INDEPENDENT AIR QUALITY REVIEW
MOOREBANK INTERMODAL PRECINCT
MPW STAGE 2 SSD 16

NSW Department of Planning & Environment

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Prepared by
Todoroski Air Sciences Pty Ltd
Suite 2B, 14 Glen Street
Eastwood, NSW 2122
Phone: (02) 9874 2123
Fax: (02) 9874 2125
Email: info@airsciences.com.au

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1 SUMMARY

Todoroski Air Sciences have reviewed the Air Quality Impact Assessment (AQIA) prepared by Ramboll Environ for the Moorebank Precinct West (MPW) Stage 2 (hereafter referred to as the Project), and the Response to Submissions prepared by Arcadis.

The AQIA, whilst not ideal is nevertheless adequate. There are some omissions, but these would not affect the conclusions. The AQIA appears to significantly overestimate potential annual average air quality impacts, but it is not clear if 24-hour average dust impacts are over or underestimated. Either way, the modelling is sufficient to indicate that the potential 24-hour average dust levels would be a modest contributor to potential impacts, provided reasonable dust controls are implemented.

The key dust controls proposed and modelled include the use of watering to control dust from dozing and wind erosion. The AQIA also modelled exposed, freshly disturbed land as an area of up to 36Ha at any one time. This is approximately one third of the cleared land area indicated in the various Project Stages, which means that the cleared land will need to be stabilised/ watered and otherwise treated to prevent significant dust generation due to the action of the wind.

Provided that watering and other forms of dust mitigation are adequate and also the total area of land available for wind erosion is constrained as per the EIS and AQIA, there is low scope for any significant impacts to arise at receptors.

Suggested conditions to this effect are provided in this report, and would be suitable to manage the potential air quality risk for the Project.

2 INTRODUCTION

Todoroski Air Sciences has been engaged by the New South Wales (NSW) Department of Planning & Environment (DP&E) to review and provide independent advice in relation to air quality matters associated with the proposed development of the Moorebank Precinct West (MPW) Stage 2 (hereafter referred to as the Project).

In summary, Todoroski Air Sciences has conducted the following:

- A review of the Air Quality Impact Assessment (AQIA) for the MPW Stage 2 prepared by Ramboll Environ Australia Pty Ltd (**Ramboll Environ, 2016**);
- A review of the Response to Submissions (**Arcadis, 2017**); and,
- Suggestions for DP&E consideration regarding specific approval conditions for the management of air quality per the predicted Project performance in the air quality impact assessment.

This report provides an overall assessment of the air quality issues associated with the Project and suggestions for the appropriate management of air quality.

3 PROJECT OVERVIEW

The Moorebank Intermodal Precinct involves the development of intermodal freight terminal facilities (IMT), linked to Port Botany and the interstate freight rail network. The precinct comprises two sites, Moorebank Precinct East (MPE) and MPW, divided by Moorebank Avenue.

The MPW Stage 2 proposal includes the construction and operation of an IMT facility and associated warehousing. The IMT facility would have capacity to support a container freight throughput volume of 500,000 twenty-foot equivalent units (TEUs) per annum.

Other infrastructure associated with the MPW Stage 2 proposal includes commercial infrastructure in the form of warehousing, a rail link connecting the MPW site to the Southern Sydney Freight Line (SSFL) and a road entry and exit point from Moorebank Avenue.

Figure 3-1 presents the Project location and overview.

Figure 3-1: Project location and overview

4 EIS METHODOLOGY AND ASSESSMENT REVIEW

The methodology followed in the air quality impact assessment applies a Level 2 assessment approach, generally per the EPA Approved Methods, for modelling key air emissions during the construction phase and operational phase of the Project.

The AERMOD modelling system is used to predict potential air quality impacts, and is generally an acceptable regulatory model in NSW and other jurisdictions, except in situations of complex terrain, and where significant other conditions may affect the results.

The key components of the assessment are identified as:

1. Modelling of the meteorological conditions and selection of the modelling period;

2. Quantification of air emissions from the Project; and,

3. The modelling approach to predicted likely cumulative impacts in the surrounding environment.

These three key components of the air quality assessment have been examined below.

4.1 Meteorological modelling

The meteorological modelling was based on the 2013 calendar period. This dataset is also used in the MPE Stage 1 air quality assessment.

