ATTACHMENT 2

Addendum to Environmental Impact Statement – 14-82 Madeline Street, Strathfield South

A submission to Strathfield Council

14 September 2016

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Disclaimer

Contents

1. Introduction

This Addendum report has been prepared in response to the Sydney East Joint Regional Planning Panel (JRPP) Record of Deferral dated 17 August 2016 regarding matter 2016SYE016 Strathfield – 2015/177 – 14-82 Madeline Street, Strathfield South (the Site).

A development application (DA) was submitted to Strathfield Council in December 2015 by Recyclecare Services Pty Ltd (Recyclecare) for the proposed upgrade of the Site to include a Materials Recovery Facility (MRF) and an expanded Paper and Cardboard Recovery facility (PCR) (the Proposal). An Environmental Impact Statement (EIS) to support the DA was prepared by MRA Consulting Group (MRA) on behalf of Recyclecare.

1.1 JRPP Requirements

In its determination meeting of 17 August 2016, the JRPP agreed to defer determination of the above matter pending further information to inform its decision. The following information was requested by the JRPP to demonstrate the environmental impact of the Proposal and mitigation of any environmental impact identified:

1. *Detailed acoustic report which measures existing, similar operations on a 24-hour basis, as well as analysis of the exiting operation on a similar 24-hour basis in terms of operation and background noise;*
2. *Detailed flood assessment report;*
3. *Mitigation methods to acoustically shield the internal operations from external receivers, involving for example, internal insulation, air conditioning, alternate external cladding materials, new or modified door openings, and alternate 'receival area floor material' etc.*
4. *Details of vehicle queuing and noise associated with same;*
5. *Visual mitigating treatment of the rear boundary where viewed from the park; and*
6. *Explanation and justification for the proposed 24-hour operation and consideration of more restricted hours.*

1.2 Overview of this Addendum

In order to address these issues, this Addendum provides information pertaining to the JRPP's requirements as follows:

- Acoustic matters, including noise from vehicle queuing and consideration of noise mitigation methods;
- Flooding matters;
- Visual mitigation;
- Vehicle queuing; and
- Operating Hours.

In addition, in order to provide a fuller understanding of the proposed facility, in particular for residents, further information and photographs of MRF operations are provided in Section 7.

2. Acoustic Matters

2.1 Background

- A detailed Noise Impact Assessment (NIA) for the Proposal was completed by SLR Consulting Australia Pty Ltd (SLR Noise) on 20 November 2015. The outcomes of this assessment were considered in Chapter 8.4 of the EIS, and the original NIA report was included as Appendix I to the EIS.
- The NIA concluded that the Proposal would, with the proposed mitigation measures implemented, meet the adopted Project Specific Noise Criteria and the requirements of the Industrial Noise Policy at all residential and industrial receptors.

2.2 Additional Noise Logging

- The JRPP has requested a detailed acoustic report which measures existing, similar operations on a 24-hour basis, as well as analysis of the existing operations on a similar 24-hour basis in terms of operation and background noise. SLR have undertaken this additional noise logging, the results of which are included as Appendix B.

2.2.1 Discussion

The addendum report prepared by SLR Consulting measured the Ambient noise levels at two separate locations (refer to Figure 4 of Appendix B), considered to be representative of the nearest potentially affected receivers to the site. The objective of this survey was to measure LA90(15minute) and LAeq(15minute) noise levels at the nearest potentially affected residential locations during the day, evening and night-time periods to enable the determination of the intrusiveness and amenity criteria for the proposed development in accordance with the INP.

Results presented in in the SLR addendum report indicate that operational noise levels are predicted to meet the Project Specific Noise Criteria at all residential and Industrial locations considered in the assessment.

2.3 Mitigation of Potential Noise Impacts

- The JRPP has requested that Recyclecare examine possible mitigation methods to acoustically shield the internal operations from external receivers, involving for example:
    - Internal insulation;
    - Air conditioning;
    - Alternate external cladding materials;
    - New or modified door openings; and
    - Alternate 'receival area floor material'.

2.3.1 Discussion

1 The revised noise assessment takes into account the construction of a 4m high wall along the northeastern wall of the Site which would help to mitigate the impact on noise on residential receivers.

2 Receival area floor material is proposed to be composed of sheet metal (steel). The use of alternative materials for the receival areas was already considered during the development of the EIS, and was eliminated as an option at that time for the following reasons:

2.1 Steel is smooth and easier to keep clean than concrete, which pits and wears; and

2.2 Steel is durable. Softer material (e.g. rubberised surface) would be ripped by machinery and wear away within days.

3 The noise level of co-mingled recyclables falling onto steel is actually quite low. 54% of the incoming material will be comprised of paper and cardboard, with 36% glass and metal. The mixed nature of the incoming material dampens the sound of a load being discharged at the receival area.

3. Flooding

3.1 Background

- A detailed Soil and Water Assessment (SWA) for the Proposal was completed by SLR Consulting Australia Pty Ltd (SLR Water) on 8 December 2015. The outcomes of this assessment were considered in Chapter 8.5 of the EIS, and the original SWA report was included as Appendix J to the EIS.
- With respect to flooding, the SWA provided information from the Cooks River Flood Study 2009 that showed that the Site is unaffected by flooding associated with the Cooks River for events up to and including the 100-year Average Recurrence Interval (ARI) event, even with a climate change scenario.
- During the development of the EIS, Strathfield Council's Drainage Engineer, Said Saqeb, had provided the opinion that flooding was not an issue for the site.

3.2 Discussion

- The JRPP has indicated that it wishes for more details regarding flooding to be submitted, as it is concerned that there would be environmental impacts if flooding were to occur on the Site.
- These concerns relate to the washing of waste material into the Cooks River canal if there should be a rain event causing overland flooding in the area.
- Storm Consulting, a specialised water and flooding consultancy, has prepared a Flooding Assessment that has reassessed the flooding risk for the Site with respect to the Cooks River and Cox's Creek, utilising the recognized flooding study for the area, prepared in 2009 for Sydney Water by MWH& PB.
- The Strom Consulting Flooding Assessment has reached the same conclusions as the SLR Water report with regard to flooding:
    - The Site is unaffected by mainstream flooding associated with the Cooks River for events up to and including the 100-year Average Recurrence Interval (ARI) event, even with a climate change scenario, with a worst-case freeboard to lowest floor level of the building being 0.94m.
    - Overland flooding in the area would affect only the western and southern fringes of the Site (Lot 23A in DP556743) during a 100 year ARI event. This is not an issue as the areas affected are not in the vicinity of the operational portion of the facility.
- The Storm Consulting report is attached to this addendum as Appendix C.

4. Visual Mitigation

4.1 Background

- A detailed Visual Impact Assessment (VIA) for the Proposal was completed by SLR Consulting Australia Pty Ltd (SLR Visual) on 9 November 2015. The outcomes of this assessment were considered in Chapter 8.7 of the EIS, and the original VIA report was included as Appendix L to the EIS.
- The VIA concluded that the Proposal would, with the proposed mitigation measures implemented, have a negligible visual impact on people living in or travelling through the landscape within and surrounding the proposed facility, as views of the Site would remain unchanged.

4.2 Discussion

- The JRPP requires the installation of visual mitigation treatment of the Site, where viewed from the park to the east. In particular, this refers to the bicycle path that runs on the far side of the Cooks River canal.
- Appendix B illustrates the area of the bike path that may possibly have a view of the rear of the Site.
- Polytrade will commit to erecting a 4.5m high wall approximately 60m long along the line shown in green in Appendix C that would shield the bike path from any view of the rear portion of the MRF (the Receival Areas).

5. Vehicle Queuing

5.1 Background

- A detailed assessment of the traffic and parking issues relating to the Proposal was undertaken in the Traffic and Transport Assessment (TTA) prepared by Solution 1 Traffic Engineers in July 2015. This TTA was summarised in Chapter 8.2 of the EIS, with the TTA report attached as Appendix G to the EIS.
- Vehicle manoeuvring on the Site was further considered in detail in the Traffic Plan of Management (TPM) that was prepared by MRA Consulting Group and submitted to Strathfield Council in July 2016.
- Further information is provided here to satisfy JRPP concerns regarding the possibility of vehicles queuing on Madeline Street and onsite.
- Traffic movement information is based on real-life MRF experience at Polytrade's other facilities (Rydalmere, Dandenong), MRA staff experience (running MRFs for other companies) and the existing traffic behaviours on the Site (existing PCR).

5.2 Assumptions

- Numbers of vehicle movements are based on information provided in the EIS, TTA and TPM;
- The JRPP's traffic concerns relate only to vehicles using the **Main Entrance/Exit** during **the busiest times**, with the MRF and PCR both **at full tonnage capacity (99,900 tpa)**;
- The situation described here is considered to be the worst-case scenario for possible traffic congestion and queuing;
- The busiest (peak) time is **8am-11am Monday-Friday** due to:
    - Peak time for delivery of incoming material for the MRF – Council trucks delivering contents of yellow top bins;
    - Peak time for delivery of incoming material for the PCR – Council trucks delivering contents of blue top bins plus commercial clients; and
    - Two scheduled arrival and departure of vehicles collecting baled material from the MRF for dispatch.
- Note: Routine pick-up of residual waste is scheduled outside of peak times;
- In this worst-case scenario, one pickup of non-conforming waste is also included;
- Vehicle movements at the Staff and Glass/PCR Access gate have not been considered, as these are not movements at the Main Entrance and do not contribute to congestion in the main vehicle area.

5.3 Proposed Vehicle Movements during Peak Time

Table 1 - Proposed vehicle movements at Main Entrance during peak time (8am-11am) – details from TPM

Description	Vehicle type	Movement frequency (maximum) during peak time
Incoming material for MRF	Garbage trucks, utes, table tops	One truck in and one truck out every 10 minutes
Incoming material for PCR	Garbage trucks, utes, table tops	One truck in and one truck out every 15 minutes
Pick up of outgoing, baled MRF material (plastic, metal, paper)	Container trucks (loaded at loading ramp)	One truck in and one truck out every 3 hours

Description	Vehicle type	Movement frequency (maximum) during peak time
		Worst case scenario - during peak time 8am-11am = two trucks in and two trucks out

5.4 Discussion

- A model has been prepared that simulates the traffic movements at the Main Gate that are described in Table 1. The model is attached as Appendix B.
- The model concludes that, even under a worst-case scenario (see worksheet 2 of Appendix B), which includes factoring in a 300% time delay at the weighbridge beyond the normal time to use the weighbridge, there would be only three trucks using the trafficable area (accessed via the Main Gate) at any one time.
- The Site is large and can accommodate trucks at the following operational locations simultaneously (see Appendix A):
    - On the weighbridge (1);
    - On the driveway approaching the receival areas (1);
    - Tipping in the MRF and PCR receival areas (up to 2 trucks in each receival area at any one time) (4, but usually 2); and
    - On the driveway enroute to the site exit (1).
- This provides a total of minimum 5 (maximum 7) operational truck locations areas where trucks can be present under normal flow conditions, making it unlikely that there would be traffic build-up.
- Nevertheless, mitigation measures have been proposed to further reduce the possibility of build-up of trucks on site.

5.5 Proposed Mitigation Measures

- Truck waiting areas are designated on either side of the weighbridge (see Appendix A).
- Truck waiting areas are in addition to the operational truck locations described in Section 5.4 above.
- The waiting areas would be located as follows:
    - 2 spaces outside doors B and C;
    - 2 spaces outside door E (overflow waiting); and
    - 1 space inside the main entrance for vehicles entering the Site.
- To prevent build-up of incoming vehicles on the surrounding streets, priority to use the weighbridge would be given to trucks waiting to enter the Site. Trucks exiting would be directed to wait in the waiting areas above until arriving trucks have entered.
- A Traffic Manager would be engaged to manage onsite traffic when required. This staff member would:
    - Direct traffic and ensure that any trucks required to wait onsite are directed to the designated waiting areas;
    - Manage and instruct turning trucks servicing the receival areas at the rear of the Site; and
    - Be in communication with staff at the receival areas by two-way radio to ensure that everyone on site is aware of vehicle movements so that necessary, timely action can be taken to manage traffic appropriately.

5.6 Vehicle Noise

- Noise from vehicles moving and queuing was included in the noise model created for the original EIS, and as such has already been assessed as part of the noise impact assessment of this Proposal.
- Noise from vehicles queuing has also been factored into the remodelling of noise impacts for the purposes of this Addendum.
- CONCLUSION
  SLR has undertaken a revised noise and vibration impact assessment (NV1A) for the materials recycling facility (MRF) and Paper and cardboard recovery (PeR) unit located at 14-82 Madeline Street, South Strathfield, NSW (Project Site).

- The objective of the revised NV1A for the MRF and PeR unit at the Project Site was to address the acoustic requirements of the Sydney East Joint Regional Planning Panel Record of Deferral Notice dated 17 August 2016.

