MALABAR

MAXWELL UNDERGROUND MINE PROJECT

APPENDIX H

Air Quality Review

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29 June 2022

Donna McLaughlin
Health, Safety, Environment and Community Manager
Malabar Resources Limited

RE: Air Quality Assessment – Maxwell Underground Coal Mine Project Modification 2

Dear Donna,

The Maxwell Underground Mine Project (the Project) is an underground coal mining operation owned by Maxwell Ventures (Management) Pty Ltd, a wholly owned subsidiary of Malabar Resources Limited (Malabar). The Project is located in the Upper Hunter Valley of New South Wales (NSW), with the Mine Entry Area (MEA) located approximately 15 kilometres (km) south-southwest of Muswellbrook.

Development Consent SSD 9526 was granted for the Project by the Independent Planning Commission (IPC) on 22 December 2020. Approval was granted under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 10 March 2021 (EPBC 2018/8287). Malabar previously sought to modify Development Consent SSD 9526 under section 4.55(1A) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for a minor extension to the MEA (Modification 1). Modification 1 was approved on 19 November 2021, and EPBC 2018/8287 was varied on 14 December 2021.

A proposed Modification is being sought under section 4.55(2) of the EP&A Act (the Modification). The Modification is located wholly within the approved Development Application Area and would comprise the following components:

- re-orientation of the longwall panels in the Woodlands Hill, Arrowfield and Bowfield Seams resulting in minor increase in the approved underground mining extent;
- reduction in width of some of the longwall panels in the Woodlands Hill Seam, which facilitates earlier commencement of longwall mining;
- repositioning of the upcast ventilation shaft site and associated infrastructure; and
- other minor works and ancillary infrastructure components (e.g. access road and ancillary water management infrastructure for the repositioned ventilation shaft site).

The Modification does not change the total resource extraction and maximum annual production but would result in some minor changes to the timing of run-of-mine (ROM) coal extraction from the Maxwell Underground.

Todoroski Air Sciences completed the Maxwell Project Air Quality and Greenhouse Gas Assessment (AQA) (**Todoroski Air Sciences, 2019**) for the Project Environmental Impacts Statement (EIS).

This report investigates the likely change in dust emissions associated with the Modification relative to the approved Project. The report has been prepared with consideration of the NSW Environment Protection Authority (EPA) *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (**NSW EPA, 2017**).

Key Modification details

Aspects of the Modification with propensity to affect the quantum of dust relative to the approved Project include:

- changes to the ROM coal production schedule; and
- the repositioning of the upcast ventilation shaft site and associated infrastructure (including an access road from the existing MEA).

The revision to the ROM coal production schedule arises due to changes to the forecast mine scheduling that result in a more gradual increase in ROM production in the early years of the mine, reaching the approved peak annual production of 8 million tonnes per annum (Mtpa) later in Year 6. A comparison of the approved project and proposed Modification ROM coal production rate is presented in **Figure 1**.

