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22 December 2021

Mr Joe Fittell
Team Leader
Resource Assessments (Coal & Quarries)
Department of Planning, Industry and Environment

By email c/o sarah.clibborn@planning.nsw.gov.au

RE: MOUNT PLEASANT OPTIMISATION PROJECT – REQUEST FOR INFORMATION

Dear Joe,

Further to the Department of Planning, Infrastructure and Environment (DPIE) request for additional information regarding the Mount Pleasant Optimisation Project (the Project) (letter dated 14 October 2021), please find below and attached MACH Energy's (MACH's) responses to the targeted air quality peer review completed by Jane Barnett of ERM.

Subsequent to receipt of DPIE's request for additional information, MACH and its air quality specialist, Todoroski Air Sciences, met with Jane Barnett and DPIE representatives on 29 November 2021 to discuss the review findings and proposed responses.

Todoroski Air Sciences' responses to the comments raised within the review, and during the meeting on 29 November, are provided as Attachment A.

The responses generally provide clarification of the analysis presented in the *Mount Pleasant Optimisation Project Air Quality Impact Assessment*, such as graphically representing analysis originally described in text.

In addition, additional analysis was conducted regarding the sensitivity of the Project's dispersion modelling results to increased silt content levels, as well as increased residual background $PM_{2.5}$[1] levels. In each case, the analysis indicated that using more conservative assumptions would not change the outcomes of the *Mount Pleasant Optimisation Project Air Quality Impact Assessment*.

Todoroski Air Sciences reiterates that the assumptions used in the *Mount Pleasant Optimisation Project Air Quality Impact Assessment* are justified and that the existing assessment is reliable and appropriate. Thus, Todoroski Air Sciences concludes that no changes to the existing assessment are warranted.

[1] Particulate matter with an equivalent aerodynamic diameter of 2.5 micrometres or less.

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Please feel free to contact me if you require further information.

Yours sincerely,

Chris Lauritzen
General Manager - Resource Development
Mount Pleasant Operation

Enclosed: Attachment A – Responses to ERM Comments

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Attachment A

Responses to ERM Comments

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21 December 2021

Chris Lauritzen
General Manager – Resource Development
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RE: Response to Peer Review – Mount Pleasant Optimisation Project Air Quality Impact Assessment

Dear Chris,

Todoroski Air Sciences has considered the issues identified in the *Peer Review – Air Quality Impact Assessment* (peer review) (**ERM, 2021**) regarding the *Mount Pleasant Optimisation Project Air Quality Impact Assessment* (AQIA) (**Todoroski Air Sciences, 2020**) and the comments made by the reviewer during the teleconference held on 29 November 2021. This letter responds to each issue raised, as listed in Table 3 of the peer review.

Each of the issues identified in Table 3 of the peer review is shown in grey italics and is followed by our response immediately below.

1) *No mention of new NEPM standards - Discussion of new NEPM standards for $PM_{2.5}$ and NO_2 and comparison to predictions.*

The amended National Environment Protection (Ambient Air Quality) Measure (NEPM) came into force on 18 May 2021, well after the AQIA was completed in December 2020. More importantly however, the NEPM goals do not apply to the assessment of projects in general, or this specific Project.

The criteria that apply for assessing this Project remain current and have not changed since the assessment was made. The applicable criteria are set out in the New South Wales (NSW) Voluntary Land Acquisition and Mitigation Policy (VLAMP) and the NSW Environment Protection Authority (NSW EPA) *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (Approved Methods). These criteria were applied in the assessment.

It is noted that the amended standards for $PM_{2.5}$ and NO_2 in the NEPM have not been adopted in the Approved Methods (**NSW EPA, 2017**), and therefore do not apply to the assessment of individual projects in NSW. A comparison of the Project's predicted $PM_{2.5}$ and NO_2 impacts to the amended NEPM standards, which do not apply to such projects, is therefore not warranted.

2) *Clarification of peak activities - Presentation of annual waste and ROM production volumes for the life of the project, in graphical or tabular form, to ensure worst-case years have been evaluated.*

The production schedule showing the volume of material handled in each year for the Mount Pleasant Optimisation Project and selected years for modelling is presented graphically in **Figure 1**.

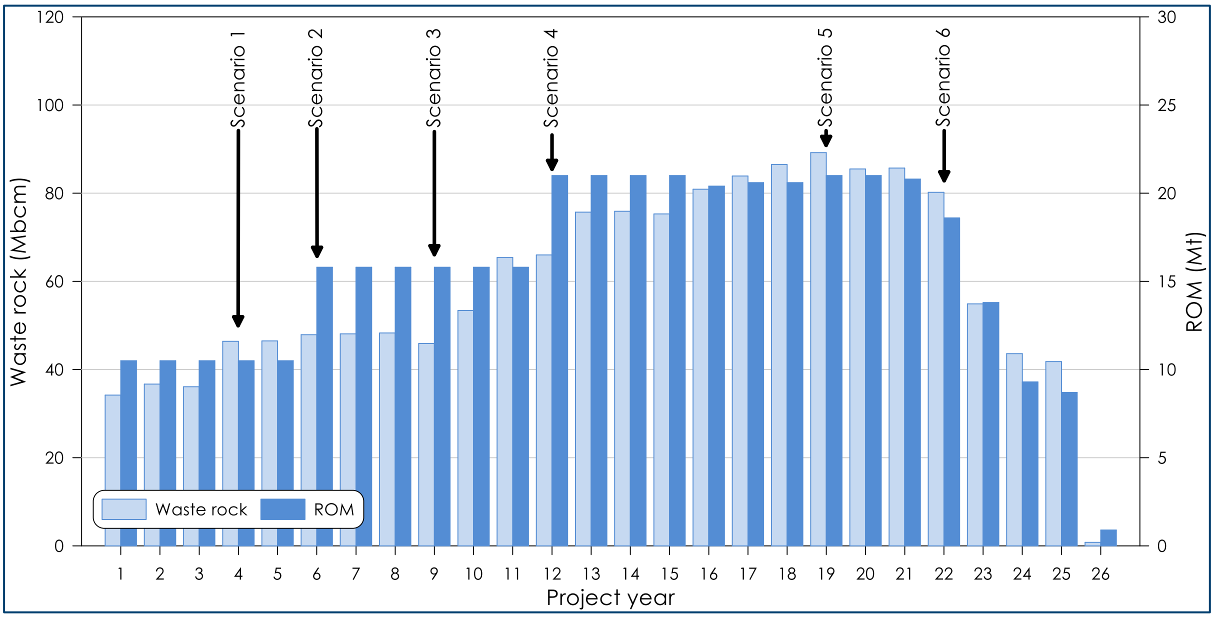

Figure 1: Production schedule for the Mount Pleasant Optimisation Project

The assessed scenarios were chosen to represent potential worst-case air quality impacts over the life of the mine with due consideration of both the quantity of material extracted and handled in each year and also the spatial extent of the mine and its proximity to receptors.

Note that there are more receptors to the east, and mining activities are closest to those receptors in the earlier stages of the project. Thus, more scenarios were examined to cover the spatial effects of the mine progression in these earlier stages. It should also be noted that the Mount Pleasant Operation is already approved to produce up to 10.5 Mtpa of Run-of-Mine (ROM) coal.

3) *Inclusion of pit terrain in CALMET - Clarification of whether pit terrain has been incorporated into the CALMET model for each year. If not, then justification provided as to why not.*

Mine plan terrain <u>was</u> included in the CALMET modelling for each scenario to account for the changing landform as the mine progresses and its effect on the local wind patterns and dispersion of dust.

4) *5-year analysis at Muswellbrook - A 5 year analysis of meteorological data from Muswellbrook should be carried out to confirm 2015 is representative in the Project area.*

A score weighting analysis, per that presented in Appendix B of the AQIA, was performed for meteorological data collected at Muswellbrook for a seven-year period and the results are presented in **Table 1** and presented graphically in **Figure 2**. The score is calculated by multiplying the weighting value (an estimate of the importance of the meteorological parameter to dust dispersion modelling) by how much the parameter in a particular year differs from the average value for that parameter in the long-term data (i.e. the deviation from the mean). Thus, a low score for a parameter indicates the parameter is close to the long-term average for the parameter.

The lowest scoring year is 2015, indicating it is most representative for use in dispersion modelling.

It is noted that during the teleconference held on 29 November 2021, the reviewer acknowledged that 2015 is an appropriate meteorological year to use for the dispersion modelling of the Mount Pleasant Optimisation Project.

