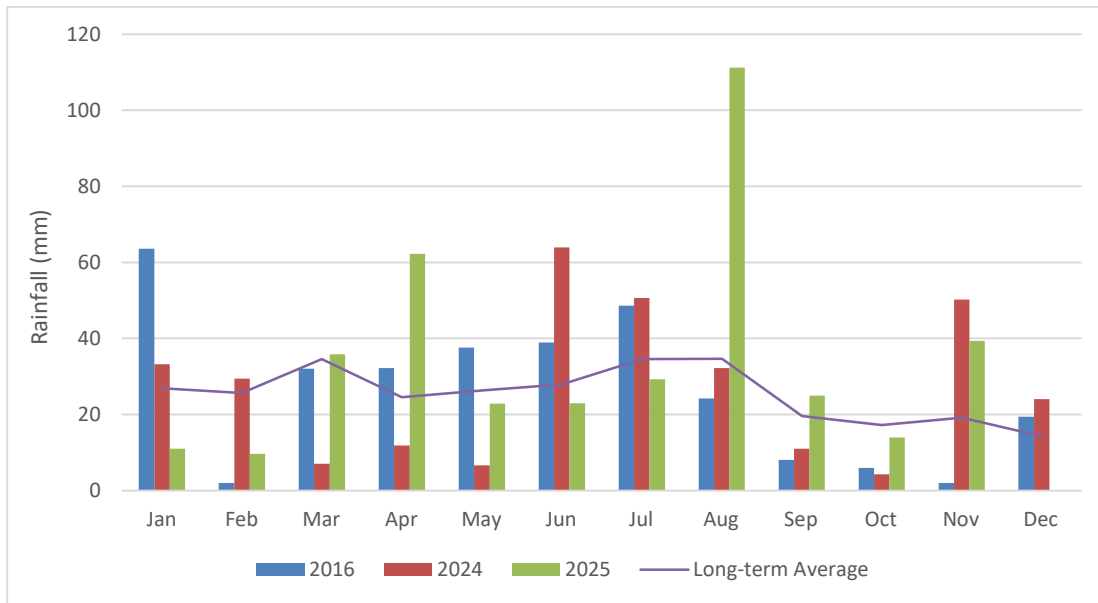


Figure 3 Long term and monthly average rainfall for 2016, 2024 and 2025, Southern Cross Airfield (BoM 2025).

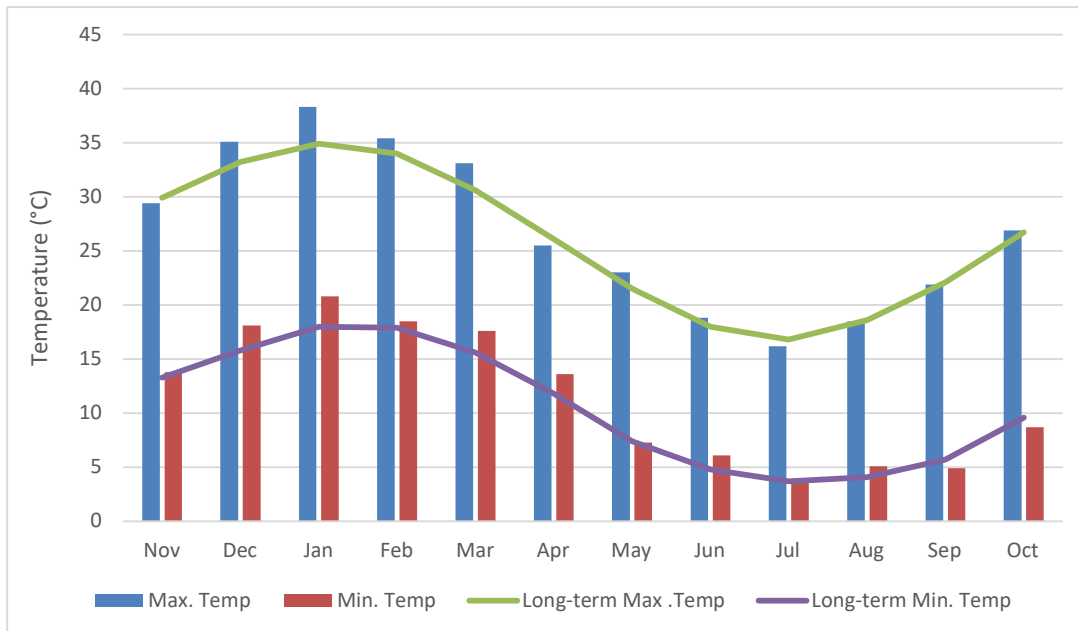


Figure 4 Mean maximum and minimum temperatures for the 12 months prior to the 2025 assessment and the long-term averages, Southern Cross Airfield (BoM 2025).

4.0 Methodology

4.1 Monitoring Design

Eleven permanent monitoring plots measuring 20 m by 20 m in dimension were established in representative vegetation types around the Mt Jackson J1 mining operation (Table 1, Appendix 1). Six monitoring plots (09, 10, 14, 21, 23 and 24) were established in 2012 and the remaining five monitoring plots (28, 29, 30 31 and 32) were established in 2016 as part of a revised monitoring program (Cliffs 2018).

Priority flora species were included where present for individual monitoring.

Table 1 Monitoring plots established at Mt Jackson.

Vegetation Unit	Location	Number of Plots (Plot No)
EcW - <i>Eucalyptus corrugata</i> Woodland	Near mining	3 (9, 10, 14)
	Control	2 (24, 32)
AeS - <i>Acacia effusifolia</i> Shrubland	Near mining	2 (28, 30)
	Control	1 (29)
AmjS - <i>Acacia collegialis</i> Shrubland	Near mining	1 (21)
	Control	2 (31,23)

The permanent monitoring plots were demarcated with a metal dropper and given a unique identification number. At each plot, the following information was recorded during annual assessments:

- Plot identification number;
- Monitoring date;
- Personnel conducting monitoring;
- GPS location (GDA94) taken from north-west corner of the plot;
- Photograph taken from the north-west corner of plot;
- Vegetation condition (as per Keighery 1994); and
- Weed assessment.