Meteorological measurements from the Liverpool Office of Environment and Heritage (OEH) meteorological station were used with any gaps in the dataset supplemented by prognostic meteorological data from CRIRO's prognostic model, TAPM. Meteorological data were input into AERMET (the meteorological pre-processor for AERMOD) with values for surface roughness, albedo and Bowen ratio to generate a data file for use in the dispersion modelling.

Rainfall was excluded from the dispersion modelling simulation, which is conservative and may slightly overestimate impacts on rainy days.

Graphs of the diurnal variation of mixing height (see Figure 4-3 in the air assessment report) and atmospheric stability (see Figure 4-4 in the air assessment report) show sensible values, and indicate that the meteorological modelling is suitable.

The development of the meteorological data thus appears to be conducted appropriately based on the methodology outlined in the air quality impact assessment.

Without access to the actual modelling files a detailed review of the meteorological data file is not possible, but based on our review of the available data there is no indication of any significant issue.

4.2 Emissions inventory

The primary emissions from the Project are identified as particulate matter, oxides of nitrogen, carbon monoxide, sulfur dioxide and volatile organic compounds. The gaseous pollutants are products of combustion associated with exhaust emissions from plant and equipment at the Project which include locomotives.

A summary of the modelled emission rates for the Project during the construction phase is presented in Table 5-2 with details of emissions calculations in Appendix 4 of the air quality impact assessment. Emission factor equations are sourced from United States Environmental Protection Authority (USEPA) AP-42 emission factors.

The emission rates presented in Table 5-2 indicate that an error may have been made in the calculations for material handling (excavators, FEL, stockpiles) activity. The estimated values for TSP and $PM_{2.5}$ appear to be based on only one action on the material, whereas the calculated value for PM_{10} appears to be based on handling the material three times, as mentioned in the text above the table. This discrepancy appears to result in an underestimation of TSP and $PM_{2.5}$ emissions for this activity by a factor of three, which overall represents approximately 3% to 5% of the total emissions. This would lead to a similar degree of underestimation in the project (incremental) TSP and $PM_{2.5}$ impacts. Generally, this discrepancy is within the margin of accuracy in the broad assumptions applied in the emissions inventory and modelling, and is not considered to be a large issue. For example, a similar variation in the emissions and impacts might reasonably occur due to the differences between the actual and assumed material properties.

For the operational phase of the Project, air emissions are estimated for diesel locomotives, container handling equipment, trucks and gas fired heating and cooling for warehouses.

Emission estimates are outlined in Section 5.3 of the air quality impact assessment.

4.2.1 Applied level of dust control

Dust control measures applied in the estimation of emissions for the Project include:

- 75% for watering haul roads with an additional 40% applied to account for speed limit restrictions; and,
- 50% for graders and dozers.

A review of the emission rates presented in Table 5-2 indicates that a 50% level of control is also applied to wind erosion surfaces, presumably via watering of the surface.

The 75% level of control for watering haul roads is reasonable and in line with normal, good practice for a construction project where roads need to be made on a fresh surface frequently.

The 50% control level applied for dozers operating on fresh material may be difficult to achieve for this project, and thus may potentially underestimate emissions significantly. Dust from dozer activity appears to account for approximately 18% of the total emissions when the 50% control factor is applied, (but may be approximately 40% of the total emissions without the control operating).

It is noted that the control measure appears to be for dozers traveling on wet roads and handling wet material. The air assessment states that the 50% control factor is sourced from the 2010 "NSW Coal Mining Benchmarking Study" by Katestone. The Katestone study lists a 50% control factor and states it is sourced from the NPI Emission estimation technique manual for mining version 2.3, 2001. However the NPI manual version 2.3 does not contain a 50% control factor for dozing operations, and neither does the current version. The NPI manual refers to the US EPA AP-42 emission factors, which also does not specify a 50% control factor for dozers.

Regardless, of its origin, in our opinion it may be reasonable to apply such a control factor for dozers traveling on pre-wetted roads, for dozers working on generally wetter than normal material, or when a water cart works alongside the dozer to wet the material the dozer is spreading or pushing.

Thus to achieve the predicted levels of performance in the air assessment, it would appear to be important to ensure that the dozers operate on wet material at all times. This may for example require a water cart to be available for each dozer, depending on the dozer proximities and for a quick fill watering point near to the operations.

In regard to the 50% control factor for wind erosion, it is noted that this would require spraying a significant quantity of water over the entire surface of any freshly handled material, and that the spraying may need to occur several times each day, depending on the specific material characteristics and the prevailing weather conditions.