- The objective of the NV1A was to also identify the potential impacts of noise and vibration from existing and proposed activities at the Project Site associated with both construction and operation of the facility and to provide recommendations with regard to noise management strategies and mitigation measures, where necessary, with the aim of achieving the project specific noise and vibration criteria.
- Existing Acoustical Environment

- An ambient noise monitoring program was conducted by SLR. Ambient noise levels were monitored at two separate locations (refer to Figure 4), considered to be representative of the nearest potentially affected receivers to the site. The objective of this survey was to measure LA90(18minute) and LAeq(18minute) noise levels at the nearest potentially affected residential locations during the day, evening and night-time periods to enable the determination of the intrusiveness and amenity criteria for the proposed development in accordance with the 1NP.

- Operational Noise Assessment

- Results presented in Table 38 and Table 39 provide the revised predicted operational noise emission levels from the Project Site for the two noise abatement operational scenarios of Scenario 1 and Scenario 2 respectively, as described in Section 11.2.2.

- Results presented in Table 38 and Table 39 indicates that operational noise levels are predicted to meet the PSNC at all residential and Industrial locations considered in the assessment.

- Section 11.2.4 provides a comparison between the predicted results of the two noise attenuation Scenarios with that of the original assessment per modelled receiver. 1t can be seen that for both modelled scenarios the maximum noise attenuation benefit obtained for the modelled Residential receivers is 2 dB and for 1ndustrial receivers, 3 dB.

- The only difference of noise attenuation benefit for the modelled Residential receivers is that Scenario 1 provides a 1 dB further predicted attenuation during the night period temperature inversion than Scenario 2.

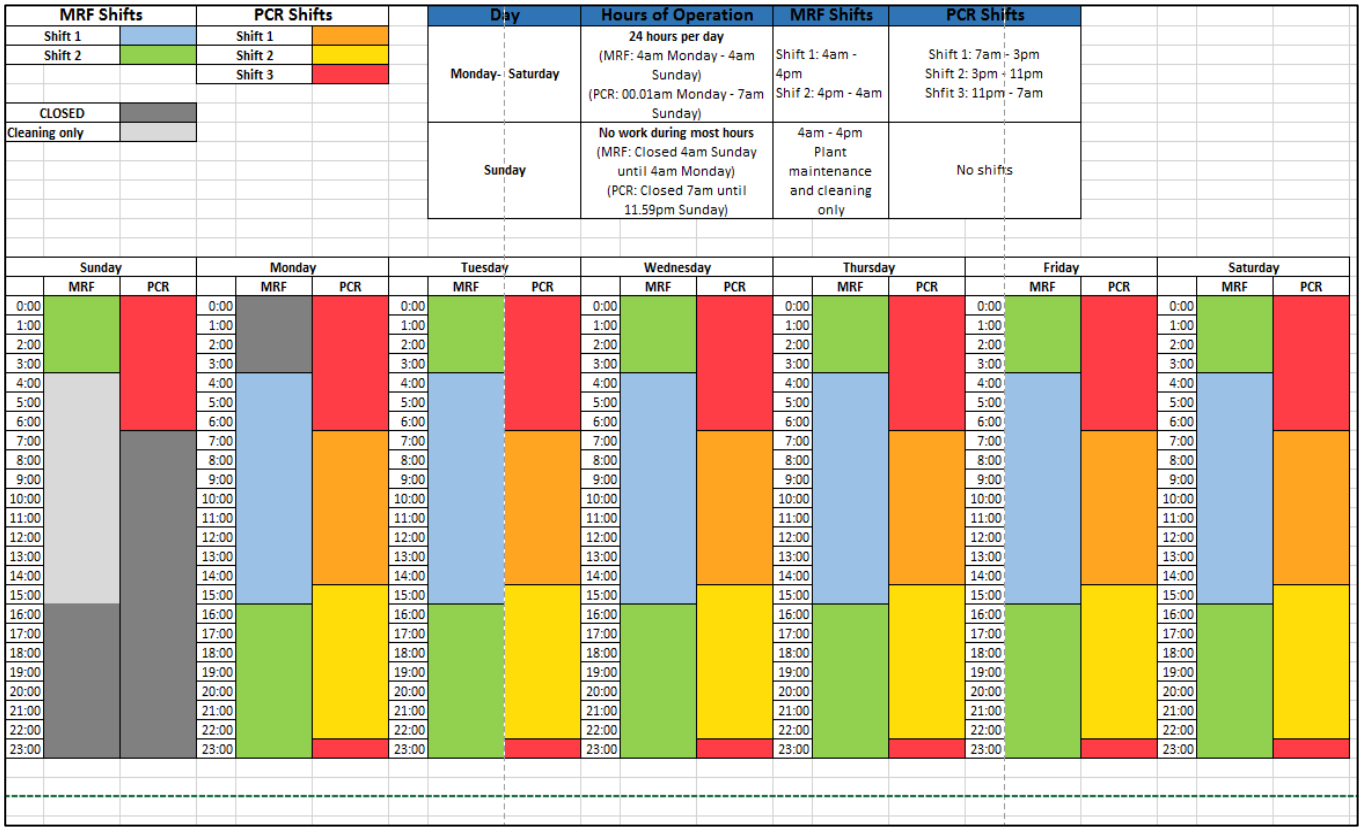
- Again, it is noted that the original 2018 assessment indicated that operational noise levels met the
- PSNe at all assessment locations.

6. Operating Hours

6.1 Background

- The EIS was prepared by MRA Consulting Group, who are specialist consultants in all aspects of the waste and recycling industry, including the running of MRF operations.
- 24-hour operation for all aspects of the facility were proposed to achieve the operational flexibility required to allow for unexpected disruption of operations;
- The original proposed hours of operation of the Site and shift pattern (from the EIS) are shown in Figure 1 below.

Figure 1 - Proposed hours of operation (from EIS)



6.2 Discussion

- The JRPP has requested further justification for the proposal of 24-hour operation 6 days per week, with consideration for more restricted operating hours.
- Whilst 24-hour operation is desirable to ensure maximum flexibility within the operations, Polytrade has considered that some constraint of operating hours could be acceptable, taking into account the unique nature of operations of the recycling business, such as:
    - Start-up time for machinery;
    - Allowance for breakdowns;
    - Collection contract time constraints; and
    - Peak seasons, such as Christmas
- The proposed amended operating hours and the justification for requiring these times are illustrated in Table 2.

Table 2 - Suggested hours of operation Monday – Saturday - MRF

MRF		
Activity	**Start**	**Finish**
Receival of incoming material	4.30am	6pm
	Council yellow top bin collections commence as early as 2.30am in some areas. Material would therefore arrive by 4.30am.	Receival till this time required to allow for: • Unforeseen delay of incoming trucks • Distance travelled by incoming trucks • Council contract requirements
Processing by machinery + cleaning	**24 hours per day preferred** However, under normal circumstances **5am-10pm - processing machinery in use (as justified below)** **10pm-5am - cleaning only**	
	5am	10pm
	Processing to commence as soon as possible after the first incoming load arrives to reduce time that material is present on site and ensure that all the material is processed in one day.	Under normal circumstances, 17 hours of processing per day would be sufficient to ensure that all material is cleared from the receival area in one day, while allowing time for prolonged machinery breakdown, lunch breaks etc. 224 t per day / 30 t per hour = 7.5 hours
Dispatch of sorted materials	6am	6pm
	6am commencement is required to dispatch, without delay, any materials separated in the period 6pm-10pm the previous day, before starting to dispatch current day materials. This would assist in preventing undesirable build-up of materials	This timeframe required in order to remove as much as possible by evening so that a manageable amount of processed material is left for removal the next day.
CLOSED	**5am Sunday (after cleaning)**	**4.30am Monday**

Table 3 - Suggested hours of operation Monday - Saturday - PCR

PCR (as per existing development consent)		
Activity	**Start**	**Finish**
Receival of incoming material	6am	10pm
	Only two councils in Sydney have blue top bin (paper and cardboard only) collections. These councils commence collection at around 5am. Contracts with commercial clients state no deliveries before 6am.	Receival until this time is required to allow for: • Commercial clients such as Flemington Market, which clean up and remove their waste after closing time • Long distance (time) travelled for country clients
Processing by machinery + cleaning	6am	10pm
	Processing to commence as soon as possible after the first load arrives to reduce time that material is present on site and ensure that all the material is processed in one day.	Under normal circumstances, 16 hours of processing per day would be sufficient to ensure that all material is cleared from the receival area in one day. 96 t per day / 30 t per hour = 3.2 hours
Dispatch of sorted materials	6am	10pm
	Required to prevent build-up of materials and remove sorted, baled paper and cardboard	This timeframe required to remove as much as possible by evening so that manageable number of bales left for removal the next day.
CLOSED	**10pm Saturday**	**6am Monday**

- In order to provide a full and conservative assessment of the Proposal, all studies for the EIS and this Addendum – noise, air quality, traffic - have assumed 24-hour operations for all activities on the Site. The reduction in operating hours as described in Table 2 and Table 3 would further reduce any residual impacts, while still being operationally achievable.

7. MRF Operations

7.1 Further Information on the MRF Facility

- As the workings of a materials recycling facility (MRF) are not commonly well known to the general public, Recyclecare wishes to provide additional information to aid understanding.
- A detailed description of the operations at the proposed facility was included in Sections 3.5 and 8.1 of the EIS.
- Further details regarding a number of parts of the operation are provided below.

Table 4 - Details of materials to be received at the MRF

Source	Example of received recyclables	Approximate product breakdown
Municipal Solid Waste (co-mingled material, source-separated yellow-topped bin)	• Plastic milk cartons • Glass bottles and jars • Steel rigid packaging, including cans • Plastic packaging • Juice cartons • Newspapers, magazines, junk mail, stationery, telephone books • Brochures • Paper/cardboard packaging • Aluminium drink cans	• 54% Paper and Cardboard • 30% Glass • 6% Plastics • 3% Steel • 1% Aluminium • 6% General Waste
Commercial and Industrial	• Paper/cardboard packaging • Office paper • Stationery • Plastic packaging • Other plastic items	

- Appendix F provides a simplified schematic representation of the flow of the MRF operations within Building 1.
- Illustrative photographs of various areas of a working MRF are included below.

Figure 2 Tipping recyclables inside building in Receival Area

Figure 3 - Front loader sorting material in Receival Area

Figure 4 - Recyclables on conveyor

Figure 5 - Supervision of sorting machinery

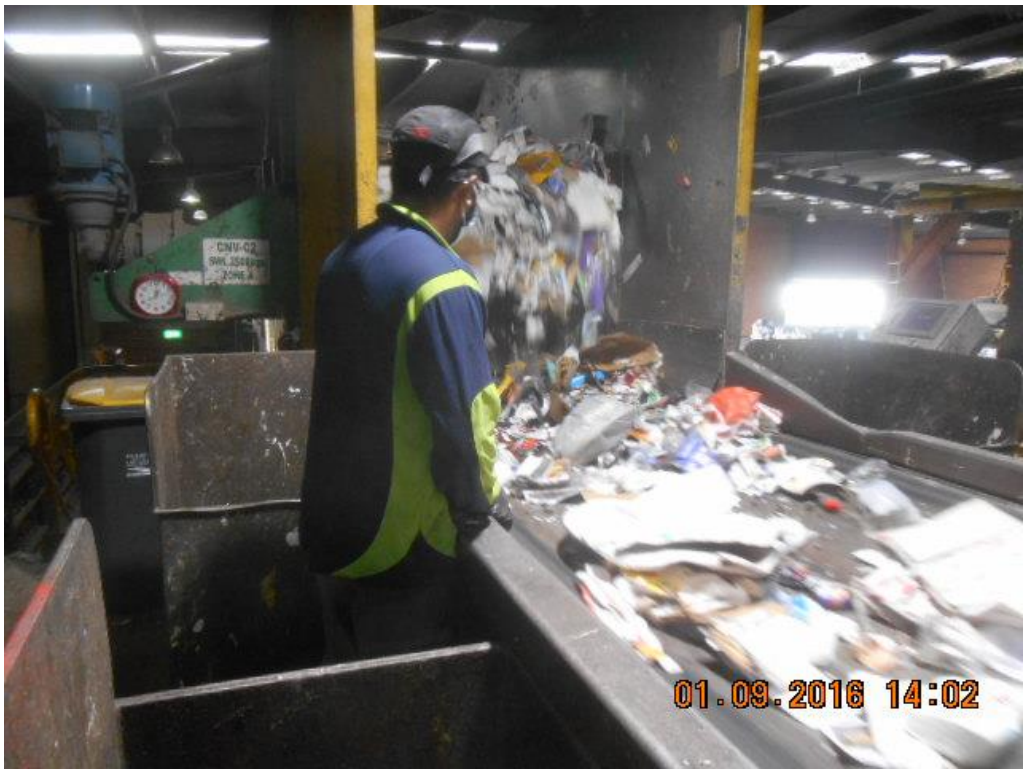


Figure 6 - Paper baling

Figure 7 - Baled paper awaiting removal

Figure 8 - Baled paper being loaded into curtain-side truck

Figure 9 - Baled paper in dispatch truck

Figure 10 - Baled aluminium cans awaiting dispatch

Figure 11 Loading of container truck via loading ramp (baled finished material from MRF)

Appendix A Site Plan

40 Madeline Street Enfield

Main Gate

Waiting Area

WEIGHBRIDGE (1)