Table 1: Score weighting analysis for Muswellbrook

Year	Wind speed	Wind direction	Temperature	Relative humidity	Score
Weighting	2	4	1	1	
2013	0.35	0.22	0.16	0.29	2.02
2014	0.29	0.26	0.17	0.50	2.28
2015	0.30	0.12	0.21	0.65	1.96
2016	0.24	0.35	0.17	0.37	2.40
2017	0.22	0.24	0.19	0.54	2.14
2018	0.57	0.33	0.13	0.45	3.04
2019	0.39	0.35	0.25	0.69	3.11

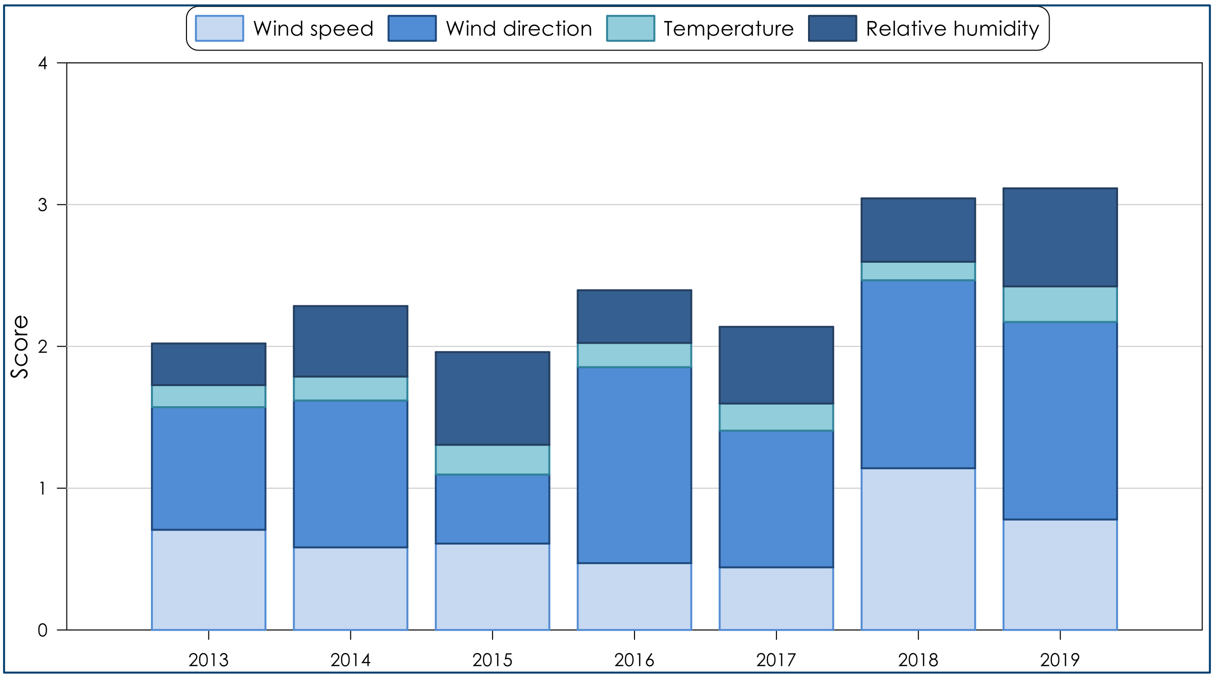

Figure 2: Score weighting analysis for Muswellbrook

5) *Weightings - Provide details on how the weightings and scores were assigned for each parameter, and justify why the $PM_{2.5}$ and PM_{10} weightings are different.*

It is important to note that the Approved Methods does not prescribe any specific test or procedure to follow to determine whether any year of meteorological data is representative of conditions at the site. The Approved Methods allows for the use of 'site-representative' data, which should be:

> *correlated against a longer-duration site-representative meteorological database of at least five years (preferably five consecutive years) to be deemed acceptable. It must be clearly established that the data adequately describes the expected meteorological patterns at the site under investigation (e.g. wind speed, wind direction, ambient temperature, atmospheric stability class, inversion conditions and katabatic drift).*

While no guidance is provided on correlating a year of 'site-representative' data to longer-duration 'site-representative' data, the Approved Methods notes:

> *The most critical parameters are wind direction, which determines the initial direction of transport of pollutants from their sources; wind speed, which dilutes the plume in the direction of transport and determines the travel time from source to receptor; and atmospheric turbulence, which indicates the dispersive ability of the atmosphere.*

The weightings of the different parameters were assigned based on consideration of their relative relevance for the purposes of air dispersion modelling and assessment, consistent with this guidance.

That is, wind direction is considered the most relevant meteorological parameter, because it will dictate the direction of the modelled air pollution. It was therefore assigned the largest weighting value, 4. Wind speed is considered the second most relevant meteorological parameter, as it influences the dispersion of the air pollution (e.g. some sources only emit dust when wind speed is above a threshold value). It was thus assigned a weighting of 2. Temperature and relative humidity, however, have a lower direct effect on the air dispersion modelling results, and were assigned a lower weighting of 1.

Per the EPA Approved Methods, background dust levels are not considered when determining the representative meteorological year. However, for completeness, in this case dust was considered to see whether it was a significant parameter that varies between the selected meteorological year and other years.

For the dust parameters, $PM_{2.5}$ was assigned a weighting of 2, as it is a better indicator of potential health impacts than PM_{10}. Notwithstanding, review of the data indicates 2015 would be the lowest scoring year if PM_{10} and $PM_{2.5}$ were both weighted the same.

A score weighting analysis of meteorological data and particulate matter data from the Muswellbrook monitoring station is presented in **Table 2** and presented graphically in **Figure 3**.

It is noted that during the teleconference held on 29 November 2021, the reviewer acknowledged that 2015 is an appropriate meteorological year to use for the dispersion modelling of the Mount Pleasant Optimisation Project.

Table 2: Score weighting analysis for Muswellbrook (including particulate matter)

Year	Wind speed	Wind direction	Temperature	Relative humidity	PM_{10}	$PM_{2.5}$	Score with dust	Score
Weighting	2	4	1	1	1	2		
2013	0.35	0.22	0.16	0.29	0.96	0.98	4.94	2.02
2014	0.29	0.26	0.17	0.50	0.90	1.01	5.20	2.28
2015	0.30	0.12	0.21	0.65	0.81	0.91	4.59	1.96
2016	0.24	0.35	0.17	0.37	0.81	0.88	4.97	2.40
2017	0.22	0.24	0.19	0.54	0.92	0.98	5.02	2.14
2018	0.57	0.33	0.13	0.45	1.15	0.98	6.15	3.04
2019	0.39	0.35	0.25	0.69	1.45	1.27	7.10	3.11

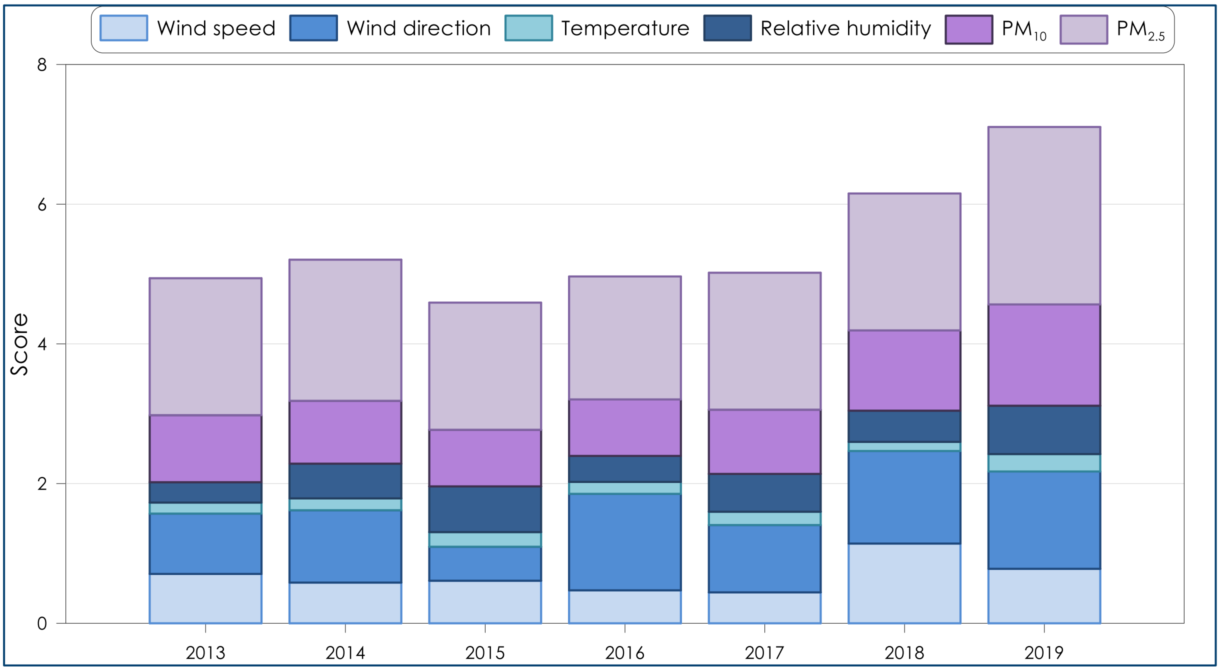

Figure 3: Score weighting analysis for Muswellbrook (including particulate matter)

6) *Use of 2015 - Evidence presented in this report and also the AQIA, suggests that 2015 is not a representative year with respect to air quality. Further justification is needed as to why this year was deemed representative when it demonstrates consistently lower PM_{10} and $PM_{2.5}$ concentrations than other years.*

The meteorological year was selected strictly per the guidelines in the NSW EPA Approved Methods by considering representative meteorological data. Considerations of dust are not related to the selection of the meteorological year in the Approved Methods.

In this case 2015 is the most representative year (even when dust levels are considered).

Note that while 2015 was selected as the most representative meteorological year, the assessment background dust levels were derived based on measured data for the period 2012 to 2015. This is further described in the following response regarding the derivation of background air quality values.

7) *Deviation from the Approved Methods - When deviating from the Approved methods, detailed justification is required for doing so. Provide a detailed description of how each background value was determined, including all assumptions so it can be verified (see below).*

The background levels were determined exactly per the Approved Methods without any deviation. The Approved Methods defines the background level as; *"existing concentrations of pollutants in the ambient air"*, i.e. the pollutants in the ambient air other than those that will be added by the project subject to assessment.