It is also relevant to minimise unnecessary activity that may disturb the material surface, requiring the application of water on such surfaces to prevent dust.

Of course, it is also critical to minimise the area of exposed surfaces that may be subject to wind generated dust. This has a direct effect on controlling potential dust emissions.

4.3 Cumulative impacts

Two scenarios were included as follows:

- Scenario 1a: Cumulative construction of the Project with construction activity for MPE Stage 1; and,
- Scenario 2a: Cumulative operations of the Project with MPE Stage 1.

Five consecutive years of background monitoring data from the Liverpool OEH monitoring station were used in the air quality assessment.

The annual average background concentrations of $PM_{2.5}$ exceed the impact assessment criteria of 8µg/m^3.

The Glenfield Waste Services site, located to the southwest of the Project, is not considered in the cumulative assessment as the air quality assessment for the operation predicted minor $PM_{2.5}$ concentrations arising from that site.

4.4 Model predictions

The modelling for the construction phase appears to have apportioned the annual emissions evenly across all hours of one year, and it is relevant to note that the construction activities are planned to be staged over a period of approximately 36 months and only a proportion of the annual emissions totals will be generated during each stage.

Thus on an annual average basis, the modelling approach appears to overestimate emissions by a factor of up to three fold, however when considering the limited hours of operation and staging, this would be less than three fold, and perhaps closer to two fold. It is therefore considered that there is a significant degree of conservatism in the predicted annual average levels, but not so for the short term 24-hour levels. For example it is normal for there to be periods of days, or even weeks when the rate of activity can be several times higher than the daily or weekly average of the annual rate of activity.

The assessment predicts that the construction phase emissions comply with all relevant impact assessment criteria. A summary of the modelling predictions for the maximum receptor is shown in **Table 4-1**.

Table 4-1: Summary of modelling predictions during Construction Phase – Receptor Maximum

Pollutant	Averaging time	Construction Phase	
		Increment	Cumulative
PM_{10}	24-hour	5.1	48.5
	Annual	1.5	20.9
$PM_{2.5}$	24-hour	2.7	24.5
	Annual	0.5	8.8
TSP	Annual	2.0	50.4
Dust Deposition	Annual	0.5	3.0

For the operational phase, the assessment finds no additional exceedances of the short-term assessment criteria for PM_{10} and $PM_{2.5}$, and indicates that the activities likely to occur would only make a modest contribution to annual dust levels in the area.

Figure 4-1 presents the predicted 24-hour average PM_{10} impact during construction phase.

Figure 4-2 presents the predicted 24-hour average $PM_{2.5}$ impact during the operational phase.

The potential impacts due to NO_2, CO and SO_2 are predicted to be below the relevant criteria.