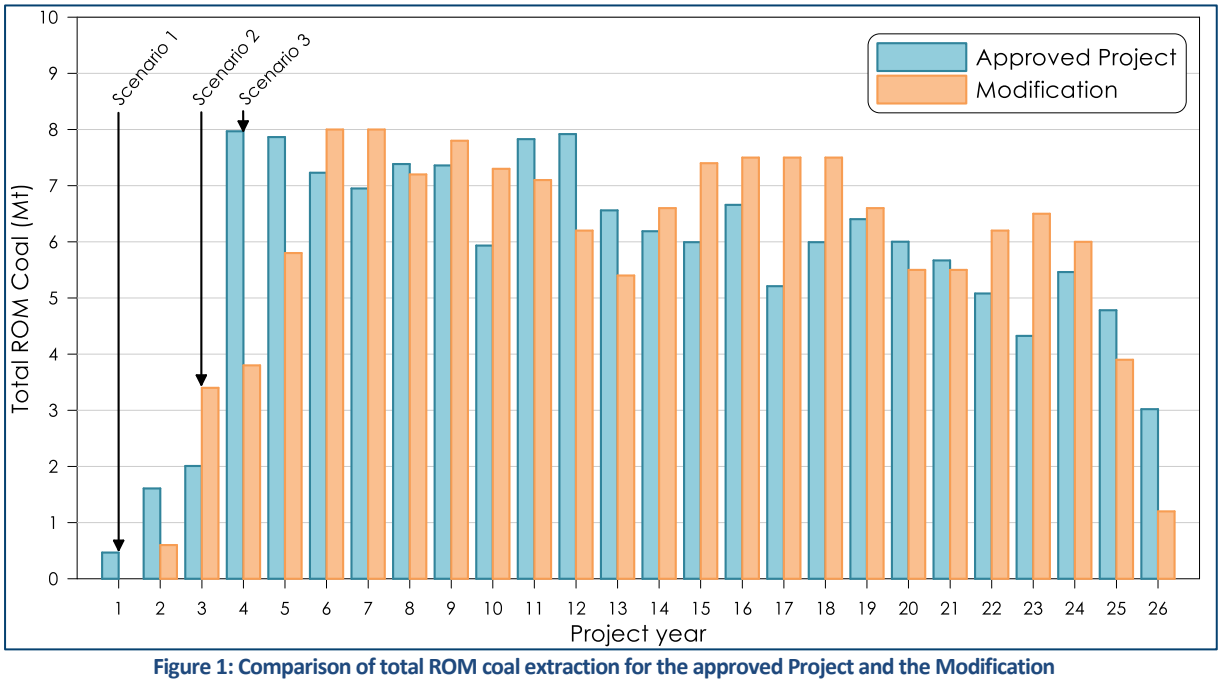

Figure 1: Comparison of total ROM coal extraction for the approved Project and the Modification

The AQA (**Todoroski Air Sciences, 2019**) considered three indicative mine plan years (scenarios) to represent the different stages of construction and operation of the mine. These include mine years 1, 3 and 4 as Scenario 1, 2 and 3, respectively. Scenario 3 represented the maximum approved ROM coal extraction rate.

Based on the proposed Modification schedule there would be a decrease in the ROM production in the early years of the mine life that coincide with the representative mine years selected for Scenario 1 and 3. The maximum annual amount of ROM (8Mtpa) does not change with the proposed revision to the production schedule and has been otherwise assessed in the approved project (i.e. Scenario 3). For Scenario 2, the annual amount of ROM is higher for the Modification compared to the approved Project, 3.4Mtpa vs 2Mtpa.

The mine upcast ventilation shafts servicing the underground mine workings would be relocated to improve efficiencies and air supply. **Figure 2** presents a comparison of the ventilation shaft locations assessed in the approved Project and the Modification.

Figure 2 shows that the location of the Portal Fan for the Modification used in the early years of mining and would only relocate approximately 0.5km to the northwest relative to the location assessed in the AQA and within the approved MEA footprint. For Year 4 onwards, the ventilation shaft is repositioned approximately 1.4km northwest of the approved Project location.