Office Car Park

Office

Office

Workshop

Toilet

Workshop Area

Diesel Fuel Tank

Staff and Visitor Car Park

Lunch Room

Toilet

Staff Access Gate

Waiting Area

Roller Door Ⓑ

Roller Door Ⓒ

Loading Ramp

Roller Door Ⓓ

Building 1
Material Recovery Facility

Roller Door Ⓐ

Roller Door Ⓔ

Waiting Area

Roller Door Ⓕ

Glass Sorting Machines

Container Baler

Receival Area 680 M2

Roller Door Ⓖ

North

SOUND WALL

Roller Door Ⓚ

Roller Door Ⓛ

Roller Door Ⓗ

Roller Door Ⓘ

Colour Bond Roof

Glass Bunkers

Hinged Door

Paper and Cardboard Facility
Building 2

Roller Door Ⓙ

Glass & Baled Paper Access Gate

WEIGHBRIDGE (2)

Car Park

Office

Car Park

Office

Car Park

Building 3

Roller Door Ⓝ

Glass Bunkers

Hinged Door

Colour Bond Roof

Toilet

Ⓐ-Ⓝ Roller Door

Bins for Residual/ Non-Conforming Waste

Incoming Waste Truck

40 Foot Container Truck /Semi-trailer/Truck and Dog

POLYTRADE RECYCLING		14-82 Madeline Street South Enfield			
For	Material Recovery Facility(MRF) Enfield Site				
Project				Edition	
				Approved	
Designed		Job No.		Scale	N.T.S
Drawn		Dwg No.	110616-1	Third Angle Projection	
Checked		Date	10-07-2016		

Appendix B Additional Noise Assessment

global environmental solutions

Noise Impact Assessment - Addendum Report

Materials Recovery Facility

14-82 Madeline Street, South Strathfield

Report Number 610.14992

14 September 2016

MRA Consulting Group

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Version: v0.1

Noise Impact Assessment - Addendum Report

Materials Recovery Facility

14-82 Madeline Street, South Strathfield

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610.14992-R2	Revision 1	9 September 2016	S. Kozakiewicz	M. Davenport	S. Kozakiewicz

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FIGURES

APPENDICES

1 INTRODUCTION

SLR Consulting (Australia) Pty Ltd (SLR) has been engaged by MRA Consulting Group (MRA) on behalf of Recyclecare Services Pty Ltd (Recyclecare) to conduct a revised noise and vibration impact assessment (NVIA) for the materials recycling facility (MRF) and Paper and cardboard recovery (PCR) unit located at 14-82 Madeline Street, South Strathfield, NSW (Project Site).

In November 2015, SLR completed the original NVIA for the MRF and PCR unit located at the Project Site, SLR reference *610.14992-R1*, issued 20 November 2015. The objective of the NVIA was to identify the potential impacts of noise and vibration from the proposed activities at the Project Site associated with the construction and operation of the facility. The findings of the original assessment are summarised below:

- Operational Noise Assessment – Operational noise levels were predicted to meet the Project Specific Noise Criteria (PSNC) at all residential locations considered in the assessment.
- Sleep Disturbance Assessment – The L_{Amax} noise levels were predicted to meet the project specific sleep disturbance noise goals for night-time period operation at all assessed receiver locations.
- Road Traffic Noise Assessment – The calculated day and night-time road traffic noise levels at the nearest roadside residential receivers was predicted meet the criteria detailed in the RNP under all prediction scenarios.
- Construction Noise Assessment – The modelling results indicated that the predicted $L_{Aeq(15minute)}$ noise levels from proposed construction activities met the 'Noise Affected' construction noise goals at all assessed sensitive receivers.
- Construction Road Traffic Noise Assessment – The calculated road traffic noise level at the nearest roadside residential receivers met the criteria detailed in the NSW Road Noise Policy (RNP) under all prediction scenarios.
- Vibration Assessment – By virtue of separation distance to the nearest affected residential receptors, the level of vibration caused by operation and construction activities was predicted to be below the level of human perception at any of the nearest receptors and therefore below the criteria for "minimal risk of cosmetic damage" at surrounding residential premises.

The objective of the scope of works for the revised NVIA for the MRF and PCR unit at the Project Site was to address the acoustic requirements of the Sydney East Joint Regional Planning Panel Record of Deferral Notice dated 17 August 2016 (refer **Section 2.4** of this report), namely:

- Existing Operations
    - Install two noise loggers on-site to measure the existing operations at the Project site. The noise loggers were installed on the northeast and southern boundary of the Project site. No suitable monitoring location being available in any of the south-eastern site corners.
    - Noise monitoring will be for a minimum of 24 hours in duration.
- Similar Operations
    - One noise logger was installed at an operationally similar facility to the proposed development at 126-134 Thomas Murrell Crescent, Dandenong South, Victoria, 3175.
    - Noise monitoring will be for a minimum of 24 hours in duration.
- Sound power level measurements were undertaken on-site of equipment and operational activities, with monitoring results to be used to give a comparative result to previously predicted noise levels.
- Model potential noise mitigation scenarios versus the noise reduction achieved. The scenarios that were assessed over each of the day, evening and night periods of 24 hour operation are as follows:

  - A fixed (colorbond type) awning constructed over the receivable area and a 2.1 m high noise wall on the eastern boundary.
  - A 4.0 high noise wall on the eastern boundary.
- Discuss the effectiveness of insulation to the internal building structure and external cladding material.
- Update the noise model to include heavy vehicle delivery trucks queuing.
- Provide revised results, findings and recommendations within an addendum report.

The objective of the revised NVIA was to identify the potential impacts of noise and vibration from the proposed activities at the Project Site associated with the construction and operation of the facility and to provide recommendations with regard to management strategies and mitigation measures, where necessary, with the aim of further increasing the predicted compliance with the project specific noise criteria that was shown in the original assessment, *610.14992-R1* (SLR 2015).

The revised NVIA has been prepared with reference to Australian Standard AS 1055:1997 *Description and Measurement of Environmental Noise* Parts 1, 2 and 3 and in accordance with the *NSW Industrial Noise Policy* (INP) (EPA, 2000) and associated Application Notes (last updated July 2012). Where issues relating to noise are not addressed in the INP, such as sleep disturbance, reference has been made to the *NSW Road Noise Policy* (RNP) (DECCW, 2011).

Road traffic noise impacts have been assessed with reference to the RNP.

Construction noise impacts have been assessed with reference to the *NSW Interim Construction Noise Guideline* (ICNG) (DECC, 2009).

Vibration impacts have been assessed with reference to the EPA *Environmental Noise Management – Assessing Vibration: a technical guide* (DEC 2006), DIN 4150 Part 3:1999 *Structural Vibration: effects of vibration on structures* and BS *6472-1:2008 guide to evaluation of human exposure to vibration in buildings - Vibration sources other than blasting, 2008.*

1.1 Acoustic Terminology

The following report uses specialist acoustic terminology. An explanation of common terms is provided in **Appendix A**.

2 STATUTORY REQUIREMENT

2.1 NSW Department of Planning and Environment

The NSW Department of Planning and Environment has provided the Secretary's Environmental Assessment Requirements (SEARs) for the preparation of the Environmental Impact Statement (EIS) for the proposed development. The following is an extract from SEARs number 915, dated May 2015 regarding assessment of acoustic impacts.

Noise and vibration – including

- *A description of all potential noise and vibration sources during construction and operation, including road traffic noise;*
- *A noise and vibration assessment in accordance with the relevant Environmental Protection Authority Guidelines; and*
- *A description and appraisal of noise and vibration mitigation and monitoring measures.*

2.2 Environment Protection Authority (EPA)

The Environment Protection Authority (EPA) has provided detailed requirements for the preparation of the Environmental Assessment (EA) of the proposed development. The following is an extract from EPA notice letter number 1529895, dated 16 April 2015 regarding assessment of acoustic impacts.

2 Description of the proposal

Noise and vibration

- *Identify all noise sources from the development (including both construction and operation phases).*
- *Detail all potentially noisy active\ties including ancillary activities such as transport of good and raw materials.*
- *Specify details of road alignment include gradients, road surface, topography, bridges, culverts etc), and land use along the proposed road and measurement locations – diagrams should be to scale sufficient to delineate individual residential blocks.*

C The Location

3. Noise and vibration

- *Identify any noise sensitive locations likely to be affected by activities at the site, such as residential properties, schools, churches and hospitals. Typically the location of any noise sensitive locations in relation to the site should be included on a map of the locality.*
- *Identify the land use zoning of the site and the immediate vicinity and the potentially affected areas.*

E The Environmental Issues

5. Noise and vibration

Describe baseline conditions

- *Determine the existing background (L_{A90}) and ambient (L_{Aeq}) noise levels in accordance with the NSW Industrial Noise Policy.*

- *Determine the existing road traffic noise levels in accordance with the NSW Environmental Criteria for Road Traffic Noise, where road traffic noise impacts may occur.*

- *The noise impact assessment report should provide details of all monitoring of existing ambient noise levels including:*

  a) *Details of equipment used for the measurements*

  b) *A brief description of where the equipment was positioned*

  c) *A statement justifying the choice of monitoring site, including the procedure used to choose the site, having regards to the definitions of 'noise sensitive location(s)' and 'most affected location(s)' described in Section 3.1.2 of the NSW Industrial Noise Policy*

  d) *Details of the exact location of the monitoring site and a description of land uses in surrounding areas.*

  e) *A description of the dominant and background noise sources at the site*

  f) *Day, evening and night assessment background levels for each day of the monitoring period*

  g) *The final Rating Background Level (RBL) value*

  h) *Graphs of the measured noise levels for each day should be provided*

  i) *A record of periods of affected data (due to adverse weather and extraneous noise), methods used to exclude invalid data and statement indicating the need for any re-monitoring under Step 1 in Section B1.3 of the NSW Industrial Noise Policy*

  j) *Determination of L_{Aeq}* noise levels from existing industry.

  Assess Impacts

  - *Determine the project specific noise levels for the site. For each identified potentially affected receiver, this should include:*

    a) *Determination of the intrusive criterion for each identified potentially affected receiver*

    b) *Selection and justification of the appropriate amenity category for each identified potentially affected receiver*

    c) *Determination of the amenity criterion for each receiver*

    d) *Determination of the appropriate sleep disturbance limit.*

- *Maximum noise levels during night-time period (10:00 pm – 7:00 pm) should be assessed to analyse possible affects on sleep. Where $L_{A1(1minute)}$ noise levels from the site are less than 15 dB above the background L_{A90} noise level, sleep disturbance impacts are unlikely. Where this is the case, further analysis is required. Additional guidance is provided in Appendix B of the NSW Environmental Criteria for Road Traffic Noise.*

- *Determine expected noise level and noise character (eg. Tonality, impulsiveness, vibration, etc) likely to be generated from noise sources during:*

    a) *Site establishment*

    b) *Construction*

    c) *Operational phases*

    d) *Transport including traffic noise generated by the proposal*

    e) *Other services.*

    Note: The noise impact assessment report should include noise sources data for each source in 1/1 or 1/3 octave band frequencies including methods for references used to determine noise source levels. Noise source levels and characteristics can be sourced from direct measurement of similar activities or from literature (if full references are provided).

- *Determine the noise levels likely to be received at the most sensitive locations (these may vary for different activities at each phase of the development). Potential impacts should be determined for any identified significant adverse meteorological conditions. Predicted noise levels under calm conditions may also aid in quantifying the extent of impact where this is not the most adverse condition.*

- *The noise impact assessment report should include*

    a) *A plan showing the assumed location of each noise source for each predicted scenario*

    b) *A list of the number and type of noise sources used in each prediction scenario to simulate all potential significant operating conditions on the site*

    c) *Any assumptions made in the predictions in terms of source heights, directivity effects, shielding from topography, buildings or barriers, etc.*

    d) *Methods used to predict noise impacts including identification of any noise models used. Where modelling approaches other than the use of the ENM or SoundPlan computer models are adopted, the approach should be appropriately justified and validated*

    e) *An assessment of appropriate weather conditions for the noise predictions including reference to any weather data used to justify the assumed conditions.*

f) The predicted noise impacts from each noise source as well as the combined noise level for each prediction scenario under any identified significant adverse weather conditions as well as calm conditions where appropriate

g) For developments where a significant level of noise impact is likely to occur, noise contours of the key prediction scenarios should be derived

h) An assessment of the need to include modification factors as detailed in Section 4 of the NSW Industrial Noise Policy.

- *Discuss the findings from the predictive modelling and, where relevant noise criteria have not been met, recommend additional mitigation measures.*
- *The noise impact assessment report should include details of any mitigation proposed including the attenuation that will be achieved and the revised noise impact predictions following mitigation.*
- *Where relevant noise/vibration criteria cannot be met after application of all feasible and cost effective mitigation measures the residual level of noise impact needs to be quantified by identifying:*

  a) Location where the noise level exceeds the criteria and extent of exceedance

  b) Numbers of people (or areas) affected

  c) Times when criteria will be exceeded

  d) Likely impact on activities (speech, sleep, relaxation, listening, etc)

  e) Change on ambient conditions

  f) The result of any community consultation or negotiated agreement.

