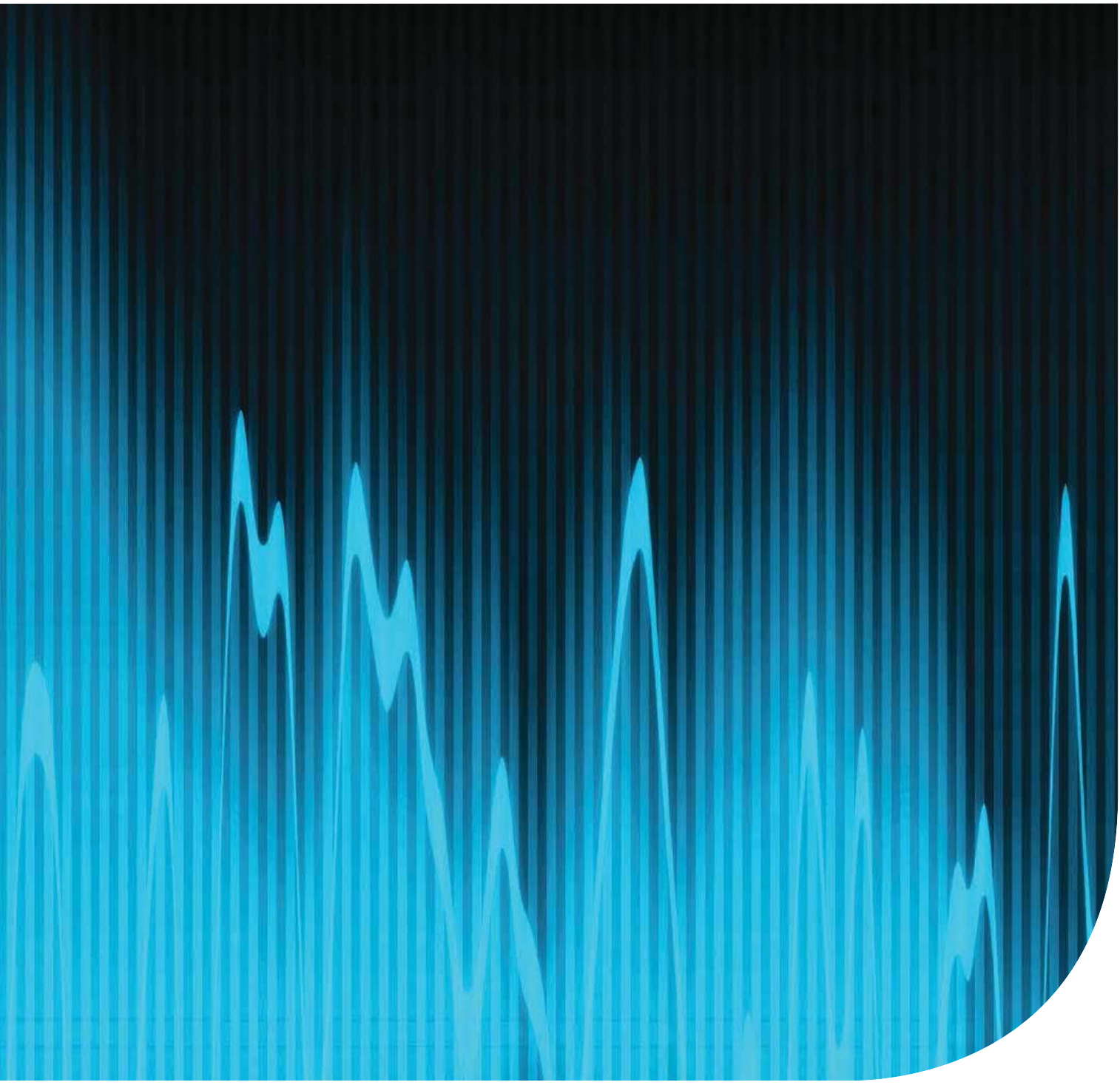
Moorebank Precinct East Stage 2

Noise and vibration independent review

Prepared for Department of Planning and Environment | 27 October 2017



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Moorebank Precinct East Stage 2

Final

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1 Introduction

EMM Consulting Pty Limited (EMM) has been engaged by the Department of Planning and Environment (the Department) to complete an independent review of information relevant to the assessment of noise and vibration impacts for the Moorebank Precinct East (MPE) Stage 2 Proposal (the Proposal) (SSD 7628).

EMM's involvement has been generally limited to a desktop review of information. EMM has not completed independent noise modelling to verify outcomes.

EMM's scope of work includes:

- Impact assessment review:
    - review the noise and vibration impact assessment report and comment on the technical adequacy and completeness of the assessment. The methodology review shall take into account relevant noise and vibration impact assessment guidelines, requirements and legislation;
    - analysis of the results of the noise and vibration impact assessment, with reference to applicable legislation, guidelines and comparable projects;
    - review the appropriateness and effectiveness of management and mitigation measures recommended for the project, taking into account relevant guidelines, industry best practice and research or monitoring evidence (preferably published);
    - gap analysis;
    - post-exhibition document review; and
- Impact assessment review report including draft recommended conditions that could be applied to avoid, minimise, mitigate, and/or manage the residual noise and vibration impacts (should approval of the project be recommended).

The following documents were reviewed as part of EMM's work:

- Moorebank Precinct East - Stage 2 Proposal, Environmental Impact Statement (EIS) – (SSD16-7628) prepared by Arcadis, December 2016;
- MPE Stage 2, Noise and vibration impact assessment (NVIA) prepared by Wilkinson Murray Pty Limited, December 2016 (EIS Appendix L);
- MPE Concept Plan Modification Review of noise and vibration impacts, prepared by Wilkinson Murray Pty Limited, November 2016;
- EIS Website Submissions, available at http://majorprojects.planning.nsw.gov.au;
- Sydney Intermodal Terminal Alliance (SIMTA) Moorebank Precinct East Response to Submissions Report – SSD 16_7628 prepared by Arcadis, July 2017;
- Moorebank Precinct East (MPE) Stage 2 (SSD 16_7628) Response to Submissions letter prepared by Arcadis to Department of Planning and Environment dated 9 August 2017;

- Moorebank Precinct West - Stage 2 Proposal, Environmental Impact Statement (EIS) – (SSD16-7709) prepared by Arcadis, October 2016; and
- Moorebank Precinct West (MPW) Stage 2, Noise and vibration impact assessment prepared by Wilkinson Murray Pty Limited, October 2016 (MPW EIS Appendix N).

2 Proposal description

2.1 Original Proposal

The Proposal involves the construction and operation of Stage 2 of the MPE Project, comprising warehousing and distribution facilities on the MPE site and upgrades to approximately 1.5 km of Moorebank Avenue.

Key components of the Proposal include:

- warehousing comprising approximately 300,000m^2 gross floor area (GFA) and additional ancillary offices;
- a freight village, comprising 8,000m^2 GFA of retail, commercial and light industrial land uses;
- establishment of an internal road network, and connection of the Proposal to the surrounding public road network;
- ancillary supporting infrastructure within the Proposal site, including:
  - stormwater, drainage and flooding infrastructure;
  - utilities relocation and installation; and
  - vegetation clearing, remediation, earthworks, signage and landscaping;
- subdivision of the MPE Stage 2 site;
- an upgrade to Moorebank Avenue; and
- upgrading existing intersections along Moorebank Avenue to the south of Anzac Road.

The Proposal would interact with the MPE Stage 1 Project (SSD_6766) via the transfer of containers between the MPE Stage 1 Intermodal Terminal (IMT) and the Proposal's warehousing and distribution facilities. This transfer of freight would be via a fleet of heavy vehicles capable of being loaded with containers and owned by SIMTA. The fleet of vehicles would be stored and used on the MPE Stage 2 site, but registered and suitable for on-road use. The Proposal is expected to operate 24 hours a day, seven days per week.