4.2 Vegetation Condition

Vegetation condition was assessed using the Keighery (1994) scale (Table 2) and a digital photograph was taken from the north-west corner of each plot.

Table 2 Vegetation condition scale as developed by Keighery (1994).

Condition Rating	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.

Condition Rating	Description
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging, and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback, and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback, and grazing.
Completely Degraded	The structure of the vegetation is no longer intact, and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.

4.3 Individual Plant Monitoring

Within each monitoring plot, up to 12 individual plants were selected for long-term assessment and tagged with a unique identification number. Representative individuals were selected from the lower, middle, and upper vegetation strata. Where possible the same species (including Priority flora when present) were selected in each plot to allow for direct comparison between 'near mining' and 'control' plots. Each individual plant monitored was marked in the field using a pin flag marker erected adjacent to the individual with a unique identification number written on the pin flag. The tagged individuals were then assessed for plant health (Table 3) and dust (Table 4).

A total of 96 plants including 52 and 47 plants were initially selected for monitoring within the near mining plots and control plots respectively. In 2025 a total of 85 plants were assessed including 43 within the near mining plots and 42 within the control plots.

Table 3 Health assessment criteria for monitoring selected individual plants.

Rating	Description
Healthy	76 – 100% of foliage alive. No obvious signs of plant distress or negative impact
Slightly stressed	51 – 75% of foliage alive
Stressed	26 – 50% of foliage alive
Very stressed	1 – 25% of foliage alive. Plant appears to be on the verge of dying
Dead	0% of foliage alive. Plant is dead

Table 4 Dust assessment criteria for monitoring selected individual plants.

Rating	Description
No dust	0% of foliage dusty
Slight dust	1 – 25% of foliage dusty
Moderate dust	26-50% of foliage dusty
Heavy dust	51 – 75% of foliage dusty
Very heavy dust	76 – 100% of foliage dusty

4.4 Chlorophyll Fluorescence

The photosynthetic efficiency of Photosystem II chlorophyll fluorescence (CF), commonly referred to as photosynthetic stress, is based on the maximum quantum yield of PC. The PC has widely been used as an indicator of plant stress and response to environmental change (Percival 2005). The benefit of using CF is that the procedure can be replicated, and represents a quantitative and non-destructive assessment compared to more commonly used metrics, e.g., leaf colour or dead/live leaf material, thereby allowing for trends to be easily identified (Ralph 2005).

Since 2017, individuals monitored for condition assessment were also assessed for CF using a pocket Plant Efficiency Analyser (PEA) unit. The measurement taken is a ratio of F_v/F_m , where F_v is the variable CF ($F_m - F_o$), F_m is the maximal CF and F_o is the minimal CF value (Lawson 2013, Percival 2005). The F_v/F_m index provides a measure of the optimal quantum yield of photosynthesis, an indicator of photosynthetic performance, thus enabling identification of plant stress (Hansatech 2006, Johnson 2000, Percival 2005). A normal range is generally between 0.7 to 0.8, with a maximum achievable level around 0.84 (Ritchie 2006). Although the index of CF range is generally species-specific, values below 0.6 typically indicate stress associated with water, light, thermal or nutrient deficiencies in plants (Percival 2005, Ritchie 2006).

A total of 75 plants (out of the 85 within the monitoring program) were assessed for photochemical stress. The CF measurements were taken by attaching a clip to a live leaf of each accessible individual (tall trees were excluded), with the leaf subsequently dark adapted. The index of CF (F_v/F_m) was then measured with the PEA unit and recorded.

4.5 *Stenanthemum newbeyi* (Priority 3 Flora)

As part of the individual plant monitoring program established in 2016, a total of 17 *Stenanthemum newbeyi* (P3) individuals occurring within the eleven permanent monitoring plots were selected for annual assessment. In November 2025 only 14 of the 17 plants were found and assessed (Table 5), with three plants having likely died. Plant health, evidence of dust and index of chlorophyll fluorescence were assessed for all 14 plants using the methods described in sections 4.2 to 4.4.

Table 5 Overview of monitoring program for *Stenanthemum newbeyi*.

Plot Location	Plot Number	No. Plants
Near mining	14	2
	21	3
Control	24	4
	23	5

4.6 Introduced Flora

Monitoring of introduced flora was conducted by recording the percentage foliar cover for all introduced flora species occurring within each of the eleven monitoring plots.

4.7 2025 Monitoring Timing

The 2025 monitoring program was conducted by Principal Botanists Dr Darren Brearley and Dr Jerome Bull and Ecologist Mr Thomas Mott between the 18th and 19th of November 2025.

5.0 Results

5.1 Vegetation Condition

In November 2025 vegetation condition was rated as pristine for one monitoring plot, excellent for eight monitoring plots, and very good for two monitoring plots (Table 6). Analysis of data confirmed an increase in vegetation condition for the near mining and control plots between 2024 to 2025, with condition improving for nine of the eleven plots from very good to either excellent or pristine.

Comparison between the baseline and 2025 monitoring events showed that condition at eight plots remained stable (excellent), one plot improved from excellent to pristine, and two plots declined from excellent to very good (Table 6).

In 2025 vegetation condition within the five control plots ranged from pristine to excellent, with condition at the six near mining plots ranging from excellent to very good (Table 6).

Table 6 Vegetation condition within plots monitored in 2016, 2024 and 2025.