TODOROSKI AIR SCIENCES | info@airsciences.com.au | 02 9874 2123

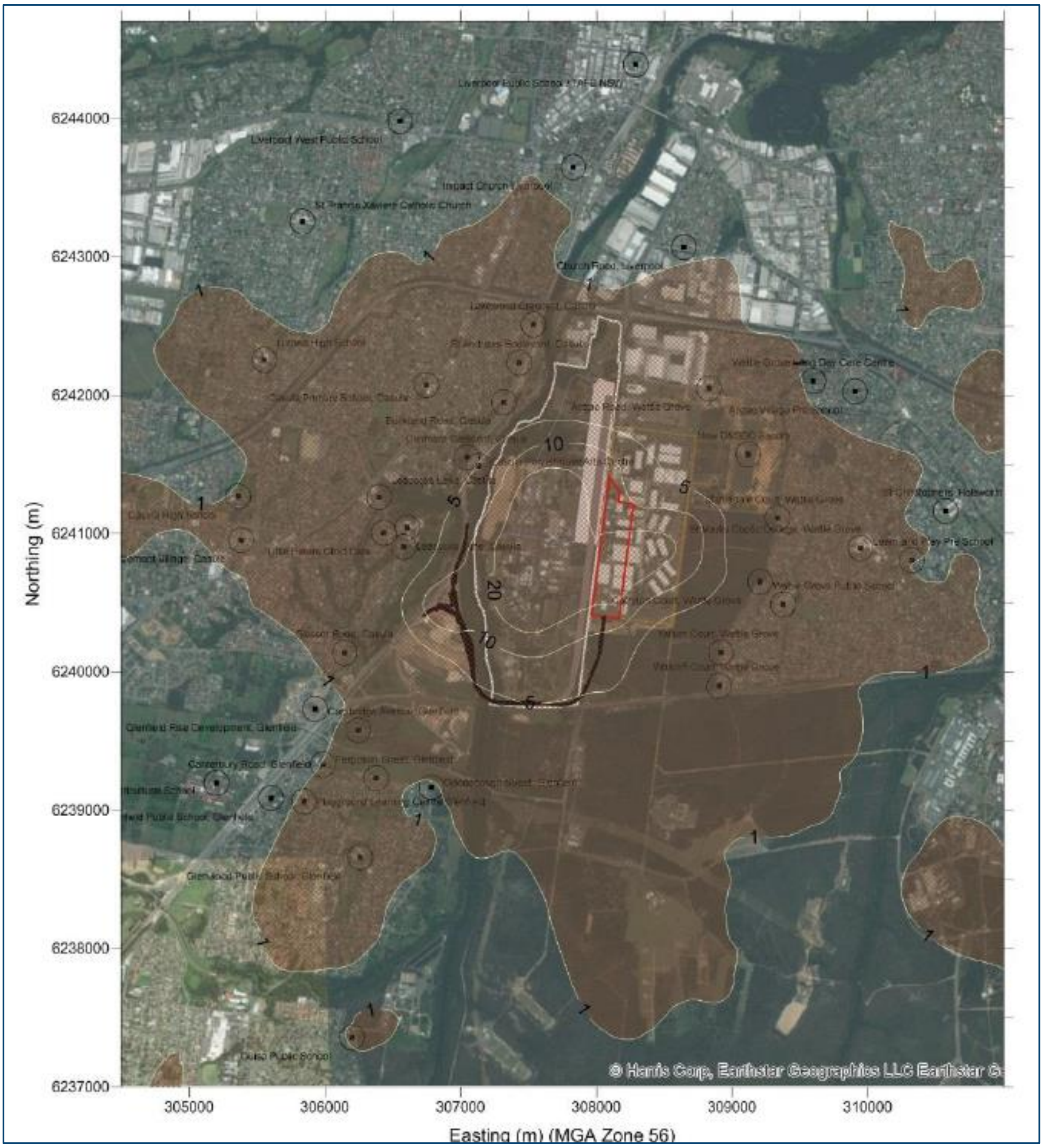

Figure 4-1: Maximum 24-hour average PM10 during construction phase (µg/m³)