To facilitate operation of the Proposal, the following construction activities would be carried out across and surrounding the Proposal site (area on which the Proposal is to be developed):

- vegetation clearance;
- remediation works;
- demolition of existing buildings and infrastructure on the Proposal site;
- earthworks and levelling of the Proposal site, including within the terminal hardstand;
- drainage and utilities installation;

- establishment of hardstand across the Proposal site, including the terminal hardstand;
- construction of a temporary diversion road to allow for traffic management along the Moorebank Avenue site during construction (including temporary signalised intersections adjacent to the existing intersections) (the Moorebank Avenue Diversion Road);
- construction of warehouses and distribution facilities, ancillary offices and the ancillary freight village; and
- construction works associated with signage, landscaping, stormwater and drainage works.

2.2 Amended Proposal

The environmental impact statement (EIS) for the Proposal was publicly exhibited between 13 December 2016 and 24 February 2017. Following exhibition, SIMTA has amended the Proposal, now known as the Amended Proposal. SIMTA states this was done to address submissions received, reflect progression in design development since lodgement of the EIS, provide additional clarity and also to minimise the overall environmental impact of the Proposal where possible.

The Amended Proposal includes the following components:

- realignment of the on-site stormwater detention in the north-eastern corner of the Proposal site;
- changes to the horizontal extent of the Moorebank Avenue upgrade;
- changes to warehouse layout in two separate locations;
- alterations to drainage design to the south of the MPE site; and
- amendments to the construction area and operational area as a result of the above amendments.

3 Methodology review

3.1 Existing noise environment and assessment locations

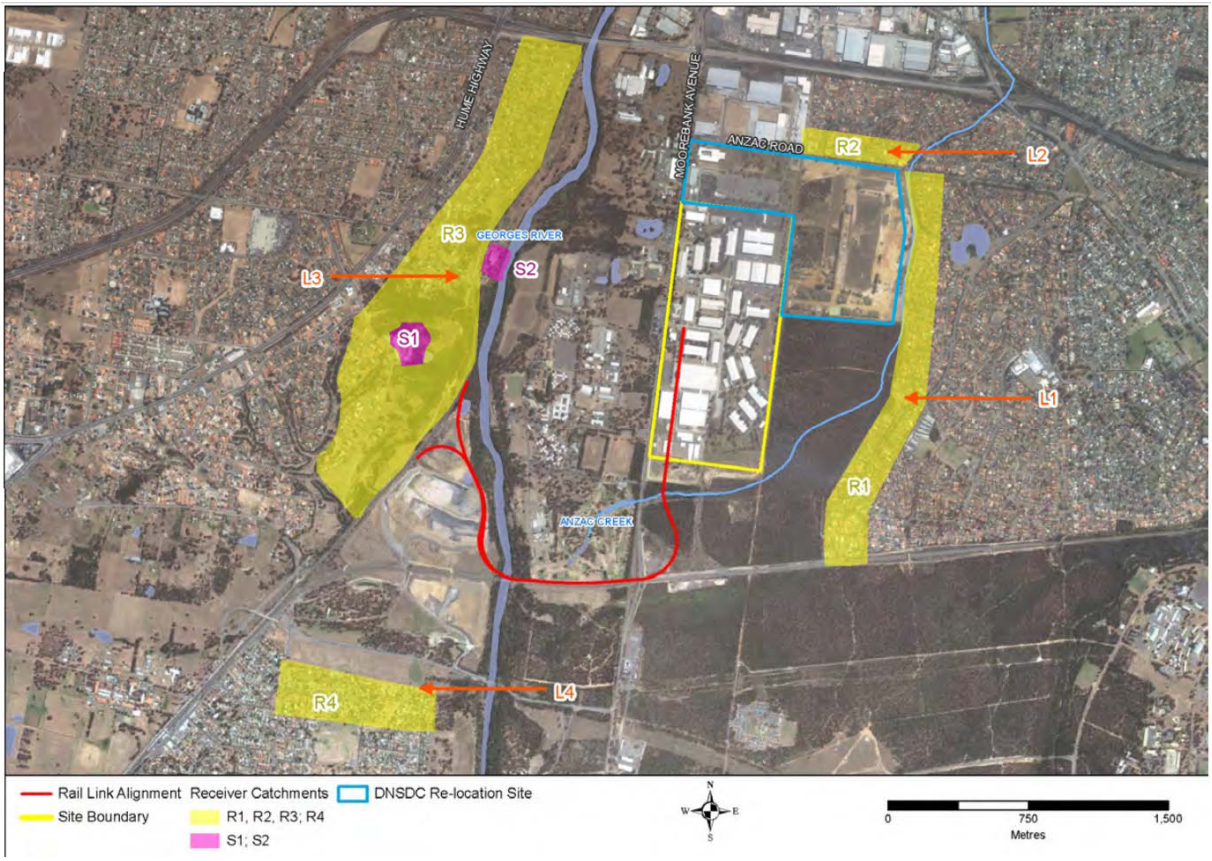
3.1.1 Assessment locations

The noise environment surrounding the site is characterised by the local road network, including Moorebank Avenue, the South Western Motorway and other transport infrastructure such as the Main Southern Railway Line and the East Hills Railway Line. Commercial and industrial areas around the site along Moorebank Avenue and Anzac Road also contribute to the local noise environment. The site is located adjacent bushland area and the Georges River to the west and residential receivers exist in the suburbs of Casula, Glenfield and Wattle Grove to the west, south west and east of the site respectively.

The locations of noise-sensitive receivers (i.e. assessment locations) adopted for the purpose of the noise assessment are considered appropriate. The assessment has considered the nearest potentially affected noise-sensitive receivers; residences, industrial facilities and educational facilities.

3.1.2 Adopted representative monitoring locations

The EIS NVIA relied upon the noise monitoring presented in the noise impact assessment prepared for the Concept Plan EIS (Wilkinson Murray, 2013). Noise monitoring was undertaken at four locations considered to be representative of all noise-sensitive receivers within the four predefined catchment areas; Wattle Grove (R1), Wattle Grove north (R2), Casula (R3) and Glenfield (R4). The noise monitoring locations (L1, L2, L3 and L4) and receiver catchment areas are shown in Figure 4-1 of the Concept Plan noise impact assessment report (Wilkinson Murray, 2013) and reproduced here in Figure 3.1.



Source: Noise impact assessment prepared for the Concept Plan EIS (Wilkinson Murray, 2013)

Figure 3.1 Noise measurement and assessment locations

The use of only one monitoring location for each of the four relatively broad residential areas is identified as a limitation to the noise impact assessment. Normal practice is to include enough sampling spread across such large geographic areas to adequately represent the potentially most impacted locations.

3.1.3 Ambient and background noise monitoring

Baseline noise monitoring was completed as part the Concept Plan EIS (Wilkinson Murray, 2013) primarily to obtain rating background levels (RBLs) for setting noise criteria to assess noise from proposed construction works and operational activities.

For RBL determination, the INP recommends collection of seven days of 'valid' data at locations representative of the most exposed sensitive receivers to the Proposal. This generally means data unaffected by rain or winds in excess of 5 m/s, with data exclusion rules applying as described in Appendix B of the INP.

It is important to monitor weather conditions during any baseline noise surveys and the INP recommends, for example, monitoring wind speed at the microphone position for the purposes of applying the data exclusion rules and calculation of final representative noise levels. In the absence of recorded weather data at microphone height it is common practice to adopt nearby weather stations operated by the Bureau of Meteorology (BoM) for such purposes, so long as these can be shown to be representative of the area where noise monitoring occurred.