Plot Number	Vegetation Condition		
	2016	2024	2025
JB9 (Near Mining)	Excellent	Very Good	Excellent
JB10 (Near Mining)	Excellent	Very Good	Very Good
JB14 (Near Mining)	Excellent	Very Good	Excellent
JB21 (Near Mining)	Excellent	Very Good	Excellent
JB28 (Near Mining)	Excellent	Very Good	Very Good
JB30 (Near Mining)	Excellent	Very Good	Excellent
JB23 (Control)	Excellent	Very Good	Pristine
JB24 (Control)	Excellent	Very Good	Excellent
JB29 (Control)	Excellent	Very Good	Excellent
JB31 (Control)	Excellent	Very Good	Excellent
JB32 (Control)	Excellent	Very Good	Excellent

5.2 Individual Species

A total of 85 plants (43 individuals in the near mining and 42 individuals in the control plots) were assessed for plant health in November 2025, defined by the % of alive foliage. Raw data for the November 2025 monitoring program is provided in Appendix 2.

5.2.1 Plant Health

Two plants were recorded as being dead in the 2025 assessment: one *Allocasuarina acutivalis* plant occurring in Plot 23 (ID 10) within *Acacia collegialis* Shrubland (AmjS) was recorded as having recently died, and one long dead plant that could not be positively identified in Plot 14 (ID 4) within *Eucalyptus corrugata* Woodland (EcW) was long dead.

In November 2025 there was a higher proportion of healthy plants recorded within the near mining plots compared to the control plots for all three dominant vegetation types where monitoring occurred (Table 7, Figure 5). There was also a higher proportion of healthy plants

recorded within the near mining plots in 2025 compared to the baseline assessment, but a lower proportion of healthy plants recorded in the control plots compared to the baseline assessment for two of the three dominant vegetation types (Table 7, Figure 5).

Table 7 Summary of plant health in 2024 and 2025 compared to the baseline assessment.

Vegetation Type	Status at November 2025	Change since 2024	Comparison between baseline and 2025
EcW	87% of plants within the near mining plots were healthy 69% of plants within the control plots were healthy	Increase in the proportion of healthy plants in the near mining plots Decrease in the proportion of healthy plants in the control plots	Near mining plots: similar proportion of healthy plants and no very stressed plants Control plots: proportion of healthy plants increased from 60% to 69%
AmjS	79% of plants within the near mining plots were healthy 67% of plants within the control plots were healthy	Increase in the proportion of healthy plants in the near mining plots Decrease in the proportion of healthy plants in the control plots	Near mining plots: higher proportion of healthy plants in 2025 (79%) compared to baseline (60%) Control plots: Lower proportion of healthy plants in 2025 (67%) compared to the baseline assessment (82%)
AeS	67% of plants within the near mining plots were healthy 50% of plants within the control plots were healthy NOTE: One plant dead and two plants very stressed in the control plots	Decrease in the proportion of healthy plants in the near mining plots and control plots	Near mining plots: Similar proportion of healthy plants in baseline and 2025 assessments Control plots: the proportion of healthy plants has decreased from 100% in the baseline to 50% in 2025

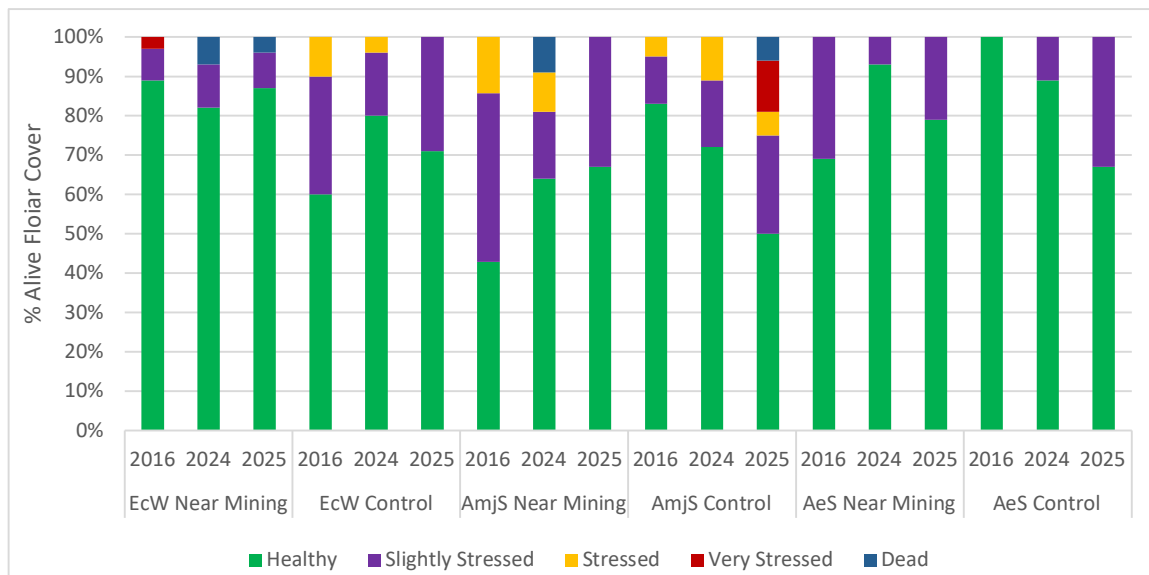


Figure 5 Health status of tagged individuals for 2016 (baseline), 2024 (previous year) and 2025 (current year).

5.2.2 Dust Monitoring

In 2025, three (out of 43) tagged plants in the near mining plots (7%) and two plants (out of 42) in the control plots (5%) were assessed as having 'slight dust' loads, while the remaining plants showed no visual evidence of dust on the leaves. This represented a minor increase from 2024 when none of the tagged plants showed visual evidence of dust (Figure 6). In comparison, the 2016 baseline assessment recorded 24% (12 individuals) of plants exhibiting visual evidence of 'slight dust' on the leaves in the near mining plots, and corresponding 34% of plants with slight dust deposition in the control plots (Figure 6).