The reviewer appears to be confusing the discussion in the AQIA about the future modelled sub-component of the background levels, rather than the actual background levels.

The future modelled sub-component discussed in the AQIA is the fraction of the observed background level due to other nearby mining activities. It is a significant component of the background level that warrants consideration, as discussed in the report. This sub-component is modelled for future scenarios to correctly account for the progressive movement of other mines over time, and also future changes in the activity rates of other mines.

The other sub-component of the background level is the non-modelled background level and is taken to be the residual dust level due to all other sources in the vicinity of the Project including agricultural activity and natural sources of dust. The residual level is calculated based on modelling predictions of the actual conditions of the operating mines at the time (the predicted or modelled other sources) and subtracting these modelled values from the measured level.

A representation of how the residual dust level and the predicted level relate to the measured background level is shown in **Figure 4** for the Muswellbrook monitor and at DC05 (Mt Arthur). At Muswellbrook, the other mine predictions reduce in the future scenario, as those mines progress away from Muswellbrook, and then the contribution associated with the Project is added to identify the predicted total cumulative impact. Conversely, the other mine predictions at DC05 (Mt Arthur) are shown to increase as the other mines progress towards the west in the future scenario.

Figure 5 presents these graphical representations on a map to assist with comprehension. The map also includes a graphical representation for Aberdeen, that shows in the future scenario the inclusion of Dartbrook Underground Mine, changes to the other mining operations, and the contribution of the Mount Pleasant Optimisation Project, would increase particulate levels to the north.

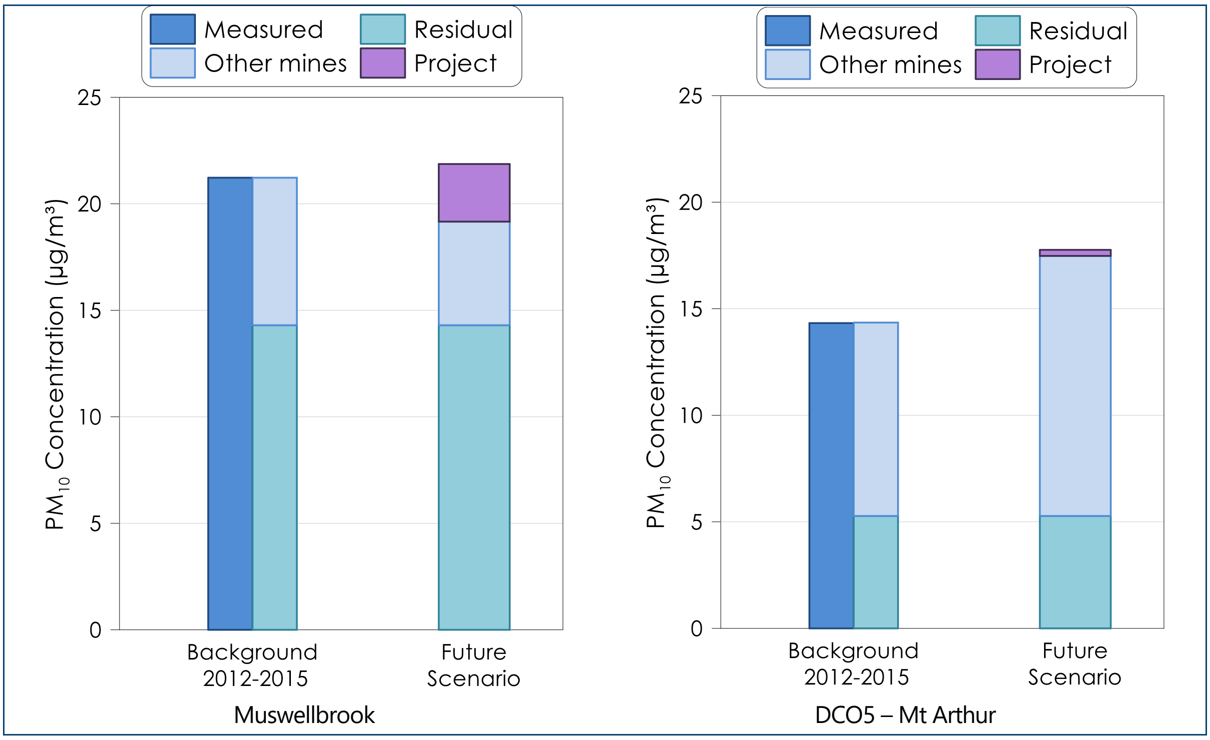

Figure 4: Graphical representation of the measured PM_{10} background level with the modelled predicted and residual level during Scenario 1

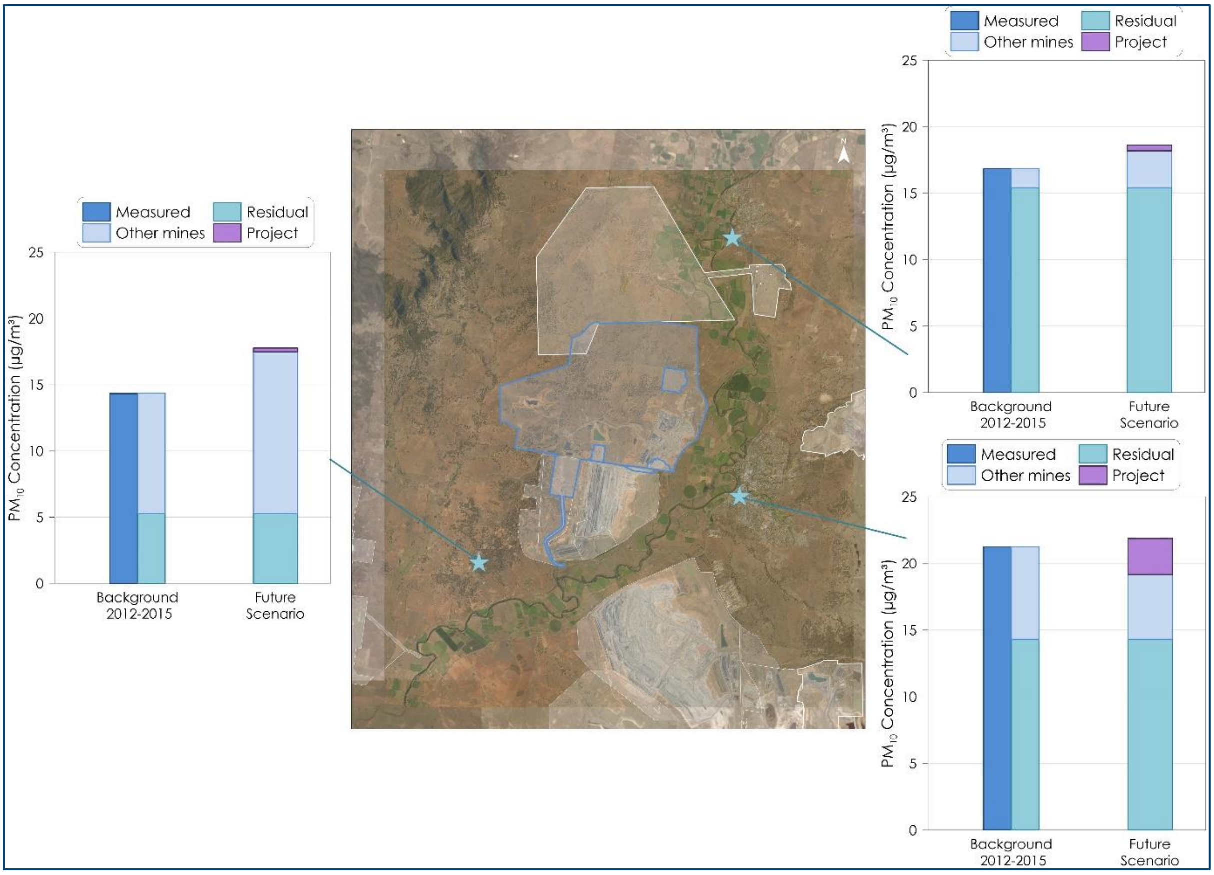

Figure 5: Map showing spatial change in modelled predicted and residual level for PM_{10} during Scenario 1

As described in the AQIA, the residual PM_{10} TSP, and dust deposition level was calculated from the analysis of the 2012-2015 period, and not just a single calendar period. This allows for variability in the predicted contribution from the modelled mining operations as they progress and alter activity rates, and also smooths out inter-annual variations in the background level.

The variation in the background level is typically governed by widespread regional conditions such as the recent drought, dust-storms, bushfires etc. **Figure 6** presents the measured annual average PM_{10} levels for air quality monitors as part of the Upper Hunter Air Quality Monitoring Network (UHAQMN) and also operated by mining operations near Muswellbrook for a 14 year period. The annual average levels typically range from 15-25µg/m^3 in the graph depending on the location of the monitor, with the effect of the drought in recent years apparent. Excluding the 2018/19 bushfire and drought years, and also the big dust-storm year in 2009, one can see that 2015 is not especially low or high in terms of dust levels. For example, nearby mine dust levels (represented by circles) are higher in 2015 than in 2016, 2011, 2010 and 2008.

In any case, the modelling assessment is based on the measured background PM_{10} dust levels between 2012 to 2015. The data used to derive the background levels are presented in **Attachment 1**.