It is not clear from the data presented in the noise impact assessment for the Concept Plan EIS (Wilkinson Murray, 2013) whether data exclusion due to weather has been conducted and, hence, whether there is the minimum requirement of seven days of valid data.

Results of ambient and background noise monitoring used for the purpose of establishing noise criteria for the MPW Stage 2 project (presented in the MPW Concept Plan EIS) are different to those used for the purpose of assessing noise from the MPE Stage 2 project and, in some cases, considerably lower. It is recommended that a detailed review and summary of data from relevant studies be provided to justify the use of the adopted ambient and background noise levels, and the resulting criteria.

Notwithstanding the preceding, the predicted noise emissions from the cumulative MPE project (Stages 1 and 2) are significantly below the noise criteria established in the NVIA and below minimum criteria that could be established as part of an INP assessment.

This issue can be addressed through the draft recommended conditions, should the Department grant approval.

4 Assessment criteria

The EIS NVIA (Wilkinson Murray, 2016) references appropriate guidelines, policies and standards including most of those nominated in the Secretary's Environmental Assessment Requirements (SEARs) for the project issued by the Department on 27 May 2016. The guidelines, policies and standards adopted are:

- NSW Industrial Noise Policy (INP), Environment Protection Authority (EPA), 2000;
- NSW Road Noise Policy (RNP), Department of Environment, Climate Change and Water (DECCW), 2011;
- Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change(DECC), 2009; and
- Assessing vibration: a technical guideline (AVATG), NSW Department of Environment and Conservation (DEC), 2006.

The guidelines from the SEARs that are not referenced are the Development Near Rail Corridors and Busy Roads Interim Guideline (DoP, 2008) and the Rail Infrastructure Noise Guideline (RING) (EPA, 2013). The consequences of this are not material to this project since there is no rail associated with the project.

5 Noise impact assessment

5.1 Construction noise assessment

A recognised and acceptable computer noise model has been adopted to predict noise emission levels from construction activity at the site. Sound power levels for typical construction plant and equipment were provided in Table 6-5 of the NVIA (Wilkinson Murray, 2016) and are considered appropriate.

The proposed construction period, inclusive of the adjoining associated developments, is expected to occur over a period of approximately five years. Construction activities are proposed generally during standard hours, although some out-of-hours (OOH) works are expected.

Details on the assumed locations and quantities of construction equipment have not been provided although it is stated that "*simultaneous operation of all plant and equipment was averaged out across the construction modelling area*".

An assessment of cumulative potential construction noise impacts has been provided in Attachment D to the Response to Submissions letter to DPE dated 9 August 2017. Construction noise levels 2 to 4 dB above the relevant noise management levels are predicted during some out-of-hours periods in the receiver areas of Casula and Wattle Grove. It is concluded that, due to the conservative nature of the assessment, that construction noise is unlikely to exceed the relevant NML's and it can be effectively managed. Confidence in this conclusion would be enhanced by the provision of assumptions regarding locations and quantities of construction equipment. Further, cumulative construction noise levels have not been assessed at the nearest industrial receivers for proposed OOH activity.

Based on the information provided, noise enhancing meteorological conditions were not considered in modelling construction noise impacts. Predicted construction noise levels will be higher when adverse weather conditions prevail. Notwithstanding this, the predictions indicate adherence with the construction NML's at most locations and for most proposed activities. Allowing for some increase in predicted levels due to adverse weather conditions, impacts are not expected to be significant at most locations. The predicted exceedances of 2 to 4 dB at Casula and Wattle Grove will be exacerbated by noise-enhancing weather conditions.

It is not clear whether the ICNG penalties have been applied to predictions for annoying characteristics such as that associated with excavators with breakers. Nonetheless, routine compliance monitoring in accordance with the developed construction noise and vibration management plan (CNVMP) will be used to confirm actual received noise levels inclusive of penalties for noise characteristics, if relevant.

This issue can be addressed through the draft recommended conditions, should the Department grant approval.

5.2 Construction vibration assessment

A detailed assessment of potential vibration from construction for specific receivers has not been completed. The NVIA only provides safe working distances for typical vibration intensive plant to achieve relevant cosmetic damage and human response criteria. This is common practice for this stage of the project however it is recommended that further consideration be given to this issue during the design stages of the project and for the purpose of preparing the CNVMP. Notwithstanding the preceding, given the separation distance between the site and the nearest residences construction vibration impacts are considered unlikely.

5.3 Operational noise assessment

A recognised and acceptable computer noise model has been adopted to predict operational noise emission levels from the site. However, details on assumed noise source locations was not provided in any mapping which makes it difficult for the reader to comprehend the scale and placement of noise producing activities. Clarification on this was sort in the gaps analysis.

A detailed analysis of site-specific weather data with regard to prevailing weather conditions has not been provided. Noise-enhancing weather conditions have been considered during the night-time only. Confirmation should be provided that prevailing conditions (i.e. source to receiver winds) are not relevant during the day and evening periods. Notwithstanding, allowing for some increase in predicted operational levels due to adverse weather conditions it is expected that operational noise levels would remain below the relevant noise criteria for the day and evening periods.

5.4 Road traffic noise

Road traffic noise associated with construction and operation of the project has been predicted using the Calculation of Road Traffic Noise (CoRTN) algorithm which is widely accepted for such purpose. The nearest residences potentially affected by an increase in project-related traffic are located adjacent to the M5 Motorway. Given the significant level of existing traffic on this roadway, the predicted increase in total road traffic noise level due to project-related traffic is negligible and well within the relevant criteria specified in the NSW RNP (DECCW, 2011), assuming all feasible and reasonable mitigation measures have been considered.

5.5 Noise and vibration mitigation

Recommendations with regard to noise and vibration mitigation and monitoring are provided in Section 9.1 of the MPE Stage 2 NVIA (Wilkinson Murray, 2016). Since predicted noise levels from the construction and operation of the project indicate compliance with the relevant noise and vibration criteria the recommendations are considered to be standard practice for a development of this scale and nature.

This issue can be addressed through the draft recommended conditions, should the Department grant approval.

6 Gap analysis

Table 6.1 provides a summary of the preliminary gap analysis undertaken as part of the review and a summary of the response provided together with final review comments provided by EMM.