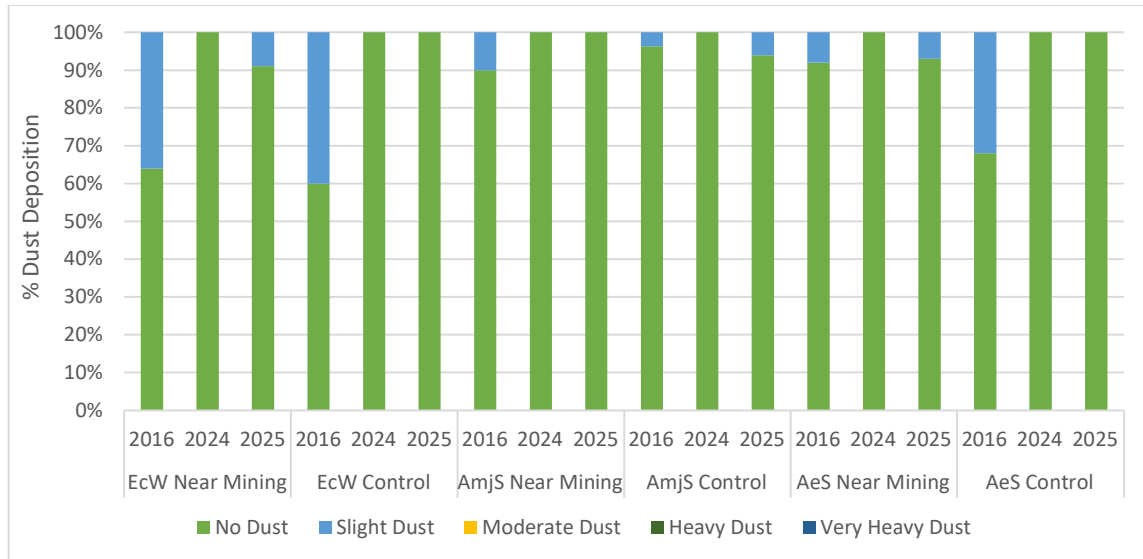


Figure 6 Dust deposition recorded on tagged individuals in 2016, 2024 and 2025.

5.2.3 Chlorophyll Fluorescence

The index of CF has been included as a monitoring parameter since 2017. In November 2025 the levels of chlorophyll fluorescence were higher than recorded during the baseline assessment for all eleven plots distributed across the three vegetation types and including near mining and control locations (Figure 7). The index of CF across all the plots in 2025 ranged from 0.76 to 0.81 (averaged 0.78) which is towards the upper end of the healthy range and confirms that plants within the near mining plots were not impacted by mining.

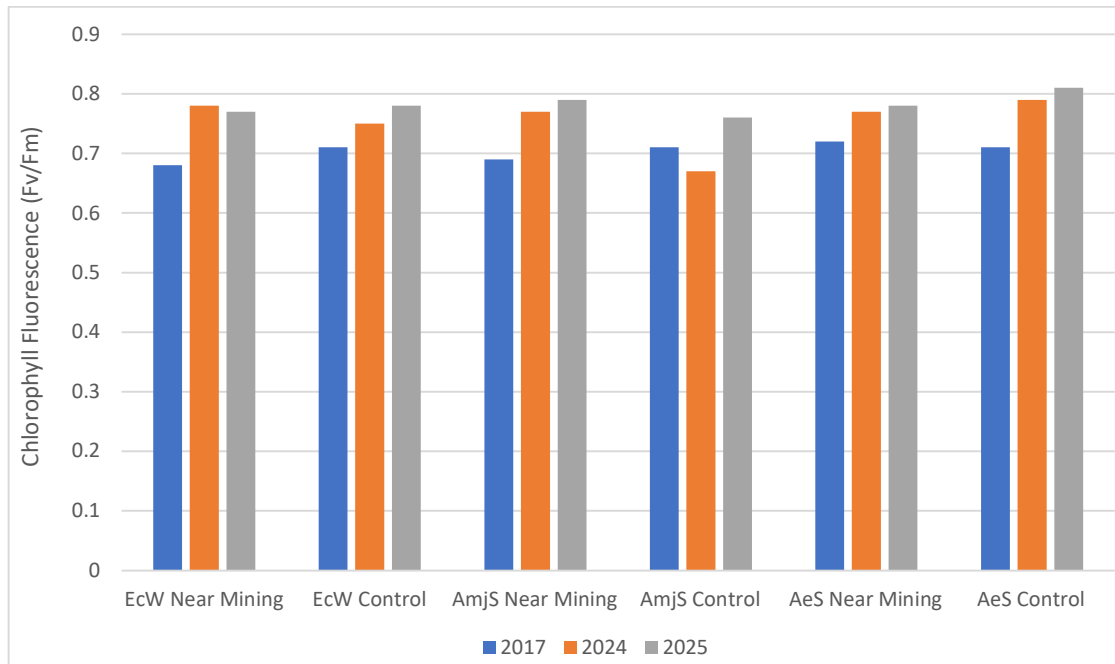


Figure 7 Chlorophyll fluorescence assessment for 2017, 2024 and 2025.

5.3 *Stenanthemum newbeyi*

5.3.1 Plant Health

A total of 17 individuals of *Stenanthemum newbeyi* were permanently tagged for long term monitoring during the 2016 baseline assessment, including eight plants within the near mining plots and nine plants within the control plots. One plant within near mining plot 21 was reported as being dead in 2023 and excluded from the analysis. In 2025 five plants were found and assessed within the near mining plots (two additional plants could not be relocated), while all nine plants within the control plots were re-assessed. Raw data for the November 2025 monitoring program is provided in Appendix 3.