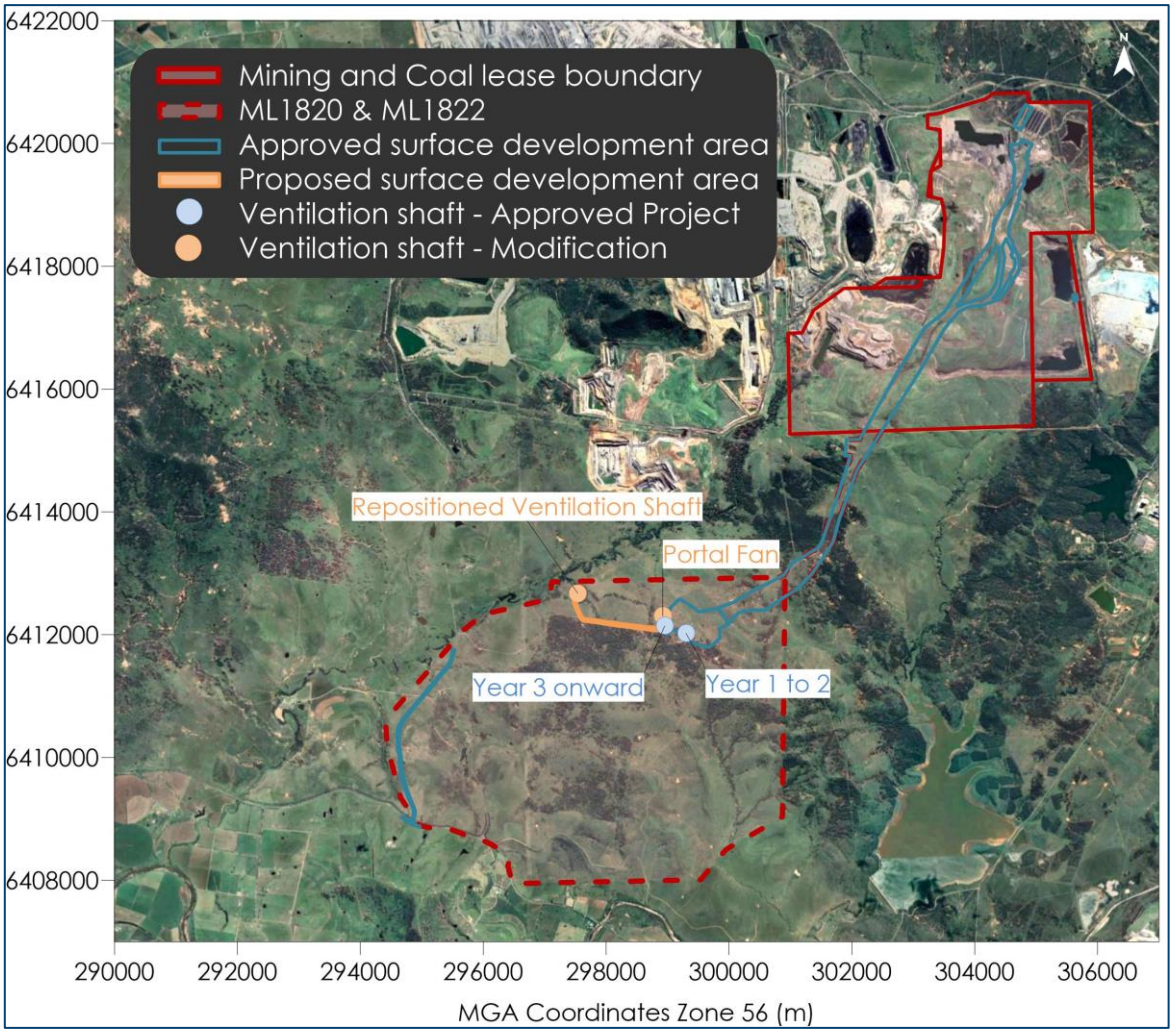

Figure 2: Ventilation shaft locations for the approved Project and the Modification

The ventilation shaft designs have also been modified to allow for improved air flows within the underground workings. **Table 1** presents a comparison of the ventilation shaft parameters for the Modification with the ventilation shaft parameters assessed for the approved Project. The comparison shows the ventilation shafts for the Modification generate less dust emissions in comparison to the approved Project. Consistent with the approved Project, the estimated dust emissions for the ventilation shaft as Total Suspended Particulates (TSP) are greatest for the Modficiation with the Repositioned Ventilation Shaft as the mine reaches and maintains full ROM production.

The Modification also involves the Portal Fan and the Repositioned Ventilation Shaft to operate concurrently for the duration of mining in the Wynot Seam and would occur from Year 4 onwards.

Table 1: Comparison of ventilation shaft parameters for the approved Project and the Modficiation

Parameter	Approved Project		Modification	
Scenario	Year 1 to 2	Year 3 onward	Portal Fan	Reposition Ventilation Shaft
Maximum Release height (m)	10	10	12.9	9.4
Air flow (m^3/s)	400	600	153 to 256	500
Velocity (m/s)	20	20	12.1 to 20.3	21
TSP emissions (kg/yr)	59,477	89,215	23,750 to 38,065	74,346

Note: m = metres, m^3/s = cubic metres per second; m/s = metres per second; kg/yr = kilograms per year.

Table 2 presents a summary of the proposed changes associated with the Modification relative to each of the assessed scenarios of the approved Project.