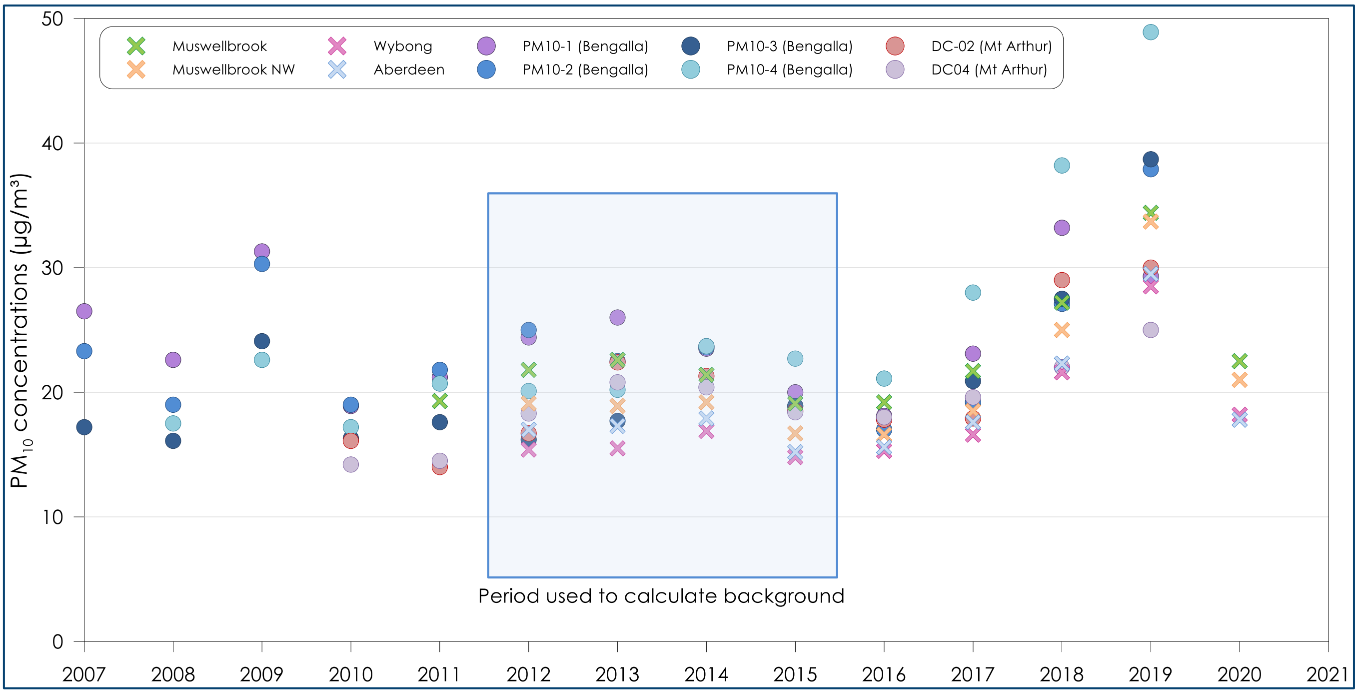

Figure 6: Annual average PM_{10} levels from air quality monitors

> 8) *Lack of detail on how the varying map for PM10 was produced - Provide the values used to calculate the spatially varying map and details on how these were determined, including boundary conditions and data and assumptions used. Provide details (a worked example or flow chart) of how this was applied to the cumulative assessment.*

The values were interpolated using a large number of data measured at a large number of monitoring locations, as set out in the request for clarification to the NSW EPA where full details are provided (**Todoroski Air Sciences, 2021a**). For convenience, this is set out in **Attachment 1**. A flowchart is provided in **Figure 7**.

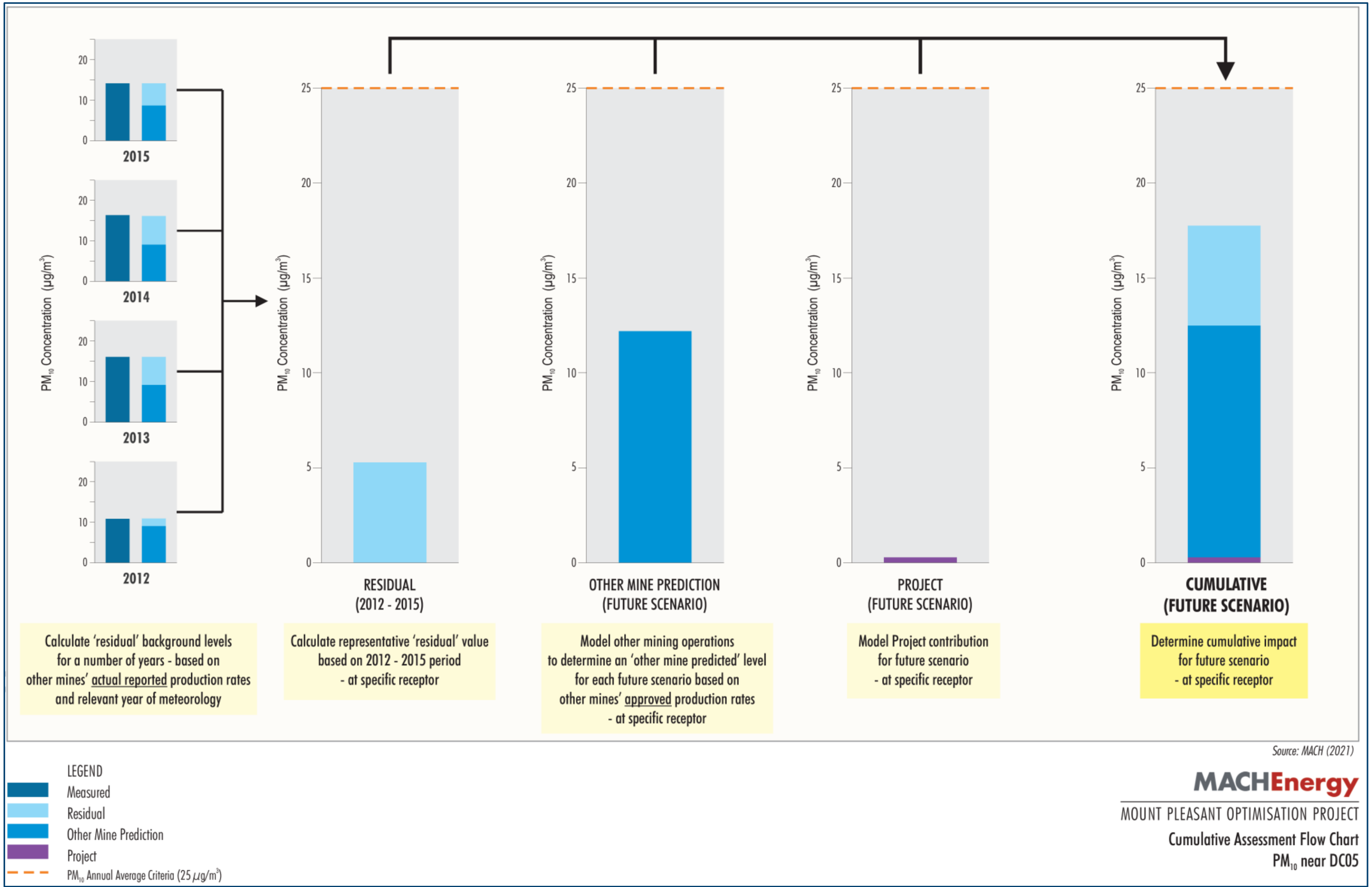

Figure 7: Cumulative assessment flow chart for PM_{10} near DC05

9) *Background estimates for annual $PM_{2.5}$ are unrealistic - Clear and full justification for the use of 2.9 µg/m^3 and 5.4 µg/m^3 for the background value for annual average $PM_{2.5}$, and why this is considered representative. This needs to demonstrate how monitoring data were used to determine these values, and not just a reference to a previous report.*

The reviewer is incorrectly referring to values for just a sub-part of the background, specifically the residual non-modelled component of the background data (i.e. the background data less the modelled sub-fraction). Please see Point 7, which describes that the modelled sub-component is only part of the background data, and the remaining portion is the residual non-modelled component of the background level.

Whilst it is agreed that $PM_{2.5}$ emissions may travel a long distance, in doing so they will disperse and dilute significantly over distance. In general, $PM_{2.5}$ is most closely associated with combustion emissions, including from wood heaters and engine exhausts.

The monitoring data show a decline in $PM_{2.5}$ concentration in the ambient air as one moves away from Muswellbrook, indicating the emissions of many wood heaters in the town cause more annual average impact at a local level than the engines from fewer items of mining equipment spread over a larger area. For example, the measured annual average $PM_{2.5}$ levels nearer to MACH's activities and potentially impacted private receptors are materially lower than the $PM_{2.5}$ levels recorded in the town. A summary of the annual average $PM_{2.5}$ levels (excluding extraordinary events) recorded at monitors near the Project is presented in **Table 3** and shows lower $PM_{2.5}$ levels.