For the near mining plots the proportion of healthy plants recorded in 2025 was similar to the 2016 baseline assessment (40% and 42% respectively). There was a lower proportion of slightly stressed plants recorded in 2025, but higher proportions of stressed and very stressed plants (Figure 8). The control plots recorded a decrease in the proportion of healthy plants in 2025 (22%) compared to the 2016 baseline assessment (67%), and a corresponding increase in the proportion of slightly stressed and very stressed plants (Figure 8).

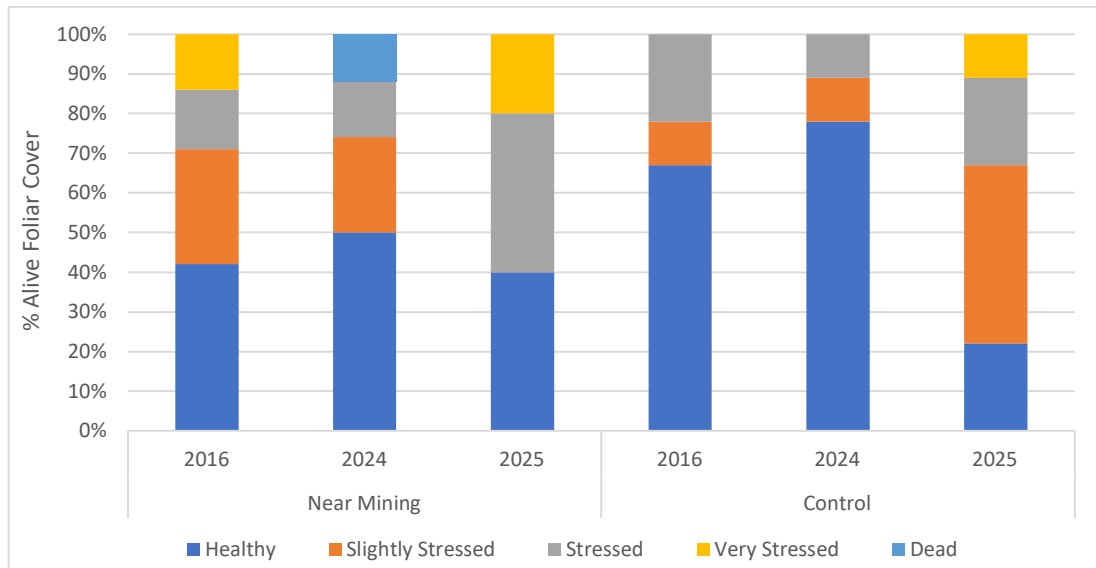


Figure 8 Condition rating for tagged *Stenanthemum newbeyi* individuals monitored in 2016 (baseline), 2024 (previous monitoring) and 2025 (current monitoring).

5.3.2 Dust

In November 2025 there was a lower proportion of *Stenanthemum newbeyi* plants within the near mining plots with 'slight dust' on the leaves (20%) compared to the 2016 baseline assessment (29%). For the control plots 100% of plants assessed in 2025 showed no evidence of dust which compared favorably to the 2016 baseline where 100% of the plants showed visual evidence of slight dust (Figure 9). None of the plants assessed within the near mining plots or control plots in 2016, 2024 or 2025 had moderate, heavy or very heavy dust loads.

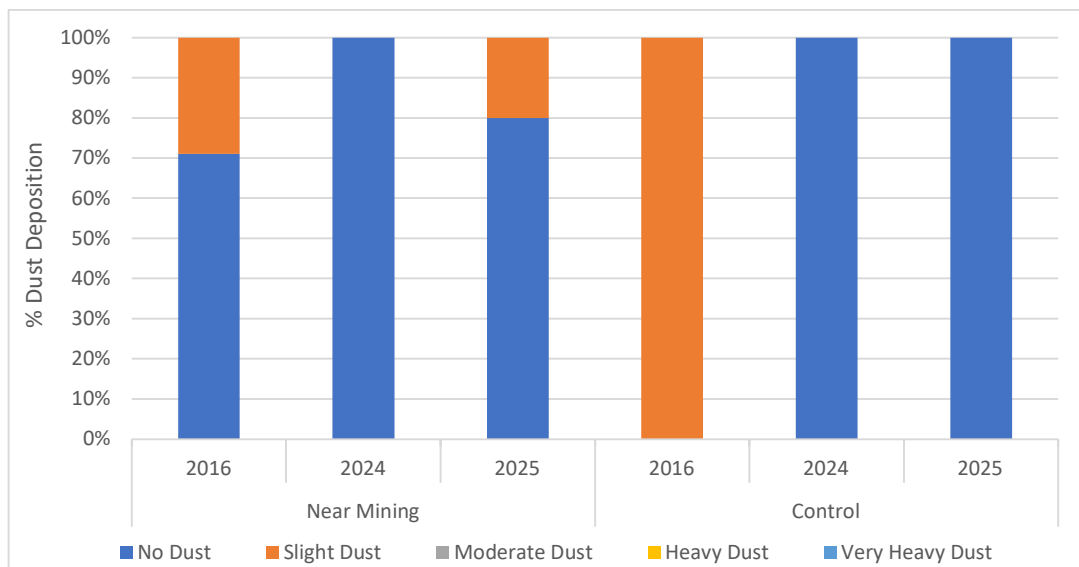


Figure 9 Dust rating of tagged *Stenanthemum newbeyi* individuals monitored in 2016 (baseline), 2024 (previous monitoring) and 2025 (current monitoring).

5.3.3 Chlorophyll Fluorescence

The average chlorophyll fluorescence index for *Stenanthemum newbeyi* plants was higher for near mining plots and control plots in 2025 compared to the first assessment undertaken in 2017 (baseline).

In November 2025 the chlorophyll fluorescence index was higher for plants located within the near mining plots (mean 0.81) compared to control plots (mean 0.74). The same trend was recorded for the 2024 assessment (Figure 10).