To assess the aspects of the Modification with the highest propensity for dust emissions relative to the approved project, the ROM production rate for Scenario 2 (which includes concurrent construction and operation) has been modelled with the maximum-case ventilation shaft parameters (i.e. Portal Fan and Repositioned Ventilation Shaft operating from Year 4). Due to the different timing of these aspects of the Modification, the predicted impacts are conservative (i.e. in practice construction is expected to be complete before the repositioned ventilation shaft is operational).

Table 2: Summary of proposed changes associated with the Modification

Aspect		Scenario 1 (Year 1)	Scenario 2 (Year 3)	Scenario 3 (Year 4)
ROM production rate (Mt)	Approved Project	0.5	2.0	8.0
	Modification	0	3.4	3.8
Ventilation shaft - TSP emission rate (kg/year)	Approved Project	59,477	59,477	89,215
	Modification	22,750	38,065	112,411

Modelled values are highlighted in blue

Assessment of potential air quality impacts

The estimated total annual dust emissions for the updated Modification scenario are presented in **Table 3**. The cells highlighted in blue shading indicate the ventilation shaft emissions.

Table 3: Estimated TSP emission rate for the Modification Scenario (kg/year)

Aspect	Activity	Modification
Construction	Excavator loading cut/fill material to haul truck (Transport and Services Corridor)	739
	Hauling cut/fill material to emplacement area (paved)	1,023
	Emplacing cut/fill material at area (Transport and Services Corridor)	739
	Exposed areas (Transport and Services Corridor)	28,850
	Excavator loading cut/fill material to haul truck at Maxwell Infrastructure Area	601
	Hauling cut/fill material to Maxwell Infrastructure emplacement area	252
	Emplacing cut/fill material to Maxwell Infrastructure emplacement area	35
	Hauling cut/fill material from Maxwell Infrastructure to North Void	3,754
	Emplacing Maxwell Infrastructure cut/fill material at North Void	529
	Dozers shaping	30,124
	Exposed areas	5,677
	Diesel Equipment	972
Operation	**MEA**	
	Conveying ROM coal from underground portal	119
	Unloading ROM coal to surge stockpile at the MEA	665
	Dozers on the MEA surge stockpile	72,056
	Loading ROM coal to haul truck	162,629
	Wind erosion from Portal stockpile	573
	Ventilation shaft	112,411*
	Maxwell Infrastructure and Transport and Services Corridor	
	Hauling ROM to hopper	128,360
	Unloading ROM to hopper	24,394
	Rehandle ROM at hopper (50%)	81,315
	Secondary crushing	2,040
	Tertiary screen	3,740
	Transfer station	665
	Unloading to Bypass stockpile	40
	Unloading to Product stockpile	265
	Conveying Product to train load-out facility	33
	Loading coal to train	398
	Wind erosion from ROM stockpile	1,381
	Wind erosion from Product stockpile	8,367
	General	
	Diesel-powered surface fleet	901
	Locomotive idling	515
	Total TSP emissions	**674,163**

Note: Totals may vary slightly due to rounding.

* Portal Fan and repositioned ventilation shaft for Year 4 onwards

In the Modification Scenario, emissions increase due to the additional ROM coal handled in this scenario and emissions associated with the proposed Portal Fan and the Repositioned Ventilation Shaft emissions operating from Year 4.

Dispersion modelling predictions

To investigate the extent of the effects on air quality due to the proposed Modification, air dispersion modelling was performed using the detailed air dispersion model previously developed for the EIS AQA (**Todoroski Air Sciences, 2019**). The model was updated to reflect the proposed features of the Modification, but all other parameters remained constant to allow for a direct comparison with the previous assessment. Full details regarding the air dispersion model development can be found in the EIS AQA (**Todoroski Air Sciences, 2019**).

Table 4 presents a comparison of the highest maximum predicted level at any receptor assessed for the approved Project and the Modification. The results indicate that no exceedances of the relevant criteria are

predicted to arise due to the Modification. The predicted incremental predictions for the Modification are presented in **Figure 3** to **Figure 8**.

The modelling predictions of the Modification Scenario are generally below the maximum predicted level for all scenarios of the approved Project except for the incremental 24-hour average $PM_{2.5}$. The incremental predictions for 24-hour average $PM_{2.5}$ are relatively small with a maximum predicted level at the receptor locations of 0.9µg/m³.