Table 6.1 Gap analysis

Item	Summary of information gap	Response / EMM comment
	EMM review 1 dated 5 May 2017	
1	Provide a summary of all relevant baseline monitoring data from historic studies and reconcile all these to show that the adopted rating background levels used to develop site specific criteria for this project are appropriate. Review of available data shows sampling as far back as 2010, and conducted by Parsons Brinckerhoff, PAE Holmes, SLR and Wilkinson Murray at various times for the various components of the Moorebank facility (both east and west of Moorebank Avenue). For example, the adopted criteria for the Wattle Grove location is based on an RBL of 37dB at night, whereas historic monitoring shows levels as low as 32dB RBL for Corryton Court located on the western edges of Wattle Grove and therefore representative of potentially the most exposed to site noise (as published in the Moorebank Intermodal Terminal Project EIS Vol3 by Parsons Brinkerhoff October 2014, Technical Paper 2 by SLR report of 1 October 2014, which cites logging by Parsons Brinkerhoff).	A summary of baseline noise monitoring was not provided. This issue will be address through draft recommended conditions, should the Department grant approval.
2	Provide separate site plan showing each of the operational stages' equipment placements used in the model (e.g. route for trucks on site for day, evening and night scenarios and position of all major noise sources).	Plans showing noise source placement were not provided. This information would assist in providing clarity and confidence in the NVIA conclusions that relevant noise criteria will be met.
3	Confirm no cumulative construction noise is expected during out of hours periods or provide an assessment of such as per the standard hours cumulative assessment.	A cumulative construction noise assessment was prepared by Wilkinson Murray and provided as Attachment D to the Response to Submissions letter to DPE dated 9 August 2018. Further information is required with regard to potential cumulative impacts at the nearest industrial receivers during OOH periods. This issue will be address through draft recommended conditions, should the Department grant approval.
	EMM review 2 dated 22 September 2017	A response directed at these two items only was provided to the Department in a letter dated 16/10/2017.
1	A response to our previous gaps analysis relating to a summary of all available baseline monitoring data and relevance of RBLs adopted has not been provided to date. Notwithstanding, further review of historical noise data relevant to the various stages of both the Moorebank Precinct East (MPE) and Moorebank Precinct West (MPW) project has been undertaken. The basis of adopting certain baseline sampling over others for determining representative background noise levels or rating background levels (RBLs) as per the EPA's Industrial Noise Policy (INP) is unclear. The MPE Stage 2 NVIA (Wilkinson Murray, November 2016) adopted data from the MPE Concept Plan EIS NVIA (Wilkinson Murray, August 2013). This data was collected by Wilkinson Murray in August 2012 or May 2013. This data is also adopted in the MPE Stage 1 NVIA	In summary, the response from the proponent included acknowledgement of disparity between the RBLs, but otherwise that these were established in accordance with the requirements of the NSW EPA's INP for the concept plan stages of each project. This issue will be address through draft recommended conditions, should the Department grant approval. The approach will include adopting

Table 6.1 Gap analysis

Item	Summary of information gap	Response / EMM comment
	(Wilkinson Murray, May 2015). The final adopted RBLs for assessment purposes in all these studies is as follows: a) Wattle Grove (east of the site at 15 Larra Court): 42 dB, 37 dB and 37 dB for the day, evening and night respectively; b) Casula (west of the site at 2 Rushton Place): 41 dB, 37 dB and 34 dB for the day, evening and night respectively; and c) Glenfield (south west of the site at 14 Goodenough Street): 44 dB, 44 dB and 37 dB for the day, evening and night respectively. By comparison, the MPW Stage 2 NVIA (Wilkinson Murray, October 2016) adopts baseline monitoring data from a third party as reported in the MPW Concept Plan EIS NVIA (SLR 2014). This monitoring was collected in 2012 from SLR's continuous noise survey, and hence around a similar time to that in the Wilkinson Murray 2013 NVIA. The final adopted RBLs for assessment purposes in the MPW Stage 2 NVIA are: d) Wattle Grove (east of the site at Corryton Court): 35 dB, 35 dB and 32 dB for the day, evening and night respectively; e) Casula (west of the site at Buckland Road): 39 dB, 39 dB and 33 dB for the day, evening and night respectively; and f) Glenfield (south west of the site at Goodenough Street): 35 dB, 35 dB and 33 dB for the day, evening and night respectively. Comparing the two sets of RBLs above for essentially the same or similar locations shows differences at all locations, which are material for Wattle Grove and Glenfield. This issue is a clear demonstration and evidence of the limitations in using sparsely deployed monitoring locations for such large geographic areas.	achievable predicted noise levels or criteria developed using the lower RBLs found in each area as reported in the MPW studies.
2	The predicted noise levels in Table 7-10 Predicted LAeq,15min Noise Levels – MPE Stage 1 & MPE Stage 2 of the MPE Stage 2 EIS NVIA (Wilkinson Murray, November 2016 or Arcadis December 2016) are inconsistent with the MPE Stage 1 predictions. For example, MPE Stage 1 NVIA night adverse weather predictions (Wilkinson Murray, May 2015) are 39 dB LAeq,15min for Wattle Grove (NCA1), while in the MPE Stage 2 document it is 32 dB LAeq,15min for the two combined operations of MPE. This requires clarification. There may be implications from MPW changes for these results including warehouse buildings and the noise barrier proposed for MPW. However, the 7dB change shown here is difficult to explain with such structures being well removed from MPE noise sources given benefits of such are limited during adverse weather. All predictions for adverse weather during the night behave in this way, ie lower for the combined operations.	In summary, the response from the proponent confirmed that the noted differences are due to the shielding offered by warehousing proposed as part of MPE Stage 2. This is noted and any noise conditions will consider the lower predicted levels as achievable.

7 Post-exhibition review

Submissions on the EIS from government agencies, organisations and the public are provided on the DPE website (http://majorprojects.planning.nsw.gov.au). EMM has reviewed these submissions together with the proponent's response to submissions report (Arcadis, 2017) with a focus on noise and vibration issues. It is noted that the response to submissions report (Arcadis, 2017) also includes an assessment of the Amended Proposal.

7.1 Government Agencies

7.1.1 EPA

The NSW EPA identified several concerns in relation to noise and vibration from the site. These are summarised as follows:

- appropriate justification for out-of-hours construction activity;
- justification for the onsite crushing and concrete batch plant instead of using local concrete suppliers;
- requirement for a construction noise and vibration management plan;
- the need for reversing on the site and for trucks to stop in exposed areas should be minimised; and
- cumulative noise from MPE and Moorebank Precinct West should be predicted and assessed.

The EPA submission is considered to be adequately addressed in the proponent's response to submissions report (Arcadis, 2017).

7.1.2 Transport for NSW and Roads and Maritime Services

TfNSW and RMS provided a joint submission to the Department with regard to the four State Significant Development Applications currently relevant to the Moorebank Precinct West and MPE. No specific comments were provided in relation to noise or vibration however concerns have been raised with regard to traffic routes and volumes generated by the construction and operational phases of the project which may have implications to the road traffic noise assessment.

If traffic routes and/or volumes change there will be a need to reassess project-related road traffic noise levels or justification provided as to why they would not need to be reassessed.

This issue can be addressed through the draft recommended conditions, should the Department grant approval.

7.2 Liverpool City Council

The Liverpool City Council (LCC) provided a detailed submission in the form of a peer review of the EIS which was prepared by Cardno (refer *SIMTA Intermodal Terminal Project – Moorebank Precinct East Stage 2 Peer Review* dated 20 February 2017). General concerns were raised with regard to noise impacts on human health during construction and operation of the project. The proponent's response to submissions is considered to adequately address these general concerns.

Specific concerns were identified in relation to the NVIA including the following:

- It is not clear if consideration has been given to construction activities identified as highly annoying as per the ICNG;
- Background noise levels (RBLs) for out-of-hours (OOH) construction periods should consider background noise levels specific to that OOH period for each noise catchment area;
- There are no figures showing source locations adopted for noise modelling of construction and operational activities;
- A summary table detailing the number and type of sources for modelling of construction and operational activities has not been included; and
- It is not clear whether the assessment has included noise contribution from internal truck movements (ie between the site and the intermodal terminal and MPW).

The proponent's response to submissions is considered to adequately address most of these concerns. As stated in the LCC submission "*The level of detail currently provided does not allow for an independent assessment to replicate or authenticate model assumptions or results"*. Outstanding information that would assist in providing clarity and confidence in the conclusions made in the NVIA includes the following:

- Diagrams showing source locations adopted for noise modelling of construction and operational activities; and
- A summary table detailing the number and type of sources for modelling of construction and operational activities including internal truck movements.

7.3 ABB Australia Pty Ltd (ABB)

ABB, which is the owner of adjoining land to the site, has raised concerns with regard to construction noise emission levels not being predicted at their site.

The response to submissions prepared by the proponent goes some way to addressing these concerns. However, additional information should be provided with regard to the potential cumulative construction noise impacts (i.e. including construction works associated with MPW) at the ABB site.