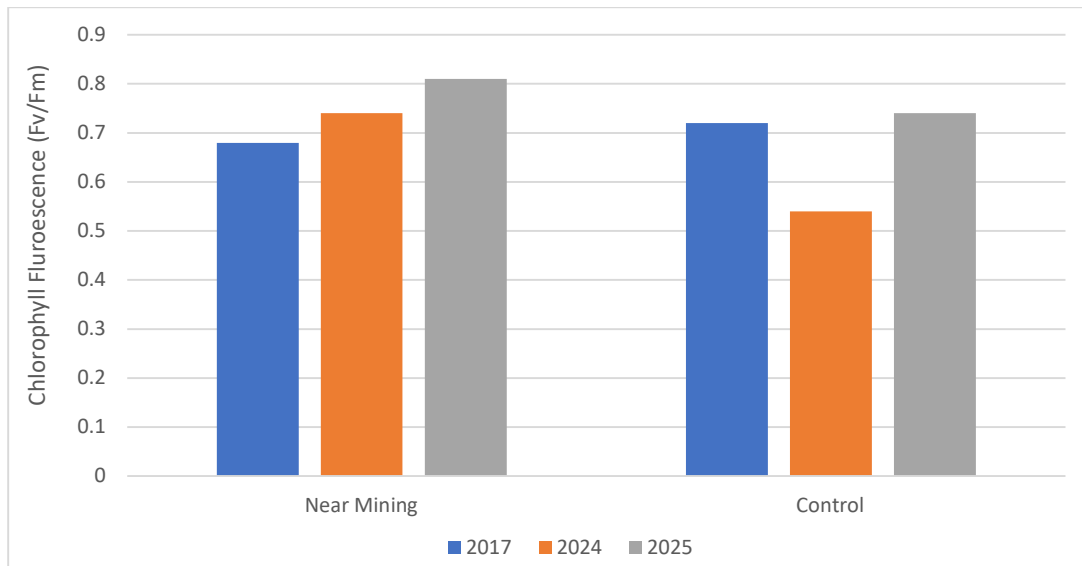


Figure 10 Chlorophyll fluorescence index (Fv/Fm) of tagged *Stenanthemum newbeyi* individuals monitored in 2017 (baseline), 2024 (previous monitoring) and 2025 (current monitoring).

5.4 Introduced Species

There were no introduced plant species (weeds) recorded from the eleven monitoring plots in November 2025.

6.0 Discussion

6.1 Vegetation Condition

Vegetation condition was assessed as being excellent for all eleven monitoring plots during the 2016 baseline monitoring event. In November 2025 vegetation condition remained stable or improved at nine of the eleven plots assessed. For the remaining two plots (JB28 and JB10) vegetation condition declined by one level to a rating of very good due to minor edge effects from the nearby haul road (26 m from JB28) and infrastructure corridor (56 m from JB10).

6.2 Individual Species Monitoring

The proportion of healthy plants recorded from near mining plots in November 2025 was higher compared to the control plots, and also higher compared to the 2016 baseline assessment. This confirmed that plant health for key structural plant species had not been impacted by mining activities at Mt Jackson J1.

Dust deposition was lower at the near mining plots and control plots in November 2025 compared to the 2016 baseline assessment. The dust load recorded in November 2025 was very minimal, impacted a small proportion of the sample population, and was not expected to adversely affect plant physiology.

Chlorophyll fluorescence was higher for the near mining and control plots in November 2025 compared to the 2016 baseline assessment, confirming that plants were under lower stress in 2025.

6.3 *Stenanthemum newbeyi*

Monitoring of the Priority 3 flora taxon *Stenanthemum newbeyi* confirmed the proportion of healthy plants and plants with 'slight dust' occurring on the leaves, and the average chlorophyll fluorescence index were all stable or showed a favorable trend for near mining plots in 2025 compared to the 2016 baseline assessment. It was concluded that mining operations at Mt Jackson J1 had not impacted plant health within the local population of *Stenanthemum newbeyi*.

7.0 References

- Berryman, E.J., Cleaver, A., Martineau, C., Fenton, N.J., Zagrtednov, N.R. and P. Huntsman (2024). Capture and characterization of fugitive mine dust around an open pit gold mine in Québec, Canada. *Applied Geochemistry*. 171. 106099 <https://doi.org/10.1016/j.apgeochem.2024.106099>
- BoM (2025). Southern Cross Airfield climate data. <http://www.bom.gov.au/climate/data/>.
- Cowan, M., Graham, G. and N. McKenzie (2001). Coolgardie 2 (COO2—Southern Cross subregion). In: May,
- DoEE (2016). Maps: Australia's bioregions (IBRA). Department of the Environment and Energy, Canberra, ACT. Available at: <http://www.environment.gov.au/topics/land/national-reserve-system/science-maps-and-data/australias-bioregions-ibra>.
- Gallager, R.V., Allen, S. and I. J Wright (2019). Safety margins and adaptive capacity of vegetation to climate change. *Scientific Reports*. 9(1). <https://doi.org/10.1038/s41598-019-44483-x>.
- Hansatech (2006). Handy PEA, Pocket PEA and PEA Plus Software. Hansatech Instruments Ltd. Version 1.0, December 2006.
- Hughes, L. (2003). Climate change and Australia: Trends, projections and impacts. *Austral Ecology* 28: 423-443
- Johnson, M. A. (2000). Chlorophyll Fluorescence - a practical guide. *Journal of Experimental Botany* 51: 659-668.
- Keighery, B. J. (1994). Bushland plant survey: a guide to plant community survey for the community. Wildflower Society of WA (Inc.), Nedlands, WA.
- Lawson, M. A. (2013). Chlorophyll fluorescence analysis: a guide to good practice and understanding some new application. *Journal of Experimental Botany* 64: 215.
- Lindenmayer, D.B. and G.E. Likens (2010). *Effective Ecological Monitoring* CSIRO Publishing, Collingwood, Australia.
- May, J. E. and McKenzie, N. L. (2003). A biodiversity audit of Western Australia's 53 biogeographical subregions in 2002. Department of Conservation and Land Management, Perth, WA, pp. 143–155.
- MRL (2019). Yilgarn Operations Flora and Vegetation Management Plan, Rev. 1. Prepared by Mineral Resources Limited (MRL) 2019.
- Percival, G. C. (2005). The Use of Chlorophyll fluorescence to identify Chemical and Environmental Stress in Leaf Tissue of Three Oak (*Quercus*) species. *Journal of Arboriculture* 31: 215.
- Phoenix Environmental Sciences (Phoenix) 2024. Annual Mount Jackson J1 flora monitoring and reporting for the Yilgarn Operations Project. Unpublished report prepared for MRL, March 2024.
- Ralph, P. J. (2005). Rapid Light Curves: a powerful tool to assess photosynthesis activity. *Journal of Aquatic Botany* 82: 222-237.
- Ritchie, G. A. (2006). Chlorophyll Fluorescence: What is it and What do the numbers mean?