Table 3: Annual average $PM_{2.5}$ levels recorded at monitors near the Project (µg/m³)

Year	Muswellbrook	APF2	APF4	APF5
2018	9.4	6.1	5.3	5.1
2019	9.6	6.4	5.2	5.5
2020	8.6	5.8	5.3	4.6

As noted in the AQIA, the residual background level for rural receptors (2.9µg/m^3) is taken from the cumulative impact assessment of Mt Arthur Coal Mine, Bengalla Mine and Mangoola Coal (**Todoroski Air Sciences, 2014a**), which is based on $PM_{2.5}$ monitoring data from monitoring stations located away from wood heater emissions. These include two $PM_{2.5}$ monitors operated by Mt Arthur Coal Mine and a $PM_{2.5}$ monitor operated by Mangoola Coal. The analysis was conducted for the 2012 period and produces a residual dust level of 2.9µg/m^3, which is applied to reasonably represent the residual levels at the nearest, potentially most-affected locations around the Project in the absence of any mining emissions. Apart from only using one year (which is a limitation of the data available for the AQIA), the methodology is the same as was used to derive the residual background PM_{10} level. A flowchart is provided in **Figure 8**.

This measured data is used directly in the assessment and is precisely reflected in the assessment. The background data in the assessment is made up of two components, the residual levels (the part the reviewer comments on) and the modelled background levels due to all other mines (this part of the background is modelled as it changes over time as the other sources (i.e. mines) increase or decrease activity or move position). The total background level reflects the measured level, both now and in the future, and the predicted levels from the Project are added to it. Thus, all three components (residual background, modelled background and Project contribution) are added to calculate the total cumulative level of impact (refer to **Figure 8**).

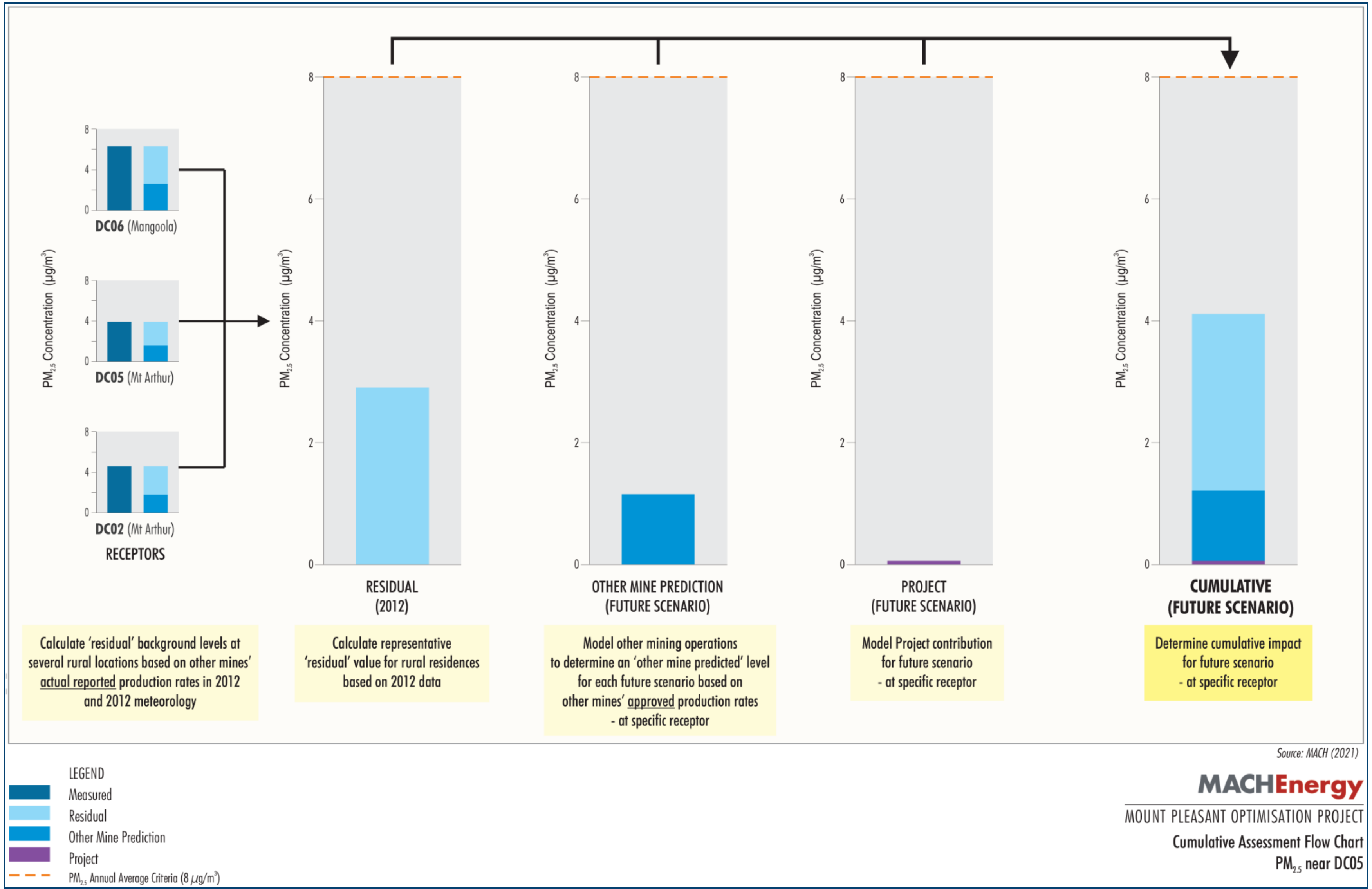

Figure 8: Cumulative assessment flow chart for $PM_{2.5}$ near DC05

The reviewer suggests that the residual background level for rural receptors is too low. However, as the methodology used means the residual background plus existing other mine predicted levels is equal to the measured background level, a lower residual background level is reflective of the fact that the contribution from other mines is overpredicted. When the "other mine predicted" and residual background levels are combined, the total background level would not be underestimated - as the contributions from other mines will continue to be overpredicted in future scenarios.

In consideration of the reviewer's comments regarding stepped difference between the conservative residual level applied for residences on the outskirts of Muswellbrook (5.4µg/m^3) and the residual level considered representative of residences close to mining operations (2.9µg/m^3), the cumulative annual average $PM_{2.5}$ concentration analysis could be refined so there is a more gradual change in residual levels in the transition zone between the two values.

The difference in the average measured annual $PM_{2.5}$ levels at the nearest MACH $PM_{2.5}$ monitor (APF2) (i.e., 6.1µg/m^3) and that at the Muswellbrook monitor (9.2µg/m^3) is a difference of 3.1µg/m^3 and the difference between the APF2 monitor and the APF4 monitor (5.3µg/m^3) is a difference of 0.8µg/m^3. The difference in the estimated residual background levels (i.e., 2.9 vs. 5.4) is 2.5µg/m^3.

The difference in these levels was used to estimate the potential change in residual background $PM_{2.5}$ levels over the distance between the monitors. Assuming a linear change in the annual average $PM_{2.5}$ level between the monitors, at the halfway point between the APF2 and Muswellbrook monitors there would be an increase of 1.55µg/m^3 relative to 6.1µg/m^3, and between the APF2 and APF4 monitors there would be an increase of 0.4µg/m^3 relative to 5.3µg/m^3. For the area between the monitors, residual background levels of 2.9 + 1.55 = 4.5 µg/m^3 and 2.9 + 0.4 = 3.3µg/m^3 were applied.

Thus, the residual background levels in the "transition" zones between the mine and Muswellbrook were conservatively derived based on the differences in recorded levels at MACH's and the Muswellbrook $PM_{2.5}$ monitors. The "transition" zones for the residual $PM_{2.5}$ levels are shown on **Figure 9**.

The analysis indicates that incorporation of additional residual background $PM_{2.5}$ level zones would not change the outcome of the cumulative annual average $PM_{2.5}$ assessment presented in the AQIA. That is, there would be no additional exceedances of the relevant criterion, and no additional receptors that would be afforded acquisition upon request rights if higher residual background $PM_{2.5}$ levels were adopted in these zones.