7.4 Peak groups and advisory organisations

No issues relating to noise and vibration were raised.

7.5 Environmental groups

No issues relating to noise and vibration were raised.

7.6 Community submissions

Approximately 11% of the total community submissions raised concerns with regard to noise impacts from the project.

The community submissions are considered to be adequately addressed in the proponent's response to submissions report (Arcadis, 2017).

8 Draft recommended conditions

8.1 Construction hours

1. Construction activities shall be undertaken during the following standard construction hours:

    a) 7:00 am to 6:00 pm Mondays to Fridays, inclusive;

    b) 8:00 am to 1:00 pm Saturdays; and

    c) at no time on Sundays or public holidays.

2. Except as permitted by an EPL, activities resulting in high noise impact (including impulsive or tonal noise emissions) shall only be undertaken:

    a) between the hours of 8:00 am to 5:00 pm Monday to Friday;

    b) between the hours of 8:00 am to 1:00 pm Saturday; and

    c) in continuous blocks not exceeding three hours each with a minimum respite from those activities and works of not less than one hour between each block.

For the purposes of this condition, 'continuous' includes any period during which there is less than a one hour respite between ceasing and recommencing any of the work that is the subject of this condition.

3. Notwithstanding the above conditions, construction works may be undertaken outside the hours specified in the following circumstances:

    a) where they can be shown to be inaudible at residences and vibration levels do not exceed those stipulated by Table 2.2 and Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006);

    b) where noise can be shown to satisfy the noise management levels specified in the Interim Construction Noise Guideline (DECC, 2009) at non-residential land uses;

    c) where a negotiated agreement has been arranged with affected receivers;

    d) for the delivery of materials required by the police or other authorities for safety reasons;

    e) where it is required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm;

    f) construction works approved through an Environment Protection Licence (including an approved Out-Of-Hours Work Protocol prepared as part of the Construction Noise and Vibration Management Plan). The protocol must include notification of the relevant Council, local residents and other affected stakeholders and sensitive receivers of the timing and duration at least 48 hours prior to the commencement of the works; and

    g) identified works approved by the Secretary.

8.2 Construction noise and vibration impact assessment criteria

The Proponent shall implement all reasonable and feasible noise mitigation measures with the aim of achieving the following construction noise management levels and vibration criteria:

a) construction noise management levels established using the Interim Construction Noise Guideline (DECC 2009);

b) vibration criteria established using the Assessing Vibration: a Technical Guide (DECC 2006) (for human exposure); and

c) the vibration limits set out in the German Standard DIN 4150-3: Structural Vibration effects of vibration on structures (for structural damage).

Any construction activities identified as exceeding the construction noise management levels and/or vibration criteria shall be managed in accordance with the Construction Noise and Vibration Management Plan. All feasible and reasonable noise mitigation and management measures shall be implemented and any activities that could exceed the construction noise management levels shall be identified and managed in accordance with the Construction Noise and Vibration Management Plan.

Note: The Interim Construction Noise Guideline identifies 'particularly annoying' activities that require the addition of 5dB(A) to the predicted level before comparing to the construction NML.

8.3 Construction traffic noise

4. Construction traffic movements on public roads shall aim to limit any increase in existing road traffic noise levels to no more than 2 dB $L_{Aeq,period}$, where 'period' is defined in the EPA's Road Noise Policy (RNP) for both day and night. All feasible and reasonable noise mitigation and management measures shall be implemented to achieve this limit.

5. The Proponent is to ensure that construction vehicle contractors operate so as to minimise impacts. Measures that could be used include toolbox talks, contracts that include provisions to deal with unsatisfactory noise performance for the vehicle and/or the operator, and specifying non-tonal movement alarms in place of reversing beepers or alternatives such as reversing cameras and proximity alarms, or a combination of these, where tonal alarms are not mandated by legislation.

6. No use of compression brakes for construction vehicles associated with the project that are on site or on nearby roads (eg Anzac Road).

8.4 Construction Noise and Vibration Management Plan (CNVMP)

7. A Construction Noise and Vibration Management Plan must be developed and detail how construction noise and vibration impacts will be minimised and managed. The Plan shall be consistent with the guidelines contained in the Interim Construction Noise Guidelines (Department of Environment and Climate Change 2009). The plan shall be developed in consultation with the EPA and shall include, but not be limited to:

    i) identification of the work areas, site compounds and access points;

ii) identification of sensitive receivers (including heritage structures if relevant) and relevant construction noise and vibration goals applicable to the project and stipulated in the conditions above;

iii) details of construction activities and an indicative schedule for construction works, including the identification of key noise and/or vibration generating construction activities (based on representative construction scenarios) that have the potential to generate noise and/or vibration impacts on surrounding sensitive receivers, particularly residential areas;

iv) an Out-of-hours Work Protocol for the assessment, management and approval of works outside standard construction hours as defined in the conditions herein, for the Secretary's approval. The Out-of-hours Work Protocol must detail:

a) assessment of out-of-hours works against the relevant noise and vibration criteria;

b) detailed mitigation measures for any residual impacts (that is, additional to general mitigation measures), including extent of at-receiver treatments; and

c) proposed notification arrangements.

v) identification of feasible and reasonable measures proposed to be implemented to minimise and manage construction noise impacts, including, but not limited to, acoustic enclosures, erection of noise walls (hoardings), respite periods;

vi) management of the number of trucks accessing the site to the maximum identified in the Environmental Assessment and subsequent documentation;

vii) a truck driver protocol addressing designated routes, acceptable delivery hours, speed limits on site, no engine braking in the vicinity or on site, no extended periods of engine idling, avoid queuing in or around the site and limit needs for reversing on site;

viii) identification of feasible and reasonable procedures and mitigation measures to ensure relevant vibration criteria are achieved, including applicable buffer distances for vibration intensive works, use of low vibration generating equipment/ vibration dampeners or alternative construction methodology, and pre- and post- construction dilapidation surveys of sensitive structures where vibration is likely to result in damage to buildings and structures (including surveys being undertaken immediately following a monitored exceedance of the criteria);

ix) a description of how the effectiveness of mitigation and management measures would be monitored during the proposed works, clearly indicating how often this monitoring would be conducted, the locations where monitoring would take place, how the results of this monitoring would be recorded and reported, and, if any exceedance is detected, how any noncompliance would be rectified;

x) noise and vibration monitoring procedures (routine and complaints triggered monitoring);

xi) a community consultation and complaints handling procedure; and

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

8.5 Blasting

8. Blasting is not permitted on the site.

8.6 Operational noise and vibration

8.6.1 Review of operational sleep disturbance impacts

9. The proponent shall prepare a review of sleep disturbance impacts based on detailed design, including:

   a) an assessment of how often noise events occur, the time of day they occur and whether there are any times of day when there is a clear change in noise the environment;

   b) confirm the operational L_{Amax} predictions of the final design; and

   c) consider appropriate noise mitigation measures where required.

   The report shall be prepared in consultation with the EPA and be submitted to the satisfaction of the Secretary within six months of commencement of construction, unless otherwise agreed by the Secretary.

8.6.2 Operational noise and vibration

10. Heavy road freight vehicles are not permitted to use Moorebank Avenue south of the East Hills Railway corridor. A main gate monitoring system (eg CCTV) shall be installed to identify heavy vehicles turning left from the terminal site onto Moorebank Avenue, or turning right from Moorebank Avenue to the terminal site. The Secretary may at any time request the proponent to provide a heavy vehicle monitoring report for the prior 12 month period.