Zhori, A., Meco, M., Brand, H, and R. Bachofen (2015). In situ chlorophyll fluorescence kinetics as a tool to quantify effects on photosynthesis in *Euphorbia cyparissias* by a parasitic infection of the rust fungus *Uromyces pisi*. *BMC Research Notes* 8:698. DOI 10.1186/s13104-015-1681-z.

APPENDIX 1

Location of Mt Jackson 1 (J1) biodiversity monitoring plots

Monitoring Plot	Proximity to Mine	Easting	Northing
JB9	Near Mining	707906	6654277
JB10	Near Mining	707945	6654216
JB14	Near Mining	709299	6654156
JB21	Near Mining	709277	6653926
JB28	Near Mining	707720	6654042
JB30	Near Mining	707183	6654597
JB23	Control	708410	6653743
JB24	Control	708418	6653824
JB29	Control	707734	6654113
JB31	Control	707171	6654739
JB32	Control	709407	6653162

APPENDIX 2

Raw data recorded in November 2025 for individual species at the Mt Jackson 1 (J1) biodiversity monitoring plots

Plot ID No.	Date	Recorder	Plant ID No.	Taxon	% Plant Alive	Leaf Surface Dust (%)	Chlor Fluor PEA
9	18/11/2025	JB/TM	3	Teucrium disjunctum	100	0	0.77
9	18/11/2025	JB/TM	4	Teucrium disjunctum	95	1	0.78
9	18/11/2025	JB/TM	6	Eucalyptus corrugata	95	0	0.82
9	18/11/2025	JB/TM	7	Acacia acuminata	95	0	0.80
9	18/11/2025	JB/TM	8	Acacia acuminata	95	0	0.64
9	18/11/2025	JB/TM	9	Acacia acuminata	90	0	0.74
9	18/11/2025	JB/TM	10	Eucalyptus loxophelba	90	0	0.82
9	18/11/2025	JB/TM	NP	Eucalyptus corrugata	95	0	NR
10	18/11/2025	JB/TM	1	Teucrium disjunctum	80	1	0.71
10	18/11/2025	JB/TM	2	Olearia muelleri	85	0	0.61
10	18/11/2025	JB/TM	3	Olearia muelleri	95	0	0.80
10	18/11/2025	JB/TM	4	Eucalyptus loxophelba	90	0	0.85
10	18/11/2025	JB/TM	5	Eucalyptus loxophelba	90	0	0.84
10	18/11/2025	JB/TM	6	Eucalyptus loxophelba	85	0	0.84
10	18/11/2025	JB/TM	7	Acacia acuminata	95	0	0.76
10	18/11/2025	JB/TM	8	Acacia acuminata	95	0	0.79
14	19/11/2025	JB/TM	4	Long dead'	-	-	NR
14	19/11/2025	JB/TM	5	Acacia collegialis	90	0	0.75
14	19/11/2025	JB/TM	7	Philotheca brucei	65	0	0.74
14	19/11/2025	JB/TM	8	Philotheca brucei	95	0	0.79
14	19/11/2025	JB/TM	9	Acacia collegialis	80	0	0.75
14	19/11/2025	JB/TM	NP	Philotheca brucei	95	0	NR
14	19/11/2025	JB/TM	NP	Philotheca brucei	75	0	NR
21	19/11/2025	JB/TM	6	Acacia collegialis	75	0	0.80
21	19/11/2025	JB/TM	7	Acacia collegialis	100	0	0.76
21	19/11/2025	JB/TM	8	Acacia collegialis	90	0	0.81
21	19/11/2025	JB/TM	9	Philotheca brucei	75	0	0.78
21	19/11/2025	JB/TM	10	Philotheca brucei	90	0	0.81
21	19/11/2025	JB/TM	11	Philotheca brucei	80	0	0.80
23	18/11/2025	JB/TM	1	Philotheca brucei	85	0	0.72
23	18/11/2025	JB/TM	6	Philotheca brucei	75	0	0.74
23	18/11/2025	JB/TM	7	Philotheca brucei	50	1	0.79
23	18/11/2025	JB/TM	8	Philotheca brucei	80	0	0.79
23	18/11/2025	JB/TM	9	Allocasuarina acutivalvis	70	0	0.65
23	18/11/2025	JB/TM	10	Allocasuarina acutivalvis	0	-	NR
23	18/11/2025	JB/TM	11	Allocasuarina acutivalvis	75	0	0.75
23	18/11/2025	JB/TM	NP	Philotheca brucei	90	0	NR
23	18/11/2025	JB/TM	NP	Philotheca brucei	65	0	NR
24	18/11/2025	JB/TM	6	Allocasuarina acutivalvis	60	0	NR
24	18/11/2025	JB/TM	7	Allocasuarina acutivalvis	95	0	0.76
24	18/11/2025	JB/TM	8	Allocasuarina acutivalvis	80	0	0.69
24	18/11/2025	JB/TM	9	Philotheca brucei	90	0	0.76
24	18/11/2025	JB/TM	10	Philotheca brucei	95	0	0.78
24	18/11/2025	JB/TM	11	Philotheca brucei	95	0	0.72
24	18/11/2025	JB/TM	NP	Philotheca brucei	100	0	NR
24	18/11/2025	JB/TM	NP	Allocasuarina acutivalvis	60	0	NR
28	18/11/2025	JB/TM	1	Philotheca brucei	80	0	0.74
28	18/11/2025	JB/TM	2	Philotheca brucei	70	5	0.78
28	18/11/2025	JB/TM	3	Philotheca brucei	60	0	0.76