- *For the assessment of existing and future traffic noise, details of data for the road should be included such as assumed traffic volume; percentage heavy vehicles by time of day; and details of the calculation process. These details should be consistent with any traffic study carried out in the EIS.*
- *Where blasting is intended an assessment in accordance with the Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration (ANZECC, 1990) should be undertaken. The following details of the blast design should be included in the noise assessment:*

  a) Bench height, burden spacing, spacing burden ratio

  b) Blast hole diameter, inclination and spacing

  c) Type of explosive, maximum instantaneous charge, initiation, blast block size, blast frequency.

Describe management and mitigation measures

- *Determine the most appropriate noise mitigation measures and expected noise reduction including both noise controls and management of impacts for both construction and operational noise. This will include selecting quiet equipment and construction methods, noise barriers or acoustic screens, location of stockpiles, temporary offices, compounds and vehicle routes, scheduling of activities, etc.*

- *For traffic noise impacts, provide description of the ameliorative measures considered (if required), reasons for inclusion or exclusion, and procedure for calculation of noise levels including ameliorative measures. Also include, where necessary, a discussion of any potential problems associated with the proposed ameliorative measures, such as overshadowing effects from barriers. Appropriate ameliorative measures may include:*

    a) *Use of alternative transportation modes, alternative routes, or other methods of avoiding the new road usage*

    b) *Control of traffic (eg limiting times of access or speed limitations)*

    c) *Resurfacing of the road using a quiet surface*

    d) *Use of (additional) noise barriers or bunds*

    e) *Treatment of the façade to reduce internal noise levels buildings where the night-time criteria is a major concern*

    f) *More stringent limits for noise emission from vehicles (ie using specially design 'quiet' trucks and/or trucks to use air bag suspension*

    g) *Driver education*

    h) *Appropriate truck routes*

    i) *Limit usage of exhaust breaks*

    j) *Use of premium muffles on trucks*

    k) *Reducing speed limits for trucks*

    l) *Ongoing community liaison and monitoring of complaints*

    m) *Phasing in the increase road use.*

2.3 Strathfield Council

Strathfield Council has provided detailed requirements for the preparation of the Environmental Assessment (EA) of the proposed development. The following is an extract from Strathfield Council letter, dated 11 February 2015 regarding assessment of acoustic impacts.

In addition to the parameters required by the Director General, Council will require a future Development Application to be accompanied by the following information:

- *Acoustic Monitoring, including noise logging of existing ambient noise levels and an assessment of plant and machinery, likely noise generation of the operation, reversing beepers and any PA systems which is proposed within the site.*

2.4 Record of Deferral

The objective of the scope of works for the revised NVIA for the MRF and PCR unit at the Project Site was to address the requirements of the Sydney East Joint Regional Planning Panel Record of Deferral Notice dated 17 August 2016 in relation to acoustic requirements:

> *'1. Detailed acoustic report which measures existing, similar operations on a 24 hour basis, as well as analysis of the existing operation on a 24 hour basis in terms of operation and background noise*
>
> *3. Mitigation methods to acoustically shield the internal operations from external receivers, involving for example, internal insulation, air conditioning, alternate external cladding materials, new or modified door openings, and alternate 'receivable area floor material', etc.*
>
> *4. Details of vehicle queuing and noise associated with same'*

3 PROJECT SITE LOCALITY

The Project Site proposed for the Strathfield MRF and PCR facility is on part of Lot 2 in DP 556743, currently known as Proposed Lot 23A at 14-82 Madeline Street, Strathfield South (refer to **Figure 1**).

The Project Site is situated in an industrial zone and is surrounded by various industries, including a large freight company and Sydney Meat Market. The industrial zone is separated from public recreational space and residential zones to the east by the Cooks River.

To the west of the Project Site, opposite the main entrance, are the premises of K&S Freighters. They use Madeline Street as their main entrance for all commercial truck movements. K&S Freighters is a substantial transport and logistics firm with a large amount of activity at their Enfield site, with trucks entering and exiting 24 hours a day. K&S Freighters also utilises a Lot to the south of the Site, with an entrance on Hope St.

To the north west of the Project Site (approx. 100m) is Sydney Meat Market, with entrances on Madeline Street and Cleveland Street.

TNT operates a large logistics centre off Cosgrove Road to the north of the Site.

Aussie Skips and Bon Diesel Repairs occupy the lots to the south of the Project Site. Aussie Skips is a waste transfer and recycling yard that accepts waste from general household, building, demolition and excavation materials for sorting, separation and recycling. Heavy machinery operations, incoming and outgoing trucks can be expected at the site. Bon Diesel Repairs is a car maintenance and repair business that operates adjacent to Aussie Skips, and is located just South of the Site. Both these businesses use Madeline Street as their entry and exit points.

Figure 1 Project Locality

4 PROJECT DESCRIPTION

4.1 Proposal Overview

Recyclecare is proposing to develop a new Materials Recovery Facility (MRF) at its existing site at 14-82 Madeline Street, Strathfield South (the Proposal). The existing operation currently takes place within Factory Building 1 (see **Figure 2**), receiving approximately 20,000 tonnes per annum (tpa) of paper and cardboard, which is baled and sent for recycling off-site.

The Proposal involves the removal of existing machinery from Building 1, and assembly of new MRF machinery in its place. The new MRF facility (the "Strathfield MRF") would process dry Commercial & Industrial (C&I) waste and source-separated recyclable municipal solid waste (MSW), recovering the following waste streams:

- Paper and cardboard.
- Mixed metals (steel/tin/aluminium).
- Glass.
- Mixed plastics.

Thereby, recyclables that would have otherwise been destined for landfill would be sorted and reprocessed ready for manufacture into a variety of value added products.

The new MRF and PCR facilities would be fully contained within existing buildings (Factory Building 1 and Factory Building 2 respectively, on site).

The Strathfield MRF and PCR operations would, once operational, be capable of processing up to a total of 99,900 tonnes of recyclable waste per annum for transfer to various resource recovery facilities for recycling off-site (manufacture into new products). Of the total, 69,900 tpa would be processed by the new MRF, with 30,000 tpa processed by the relocated PCR facility.

The layout of the site is shown in **Figure 2**. There are three large industrial buildings on Project Site. They include:

- Factory Building 1 is in the centre of the site and is approximately 139 m by 44 m in size and 11 m in height. It is constructed of brick and steel and is proposed to house the MRF equipment and be an operating MRF facility. Building 3 has seven roller doors.
- Factory Building 2 is on the eastern corner of the site and is 80 m by 18 m in size and 11 m in height. It is constructed of sheet metal and is proposed to house the PCR machinery and be an operating PCR facility.
- Building 3 on the southern corner of the site and is 49 m by 32 m in size and 11 m in height. It is constructed of metal sheeting and is proposed to be a storage facility.

The proposed hours of operation of the Project Site and shift patterns are shown in **Table 1**.

Table 1 Proposed Hours of Operation for the MRF and PCR

Day	Hours of Operation	MRF Shifts	PCR Shifts
Monday – Saturday	24 hours per day (MRF: 4am Monday – 4am Sunday) (PCR: 00.01am Monday – 7am Sunday)	Shift 1: 4am-4pm Shift 2: 4pm-4am	Shift 1: 7am-3pm Shift 2: 3pm-11pm Shift 3: 11pm-7am
Sunday	No work during most hours (MRF: Closed 4am Sunday until 4am Monday) (PCR: Closed 7am Sunday until 11.59pm Sunday)	4am – 4pm Plant Maintenance and cleaning only	No shifts

Figure 2 Project Site Layout

5 SENSITIVE RECEPTORS

The Project Site is located in an industrial area just off the Hume highway and the Project site is zoned IN1 General Industrial. The neighbouring businesses include engineering firms, waste transfer stations, car maintenance and repair, transport & logistics (container) firms and Sydney Meat Market (the largest fresh food market in the southern hemisphere).

The closest sensitive receptor is located approximately 100 m to the southeast on the corner of Excelsior Avenue and Chisholm Street. In total, eight sensitive receptor locations were used in this study to assess the potential impacts on noise quality of the site operations at sensitive receptor locations identified within 2 km of the Project Site. These locations are listed in **Table 2** are shown in **Figure 3**.

Table 2 Sensitive Receptor Locations Used in this Assessment

Receptor ID	Description	UTM Zone 56S	
		Easting (m)	Northing (m)
R1	17 Excelsior Avenue	322,530	6,247,475
R2	150 Dean Street	322,246	6,247,889
R3	569-573 Fitzgerald Crescent	321,970	6,248,623
R4	34 Jean Street	321,218	6,248,491
R5	14 Callistemon Grove	321,171	6,247,851
R6	182 Roberts Road	321,007	6,246,825
R7	2 Wentworth Street	321,827	6,246,730
R8	79 Madeline St	322,353	6,247,268

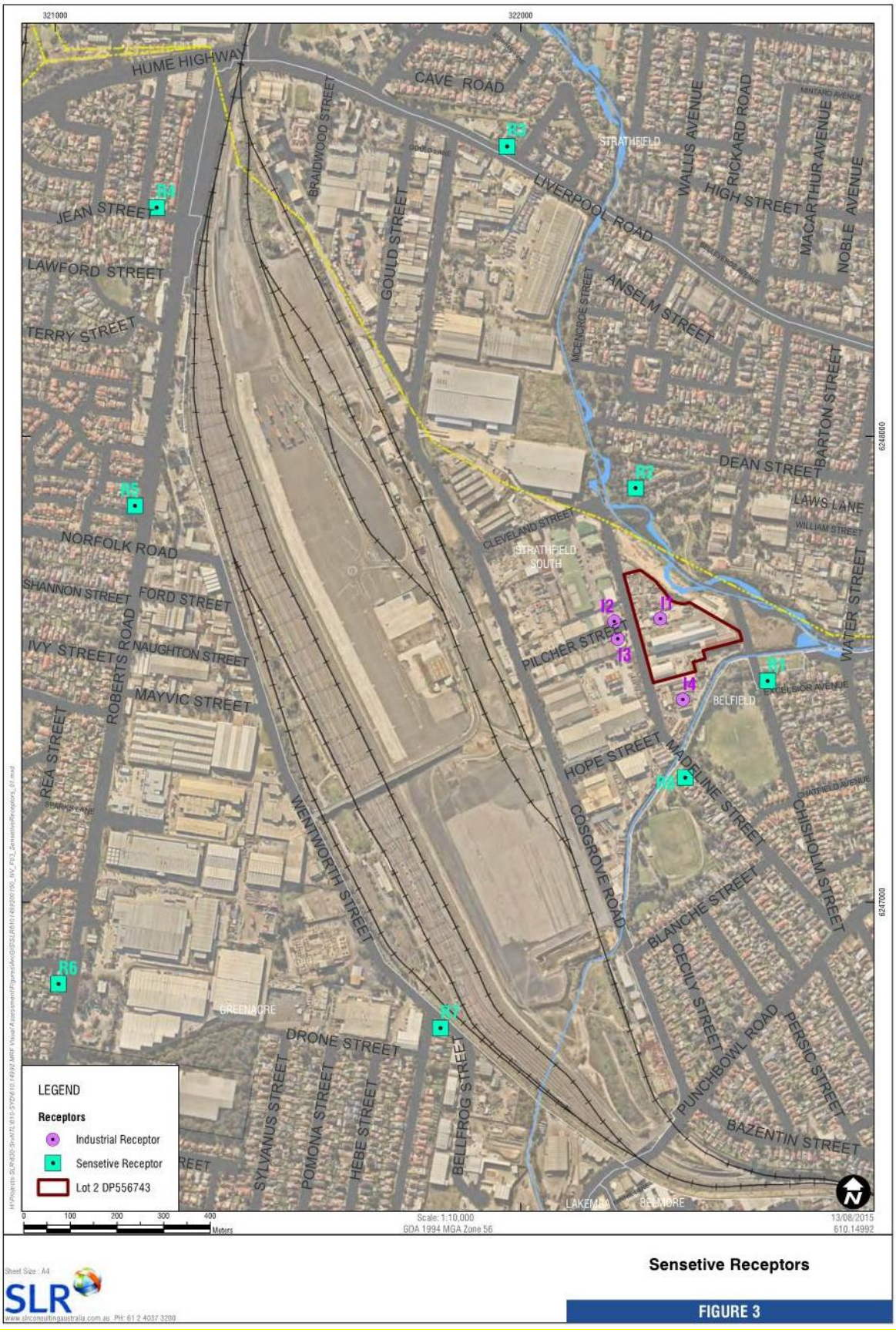
In addition to the sensitive receptors outlined in **Table 2**, a number of industrial receptors in the vicinity of the Project site have also been included in this assessment. The locations of industrial receptors used in the modelling are listed in **Table 3**.

The locations of both sensitive and industrial receptors are shown in **Figure 3**.

Table 3 Industrial Receptor Locations Used in this Assessment

Receptor ID	Description	UTM Zone 56S	
		Easting (m)	Northing (m)
I1	Near northern boundary (adjacent lot to the Project Site)	322,300	6,247,609
I2	Near north-western boundary (across the road from Project Site)	322,201	6,247,603
I3	Near western boundary (across the road from Project Site)	322,208	6,247,566
I4	Near southern boundary (adjacent lot to the Project Site)	322,348	6,247,436

Figure 3 Sensitive and Industrial Receptor Locations – Project Site



6 DEVELOPMENT CONSENT DA 2011/193

Condition 9 of the existing development consent provides the following noise conditions for the Project Site:

9. All exhaust and other emissions including noise from the premises shall comply with the provisions of the Protection of the Environment Operations Act 1997 and Regulations.