11. Within 12 months of the commencement of operation of the project, or as otherwise agreed by the Secretary, the proponent shall undertake operational noise monitoring to compare actual noise performance of the project against noise performance predicted in the review of noise mitigation measures predicted in documents specified under conditions of this approval, and prepare an Operational Noise Report to document this monitoring. The Report shall include, but not necessarily be limited to:

   a) noise monitoring to assess compliance with the operational noise levels predicted in documents specified under conditions of this approval;

   b) a review of the operational noise levels in terms of criteria and noise goals established in the NSW Road Noise Policy (EPA, 2011);

   c) sleep disturbance impacts compared to those determined in documents referenced in conditions of this approval;

   d) methodology, location and frequency of noise monitoring undertaken, including monitoring sites at which project noise levels are ascertained, with specific reference to locations indicative of impacts on sensitive receivers;

e) details of any complaints and enquiries received in relation to operational noise generated by the project between the date of commencement of operation and the date the report was prepared;

f) any required recalibrations of the noise model taking into consideration factors such as actual traffic numbers and proportions;

g) an assessment of the performance and effectiveness of applied noise mitigation measures together with a review and if necessary, reassessment of all feasible and reasonable mitigation measures; and

h) identification of additional feasible and reasonable measures to those predicted in the documents specified under conditions of this approval, that would be implemented with the objective of meeting the criteria outlined in the NSW Road Noise Policy (EPA, 2011), when these measures would be implemented and how their effectiveness would be measured and reported to the Secretary and the EPA.

12. The proponent shall provide the Secretary and the EPA with a copy of the Operational Noise Report within 60 days of completing the operational noise monitoring referred to in (a) above or as otherwise agreed by the Secretary.

13. To ensure the operational noise impacts are appropriately managed, the following measures apply:

a) Best practice plant; and

b) A risk assessment to determine if non-tonal reversing alarms can be fitted as a condition of site entry. Alternatively, site design may include traffic flow that does not require or precludes reversing of vehicles.

14. The Proponent shall ensure that the noise generated by the overall operations does not exceed the noise impact assessment criteria below at any residence on privately-owned land:

a) Casula

i) 35 dB $L_{Aeq,15minute}$ for the day, evening and night time periods and 45 dB $L_{A1,1minute}$ during the night for MPE alone; and

ii) 39 dB $L_{Aeq,15minute}$ for the day, evening and night time periods and 45 dB $L_{A1,1minute}$ during the night for the precinct (MPE and MPW).

b) Glenfield - 35 dB $L_{Aeq,15minute}$ for the day, evening and night time periods and 45 dB $L_{A1,1minute}$ during the night for the precinct (MPE and MPW); and

c) Wattle Grove

i) 35 dB $L_{Aeq,15minute}$ for the day, evening and night time periods and 45 dB $L_{A1,1minute}$ during the night for MPE alone; and

ii) 36 dB $L_{Aeq,15minute}$ for the day, evening and night time periods and 45 dB $L_{A1,1minute}$ during the night for the precinct (MPE and MPW).

Notes:

The precinct is defined as all activities within the MPE site boundary (stage 1 and 2), together with MPW areas as shown in Appendix B figures herein.

To determine compliance with the $L_{Aeq,15\ minute}$ noise limits, noise from the project is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the EPA may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.

To determine compliance with the $L_{A1,1\ minute}$ noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the EPA may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).

The noise emission limits identified above apply under meteorological conditions of:

(i) wind speeds of up to 3 m/s at 10 metres above ground level; or

(ii) 'F' atmospheric stability class.

Continuous improvement

15. The Proponent shall:

a) continue to implement all reasonable and feasible best practice noise mitigation measures;

b) continue to investigate ways to reduce the noise generated by the project, including maximum noise levels which may result in sleep disturbance; and

c) report on these investigations and the implementation and effectiveness of these measures in the Annual Review to the satisfaction of the Director-General.

Appendix A

Glossary of acoustic terms

A.1 Acoustic terms

A number of technical acoustic descriptions are used in this report. A list of terms and a brief explanation are provided in Table A.1.

Table A.1 Glossary of acoustic terms

Abbreviation or term	Description
ABL	The assessment background level (ABL) is defined in the INP as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L90 statistical noise levels.
Amenity criteria	The amenity criteria relate to all industrial noise. Where industrial noise approaches base amenity criteria, then noise levels from new industries need to demonstrate that they will not be an additional contributor to existing industrial noise.
ANZECC	Australian and New Zealand Environment Conservation Council
CNMP	Construction noise management plan
Day period[1]	Monday to Saturday: 7.00 am to 6.00 pm, on Sundays and public holidays: 8.00 am to 6.00 pm.
dB	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
DGRs	Director-General's environmental assessment requirements
Department	Department of Planning and Environment (NSW government)
EPA	NSW Environment Protection Authority
EP&A Act	Environmental and Planning Assessment Act 1979 (NSW)
Evening period[1]	Monday to Saturday: 6.00 pm to 10.00 pm, on Sundays and public holidays: 6.00 pm to 10.00 pm.
ICNG	Interim Construction Noise Guideline
INP	Industrial Noise Policy (NSW EPA 2000)
Intrusive criteria	The intrusive criteria refers to noise that intrudes above the background level by more than 5 dB. The intrusiveness criterion is described in detail in this report.
L_{A1}	The noise level exceeded for 1% of the time.
L_{A10}	The noise level which is exceeded 10% of the time. It is roughly equivalent to the average of maximum noise level.
L_{A90}	The noise level that is exceeded 90% of the time. Commonly referred to as the background noise level.
L_{Aeq}	The energy average noise from a source. This is the equivalent continuous sound pressure level over a given period. The $L_{eq(15min)}$ descriptor refers to an L_{eq} noise level measured over a 15-minute period.
Linear peak	The peak level of an event is normally measured using a microphone in the same manner as linear noise (ie unweighted), at frequencies both in and below the audible range.
L_{Amax}	The maximum sound pressure level received during a measuring interval.
Night period[1]	Monday to Saturday: 10.00 pm to 7.00 am, on Sundays and public holidays: 10.00 pm to 8.00 am.
NMP	Noise management plan
PSNL	The project-specific noise levels (PSNL) are criteria for a particular industrial noise source or industry. The PSNL is the lower of either the intrusive criteria or amenity criteria.
RBL	The rating background level (RBL) is an overall single value background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the average background levels.
RNP	Road Noise Policy
RING	Rail Infrastructure Noise Guideline

Table A.1 Glossary of acoustic terms

Abbreviation or term	Description
Sound power level (Lw)	A measure of the total power radiated by a source. The sound power of a source is a fundamental property of the source and is independent of the surrounding environment.
Temperature inversion	A meteorological condition where the atmospheric temperature increases with altitude.
Vibration	A motion that can be measured in terms of its displacement, velocity or acceleration. The common unit for velocity is millimetres per second (mm/s).

Note: 1. excludes road traffic noise where Day: 07.00 am to 10.00 pm; Night: 10.00 pm to 07.00 am.