Plot ID No.	Date	Recorder	Plant ID No.	Taxon	% Plant Alive	Leaf Surface Dust (%)	Chlor Fluor PEA
28	18/11/2025	JB/TM	4	Acacia effusifolia	80	0	0.79
28	18/11/2025	JB/TM	5	Acacia effusifolia	100	0	0.81
28	18/11/2025	JB/TM	6	Acacia effusifolia	95	0	0.83
28	18/11/2025	JB/TM	7	Eucalyptus longissima	85	0	0.83
29	18/11/2025	JB/TM	1	Philotheca brucei	70	0	0.79
29	18/11/2025	JB/TM	2	Eucalyptus longissima	90	0	0.85
29	18/11/2025	JB/TM	3	Eucalyptus longissima	90	0	0.85
29	18/11/2025	JB/TM	4	Acacia acuminata	100	0	0.83
29	18/11/2025	JB/TM	5	Acacia acuminata	90	0	0.81
29	18/11/2025	JB/TM	6	Acacia acuminata	100	0	0.83
29	18/11/2025	JB/TM	7	Philotheca brucei	80	5	0.73
29	18/11/2025	JB/TM	8	Philotheca brucei	70	0	0.79
29	18/11/2025	JB/TM	9	Philotheca brucei	70	0	0.80
30	18/11/2025	JB/TM	1	Philotheca brucei	90	0	0.78
30	18/11/2025	JB/TM	2	Acacia effusifolia	80	0	0.80
30	18/11/2025	JB/TM	3	Acacia effusifolia	70	0	0.80
30	18/11/2025	JB/TM	4	Philotheca brucei	100	0	0.76
30	18/11/2025	JB/TM	5	Philotheca brucei	95	0	0.73
30	18/11/2025	JB/TM	6	Philotheca brucei	90	0	0.74
30	18/11/2025	JB/TM		Philotheca brucei	80	0	0.78
31	18/11/2025	JB/TM	1	Philotheca brucei	80	0	0.74
31	18/11/2025	JB/TM	2	Philotheca brucei	90	0	0.78
31	18/11/2025	JB/TM	3	Philotheca brucei	85	0	0.73
31	18/11/2025	JB/TM	4	^Banksia arborea	90	0	0.77
31	18/11/2025	JB/TM	5	Allocasuarina acutivalvis	10	0	0.82
31	18/11/2025	JB/TM	6	Allocasuarina acutivalvis	95	0	0.77
31	18/11/2025	JB/TM	7	Allocasuarina acutivalvis	10	0	0.78
32	18/11/2025	JB/TM	1	Eucalyptus corrugata	90	0	0.83
32	18/11/2025	JB/TM	2	Eucalyptus corrugata	90	0	0.83
32	18/11/2025	JB/TM	3	Eucalyptus corrugata	90	0	0.82
32	18/11/2025	JB/TM	4	Eremophila oldfieldii	75	0	0.80
32	18/11/2025	JB/TM	5	Eremophila oldfieldii	85	0	0.81
32	18/11/2025	JB/TM	6	Acacia acuminata	60	0	0.81
32	18/11/2025	JB/TM	7	Philotheca brucei	75	0	0.76
32	18/11/2025	JB/TM	8	Philotheca brucei	85	0	0.80
32	18/11/2025	JB/TM	9	Philotheca brucei	90	0	0.79

APPENDIX 3

Raw data recorded in November 2025 for *Stenanthemum newbeyi* plants
within the Mt Jackson 1 (J1) biodiversity monitoring plots

Plot ID No.	Date	Recorder	Plant ID No.	Priority Flora Taxon	% Plant Alive	Leaf Surface Dust (%)	Chlor Fluor PEA
14	19/11/2025	JB/TM	1	Stenanthemum newbeyi	100	0	0.79
14	19/11/2025	JB/TM	2	Stenanthemum newbeyi	85	0	0.83
21	19/11/2025	JB/TM	1	Stenanthemum newbeyi	50	5	0.83
21	19/11/2025	JB/TM	4	Stenanthemum newbeyi	40	0	0.82
21	19/11/2025	JB/TM	5	Stenanthemum newbeyi	5	0	0.77
23	18/11/2025	JB/TM		Stenanthemum newbeyi	50	0	0.82
23	18/11/2025	JB/TM		Stenanthemum newbeyi	30	0	0.76
23	18/11/2025	JB/TM		Stenanthemum newbeyi	20	0	0.68
23	18/11/2025	JB/TM		Stenanthemum newbeyi	55	0	0.7
23	18/11/2025	JB/TM		Stenanthemum newbeyi	65	0	0.78
24	18/11/2025	JB/TM		Stenanthemum newbeyi	85	0	0.76
24	18/11/2025	JB/TM		Stenanthemum newbeyi	75	0	0.69
24	18/11/2025	JB/TM		Stenanthemum newbeyi	70	0	0.79
24	18/11/2025	JB/TM		Stenanthemum newbeyi	80	0	0.72