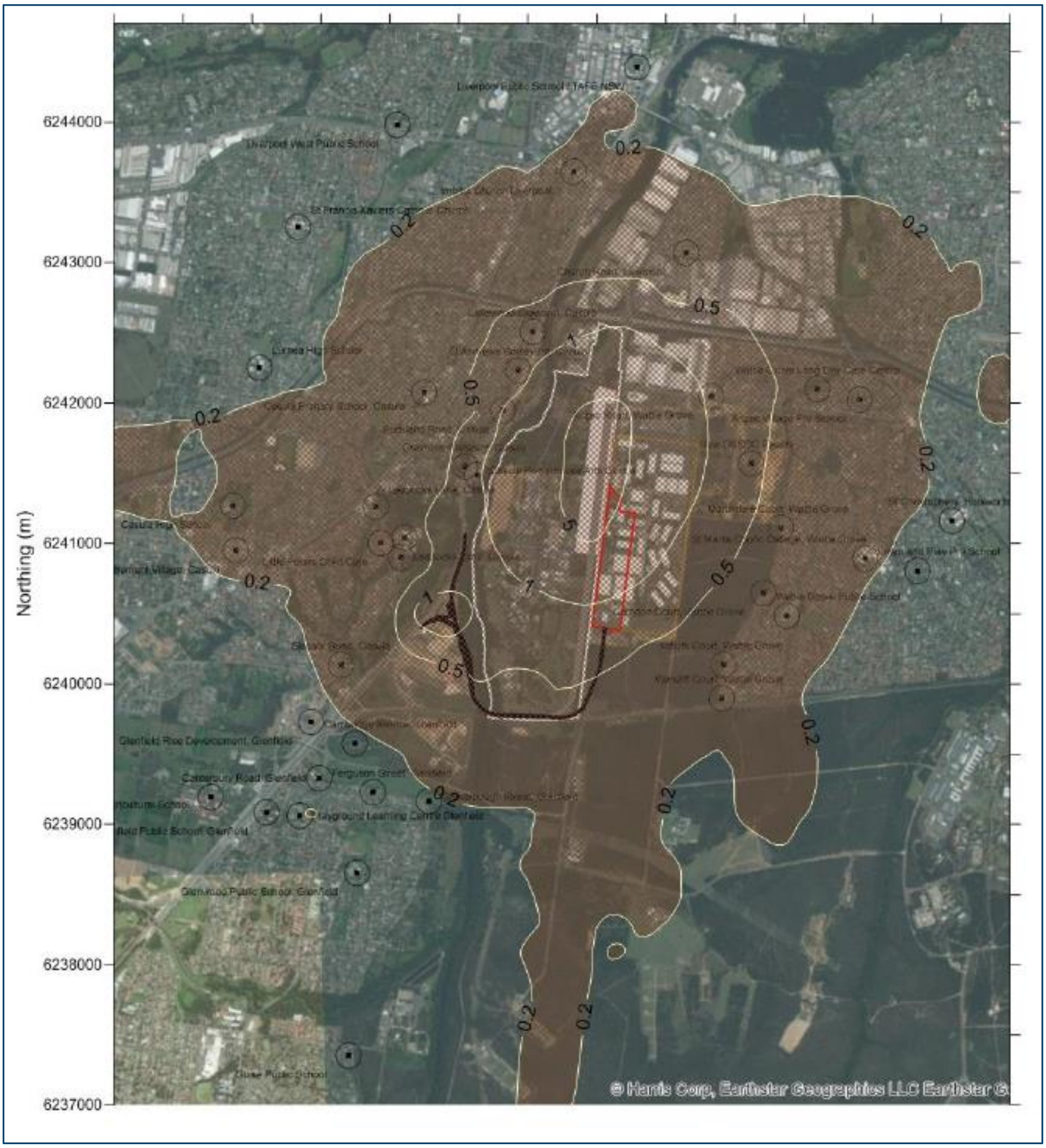

Figure 4-2: Maximum 24-hour average PM2.5 during operational phase (µg/m³)

4.4.1 Overview of predicted levels of impact

The assessment is considered to effectively show that no significant impact is likely to arise at the nearby residential receptors. This is largely due to the low, and conservatively assessed annual average dust impacts and other pollutant impacts arising due to the Project being low.

Whilst it is unclear whether 24-hour average dust impacts may be over or underestimated, there is a relatively small contribution to 24-hour average levels of approximately 10% of criteria. An increase in the short-term project emissions may lead to NSW EPA criteria being exceeded, however it needs to be considered that this may also arise had a different modelling period been chosen, and ultimately, even doubling short term dust impacts would still result in a modest (e.g. approximately 20% of criteria) contribution to impacts at receptors.

Overall, whilst it is relevant to ensure that short term dust levels are adequately managed, the indication from the air assessment is that there would only be scope for minor overall effects on residents, relative to the NSW EPA impact assessment criteria.

5 REVIEW OF RESPONSE TO SUBMISSIONS

Contrary to the proponent's statement in its response to submissions relating to the choice of the AERMOD model, the site conditions do include complex terrain effects for some receptors to the west. These receptors are in an elevated position higher than the sources of dust generation, thus it is reasonable to consider this further to evaluate if it is a significant issue or not.

As indicated in the proponent's response to submissions, the later versions of AERMOD can apply modified settings to handle such terrain effects better than say AUSPLUME or the ISC model which AERMOD replaced, but it is not clear if these settings were used in this case. Also it is observed that the height differential is relatively small, and such effects may not be large.

Examination of the air dispersion plots, for example the 24-hour average PM_{10} and $PM_{2.5}$ figures presented in **Figure 4-1** and **Figure 4-2**, indicates that there is no abnormal bunching or spreading of the dispersion lines for the receptors in this area, indicating that the model is handling the dispersion of the dust adequately well in the location of the receptors in complex terrain. Thus, whether or not the most ideal model or settings were applied, the results appear to be adequate, and this is not considered to be a significant issue.

Regarding cumulative impacts, it is correct that the Project would only make a relatively small contribution to annual average impacts, however it appears that it would contribute 0.5, not <0.4 $\mu g/m^3$ to annual average $PM_{2.5}$ levels.

The regional cumulative impact assessment of the original two proposals on the Project site found only a small, improvement in the regional exposure to $PM_{2.5}$ due to the proposed development, largely as the existing fleet of locomotives in NSW has relatively higher emissions than in other overseas jurisdictions. This is a key reason for the current program of measures to tackle locomotive emissions. If these measures are successful, there may be a more significant improvement in regional air quality, but this is not directly related to the Project.