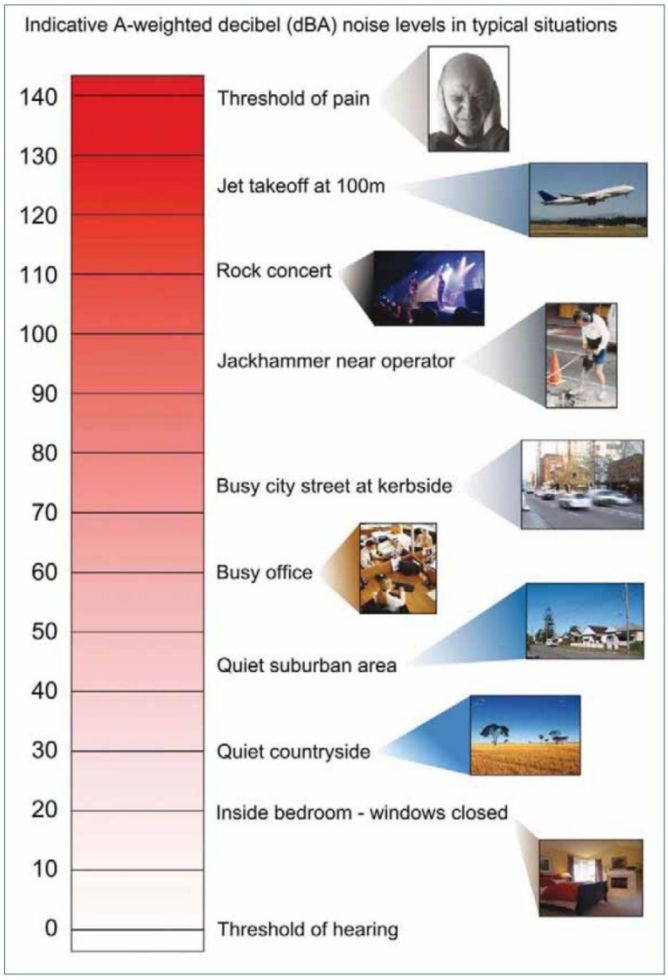
A.2 Common noise levels

It is useful to have an appreciation of the decibel (dB), the unit of sound measurement, when reading this assessment. Table A.2 gives some practical indication of what an average person perceives about changes in noise levels.

Table A.2 Perceived change in noise

Change in sound level (dB)	Perceived change in noise
3	just perceptible
5	noticeable difference
10	twice (or half) as loud
15	large change
20	four times as loud (or quarter) as loud

Examples of common noise levels are provided in Figure A.1.



Source: *RTA Environmental Noise Management Manual (RTA 2001)*

Figure A.1 Common noise levels

Appendix B

Project and Noise Impact Assessment report figures

Figure 1-1 Overview of the Proposal

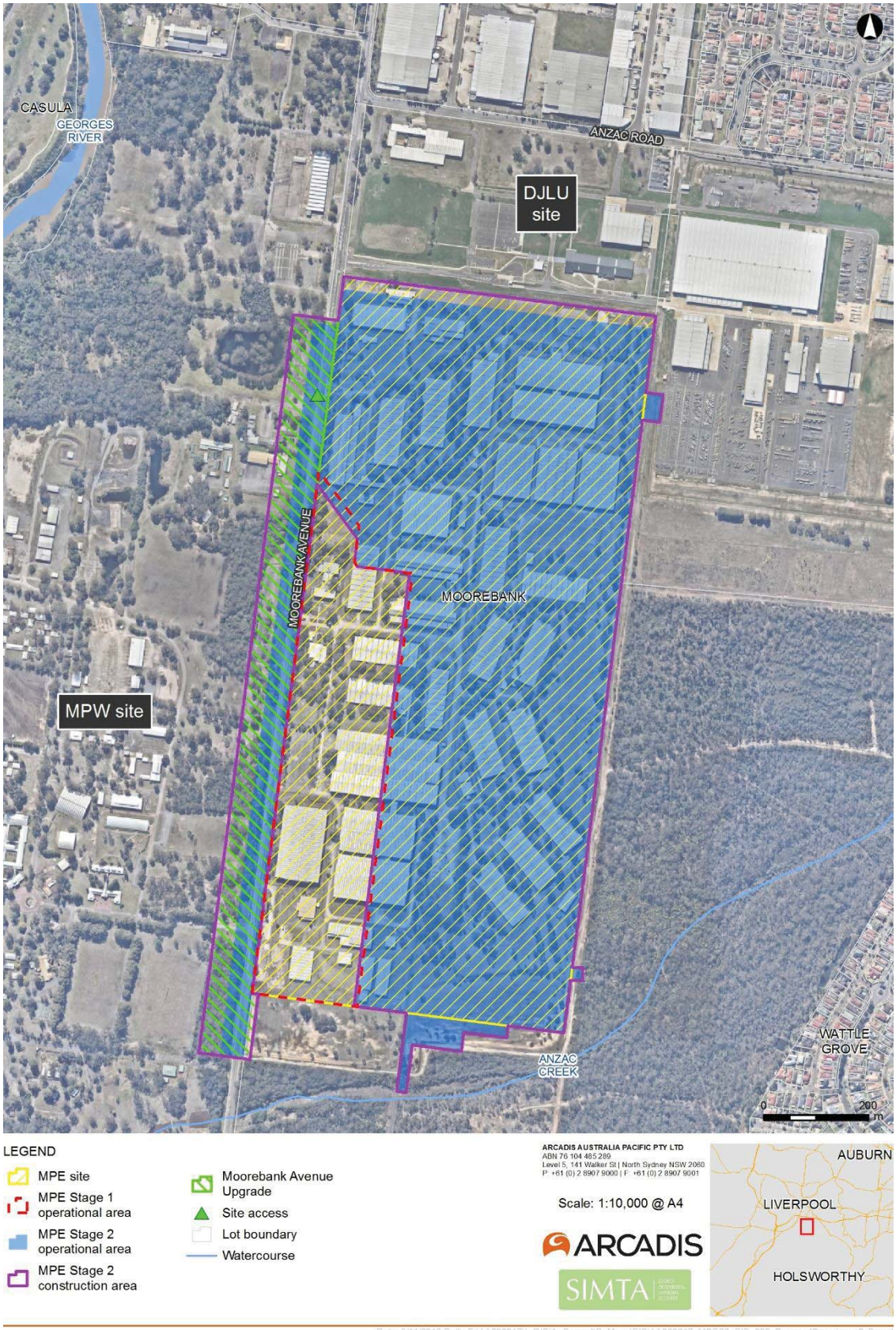
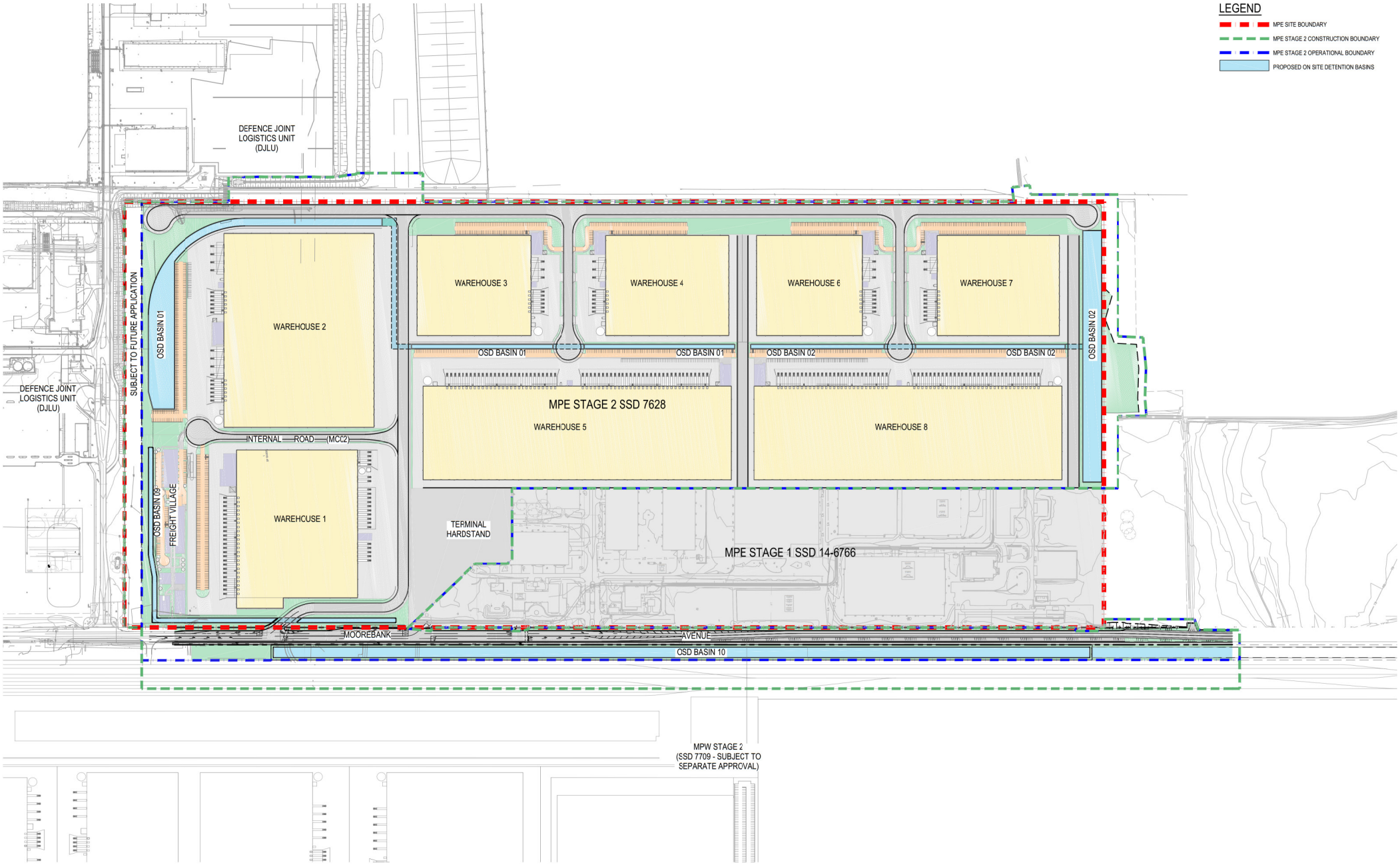