As outlined in the AQA (**Todoroski Air Sciences, 2019**), the 2015 calendar year was selected as the modelling year due to its representativeness of the available long-term datasets (wind speed, wind direction, temperature, humidity, etc.). In 2015, the maximum measured 24-hour average $PM_{2.5}$ level at the Spur Hill air quality monitor in 2015 was 21.4µg/m³ (refer to Table 6-6 of the AQA). Assuming the maximum predicted level of 0.9µg/m³ for the Modification coincides with the maximum measured level for the contemporaneous period, the potential cumulative result would still be below the applicable criteria of 25µg/m³ (i.e. 0.9µg/m³ + 21.4µg/m³ = 22.3µg/m³).

Table 4: Comparison of highest maximum predicted level at any receptor for approved Project and Modification

Pollutant		Period	Criteria	Results per Modelling Scenario – approved project			Modification Scenario
				Scenario 1	Scenario 2	Scenario 3	
$PM_{2.5}$ (µg/m³)	Project in isolation (incremental)	24-hr	25 *	0.7	0.7	0.7	0.9
		Ann. ave.	-	0.1	0.1	0.1	0.1
PM_{10} (µg/m³)		24-hr	50 *	2.9	3.3	6.2	4.3
		Ann. ave.	-	0.4	0.3	0.8	0.4
TSP (µg/m³)		Ann. ave.	-	0.8	0.8	1.7	1.1
DD (g/m²/mth)		Ann. ave.	2	<0.1	<0.1	<0.1	0.02
$PM_{2.5}$ (µg/m³)	Total impact (Cumulative)	Ann. ave.	8	5.4	5.5	5.5	5.5
PM_{10} (µg/m³)		Ann. ave.	25	18.4	18.8	19.5	18.9
TSP (µg/m³)		Ann. ave.	90	43.3	44	45.1	44.1
DD (g/m²/mth)		Ann. ave.	4	1.8	1.8	1.8	1.8

Note: g/m³/mth – grams per metre squared per month; Ann. ave. – annual average; DD – dust deposition

Overall, the modelling indicates the estimated increase in dust emissions due to the Modification is minor and would be unlikely to be discernible beyond the existing approved levels of dust in the area.

Summary and Conclusions

This assessment has examined the potential air quality effects associated with the Modification. Relevant aspects of the Modification include a revision of the ROM coal production schedule and relocation of the upcast ventilation shafts.

Direct modelling of all mining activities including the Modification was conducted and compared with the approved levels in **Todoroski Air Sciences (2019)**.

The comparison shows that the Modification would only have a minor influence in predicted dust levels and that no significant change in dust level at any off-site receptor would occur from the mine as a result of the

Modification. The cumulative levels, including background levels and the emissions from all other mines show no discernible change relative to the approved levels. No additional impacts at any receptor locations due to the Modification are predicted to lead to any new exceedance of any of the relevant air quality criterion.

Please feel free to contact us if you would like to clarify any aspect of this report.

Yours faithfully,
Todoroski Air Sciences

Philip Henschke

References

NSW Environment Protection Authority (2017)
"Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales", January 2017.

Todoroski Air Sciences (2019)
"Maxwell Project Air Quality and Greenhouse Gas Assessment", prepared for Malabar Coal Limited by Todoroski Air Sciences, July 2019.