In absence of any existing noise emissions criteria for the Project Site, assessment and establishment of project related noise emission criteria for the Project Site have been established in accordance with the methodologies outlined in the NSW INP.

7 NOISE IMPACT ASSESSMENT PROCEDURES

7.1 General Objectives – NSW Industrial Noise Policy

Responsibility for the control of noise emission in NSW is vested in Local Government and the EPA. The INP was released in January 2000 and provides a framework and process for deriving noise criteria for consents and licences that will enable the relevant authority to regulate premises that are scheduled under the *Protection of the Environment Operations Act 1997* (POEO Act).

The specific policy objectives are:

- To establish noise criteria that would protect the community from excessive intrusive noise and preserve amenity for specific land uses.
- To use the criteria as the basis for deriving project specific noise levels.
- To promote uniform methods to estimate and measure noise impacts, including a procedure for evaluating meteorological effects.
- To outline a range of mitigation measures that could be used to minimise noise impacts.
- To provide a formal process to guide the determination of feasible and reasonable noise limits for consents or licences that reconcile noise impacts with the economic, social and environmental considerations of industrial development.
- To carry out functions relating to the prevention, minimisation and control of noise from premises scheduled under the POEO Act.

The policy sets two separate noise criteria to meet environmental noise objectives; one to account for intrusive noise and the other to protect the amenity of particular land uses.

Assessing Intrusiveness

For assessing intrusiveness, the background noise level must be measured. The intrusiveness criterion essentially means that the equivalent continuous noise level (L_{Aeq}) of the source should not be more than five decibels above the measured background level (L_{A90}).

Assessing Amenity

The amenity assessment is based on noise criteria specific to land use and associated activities (**Table 4**). The criteria relate only to industrial-type noise and do not include road, rail or community noise. The existing noise level from industry is measured. If it approaches the criterion value, then noise levels from new industries need to be designed so that the cumulative effect does not produce noise levels that would significantly exceed the criterion (**Table 5**).

Table 4 Amenity Criteria Recommended L_{Aeq} Noise Levels from Industrial Noise Sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended $L_{Aeq(Period)}$ Noise Level (dBA)	
			Acceptable	Recommended Maximum
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45
	Suburban	Day	55	60
		Evening	45	50
		Night	40	45
	Urban	Day	60	65
		Evening	50	55
		Night	45	50
	Urban/Industrial Interface (for existing situations only)	Day	65	70
		Evening	55	60
		Night	50	55
School classrooms - internal	All	Noisiest 1 hour period when in use	35	40
Hospital wards - internal - external	All	Noisiest 1 hour period	35 50	40 55
Place of worship - internal	All	When in use	40	45
Area specifically reserved for passive recreation (eg National Park)	All	When in use	50	55
Active recreation area (eg school playground, golf course)	All	When in use	55	60
Commercial premises	All	When in use	65	70
Industrial premises	All	When in use	70	75

Note: Monday - Saturday: Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am. Sundays, Public Holidays: Daytime 8.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night-time 10.00 pm - 8.00 am. The L_{Aeq} index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

Table 5 Modification to Acceptable Noise Level (ANL)* to Account for Existing Levels of Industrial Noise

Total Existing L_{Aeq} Noise Level from Industrial Noise Sources	Maximum L_{Aeq} Noise Level for Noise from New Sources Alone, dBA
≥ Acceptable noise level plus 2 dBA	If existing noise level is *likely to decrease* in future acceptable noise level minus 10 dBA If existing noise level is *unlikely to decrease* in future existing noise level minus 10 dBA
Acceptable noise level plus 1 dBA	Acceptable noise level minus 8 dBA
Acceptable noise level	Acceptable noise level minus 8 dBA
Acceptable noise level minus 1 dBA	Acceptable noise level minus 6 dBA
Acceptable noise level minus 2 dBA	Acceptable noise level minus 4 dBA
Acceptable noise level minus 3 dBA	Acceptable noise level minus 3 dBA
Acceptable noise level minus 4 dBA	Acceptable noise level minus 2 dBA
Acceptable noise level minus 5 dBA	Acceptable noise level minus 2 dBA
Acceptable noise level minus 6 dBA	Acceptable noise level minus 1 dBA
< Acceptable noise level minus 6 dBA	Acceptable noise level

* ANL = recommended acceptable L_{Aeq} noise level for the specific receiver, area and time of day from **Table 4**

7.2 Applying the Policy to Existing Industrial Premises

The INP states that where there is a proposal to upgrade or expand an existing industrial operation there may be a need to establish achievable noise limits and, if necessary, implement a noise reduction plan. The approach is designed to allow established industries to adapt to changes in the noise expectations of the community while remaining economically viable.

The INP recognises that many existing industrial sources were designed for higher noise emission levels than those set out in the policy and that in some cases industries may have been in existence before neighbouring noise sensitive developments or even noise legislation were introduced.

Where noise emissions from the site exceed the project specific noise levels, the regulatory authorities and the noise source manager need to negotiate achievable noise limits for the site. Therefore, the project specific noise levels should not be applied as mandatory noise limits but, rather, should supply the initial target levels and drive the process of assessing all feasible and reasonable control measures. For sites with limited noise mitigation options the achievable noise levels may sometimes be above the project specific noise levels.

Efforts should be aimed at achieving a reduction in noise in a manner that provides the greatest benefit to residents without undue impact on the existing business.

7.3 INP Noise Assessment Strategy

The INP project specific noise criteria (PSNC) are the more stringent of either the amenity or intrusive criteria. The INP states that these criteria have been selected to protect at least 90% of the population living in the vicinity of industrial noise sources from the adverse effects of noise for at least 90% of the time. Provided the criteria in the INP are achieved, it is unlikely that most people would consider the resultant noise levels excessive.

In those cases where the PSNC are not achieved, it does not automatically follow that all people exposed to the noise would find the noise unacceptable. In subjective terms, exceedances of the PSNC can be generally described as follows:

- Negligible noise level increase <1 dBA (Not noticeable by all people).

- Marginal noise level increase 1 dBA to 2 dBA (Not noticeable by most people).
- Moderate noise level increase 3 dBA to 5 dBA (Not noticeable by some people but may be noticeable by others).
- Appreciable noise level increase >5 dBA (Noticeable by most people).

In view of the foregoing, **Table 6** presents the methodology for assessing noise levels which may exceed the INP project specific noise assessment criteria.

Table 6 Noise Impact Assessment Methodology

Assessment Criteria	Project Specific Criteria	Noise Management Zone	Noise Affectation Zone
Intrusive	Rating background level plus 5 dBA	≤ 5 dBA above project specific criteria	> 5 dBA above project specific criteria
Amenity	INP based on existing industrial level	≤ 5 dBA above project specific criteria	> 5 dBA above project specific criteria

For the purposes of assessing the potential noise impacts the project specific, management and affectation criteria are further defined as follows:

7.3.1 Project Specific Criteria

Most people in the broader community would generally consider exposure to noise levels corresponding to this zone acceptable.

7.3.2 Noise Management Zone

Depending on the degree of exceedance of the project specific criteria (1 dBA to 5 dBA) noise impacts could range from negligible to moderate. It is recommended that management procedures be implemented including:

- Prompt response to any community issues of concern.
- Noise monitoring on site and within the community.
- Refinement of on-site noise mitigation measures and plant operating procedures where practical.

7.3.3 Noise Affectation Zone

Exposure to noise levels exceeding the project-specific criteria by more than 5 dBA may be considered unacceptable by some property holders and the INP recommends that the proponent explore the following:

- Discussions with relevant property holders to assess concerns and provide solutions.
- Implementation of acoustical mitigation at receivers.
- Negotiated agreements with property holders, where required.

7.4 Assessing Sleep Disturbance

The potential for sleep disturbance has been assessed using the guidance provided in the INP Application Notes and the RNP.

As per the INP Application Notes (last updated 12 July 2012), it is recognised that the current $L_{A1(1minute)}$ sleep disturbance criteria of 15 dBA above the prevailing $L_{A90(15minute)}$ level is not ideal. The assessment of potential sleep disturbance is complex and poorly understood and the EPA believes that there is insufficient information to determine a suitable alternative criteria.

The INP guideline suggests that the $L_{A1(1minute)}$ level of 15 dBA above the measured background noise level (L_{A90}) is a suitable screening criteria for sleep disturbance for the night-time period.

Guidance regarding potential for sleep disturbance is also provided in the RNP. The RNP calls upon a number of studies that have been conducted into the effect of maximum noise levels on sleep. The RNP acknowledges that, at the current level of understanding, it is not possible to establish absolute noise level criteria that would correlate to an acceptable level of sleep disturbance. However, the RNP provides the following conclusions from the research on sleep disturbance:

- Maximum internal noise levels below 50 to 55 dBA are unlikely to awaken people from sleep.
- One or two noise events per night, with maximum internal noise levels of 65 to 70 dBA, are not likely to affect health and wellbeing significantly.

It is generally accepted that internal noise levels in a dwelling, with the windows open, are 10 dBA lower than external noise levels. Based on a worst case minimum attenuation, with windows open, of 10 dBA, the first conclusion above suggests that short term external noises of 60 dBA to 65 dBA are unlikely to cause awakening reactions. The second conclusion suggests that one or two noise events per night with maximum external noise levels of 75 dBA to 80 dBA are not likely to affect health and wellbeing significantly.

7.5 Road Traffic Noise

The RNP sets out noise criteria applicable to particular types of projects, road categories and land uses for the purpose of defining traffic noise impacts.

Table 7 presents the most relevant RNP criteria for residential land uses affected by noise from additional traffic on a freeway, arterial, sub-arterial, or local road. Noise levels provided in **Table 7** are external noise levels and refer only to road traffic noise; they do not include ambient noise from other sources.

Table 7 Road Traffic Noise Assessment Criteria for Residential Land Uses

Road category	Type of project/land use	Assessment criteria – dBA	
		Day (7 am–10 pm)	**Night (10 pm–7 am)**
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	LAeq, (15 hour) 60 (external)	LAeq, (9 hour) 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	LAeq, (1 hour) 55 (external)	LAeq, (1 hour) 50 (external)

Note: 1. Land use developers must meet internal noise goals in the Infrastructure SEPP (Department of Planning NSW 2007) for sensitive developments near busy roads (see **Appendix C10** of the RNP for details).

Note: 2. Sub-arterial roads previously designated as 'collector roads' in the Environmental criteria for road traffic noise.

Furthermore, Section 2.4 of the RNP states that in addition to the assessment criteria presented in **Table 7**, any increase in the traffic noise level at a location due to a proposed project or traffic generating development must be considered. Residences experiencing increases in total traffic noise level above the relative increase criteria should also be considered for mitigation. **Table 8** shows relative increase criteria for residential land uses.

Table 8 Relative Increase Criteria for Residential Land Uses

Road category	Type of Project/development	Total traffic noise level increase – dBA	
		Day (7am to 10pm)	Night (10pm to 7am)
Freeway/arterial/ sub-arterial roads and transitways	New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road	Existing traffic LAeq, (15 hour) + 12 dB (external)	Existing traffic LAeq, (9 hour) + 12 dB (external)

In **Table 8** above, the 'existing' traffic noise level refers to the level from all road categories which would occur for the relevant 'no build' option. Where the existing $L_{Aeq(period)}$ road traffic noise level is found to be less than 30 dBA, it is deemed to be 30 dBA.

Section 3.4 of the RNP also states:

Where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria. A secondary objective is to protect against excessive decreases in amenity as the result of a project by applying the relative increase criteria.

In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.

7.6 Construction Noise

The EPA released the ICNG in July 2009. The guideline sets out noise management levels in relation to construction type activities, for sensitive receivers and how they are to be applied. These guidelines provide two different methods for the assessment of construction noise and vibration; a qualitative method and a quantitative method.

The quantitative method involves predicting noise levels and comparing them with the levels in the guideline. The guidance noise levels are given for airborne noise at sensitive land uses, including commercial and industrial premises, ground-borne noise and sleep disturbance.

The qualitative method for assessing noise is a simplified way to identify the cause of potential noise impacts. It avoids the need to perform complex predictions by using a checklist approach to assessing and managing noise.

A quantitative assessment method has been conducted for the works given the construction period of more than three weeks in total.

The ICNG sets out noise management levels for residential and other noise-sensitive receivers and how they are to be applied. The policy suggests restriction to the hours of construction that apply to activities that generate noise at residences above the 'highly affected' noise management level. A summary of the noise management levels is contained in **Table 9** and **Table 10**.

Table 9 Construction Noise Management at Residential Receivers

Time of day	Management level LAeq(15minute)	How to apply
Recommended standard hours Monday to Friday 7am to 6pm Saturday 8am to 1pm No work Sundays or public holidays	Noise Affected RBL** + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise Affected RBL** + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see section 7.2.2 of the ICNG.

*Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30m of the residence. Noise levels may be higher at upper floors of the noise-affected residence.
**RBL: Rating Background Level, as defined in the NSW Industrial Noise Policy (EPA, 2000).

Table 10 Noise at sensitive land uses (other than residences)

Land use	Management level, LAeq(15minute) (applies when properties are being used)
Classrooms at schools and other educational institutions	Internal noise level 45 dB(A)
Hospital wards and operating theatres	Internal noise level 45 dB(A)
Places of worship	Internal noise level 45 dB(A)
Active recreation areas (characterized by sporting activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dB(A)
Passive recreation areas (characterized by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External noise level 60 dB(A)
Community centres	Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS 2107 for specific uses.

7.6.1 Other Sensitive Land Uses

The ICNG's quantitative assessment method includes guidance on how to establish noise management levels for residential receivers and appropriate management levels for some 'other sensitive land uses' such as educational institutions, hospitals etc. however, a suitable management level is not specified for all classifications of sensitive land use. Where other sensitive land uses are identified within a construction noise catchment, the following guidance is given:

The proponent should undertake a special investigation to determine suitable noise levels on a project-by-project basis; the recommended 'maximum' internal noise levels in AS 2107 Acoustics – Recommended design sound levels and reverberation times for building interiors may assist in determining relevant noise levels (Standards Australia 2000).

7.6.2 Commercial Receivers

The ICNG explains that due to the broad range of sensitivities that commercial or industrial land can have to noise from construction, the process of defining management levels is separated into two categories:

- Industrial premises: external $L_{Aeq(15minute)}$ 75 dBA
- Offices, retail outlets: external $L_{Aeq(15minute)}$ 70 dBA

The external noise levels should be assessed at the most-affected occupied point of the premises.

7.7 Assessing Vibration

7.7.1 Human Response

The EPA released *Assessing Vibration: a technical guideline* (the Guideline) in February 2006. The Guideline presents preferred and maximum vibration values for use in assessing human responses to vibration and provides recommendations for measurement and evaluation techniques. The Guideline is based on British Standard BS 6472-1998 *Evaluation of human exposure to vibration in buildings (1-80Hz)* which is similar to Australian Standard AS-2670.2-1990 but includes additional guidelines in relation to intermittent vibration. The criteria presented in the Guideline are non-mandatory. Where all feasible and reasonable mitigation measures have been applied and vibration values are still beyond the maximum value, the operator would need to negotiate directly with the affected community.

Section 2.4 of the Guideline provides acceptable values for intermittent vibration in terms of vibration dose values (VDV) which requires the measurement of the overall weighted root mean square (rms) acceleration over the frequency range 1 Hz to 80 H. To calculate VDV the following formula is used:

$$VDV = \left[\int_0^T a^4(t)dt \right]^{0.25}$$

where VDV is the vibration dose value in $m/s^{1.75}$, *a(t)* is the frequency-weighted acceleration in m/s^2 and *T* is the total period of the day (in seconds) during which vibration may occur.

The acceptable VDV are reproduced here in **Table 11**.

Table 11 Acceptable Vibration Dose Values for Intermittent Vibration

Location	Daytime		Night-time	
	Preferred Value	**Maximum Value**	**Preferred Value**	**Maximum Value**
Residences	0.20 $m/s^{1.75}$	0.40 $m/s^{1.75}$	0.13 $m/s^{1.75}$	0.26 $m/s^{1.75}$

Note: Daytime is 7.00 am to 10.00 pm and night-time is 10:00pm to 7:00am

There is a low probability of adverse comment or disturbance to building occupants at vibration values below the preferred values. Adverse comment or complaints may be expected if vibration values approach the maximum values. The guideline states that activities should be designed to meet the preferred values where an area is not already exposed to vibration.

7.7.2 Human Perception

The human perception intermittent vibration dose levels at residences for the project are provided in **Table 12** from the *British Standard BS 6472:2008*.

Table 12 Human Perception Values for Intermittent Vibration

Vibration dose values ($m/s^{1.75}$) above which various degrees of adverse comment may be expected in residential buildings			
Place	**Low probability of adverse comment**	**Adverse comment possible**	**Adverse comment probable**
Residential building 16 hours day*	0.2 to 0.4[1]	0.4 to 0.8	0.8 to 1.6[2]
Residential building 8 hours night	0.13[1]	0.26	0.51[2]

Note: *Daytime is 7:00 am to 11:00 pm and Night-time 11:00pm to 7:00am

1. Below these ranges adverse comment is not expected.
2. Above these ranges adverse comment is very likely.

7.7.3 Building Response

British Standard 7385: Part 2-1993 "*Evaluation and measurement for vibration in buildings Part 2*" provides criteria against which the likelihood of building damage from ground vibration can be assessed.

Sources of vibration which are considered in the standard include blasting (carried out during mineral extractions or construction excavation), demolition, piling, ground treatments (compaction), construction equipment, tunnelling, road and rail traffic and industrial machinery.

The standard states that the guide values relate predominantly to transient vibration which does not give rise to resonant responses in structures, and to low-rise buildings. Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values may need to be reduced by up to 50%. Since the nearest buildings could potentially experience resonance effects, a conservative level of continuous "minimal risk of cosmetic damage" criterion has been adopted here and is shown in **Table 13**.

Table 13 Transient Vibration Guide Values – Minimal Risk of Cosmetic Damage

Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and Above
Reinforced or framed structures - Industrial and heavy commercial buildings	25 mm/s at 4 Hz and above	
Unreinforced or light framed structures - Residential or light commercial type buildings	7.5 mm/s at 4 Hz increasing to 10 mm/s at 15 Hz	10 mm/s at 15 Hz increasing to 25 mm/s at 40 Hz and above

Note: Values referred to are at the base of the building being considered.

Furthermore, **Table 14** outlines the adopted structural damage vibration limits for residential dwellings from the German Standard *DIN 4150: Part 3-1999* for the proposed development.

Table 14 Adopted Long-term Structural Vibration Velocity Limits on Structures

Line	Type of Structure	Guideline values for velocity, v_i, in mm/s, of vibration in horizontal plane of highest floor, at all frequencies
1	Building used for commercial purposes, industrial buildings, and buildings of similar design	10
2	Dwellings and buildings of similar design and/or occupancy	5
3	Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are great intrinsic value (e.g. listed buildings under preservation order)	2.5

8 EXISTING ACOUSTICAL AND METEOROLOGICAL ENVIRONMENT

8.1 General Methodology

An ambient noise survey was conducted to characterise and quantify the existing acoustical environment in the area surrounding the Project Site. Noise monitoring was undertaken at two locations M1 and M2 considered representative of the nearest potentially-affected noise-sensitive receivers to the Project Site. The noise monitoring locations are shown in **Figure 4**.

The ambient noise monitoring consisted of continuous, unattended noise logging and operator attended noise surveys. The operator attended noise surveys help to define noise sources and the character of noise in the area and are, therefore, used to qualify unattended noise logging results.

All acoustic instrumentation employed throughout the monitoring programme has been designed to comply with the requirements of AS IEC 61672 2004 "*Electroacoustics - Sound Level Meters*" (parts 1 and 2) and carries current NATA or manufacturer calibration certificates. Instrument calibration was checked before and after each measurement survey, with the variation in calibrated levels not exceeding ±0.5 dBA.

Figure 4 Noise Monitoring Locations

8.2 Operator-Attended Noise Monitoring

Operator attended noise measurements were conducted during the day period at the unattended noise monitoring locations (Location M1 and M2). The purpose of these surveys was twofold; to qualify the unattended noise logging results and to determine the contribution of existing industrial noise sources (including those from the Project Site) to the total ambient noise environment.

Operator attended noise measurements were conducted during the day on Friday 7 August 2015 using a Bruel & Kjaer 2260 integrating sound level meter (S/N 2115053). Each operator attended noise survey was 15 minutes duration.

The results of the operator attended noise measurements are given in **Table 15**. Ambient noise levels given in the tables include all noise sources such as traffic, insects, birds, and any other industrial operations.

The tables provide the following information:

- Monitoring location.
- Date and start time.
- Wind velocity (m/s) and Temperature (ºC) at the measurement location.
- Typical maximum (L_{Amax}) and contributed noise levels.

Table 15 Operator Attended Noise Survey Results

Date/Start Time Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission and Typical Maximum Levels LAmax – dBA
	LAmax	LA1	LA10	LA90	LAeq	
M1 – 148 Dean Street, Strathfield Day 07/08/2015 16:19 pm W = Calm Temp = 14°C	64	57	49	42	47	Distant Road traffic ~ 45 to 64 dBA Birds ~ 51 to 63 dBA Helicopter 56 to 60 dBA Hosking Estate Industrial Area mechanical plant 45 to 57, Existing Materials Recovery Facility operations not audible
M2 – 2 Chisholm Street, Strathfield Day 07/08/2015 15:37 pm W = 1 m/s E Temp = 15°C	71	59	55	50	53	Hosking Estate Industrial Area mechanical plant (compressors) - constant 51 – 59dBA, Trucks unloading 59 to 71dBA , Existing Materials Recovery Facility - intermittent operations audible trucks loading/unloading with reversing alarms 57 Material handling 58 to 62 dBA,

Results of operator-attended noise surveys indicate that natural noise sources, distant road traffic and industrial noise from the nearby Hosking Industrial estate are the main contributors to the ambient noise environment during all monitoring periods at logger location M1.

However, the operator-attended noise surveys at logger location M2 indicate that constant industrial noise from the nearby Hosking Industrial estate and intermittent industrial noise from the existing materials recovery facility are the main contributors to the ambient noise environment during all monitoring periods.

8.3 Unattended Continuous Noise Monitoring

8.3.1 Background Noise Monitoring

Background noise levels were monitored by SLR with the objective being to measure $L_{A90(period)}$ and $L_{Aeq(15minute)}$ noise levels at the nearest potentially affected residential locations during the day, evening and night-time periods to enable the determination of the intrusiveness and amenity criteria for the project.

Background noise levels were monitored from Tuesday 7 July 2015 to Friday 17 July 2015 inclusive at locations M1 and M2. Details of the monitoring location are provided in **Table 16** and **Figure 4**.

Table 16 Ambient Noise Monitoring Locations

Logger Type/ Serial No.	Location	Location (m, UTM)	
		Easting	Northing
SVAN 957 20674	M1 – 148 Dean Street, Strathfield	322341	6247876
SVAN 957 27578	M2 – 2 Chisholm Street, Strathfield	322514	6247503

The noise logger was programmed to record statistical noise level indices continuously in 15 minute intervals, including L_{Amax}, L_{A1}, L_{A50}, L_{A90}, L_{A99}, L_{Amin} and L_{Aeq}. Precautions were taken to minimise influences from extraneous noise sources and reflections from adjacent buildings.

Weather data for the survey period was obtained from the Bureau of Meteorology (BOM) weather station located at Bankstown Airport (approximately 8.5 km west-north-west of the Project Site). Noise data corresponding to periods of rainfall and/or wind speeds in excess of 5 m/s (approximately 9 knots) were discarded in accordance with INP data exclusion methodology. A summary of the results of the background survey is given in **Table 17**. Results are displayed graphically in **Appendix B**.

Table 17 Summary of Existing Ambient Noise Levels

Location	Period	Measured $L_{Aeq\ (period)}$	Measured Background L_{A90} Noise Level	Adopted Rating Background Level	Estimated Existing Industrial Contribution L_{Aeq} (non project related)
M1 – 148 Dean Street, Strathfield	Daytime	53 dBA	44 dBA	44 dBA	44 dBA
	Evening	48 dBA	44 dBA	44 dBA	44 dBA
	Night-time	48 dBA	42 dBA	42 dBA	42 dBA
M2 – 2 Chisholm Street, Strathfield	Daytime	58 dBA	48 dBA	48 dBA	48 dBA
	Evening	50 dBA	44 dBA	44 dBA	44 dBA
	Night-time	48 dBA	41 dBA	41 dBA	41 dBA

Note: Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am
On Sundays and Public Holidays, Daytime 8.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 8.00 am
The L_{A90} represents the level exceeded for 90% of the interval period and is referred to as the average minimum or background noise level
L_{Aeq} - The equivalent continuous noise level is defined as the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

The operator-attended noise measurements presented in **Table 15** show that the existing Project Site operations is intermittent in nature and the constant noise from the nearby Hosking Industrial Estate is the dominate noise source at both monitoring locations. As such, the measured L_{A90} background noise levels presented in **Table 17** have not been affected by noise from the existing Project Site at location M1 and location M2 during all periods, and are considered appropriate to be used in the establishment of PSNC.

8.3.2 Ambient Noise Monitoring

8.3.2.1 Existing Operations

Ambient noise levels at both the north-eastern and the southern Project Site boundary were monitored by SLR during the day, evening and night-time periods to determine the contribution of existing industrial noise sources (including those from the Project Site) to the total ambient noise environment.

Ambient noise levels were monitored from Thursday 1 September 2016 to Tuesday 6 September 2016 inclusive at both boundary locations. Details of the monitoring locations are provided in **Table 18** and **Figure 4**.