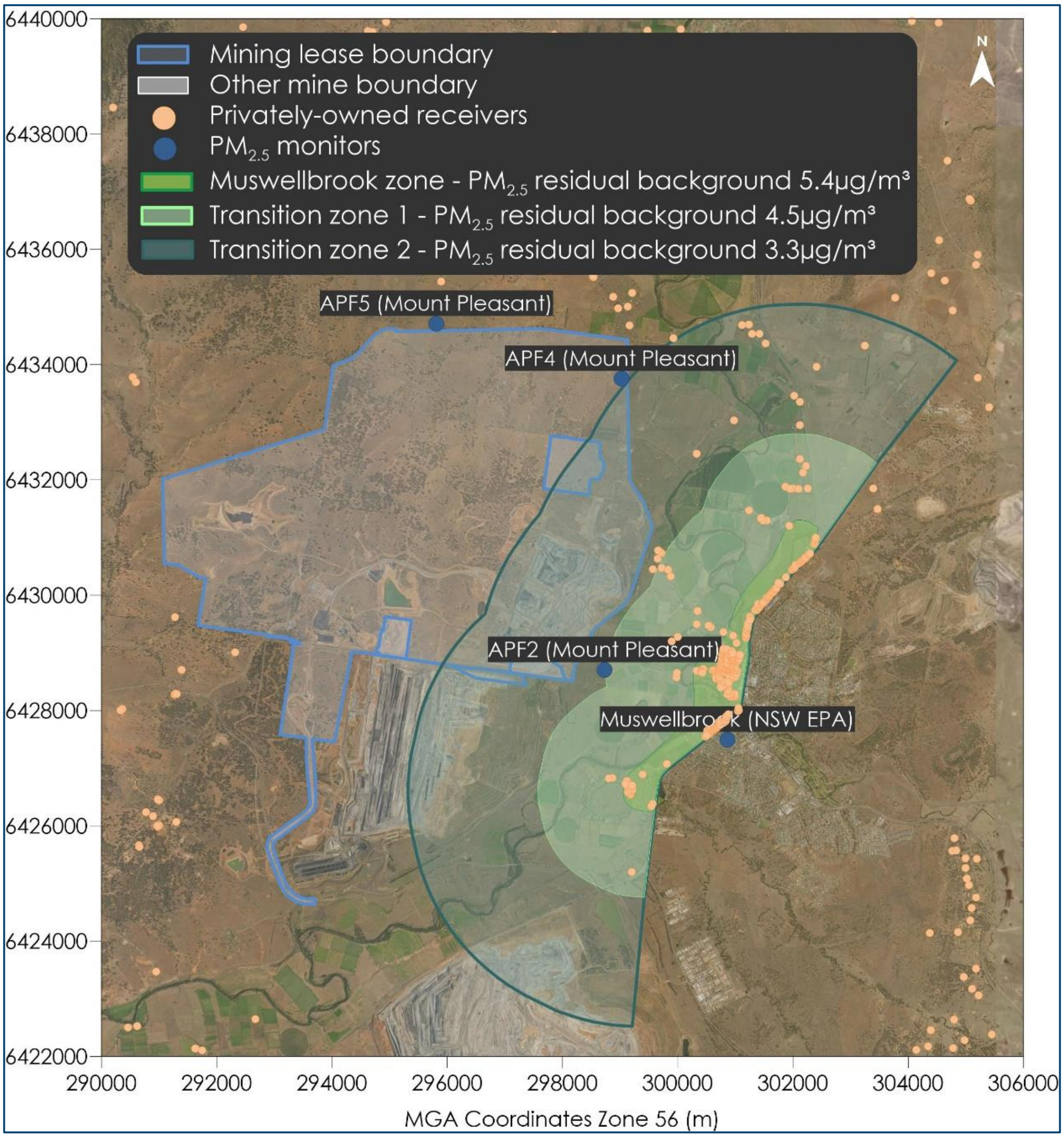

Figure 9: Map indicating transitions zone for $PM_{2.5}$ residual background

10) *NO_2 - Details should be provided as to what background NO_X and NO_2 values were used and how cumulative NO_2 values were calculated to provide the contours in Appendix H of the AQIA.*

The blast fume contours presented in Appendix H of the AQIA show the predicted maximum incremental 1-hour average NO_2 concentrations during each potential blast hour. As blast fume impacts are typically localised, and the closest receptors to blasting activities are in a rural setting (i.e. where background NO_2 levels would be expected to be low) and noting also that in general mine activity also ceases for a period before and after a blast, background NO_2 values have not been applied to the contour plots. However, 100% conversion of NO_X to NO_2 is assumed, which is highly conservative (overestimating), especially because the modelling also assumes a worst-case blast occurring every hour when blasting is permitted (which would not occur in reality).

The results indicate that blasts occurring between 9:00am and 3:00pm pose little potential for adverse blast fume impacts to occur, with contours relating to the 1-hour average NO_2 criterion remaining well within the site boundary. The analysis suggested that blasts later in the afternoon had greater potential for off-site blast fume impacts. As such, MACH has committed to the implementation of a specific Trigger Action Response Plan to minimise the potential for blast fume emissions if blasting is required during that time.

With regard to background NO_2 levels, review of data recorded at the Muswellbrook UHAQMN monitor from 2012 to 2019 suggests that maximum 1-hour average levels in Muswellbrook range from 80.0µg/m^3 to 118.9µg/m^3. If these values are adopted as a background level across the modelling domain, the outcomes of the assessment would remain the same. That is, blasting activities would be considered unlikely to lead to exceedances of the 1-hr average NO_2 criterion.

11) *Dragline emissions - If draglines are to be used in the future then further investigation should be done to includes these emission in the inventories and modelling to ensure the outcomes of the assessment do not change.*

An assessment for the use of a dragline at the Mount Pleasant Operation has been prepared separately, in *Air Quality Assessment - Mount Pleasant Optimisation Project Dragline* (**Todoroski Air Sciences, 2021b**).

The assessment found that incorporating dragline operations would result in a net maximum change in total annual dust emissions ranging from -5.3% to +2.3% for the various dust metrics. Relative to operations assessed in the AQIA, the estimated change in dust emissions incorporating dragline operations is considered small and unlikely to cause any discernible negative impact at any surrounding sensitive receptor locations relative to the assessed operations.

12) *90% control on some haul roads - Justification for this level of control should be provided and should be site specific. This is a high level of control for only Level 2 watering and evidence is required to justify this assumption.*

A 90% control factor was applied only to the main haul road transporting ROM to the CHPP. This haul road is a generally permanent haul road maintained for the life of project. It is constructed of high-quality materials to ensure its longevity and would easily achieve this level of control through regular maintenance. This level of control efficiency and greater has been measured at other mines in the Hunter Valley and would be achievable for the main road at the Project. A summary of directly measured control efficiencies for various Hunter Valley Mines is set out in **Table 4**.

Table 4: Summary of average measured haul road control efficiency for Hunter Valley mines

Mine	Haul road control efficiency (%)	Source
Bengalla	85.4	Todoroski Air Sciences (2014a)
Muswellbrook Coal	96.8	Todoroski Air Sciences (2014b)
Hunter Valley Operations	95.9	Todoroski Air Sciences (2014c)
Mount Thorley Warkworth	97.1	Todoroski Air Sciences (2014d)

A lower level of control for haul roads (i.e., 80% control factor) was applied for lesser roads, such as haul roads within the overburden dumps that are subject to frequent change as the mine progresses, as set out in the AQIA. The control factor adopted is consistent with the minimum specified by the NSW EPA for coal mine haul roads, as part of the Dust Stop Pollution Reduction Program in 2013.

13) *Silt content on haul roads - Site specific investigations should be carried out on a number of different types of haul roads to ensure that 2% silt content is representative of the site. If this is higher then the inventories need to be recalculated and additional modelling may need to be carried out to understand if this changes the assessment outcome for any sensitive receptors.*

The silt content applied in the AQIA is consistent with previous assessments for the site. A review of silt sampling conducted for haul roads at nearby mining operations (Bengalla Mine, Mt Arthur Coal Mine and Muswellbrook Coal Mine) found the average measured silt level for a controlled haul road at these coal mining operations is 1.7% and it is reasonable to expect the conditions to be similar at this site also. The level is consistent with a well-managed haul road surface.

The publicly available data for haul road silt measurements taken at all haul roads at the Bengalla Mine and Mt Arthur Coal Mine, two similar large scale coal mines located in close proximity to the Project, are presented in **Table 5**. The Muswellbrook Coal Mine is a relatively smaller scale mine in comparison and its position indicates it would have a different geology to the Project. The data from Bengalla Mine and Mt Arthur Coal Mine included the non-main haul roads, where silt levels may be higher, and excludes four samples at Bengalla with no silt content recorded (i.e. a silt fraction of 0%).

The results show that the average silt levels measured for haul roads at Mt Arthur are 1.6%, and the average haul road silt content is 2.6% for both mines, including one outlier (6.3% at Bengalla Mine). Silt levels are 2.16% without the outlier result.

Table 5: Summary of average measured haul road silt content for Bengalla and Mt Arthur

Mine	Haul road silt content (%)	Source
Bengalla Mine	3.5	Todoroski Air Sciences (2014a)
	2.7	
	3.2	
	2.2	
	1.7	
	1.9	
	6.3	
Mt Arthur Coal Mine	1.6	Pacific Environment Limited (2015)
	0.43	
	1.25	
	3.1	
Average	**2.6**	

A sensitivity analysis assuming a haul road silt content of 3% for the Project has been conducted to understand the sensitivity of predictions to silt content assumptions. **Table 6** presents a comparison of the estimated TSP emissions for the Project as assessed in the AQIA with a haul road silt content of 2% and assuming a haul road silt content of 3%. Applying a haul road silt content of 3% results in an increase of approximately 11-13% for the different modelling scenarios.

Table 6: Comparison of estimated TSP emissions for the Project

Scenario	Estimated TSP emissions with haul road silt content of 2% as assessed in AQIA (kg/year)	Estimated TSP emissions with haul road silt content of 3% silt (kg/year)	Change in TSP emissions (%)
Scenario 1	3,836,837	4,273,476	11
Scenario 2	4,640,569	5,134,264	11
Scenario 3	5,122,089	5,804,866	13
Scenario 4	6,273,114	7,068,692	13
Scenario 5	7,157,638	8,028,023	12
Scenario 6	7,558,308	6,696,511	13

The sensitivity analysis focuses on selected privately-owned receivers surrounding the Project shown in **Figure 10**. These receivers were selected as the closest receivers to the Project that do not have predicted air quality impacts due to the Project.