Figure 5-1 Sensitive Receivers

Figure 7-1 Noise Wall and Buildings Included in Noise Model



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Client: SIMTA SYDNEY INTERMODAL TERMINAL ALLIANCE; TACTICAL GROUP

Status: PRELIMINARY ONLY
INDICATIVE / CONCEPT AND SUBJECT TO CONFIRMATION DURING DETAILED DESIGN

		Current Issue Signatures	
Scales	1 : 2500	Drawn	A.ZHAO
Original Size	A1	Designed	J.WOOD
Height Datum	AHD	Checked	K.MCAREAVEY
Grid	MGA	Approved	M.KEFFORD

Filename: SSS2-ARC-CV-SKC-3053-GeneralArrangementPlan.dwg

Project: MOOREBANK PRECINCT EAST (MPE) STAGE 2

Title: GENERAL ARRANGEMENT PLAN

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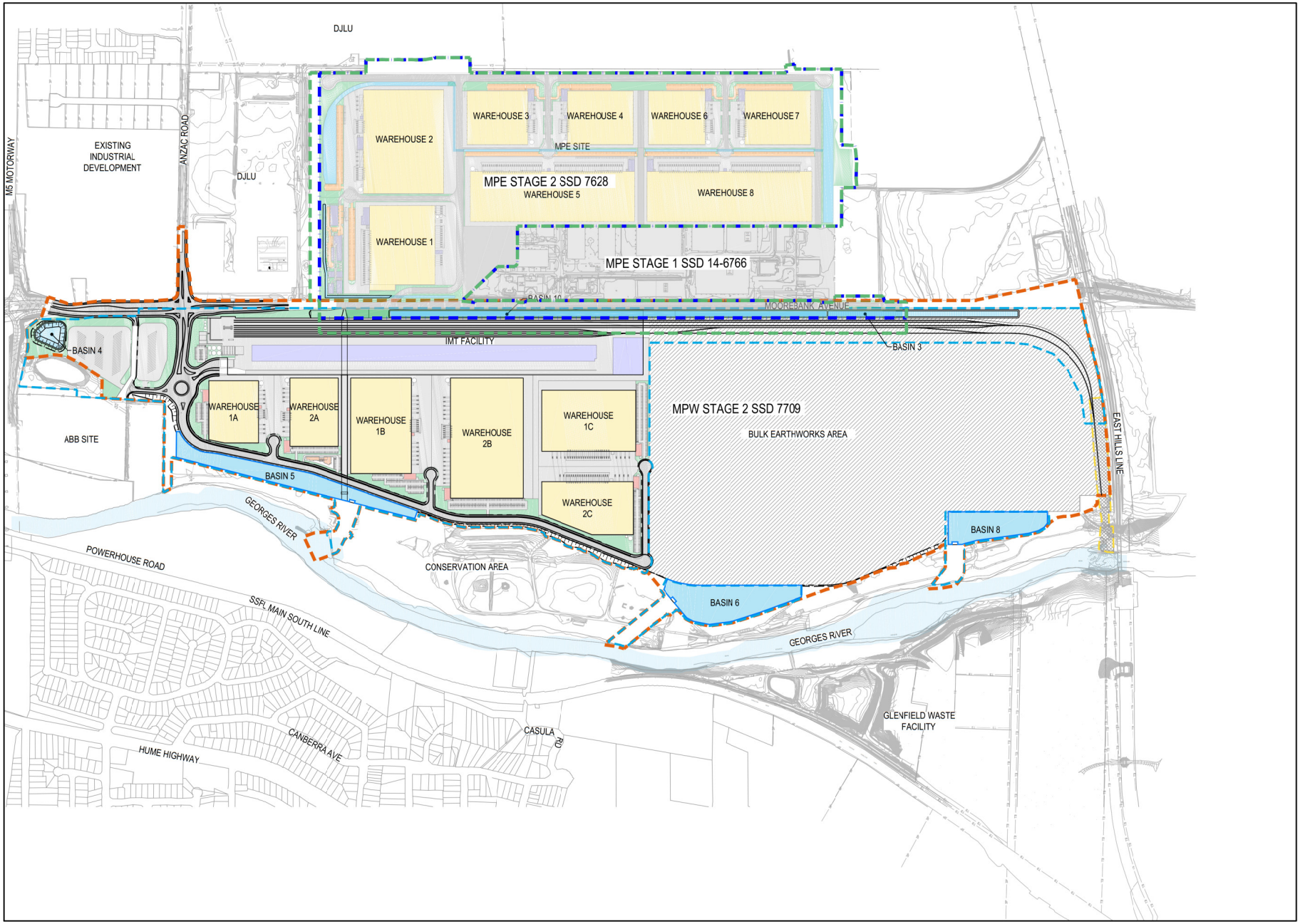
Date Plotted: 19 Sep 2017 - 10:23AM File Name: F:\AA009335\3_SSS2\CV\SKC\SSS2-ARC-CV-SKC-0053-GeneralArrangementPlan.dwg



Issue	Description	Date
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Client: SIMTA Sydney Intermodal Terminal Alliance; TACTICAL GROUP

Status: FOR INFORMATION
INDICATIVE / CONCEPT AND SUBJECT TO CONFIRMATION DURING DETAILED DESIGN

Scales	1 : 5000	Current Issue Signatures
		Drawn A.ZHAO
Original Size	A1	Designed L.CORSCADDEN
Height Datum	AHD	Checked K.MCAREAVEY
Grid	MGA	Approved M.KEFFORD

Filename: PREC-ARC-CV-SKC-0237-GeneralArrangementPlan.dwg

Project: MOOREBANK INTERMODAL OVERALL PRECINCT

Title: GENERAL ARRANGEMENT PLAN

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