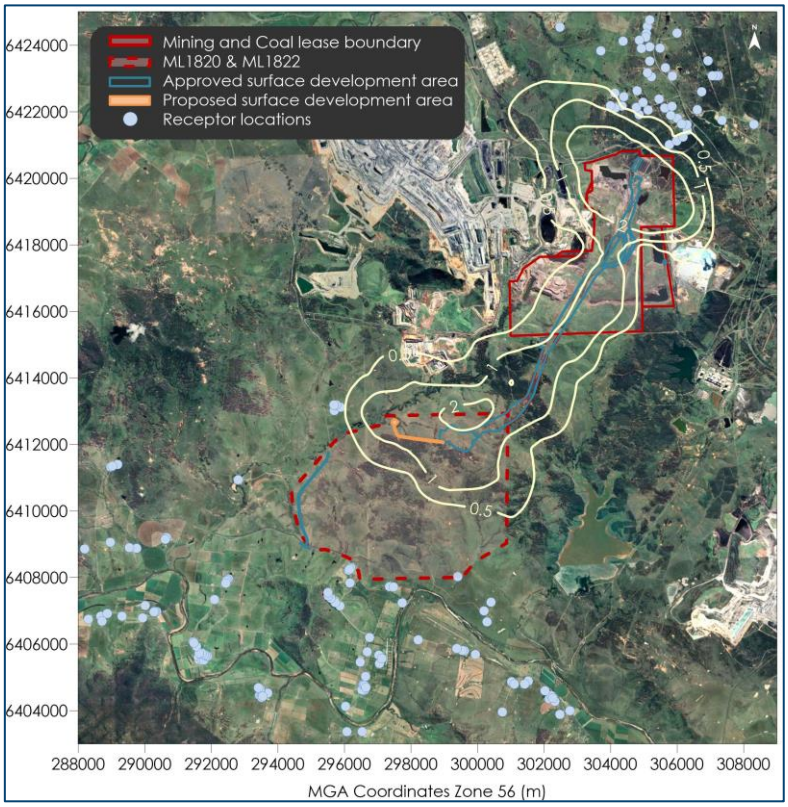

Figure 3: Predicted maximum incremental 24-hour average $PM_{2.5}$ concentrations for the Modification Scenario (µg/m³)

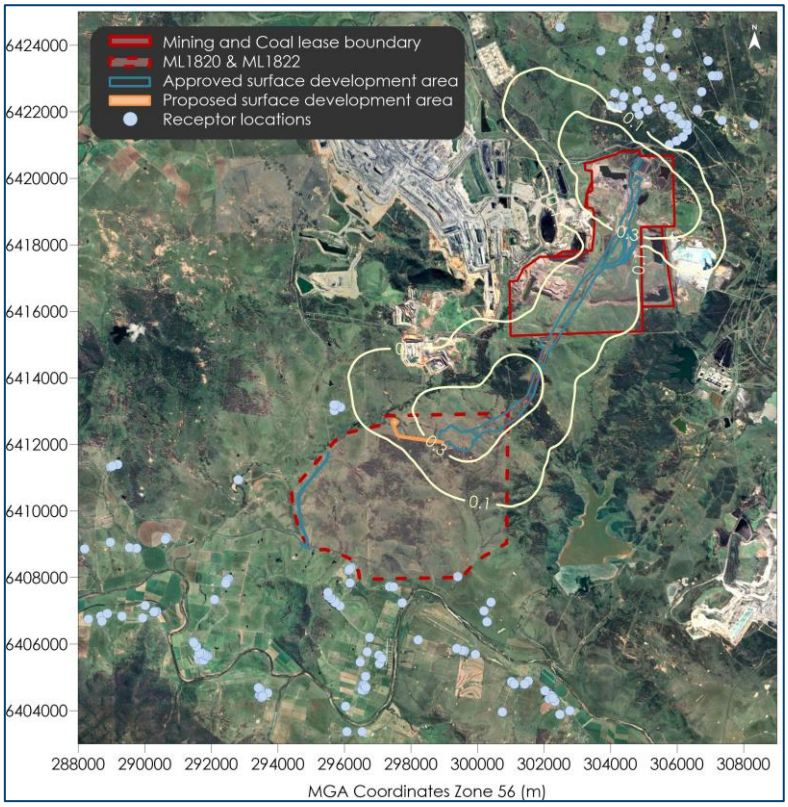

Figure 4: Predicted incremental annual average $PM_{2.5}$ concentrations for the Modification Scenario (µg/m³)