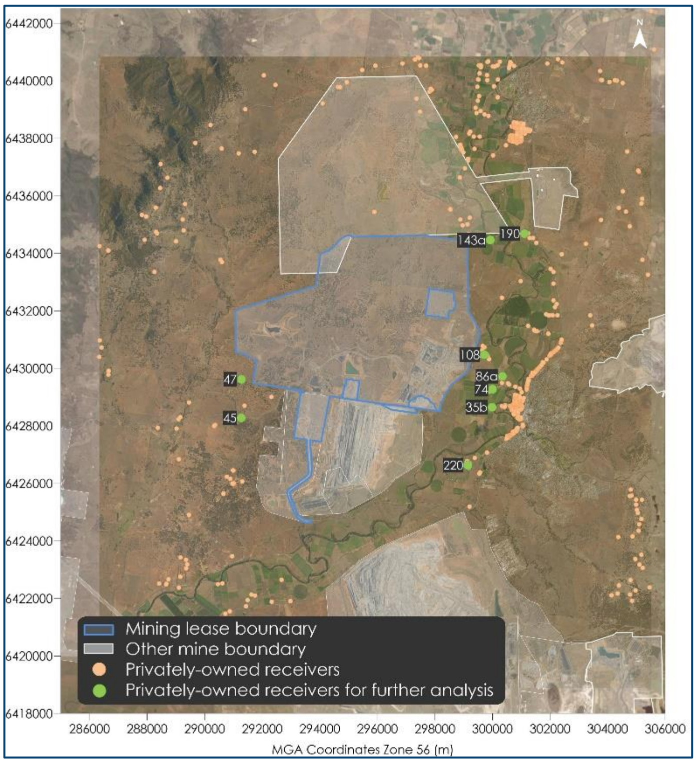

Figure 10: Selected privately-owned receivers for sensitivity analysis

The dispersion modelling results showing the predicted annual average $PM_{2.5}$ and PM_{10} concentrations assuming a haul road silt content of 3% are summarised in **Table 7**, for the scenario with the highest predicted Project impact at each receiver. The results indicate that the Project would not result in an exceedance of the annual average $PM_{2.5}$ and PM_{10} criteria with an increase in the haul road silt content of 50%. Thus, there would be no additional exceedances of the relevant criterion, and no additional receptors that would be afforded acquisition upon request rights.

For 24-hour average impacts, assuming a haul road silt content of 3% would likely result in an increase in the predicted impacts. However, the implementation of the predictive/reactive mitigation measures as described in the AQIA show that these impacts can be averted. In other words, the predictive/reactive mitigation measures would need to be applied more often.

The haul road silt content was further analysed to determine its influence for each of the sensitivity analysis receivers. The analysis investigated the haul road silt content which could be applied before a potential exceedance of the annual average PM_{10} would occur. The results of the analysis are included in **Table 7** and indicate that a haul road silt content of between 7-8% would be required for a potential exceedance to occur (i.e., a much higher silt content level than measured or appropriate for a site like the Mount Pleasant Operation).

Table 7: Summary of predicted annual average $PM_{2.5}$ and PM_{10} impacts with haul road silt content of 3% and potential exceedance level

Receptor ID	Annual average $PM_{2.5}$ (µg/m³)				Annual average PM_{10} (µg/m³)				Approx. silt content before potential exceedance[1]
	Incremental		Cumulative		Incremental		Cumulative		
	Scenario	Predicted	Scenario	Predicted	Scenario	Predicted	Scenario	Predicted	
35b	5	1.6	4	4.6	5	7.6	4	22.1	7%
45	5	0.2	1	4.3	5	0.8	1	17.3	>8%
47	5	0.2	4	4.8	5	0.8	4	23.1	>8%
74	5	1.7	3	4.4	5	8.1	4	22.2	7%
86a	5	1.5	4	4.4	5	7.1	4	21.7	>8%
108	5	2.2	4	5.2	5	10.6	4	21.9	>8%
143a	4	0.8	4	3.8	4	3.9	1	13.7	>8%
190	5	0.4	1	3.4	5	1.8	1	14.4	>8%
220	5	1.6	1	5.3	5	7.9	1	21.6	>8%

[1] The silt content level required for a potential exceedance was determined for the scenario with the closest predicted levels to the applicable PM_{10} criterion - Scenario 4.

In summary, the silt content adopted in the AQIA is considered representative of the site. To materially change the outcomes of the assessment, the sensitivity analysis shows that the silt level would need to be increased to an unrealistically high value, much higher than has been measured, and this is not appropriate. It is noted that the silt content is just one of many parameters applied in the calculation of the dust emissions that are input into the air dispersion model to predict the potential air quality impact. The silt level adopted for the AQIA is consistent with the measured data and the values adopted for previous Mount Pleasant Operation dispersion modelling and it is strongly supported by actual air quality performance of the Mount Pleasant Operation and is therefore considered appropriate.

Overall, our examination of the issues raised has identified that the key criticisms by the reviewer stem from a misunderstanding of the adopted approach. As such, this letter has explained the approach more clearly and has provided all of the data requested for transparency. Furthermore, additional assessments, including a separate report on dragline emissions, were made to explicitly quantify what effects the issues raised by the reviewer may have, and found that none of the assessment conclusions would change.

As such, the existing assessment is reliable and appropriate for use without any change.

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

Yours faithfully,
Todoroski Air Sciences

Aleks Todoroski

Philip Henschke

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Attachment 1: Summary of background dust level estimation (2012-2015)

Dust metric	Monitor ID	Type	Measured level				Model prediction				Difference (Residual dust level)				Unit
			2012	2013	2014	2015	2012	2013	2014	2015	2012	2013	2014	2015	
PM_{10}	Muswellbrook	TEOM	21.8	22.6	21.4	19.1	6.9	7.0	7.1	6.7	14.9	15.6	14.3	12.4	$\mu g/m^3$
	Muswellbrook NW	TEOM	19.1	18.9	19.2	16.7	5.0	4.8	5.0	4.7	14.1	14.1	14.2	12.0	$\mu g/m^3$
	Aberdeen	TEOM	17.0	17.3	17.9	15.2	1.2	1.4	1.6	1.6	15.8	15.9	16.3	13.6	$\mu g/m^3$
	Wybong	TEOM	15.4	15.5	17.0	14.8	1.6	1.7	1.9	1.7	13.8	13.8	15.1	13.1	$\mu g/m^3$
	DC02 (Mt Arthur)	TEOM	16.7	22.4	21.3	18.5	14.6	15.9	16.0	15.5	2.1	6.5	5.3	3.0	$\mu g/m^3$
	DC03 (Mt Arthur)	TEOM	18.9	-	-	-	17.6	-	-	-	1.3	-	-	-	$\mu g/m^3$
	DC04 (Mt Arthur)	TEOM	18.3	20.8	20.4	18.4	8.5	9.0	9.1	8.7	9.8	11.8	11.3	9.7	$\mu g/m^3$
	DC05 (Mt Arthur)	TEOM	10.8	16.1	16.3	14.1	9.1	9.2	9.3	8.7	1.8	6.9	7.0	5.4	$\mu g/m^3$
	DC04 (Mangoola)	TEOM	11.1	12.2	12.2	9.9	2.7	2.8	2.9	2.7	8.4	9.4	9.3	7.2	$\mu g/m^3$
	DC03 (Mangoola)	TEOM	13.6	14.9	15.4	12.3	9.5	9.4	9.8	10.4	4.1	5.5	5.6	1.9	$\mu g/m^3$
	DC02 (Mangoola)	TEOM	13.3	14.5	14.4	11.4	6.8	6.2	6.9	6.2	6.5	8.3	7.5	5.2	$\mu g/m^3$
	PM10-2 (Bengalla)	TEOM	25.0	22.5	23.6	18.9	9.8	10.2	10.3	9.7	15.2	12.3	13.3	9.2	$\mu g/m^3$
	PM10-3 (Bengalla)	TEOM	16.2	17.7	23.7	18.9	10.4	10.7	10.8	9.9	5.8	7.0	12.9	9.0	$\mu g/m^3$
	Site 1 (MCC)	TEOM	-	16.6	17.2	14.9	-	5.4	5.9	6.1	-	11.2	11.3	8.8	$\mu g/m^3$
	Site 2 (MCC)	TEOM	-	17.3	17.6	14.9	-	2.7	3.0	3.0	-	14.6	14.6	11.9	$\mu g/m^3$
	Site 3 (MCC)	TEOM	-	18.6	15.3	13.7	-	4.2	5.2	5.6	-	14.4	10.1	8.1	$\mu g/m^3$
TSP	D02-TSP (Mangoola)	HVAS	41.4	42.9	47	37.3	8.5	8.0	8.7	8.0	32.9	34.9	38.3	29.3	$\mu g/m^3$
	D03-TSP (Mangoola)	HVAS	37.7	43.5	50	38	14.0	13.7	14.3	15.4	23.7	29.8	35.7	22.6	$\mu g/m^3$
	D04-TSP (Mangoola)	HVAS	28.7	36.7	38.6	39.5	3.2	3.4	3.6	3.2	25.5	33.3	35.0	36.3	$\mu g/m^3$
	HV1 (Bengalla)	HVAS	50.1	45.5	60.3	45.8	11.5	11.5	11.9	10.9	38.6	34.0	48.4	34.9	$\mu g/m^3$
	HV2 (Bengalla)	HVAS	60.9	61.3	67.3	54.1	19.7	21.2	21.1	20.8	41.2	40.1	46.2	33.3	$\mu g/m^3$
	HV3 (Bengalla)	HVAS	43.5	42.6	49.3	39.1	8.6	8.6	8.6	8.2	34.9	34.0	40.7	30.9	$\mu g/m^3$
	HV4 (Bengalla)	HVAS	55	51.6	60.9	44.5	12.7	13.2	13.3	12.7	42.3	38.4	47.6	31.8	$\mu g/m^3$
	HV6 (Bengalla)	HVAS	64.6	66.1	80.1	73.1	26.9	30.0	33.9	32.1	37.7	36.1	46.2	41.0	$\mu g/m^3$
	Site 1 (MCC)	HVAS	-	33	39.5	29.8	-	7.6	8.3	8.8	-	25.4	31.2	21.0	$\mu g/m^3$
	Site 2 (MCC)	HVAS	-	37.5	39.4	29.7	-	3.4	3.9	4.1	-	34.1	35.5	25.6	$\mu g/m^3$
	Site 3 (MCC)	HVAS	-	38.2	51.4	32.9	-	6.8	8.9	9.9	-	31.4	42.5	23.0	$\mu g/m^3$
Dust deposition	DG02 (Mangoola)	DD	3.4	3.0	2.3	1.3	0.01	0.02	0.02	0.02	3.39	2.98	2.28	1.28	g/m^2/month
	DG03 (Mangoola)	DD	-	1.2	1.2	0.8	-	0.03	0.03	0.02	-	1.17	1.17	0.78	g/m^2/month
	DG04 (Mangoola)	DD	2.5	2.3	1.9	1.7	0.20	0.22	0.19	0.20	2.30	2.08	1.71	1.50	g/m^2/month
	DG06 (Mangoola)	DD	1.4	2.4	1.7	1.2	0.52	0.52	0.55	0.59	0.88	1.88	1.15	0.61	g/m^2/month