Table 18 Year 2016 Project Site Boundary Ambient Noise Monitoring Locations

Logger Type/ Serial No.	Location	Location (m, UTM)	
		Easting	Northing
SVAN 957 21425	North-eastern site boundary	322369	6247623
SVAN 957 27579	Southern site boundary	322336	6247487

The noise logger was programmed to record statistical noise level indices continuously in 15 minute intervals, including L_{Amax}, L_{A1}, L_{A50}, L_{A90}, L_{A99}, L_{Amin} and L_{Aeq}. Where possible, precautions were taken to minimise influences from adjacent buildings.

Weather data for the survey period was obtained from the Bankstown Airport BOM weather station. Noise data corresponding to periods of rainfall and/or wind speeds in excess of 5 m/s were discarded in accordance with INP data exclusion methodology. A summary of the results of the noise survey is given in **Table 19**. Results are displayed graphically in **Appendix B**.

Without the provision of detailed site operational plant and activity logs the site contribution was not discernible against the ambient industrial noise level of activity from adjoining premises (and construction of the industrial site adjacent to the north-eastern site boundary) specifically and from the industrial area generally.

Table 19 Summary of Existing Ambient Noise Levels – Project Site Boundary

Location	Period	Measured $L_{Aeq\ (period)}$	Measured Background L_{A90} Noise Level
North-eastern site boundary	Daytime	59 dBA	50 dBA
	Evening	55 dBA	46 dBA
	Night-time	51 dBA	43 dBA
Southern site boundary	Daytime	61 dBA	46 dBA
	Evening	49 dBA	40 dBA
	Night-time	46 dBA	37 dBA

Note: Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am
On Sundays and Public Holidays, Daytime 8.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 8.00 am
The L_{A90} represents the level exceeded for 90% of the interval period and is referred to as the average minimum or background noise level
L_{Aeq} - The equivalent continuous noise level is defined as the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

8.3.2.2 Similar Operations

Ambient noise levels at the north-western site boundary of the Polytrade Recycling Facility, 126-134 Thomas Murrell Crescent, Dandenong South, Victoria were monitored by SLR during the day, evening and night-time periods to determine the contribution of existing industrial noise sources (including those from the site) to the total ambient noise environment.

Ambient noise levels were monitored from Thursday 1 September 2016 to Monday 5 September 2016. Details of the monitoring locations are provided in **Table 20**.

Table 20 126-134 Thomas Murrell Crescent, Dandenong South, Victoria Ambient Noise Monitoring Location

Logger Type/ Serial No.	Location	Location (m, UTM)	
		Easting	Northing
ARL Ngara s/n 878048	North-western site boundary	341370	14209785

The noise logger was programmed to record statistical noise level indices continuously in 15 minute intervals, including L_{Amax}, L_{A1}, L_{A50}, L_{A90}, L_{A99}, L_{Amin} and L_{Aeq}. Precautions were taken to minimise influences from adjacent buildings.

Weather data for the survey period was obtained from the Bankstown Airport BOM weather station. Noise data corresponding to periods of rainfall and/or wind speeds in excess of 5 m/s were discarded in accordance with INP data exclusion methodology. A summary of the results of the noise survey is given in **Table 21**. Results are displayed graphically in **Appendix B**.

Ambient noise levels included contributions from the site operational activity, adjoining roadway traffic noise and industrial noise from the surrounding industrial estate premises. Detailed site operational plant and activity logs were not provided.

Table 21 Summary of Existing Ambient Noise Levels – Polytrade Dandenong South, Victoria

Location	Period	Measured $L_{Aeq\ (period)}$	Measured Background L_{A90} Noise Level
North-eastern site boundary	Daytime	71	62
	Evening	67	49
	Night-time	60	43

Note: Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am
On Sundays and Public Holidays, Daytime 8.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 8.00 am
The L_{A90} represents the level exceeded for 90% of the interval period and is referred to as the average minimum or background noise level
L_{Aeq} - The equivalent continuous noise level is defined as the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

9 EFFECTS OF METEOROLOGY ON NOISE LEVELS

9.1 Wind

Wind has the potential to increase noise at a receiver when it is light and stable and blows from the direction of the source of the noise. As the strength of the wind increases the noise produced by the wind will obscure noise from most industrial and transport sources.

Wind effects need to be considered when wind is a feature of the area under consideration (in accordance with the INP). Where wind blows from the source to the receiver at speeds up to 3 m/s for more than 30% of the time in any season, then wind is considered to be a feature of the area and noise level predictions must be made under these conditions.

The INP provides two methods to assess wind effects; analysis of relevant weather data to determine whether wind is a feature based on the frequency of occurrence and wind speed (*detailed approach*) or simply assume that wind is a feature of the area (*simple approach*). Wind speed and direction data, among other parameters, have been measured at the BOM automated weather station (AWS) at Bankstown Airport (Station Number 066137) for many years. Thus, a detailed approach has been utilised for the purpose of this assessment.

In order to determine the prevailing conditions for the Project Site, five (5) years of weather data (2010, 2011, 2012, 2013, 2014) was obtained from the BOM AWS at Bankstown Airport (approximately 8.5 km west-north-west of the Project Site).

In Accordance with the INP, this data was analysed to determine the frequency of occurrence of winds of speeds up to 3 m/s in each season during the day, evening and night time periods. The results of the wind analysis for daytime, evening, and night-time winds are presented in **Table 22**, **Table 23** and **Table 24** respectively. In each table, the wind directions and percentage occurrence are those dominant during each season.

Table 22 Seasonal Frequency of Occurrence of Wind Speed Intervals – Daytime

Period	Calm	Wind Direction	0.5 – 2 m/s	2 – 3 m/s	0.5 – 3 m/s
Summer	2.0%	NW±45	4.1%	4.8%	9.0%
Autumn	4.6%	WNW±45	8.9%	10.2%	19.1%
Winter	3.7%	WNW±45	9.3%	10.7%	20.0%
Spring	1.6%	WNW±45	5.0%	7.6%	12.6%

Table 23 Seasonal Frequency of Occurrence of Wind Speed Intervals – Evening

Period	Calm	Wind Direction	0.5 – 2 m/s	2 – 3 m/s	0.5 – 3 m/s
Summer	0.3%	ENE±45	3.6%	6.2%	9.7%
Autumn	20.1%	SW±45	9.1%	5.4%	14.5%
Winter	22.7%	WSW±45	9.4%	7.4%	16.8%
Spring	5.7%	NE±45	6.6%	7.7%	14.4%

Table 24 Seasonal Frequency of Occurrence of Wind Speed Intervals – Night

Period	Calm	Wind Direction	0.5 – 2 m/s	2 – 3 m/s	0.5 – 3 m/s
Summer	23.6%	SSW±45	12.1%	7.3%	19.5%
Autumn	39.1%	WSW±45	16.4%	6.3%	22.7%
Winter	26.7%	WNW±45	18.3%	8.9%	27.1%
Spring	34.1%	SW±45	12.9%	6.0%	18.9%

From the above weather data, significant wind (i.e. wind speed of up to 3 m/s) was not recorded more than the assessment threshold of 30% during the periods between 2010 and 2014 and therefore prevailing winds have not been considered in this assessment.

9.2 Temperature Inversion

Temperature inversions, when they occur, have the ability to increase noise levels by focusing sound waves. Temperature inversions occur predominantly at night during the winter months. For a temperature inversion to be a significant characteristic of the area it needs to occur for approximately 30% of the total night-time during winter, or about two nights per week.

Meteorological data was available from the AWS at Bankstown Airport to allow the determination of the percentage occurrence of temperature inversions during winter nights. The most current temperature inversion data was contained in the years 2010 to 2014.

The INP states: '*Temperature inversions occur during E, F and G stability categories. These three categories are considered to represent weak, moderate and strong inversions respectively. For noise-assessment purposes, only moderate and strong inversions are considered significant enough to require assessment'*.

In dispersion modelling, stability class is used to categorise the rate at which a plume will disperse. In the Pasquill-Gifford stability class assignment scheme there are six stability classes, A through to F. Class A relates to unstable conditions, such as might be found on a sunny day with light winds. Class F relates to stable conditions, such as those that occur when the sky is clear, the winds are light and an inversion is present. The intermediate classes B, C, D and E relate to intermediate dispersion conditions. A seventh class, G, has also been defined to accommodate extremely stable conditions such as might be found in arid rural areas.

An analysis of the occurrence of each stability class has been conducted and is provided in **Table 25**.

Table 25 Seasonal Frequency of Occurrence of Temperature Inversion – Night

Stability Class	Winter
A	0.0%
B	0.0%
C	0.0%
D	31.4%
E	10.6%
F	26.0%
G	32.0%
F + G	58.0%

Results of the analysis is provided in **Table 25** indicate that temperature inversions occur in the area and have therefore been considered as part of this noise assessment.

9.2.1 Suitability of Meteorological Data

It is noted that the dataset utilised for the purpose of the NVIA may differ to that utilised in other environmental impact assessments including, but not limited to, air quality. Whilst the starting point for each assessment may be similar, the requirements for meteorological data vary, as stated in guidance documentation from the appropriate regulatory authorities.

The factors considered in selecting the meteorological data for use in an air quality impact assessment can be considerably different to those that need to be considered when compiling data for a noise impact assessment.

Worst case noise impacts tend to occur under conditions of low wind speeds when there is little atmospheric turbulence to dissipate the noise emissions. Impacts resulting from particulate emissions tend to be greatest under moderate to strong wind speeds, when wind-blown dust is generated and particulate matter can be carried significant distances before settling out of the air.

Dust impacts are also assessed based on longer term averages (24-hour and annual averages), whereas noise and odour nuisance impacts are more likely to be associated with peak events.

Furthermore, the weather dataset as a whole is required to contain different meteorological parameters to assess the noise impacts or air quality impacts. For example, for air quality impacts, the mixing heights in the dataset are required to assess the vertical dispersion of pollutants which can have a significant impact on the resultant ground level concentration at the discrete receptors. Whereas for noise impacts, the mixing heights do not directly influence the noise levels experienced.

For these reasons, the meteorological data used in this assessment differs from that used in the assessment of air quality impacts from the Project.

Appendix C provides further discussion with regard to the requirements for weather data and how it is analysed for the purpose of the NVIA.

10 PROJECT SPECIFIC NOISE CRITERIA

10.1 Operational Noise Design Criteria

The project specific noise criteria (PSNC) for the Project have been established with reference to the INP outlined in **Section 7** of this report and are provided in **Table 26**.

The INP defines three types of acoustical environments; rural, suburban or urban. Based on the definitions of these environments in the INP, the acoustical environment around the Project Site typifies a Urban environment, which is defined as; "*an area with an acoustical environment that is dominated by urban hum or industrial source noise, is near commercial district or industrial district"* (INP, 2000). Therefore, the residences in the general area have been assessed as "Urban" receiver types.

In accordance with the INP, the PSNC reflect the most stringent noise level requirements from the noise levels derived for both the intrusive and amenity criteria. Applying the most stringent requirement as the PSNC ensures that both intrusive noise is limited and amenity is protected.

The operational PSNC for residences R1, R6, R7 and R8 (see **Figure 3**) is based on LA90 and LAeq noise levels measured at Logger Location M2 (see **Figure 4**).

The operational PSNC for residences R2, R3, R4 and R5 (see **Figure 3**) is based on LA90 and LAeq noise levels measured at Logger Location M1 (see **Figure 4**).

Table 26 Operational PSNC

Location	Period	Adopted RBL L_{A90}	Intrusiveness Criteria $L_{Aeq(15minute)}$ (RBL +5dB)	Amenity Criteria $L_{Aeq(Period)}$	PSNC L_{Aeq}
R2, R3, R4 & R5	Day	44 dBA	49 dBA	60 dBA	**49 dBA** LAeq(15min)
	Evening	44 dBA	49 dBA	49 dBA[1]	**49 dBA** LAeq(Period)
	Night	42 dBA	47 dBA	42 dBA[1]	**42 dBA** LAeq(Period)
R1, R6, R7 & R8	Day	48 dBA	53 dBA	60 dBA	**53 dBA** LAeq(15min)
	Evening	44 dBA	49 dBA	49 dBA[1]	**49 dBA** LAeq(Period)
	Night	41 dBA	46 dBA	43 dBA[1]	**43 dBA** LAeq(Period)
I1, I2, I3 & I4	When in use	N/A	N/A	70 dBA	70 dBA LAeq(Period)

Note: Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am On Sundays and Public Holidays, Daytime 8.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 8.00 am

1. Amenity criteria adjusted in accordance with INP

10.2 Sleep Disturbance Noise Goals

The relevant sleep disturbance noise goals for each residential area have been set with reference to the INP Application Notes as outlined in **Section 7** of this report and are provided in **Table 27**.

Table 27 Sleep Disturbance Noise Goals

Location	Period	Adopted RBL L_{A90}	Sleep Disturbance Noise Goal (External)
R2, R3, R4 & R5	Night	42 dBA	**57 dBA**
R1, R6, R7 & R8		41 dBA	**56 dBA**
I1, I2, I3 & I4		N/A	**N/A**

Notes: * For the purposes of determining the relevant sleep disturbance noise goal the adopted RBL has been calculated such that the background noise level excludes the existing contribution from the Project Site

10.3 Road Traffic Noise Goals

Table 28 provides the relevant project specific operational and construction road traffic noise goals that are applicable for the Project Site.