The sensitivity analysis related to dust emissions shows only minor changes would arise if the assumed area of exposed and crusted land were to increase. This analysis appears to incorporate the 50% control factor for the active 36 Ha of land. The results indicate the Project's ability to comply with the criteria is not governed by the area of land exposed to wind erosion, but the analysis did not quantify the potential effects that may arise due to a lower dust wind erosion threshold that may perhaps occur for the local soils, or that the soils may have less propensity for crusting than stockpiled materials. The analysis highlights that it is important to ensure the proposed dust mitigation measures are diligently applied in order to achieve the predicted level of performance.

6 SUGGESTIONS FOR CONDITIONS OF APPROVAL

As outlined above, there is a significant level of dust control proposed for managing wind erosion and dozer emissions. In daily practice, the degree of control needed and the specific actions required will vary, for example according to the dustiness, moisture and other material properties, the prevailing weather conditions, and the extent and duration of the specific activity at the time.

Suggestions for inclusion in the Condition of Approval for the Project are as follows:

Construction Environmental Management

Dust Management

E1 The Applicant shall carry out all feasible and reasonable measures to minimise dust generated by the Development.

Construction Environmental Management Plan – Sub Plans

The Applicant shall prepare and implement:

a) a Construction Air Quality Management Plan to detail how impacts on local air quality will be minimised and managed. The Plan shall be developed in consultation with the EPA, and shall include, but not necessarily be limited to:

   i. identification of sources (including stockpiles and open work areas) and quantification of airborne pollutants;

   ii. key performance indicators for local air quality during construction;

   iii. details of monitoring methods, including location, frequency and duration of monitoring;

   iv. mitigation measures to minimise impacts on local air quality;

   v. a plan for preventing the emission of visible dust from the premises;

   vi. procedures for record keeping and reporting against key performance indicators;

   vii. provisions for implementation of additional mitigation measures in response to issues identified during monitoring and reporting; and,

   viii. mechanisms for the monitoring, review and amendment of this plan.

The predicted dust impacts during construction depend significantly on the level of dust control applied to manage dozing and wind erosion emissions. Conditions similar to the following may be suitable for consideration to apply during construction of the Project:

1. All vehicles entering or leaving the site to be covered;

2. All vehicles to be cleaned of loose dirt, sand and other materials before they leave the site, to avoid tracking these materials onto public roads.

3. Water carts are to be used to control dust emissions from exposed areas and vehicles travelling on unpaved surfaces, graders and for dozers pushing fill material. Exposed areas will be watered regularly to minimise dust emissions. Grader and bulldozer travel routes and materials handled must be kept suitably moist.

4. Water will be used as appropriate to maintain moisture in the material being dozed, such that dust emissions on a dry day would be halved relative to not applying the water. Water may be applied prior to materials being taken on site, provided that the same effect is achieved.

5. The total exposed, freshly disturbed area of land at the site at any time will be kept below 36Ha (consistent with the AQIA), and the total area of exposed land (i.e. cleared, non-vegetated land, that is not treated to prevent wind erosion) will be kept below 100Ha (consistent with the staging of the Project.

7 SUMMARY AND CONCLUSIONS

The air quality impact assessment demonstrates that the Project would not cause unacceptable air quality impacts.

As with most assessments, there are some aspects of the air quality impact assessment that could in hindsight be improved, but these issues do not affect the overall conclusions or findings.

Overall, the modelling methodology is generally adequate and is suitable as a basis for assessing the projects air quality impacts, which are predicted to be below the relevant criteria for each of the modelled pollutants at the sensitive receptors.

The proposed implementation of dust control measures during the construction phase are consistent with good practice. The assumptions in the assessment relating to the level of dust control, such as 50% control of dust due to wind erosion and from dozing activities, are important measures to implement in practice to ensure the predicted project emissions, or lower, are achieved for the actual operation.

Conditions have been recommended per the assumptions applied in the assessment. It is important to ensure these controls are implemented for the project construction phase, and also the operational phase as applicable.

8 REFERENCES

Arcadis (2017)

"Moorebank Precinct West (MPW) Stage 2 (SSD 7709) Response to Submissions", prepared by Arcadis, July 2017.

Ramboll Environ (2016)

"Moorebank Precinct West Stage 2 Air Quality Impact Assessment", prepared for Arcadis by Ramboll Environ, October 2016.