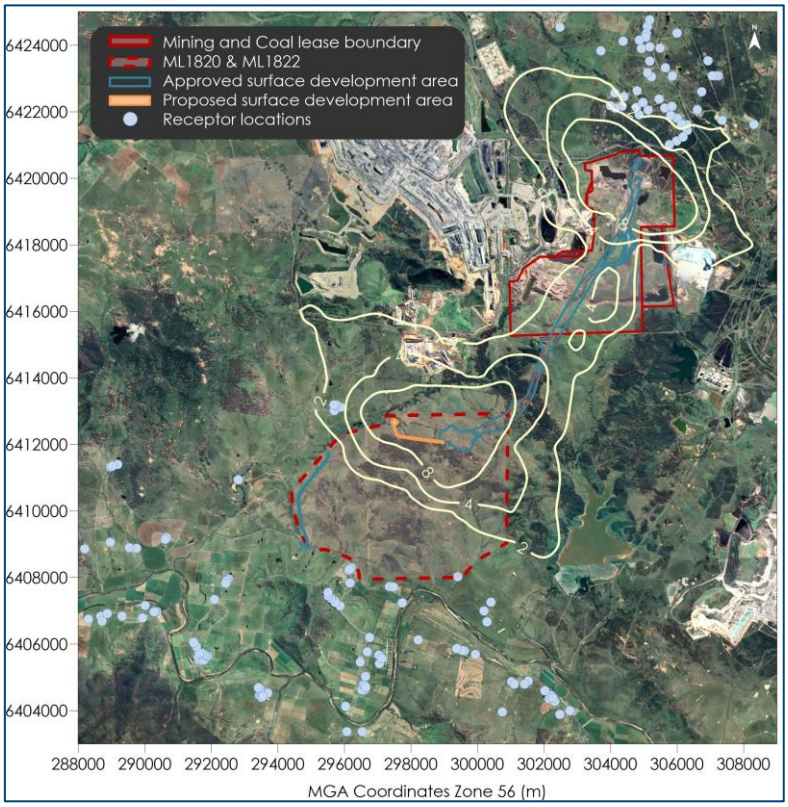

Figure 5: Predicted maximum incremental 24-hour average PM_{10} concentrations for the Modification Scenario (µg/m³)

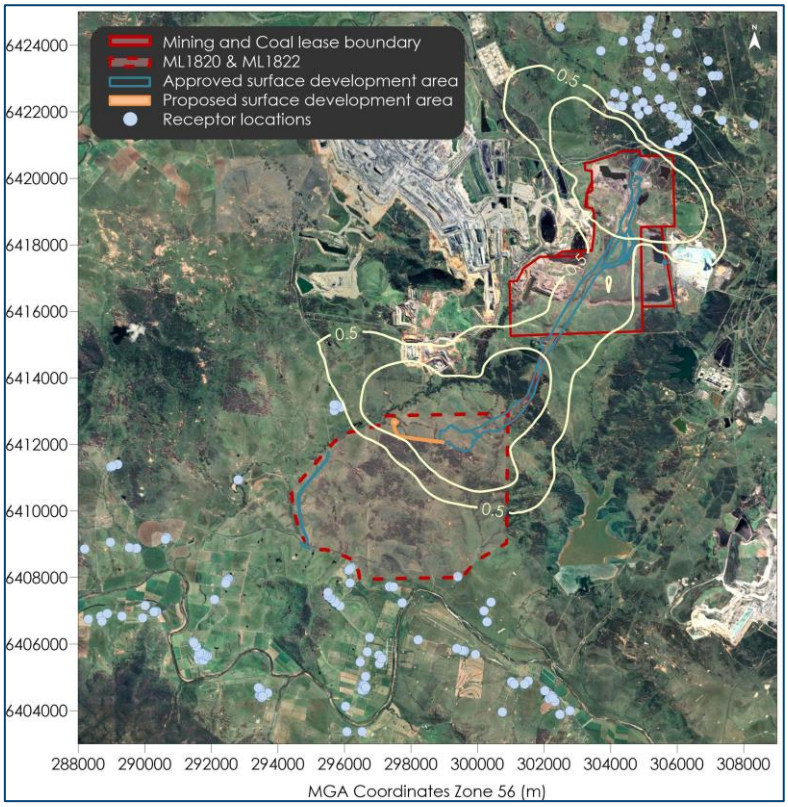

Figure 6: Predicted incremental annual average PM_{10} concentrations for the Modification Scenario (µg/m³)