Dust metric	Monitor ID	Type	Measured level				Model prediction				Difference (Residual dust level)				Unit
			2012	2013	2014	2015	2012	2013	2014	2015	2012	2013	2014	2015	
	DG07 (Mangoola)	DD	2.3	2.0	1.8	1.4	0.58	0.56	0.60	0.63	1.72	1.44	1.20	0.77	g/m^2/month
	DG09 (Mangoola)	DD	2.5	2.4	1.9	1.6	0.10	0.10	0.11	0.09	2.40	2.30	1.79	1.51	g/m^2/month
	DG10 (Mangoola)	DD	2.1	1.9	1.6	1.4	0.19	0.17	0.18	0.17	1.91	1.73	1.42	1.23	g/m^2/month
	DG18 (Mangoola)	DD	2.0	1.4	1.9	1.4	0.05	0.05	0.05	0.04	1.95	1.35	1.85	1.36	g/m^2/month
	DG19 (Mangoola)	DD	2.1	1.6	1.5	1.1	0.28	0.30	0.35	0.36	1.82	1.30	1.15	0.74	g/m^2/month
	DG20 (Mangoola)	DD	2.9	2.2	1.1	1.2	0.05	0.05	0.05	0.04	2.85	2.15	1.05	1.16	g/m^2/month
	D05 (Bengalla)	DD	2.0	1.7	1.3	1.2	0.08	0.08	0.08	0.07	1.92	1.62	1.20	1.14	g/m^2/month
	D10 (Bengalla)	DD	2.0	2.0	2.7	1.9	0.43	0.47	0.47	0.47	1.57	1.53	2.23	1.44	g/m^2/month
	D07A (Bengalla)	DD	1.7	1.6	1.8	1.7	0.28	0.29	0.28	0.28	1.42	1.31	1.51	1.41	g/m^2/month
	D21 (Bengalla)	DD	4.6	5.2	5.6	4.9	0.54	0.66	0.78	0.71	4.06	4.54	4.86	4.23	g/m^2/month
	D01 (Bengalla)	DD	1.1	1.1	1.3	0.8	0.08	0.09	0.09	0.09	1.02	1.01	1.16	0.71	g/m^2/month
	D02 (Bengalla)	DD	1.9	2.3	1.9	1.2	0.15	0.14	0.14	0.14	1.75	2.16	1.72	1.11	g/m^2/month
	D04A (Bengalla)	DD	2.6	2.3	2.4	2.1	0.36	0.38	0.42	0.38	2.24	1.92	1.93	1.72	g/m^2/month
	D06 (Bengalla)	DD	2.5	2.2	3.1	2.1	0.16	0.16	0.16	0.15	2.34	2.04	2.96	1.99	g/m^2/month
	D08 (Bengalla)	DD	1.8	1.7	1.6	1.5	0.36	0.39	0.41	0.40	1.44	1.31	1.20	1.10	g/m^2/month
	D17 (Bengalla)	DD	3.0	2.9	3.8	3.8	0.30	0.31	0.30	0.30	2.70	2.59	3.50	3.54	g/m^2/month
	D20 (Bengalla)	DD	2.9	2.6	3.9	3.3	0.33	0.35	0.36	0.33	2.57	2.25	3.58	2.98	g/m^2/month
	D23A (Bengalla)	DD	2.1	3.3	2.0	1.7	0.22	0.22	0.21	0.20	1.88	3.08	1.76	1.46	g/m^2/month
	D25 (Bengalla)	DD	1.9	3.2	3.5	3.1	0.41	0.45	0.53	0.45	1.49	2.75	2.97	2.62	g/m^2/month
	D26 (Bengalla)	DD	2.3	2.9	3.5	1.7	0.45	0.51	0.66	0.54	1.85	2.39	2.84	1.13	g/m^2/month
	DA (Bengalla)	DD	2.7	2.4	3.4	3.4	0.42	0.46	0.54	0.47	2.28	1.94	2.88	2.91	g/m^2/month
	DB (Bengalla)	DD	3.7	3.9	3.1	3.4	0.56	0.63	0.76	0.64	3.14	3.27	2.29	2.78	g/m^2/month
	DM19 (MCC)	DD	-	2.1	1.9	1.5	-	0.02	0.02	0.02	-	2.12	1.85	1.46	g/m^2/month
	DM18 (MCC)	DD	-	1.5	1.6	1.6	-	0.13	0.18	0.18	-	1.37	1.40	1.46	g/m^2/month
	DM17 (MCC)	DD	-	2.5	2.9	2.5	-	0.17	0.25	0.26	-	2.35	2.67	2.23	g/m^2/month
	DM14 (MCC)	DD	-	1.4	1.7	-	-	0.06	0.07	-	-	1.34	1.63	-	g/m^2/month
	DM26 (MCC)	DD	-	1.6	-	1.7	-	0.09	-	0.12	-	1.54	-	1.60	g/m^2/month
	DM29 (MCC)	DD	-	2.1	1.5	1.4	-	0.11	0.11	0.11	-	1.96	1.42	1.28	g/m^2/month
	DM22 (MCC)	DD	-	1.8	2.7	2.3	-	0.09	0.09	0.10	-	1.75	2.62	2.18	g/m^2/month
	DM16 (MCC)	DD	-	1.5	1.2	1.4	-	0.06	0.07	0.08	-	1.45	1.10	1.36	g/m^2/month
	DM23 (MCC)	DD	-	1.2	1.5	1.6	-	0.09	0.09	0.10	-	1.14	1.38	1.50	g/m^2/month
	DM28 (MCC)	DD	-	-	1.9	-	-	-	0.05	-	-	-	1.87	-	g/m^2/month

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Dust metric	Monitor ID	Type	Measured level				Model prediction				Difference (Residual dust level)				Unit
			2012	2013	2014	2015	2012	2013	2014	2015	2012	2013	2014	2015	
	DM2 (MCC)	DD	-	2.3	1.8	1.8	-	0.08	0.09	0.11	-	2.25	1.71	1.70	g/m^2/month
	DM7 (MCC)	DD	-	1.1	1.3	1.2	-	0.08	0.08	0.08	-	0.98	1.26	1.14	g/m^2/month
	DM30 (MCC)	DD	-	1.3	1.3	1.2	-	0.04	0.05	0.05	-	1.22	1.24	1.16	g/m^2/month
	DM24 (MCC)	DD	-	2.2	3.0	2.0	-	0.15	0.19	0.22	-	2.05	2.80	1.82	g/m^2/month
	MTP D1	DD	1.4	1.2	1.3	1.0	0.06	0.06	0.07	0.06	1.29	1.14	1.23	0.94	g/m^2/month
	MTP D3	DD	2.2	1.8	1.8	1.5	0.22	0.21	0.21	0.20	1.99	1.59	1.57	1.32	g/m^2/month
	MTP D4	DD	1.6	1.3	1.6	2.4	0.04	0.04	0.04	0.05	1.60	1.26	1.57	2.38	g/m^2/month
	MTP D6	DD	2.2	3.3	3.7	2.5	0.06	0.05	0.06	0.06	2.17	3.25	3.63	2.40	g/m^2/month
	MTP D8	DD	3.4	4.4	3.7	3.0	0.49	0.59	0.71	0.64	2.88	3.81	3.02	2.38	g/m^2/month
	MTP D9	DD	1.3	1.4	1.5	1.3	0.20	0.25	0.28	0.25	1.06	1.15	1.24	1.07	g/m^2/month
	MTP D10	DD	2.0	-	1.0	0.8	0.05	-	0.05	0.05	1.97	-	0.95	0.74	g/m^2/month
	MTP D11	DD	2.0	1.3	1.6	1.4	0.09	0.12	0.12	0.11	1.95	1.18	1.48	1.27	g/m^2/month
	MTP D12	DD	1.1	0.7	1.0	0.8	0.09	0.13	0.13	0.11	1.01	0.57	0.85	0.66	g/m^2/month
	MTP D13	DD	2.2	3.2	3.2	2.1	0.05	0.06	0.07	0.06	2.16	3.14	3.16	2.07	g/m^2/month
	MTP D14	DD	2.4	3.0	3.4	2.2	0.55	0.69	0.83	0.76	1.85	2.31	2.53	1.41	g/m^2/month