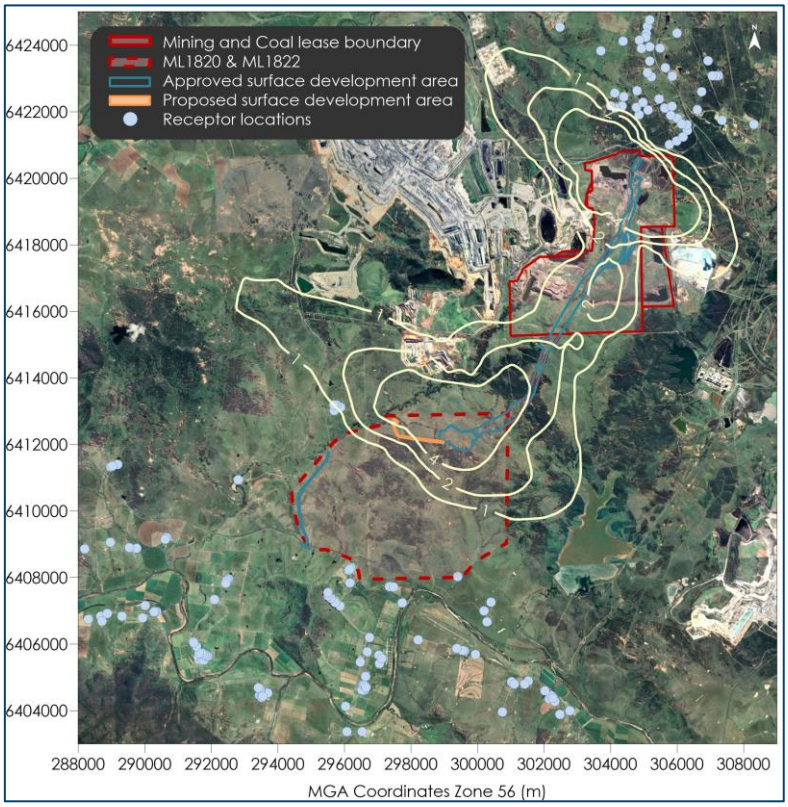

Figure 7: Predicted incremental annual average TSP concentrations for the Modification Scenario (µg/m³)

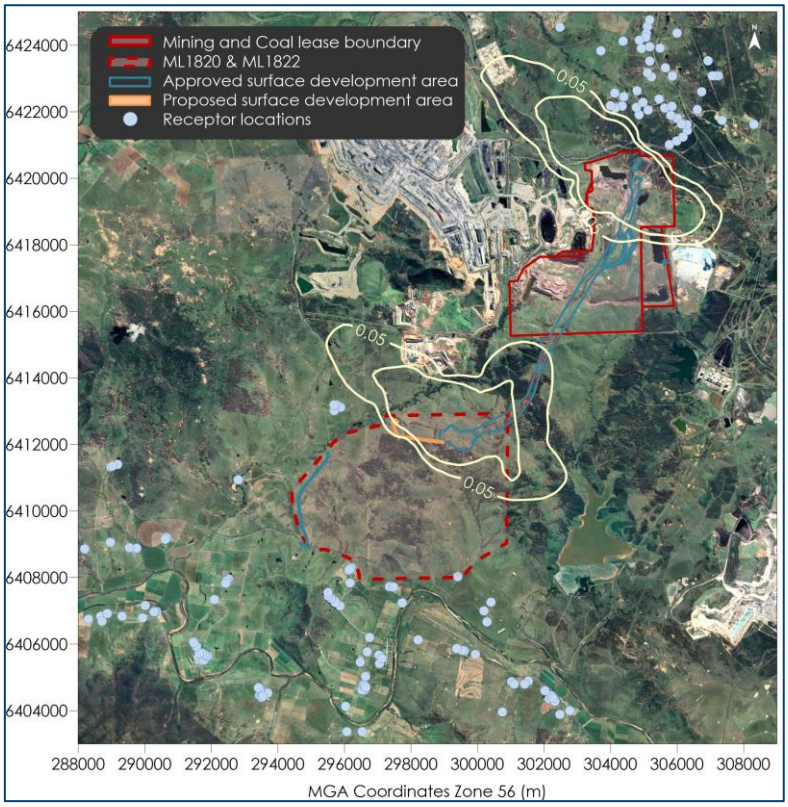

Figure 8: Predicted incremental annual average dust deposition levels for the Modification Scenario (g/m²/month)