Table 28 Project Specific Road Traffic Noise Assessment Criteria for Residential Land Uses

Road	Assessment criteria – dBA	
	Day (7 am–10 pm)	Night (10 pm–7 am)
Madeline Street	LAeq, (1 hour) 55 (external)	LAeq, (1 hour) 50 (external)
Punchbowl Road	LAeq, (15 hour) 60 (external)	LAeq, (9 hour) 55 (external)
Cosgrove Road	LAeq, (15 hour) 60 (external)	LAeq, (9 hour) 55 (external)
Liverpool Road	LAeq, (15 hour) 60 (external)	LAeq, (9 hour) 55 (external)

10.4 Construction Noise Goals

Similar to the intrusive PSNC, the adopted project specific noise goal for construction activities is the background noise level plus 10 dBA (L_{A90} + 10 dBA) for standard hours and background noise level plus 5 dBA (L_{A90} + 5 dBA) for outside of standard hours. **Table 29** presents the noise goals for construction activities at the Project Site.

The construction PSNC for residences R1, R6, R7 and R8 (see **Figure 3**) is based on LA90 and LAeq noise levels measured at Logger Location M2 (see **Figure 4**).

The construction PSNC for residences R2, R3, R4 and R5 (see **Figure 3**) is based on LA90 and LAeq noise levels measured at Logger Location M1 (see **Figure 4**).

Table 29 Construction Noise Goals

Residential Location	Period	Noise Goal (LAeq,15minute) (dBA)	
		Noise Affected	Highly Noise Affected
R2, R3, R4 & R5	Recommended Standard Hours	54 dBA	75 dBA
R1, R6, R7 & R8		58 dBA	75 dBA
I1, I2, I3 & I4		75 dBA when in use	

Note: Recommended standard hours for construction are between the hours of 7.00 am and 6.00 pm Monday to Friday and Saturday 8am to 1pm. No work Sundays or public holidays.

10.5 Operational and Construction Vibration Goals

Table 30 and **Table 31** provide the relevant project-specific operational and construction vibration goals that are applicable for the Development Site.

Table 30 Project Specific Acceptable Vibration Dose Values for Intermittent Vibration

Location	Daytime		Night-time	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Residences	0.20 $m/s^{1.75}$	0.40 $m/s^{1.75}$	0.13 $m/s^{1.75}$	0.26 $m/s^{1.75}$

Note: Daytime is 7.00 am to 10.00 pm and night-time is 10:00pm to 7:00am

Table 31 Project Specific Adopted Long-term Structural Vibration Velocity Limits on Structures

Line	Type of Structure	Guideline values for velocity, v_i, in mm/s, of vibration in horizontal plane of highest floor, at all frequencies
1	Building used for commercial purposes, industrial buildings, and buildings of similar design	10
2	Dwellings and buildings of similar design and/or occupancy	5
3	Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are great intrinsic value (e.g. listed buildings under preservation order)	2.5

11 OPERATIONAL NOISE IMPACT ASSESSMENT

11.1 Acoustically Significant Sources

Sound power levels for acoustically significant items of plant and equipment operating at the Project Site have been obtained from manufacture data where possible. Where this was not possible data was obtained from an SLR noise source database of similar equipment. In addition to the above, noise data source for plant and equipment was measured within existing similar operations at two Polytrade facilities located at Rydalmere in NSW and a facility at 126-134 Thomas Murrell Crescent, Dandenong South, Victoria.

The Victorian centre measurements were conducted on the 5 September 2016 was used to give a refined comparative result to previously predicted noise levels.

The L_{Aeq} sound power levels of relevant plant and equipment utilised for the purpose of predicting noise emission levels are given in **Table 32**.

Table 32 Equipment Sound Power Levels

Plant and Equipment	Data Source	Typical Sound Power Level L_{Aeq} (dBA)
MRF operations		
Delivery/ pickup Trucks	SLR Database	102 dBA[1]
MRF (Building 1)	Measured data	85 dBA (internal sound pressure level)[2]
Forklift diesel (1)	SLR Database	97 dBA per forklift[1]
Forklift gas (1)	SLR Database	91 dBA per forklift[1]
Frontend loader (1)	SLR Database	104 dBA[1]
Roof ventilation Fans (6) – Building 1	SLR Database	88 dBA per fan
PCR Operations		
Delivery/ pickup Trucks	SLR Database	102 dBA[1]
PCR (Building 2)	Measured data	85 dBA (internal sound pressure level) [2]
Forklift diesel (1)	SLR Database	97 dBA per forklift[1]
Forklift gas (1)	SLR Database	91 dBA per forklift[1]
Frontend loader (1)	SLR Database	104 dBA[1]
Portable conveyor (glass waste loading trucks)	SLR Database	95 dBA
General Operations		
Carpark 1 & 2	SLR Database	64 dBA
Idling Delivery Trucks (2)	SLR Database	85 dBA
Idling Pickup (outbound) Trucks (2)	SLR Database	85 dBA

Note 1: Noise levels include reversing alarms.
Note 2: Measured data from similar Polytrade facility located at Dandenong South.

It is relevant to note that PA systems are not proposed as part of the Project Site and therefore have not been included as part of this assessment.

11.1.1 Traffic Generation

The traffic generation associated with the Project Site is also summarised in **Table 33**.

Table 33 Proposed Daily Service Vehicle Activities for the Project Site

Scenario	Material Delivery Trips/day		Outbound Material Trips/day	
	In	Out	In	Out
Proposed PCR – heavy vehicles	33	33	5	5
Proposed MRF –heavy vehicles	45	45	9	9
Staff PCR – Light vehicles	10 inbound	10 outbound		
Staff MRF – Light vehicles	14 inbound	14 outbound		

11.2 Operational Noise Modelling

11.2.1 Operational Noise Modelling Parameters

The Conservation of Clean Air and Water Europe (CONCAWE) prediction methodology was utilised within SoundPLAN 3D modelling software (Version 7.3), developed by Braunstein and Berndt Gmbh in Germany, to predict noise emissions from operation of the Project Site. A three-dimensional digital terrain map giving all relevant topographic information was used in the modelling process. The model used this map, together with noise source data, ground cover, shielding by barriers and/or adjacent buildings and atmospheric information to predict noise levels at the nearest sensitive receivers.

Prediction of noise emission levels was carried out under calm and worst-case prevailing atmospheric conditions. Atmospheric parameters under which noise predictions were made are given in **Table 34**.

Table 34 Meteorological Parameters Considered for Noise Predictions

Period	Temperature	Humidity	Wind Speed	Wind Direction	Stability Class
Day (calm)	19 ^{o}C	59%	n/a	n/a	D
Evening (calm)	19 ^{o}C	65%	n/a	n/a	D
Night (calm)	15 ^{o}C	80%	n/a	n/a	D
Temperature Inversion (night)	15 ^{o}C	80%	n/a	n/a	G

Note: 1. The basis of this correction is the meteorological category of the atmosphere which is assessed in accordance with Pasquill and Turner Stability Categories contain within the CONCAWE algorithm. The 6 categories are shown in **Table 35** with the effect on attenuation.

Table 35 Pasquill Stability Category

Meteorological Category	Pasquill Stability Category		
	A, B	C, D, E	F, G
1	V< -3.0	-	-
2	-3.0 < V < -0.5	V < - 3.0	-
3	-0.5 < V < +0.5	-3.0 < V < -0.5	V < -3.0
4	+0.5 < V < +3	-0.5 < V < 0.5	-3.0 < V < -0.5
5	V > 3	0.5 < V < +3	-0.5 < V < +0.5
6	-	V> +3	+0.5 < V < +3

Assumptions made in modelling noise emissions from the Project Site include the following:

- All acoustically significant plant and equipment operates simultaneously.
- Mobile noise sources, such delivery vehicles, were modelled at typical locations and assumed to operate in repetitive cycles.

11.2.2 Operational Scenarios – Noise Model Summary

The noise sources of the revised operational scenarios modelled during each period are summarised in **Table 36**. A tick (✓) indicates that the equipment is in operation during the relevant period. A cross (×) indicates that the equipment is not in operation during the relevant period. It should be noted that the operational scenarios modelled are likely to represent an acoustically worst-case scenarios.

Listed in **Table 36** are the idling delivery heavy vehicles that address the Record of Deferral Notice requirement 4 to detail on-site queuing vehicles. As a worst-case queuing operational scenario it was assumed that two heavy vehicles were modelled idling continuously situated east of the weighbridge, along the northern boundary, as well as two heavy vehicles continuously idling in the hard-stand area in the south of the site.

Table 36 Revised Operational Scenario Noise Sources Considered in Noise Model

Plant and Equipment	Day	Evening	Night
MRF operations			
Delivery/ pickup Trucks	✓	✓	✓
MRF (Building 1)	✓	✓	✓
Forklift Diesel (1)	✓	✓	✓
Forklift gas (1)	✓	✓	✓
Frontend loader (1)	✓ Receival Area	✓ Receival Area	✓ Receival Area
Roof Ventilation Fans (6) – Building 1	✓	✓	✓
PCR Operations			
Delivery/ pickup Trucks	✓	✓	✓
PCR (Building 2)	✓	✓	✓
Forklift diesel (1)	✓	✓	✓
Forklift gas (1)	✓	✓	✓
Frontend Loader (1)	✓ Glass Bunkers and Receival Area	✓ Glass Bunkers and Receival Area	✓ Receival Area only
Portable conveyor (glass waste loading trucks)	✓	✓	×
General Operations			
Carpark 1 & 2	✓	✓	✓
Idling Delivery Trucks (2)	✓	✓	✓
Idling Pickup (outbound) Trucks (2)	✓	✓	✓

Two noise mitigation scenarios were assessed over each of the day, evening and night periods of 24 hour operation:

- Scenario 1 – A fixed (colorbond type) awning constructed over the receivable area and a 2.1 m high noise wall along the eastern boundary extent, understood to be approximately 61 m long. The awning cover was modelled at 7 m above round height.
- Scenario 2 – A 4.0 m high noise wall along the eastern boundary extent. There is no awning cover over the receivable area in this scenario.

The revised assessment now takes into account the acoustic shielding provided by a large – in extent and height – concrete tilt-panel industrial building currently being constructed in the adjacent lot along the north-east site boundary. **Figure 2** shows the concrete slab footprint of the structure.

11.2.3 Original November 2015 NVIA Operational Noise Modelling Results

In November 2015, SLR completed the original NVIA for the MRF and PCR unit located at the Project Site, SLR reference 610.14992-R1, issued 20 November 2015. **Table 38** provides the predicted operational noise emission levels from the original assessment.

Table 37 Original 2015 Assessment Operational Predicted Noise Level Results

Location	Period	Predicted Noise Level (dBA)		PSNC $L_{Aeq(15minute)}$ / $L_{Aeq(period)}$ (dBA)
		Calm	Temperature Inversion	
R1	Day	45	N/A	53 dBA $L_{Aeq(15minute)}$
	Evening	42	N/A	49 dBA $L_{Aeq(Period)}$
	Night	42	42	43 dBA $L_{Aeq(Period)}$
R2	Day	41	N/A	49 dBA $L_{Aeq(15minute)}$
	Evening	38	N/A	49 dBA $L_{Aeq(Period)}$
	Night	38	40	42 dBA $L_{Aeq(Period)}$
R3	Day	<30	N/A	49 dBA $L_{Aeq(15minute)}$
	Evening	<30	N/A	49 dBA $L_{Aeq(Period)}$
	Night	<30	<30	42 dBA $L_{Aeq(Period)}$
R4	Day	<30	N/A	49 dBA $L_{Aeq(15minute)}$
	Evening	<30	N/A	49 dBA $L_{Aeq(Period)}$
	Night	<30	<30	42 dBA $L_{Aeq(Period)}$
R5	Day	<30	N/A	49 dBA $L_{Aeq(15minute)}$
	Evening	<30	N/A	49 dBA $L_{Aeq(Period)}$
	Night	<30	<30	42 dBA $L_{Aeq(Period)}$
R6	Day	<30	N/A	53 dBA $L_{Aeq(15minute)}$
	Evening	<30	N/A	49 dBA $L_{Aeq(Period)}$
	Night	<30	<30	43 dBA $L_{Aeq(Period)}$
R7	Day	<30	N/A	53 dBA $L_{Aeq(15minute)}$
	Evening	<30	N/A	49 dBA $L_{Aeq(Period)}$
	Night	<30	<30	43 dBA $L_{Aeq(Period)}$
R8	Day	40	N/A	53 dBA $L_{Aeq(15minute)}$
	Evening	37	N/A	49 dBA $L_{Aeq(Period)}$
	Night	37	37	43 dBA $L_{Aeq(Period)}$
I1	Day	58	N/A	70 dBA when is use
	Evening	58	N/A	
	Night	59	59	
I2	Day	53	N/A	70 dBA when is use
	Evening	53	N/A	
	Night	53	53	
I3	Day	54	N/A	70 dBA when is use
	Evening	54	N/A	
	Night	53	53	
I4	Day	68	N/A	70 dBA when is use
	Evening	69	N/A	

Location	Period	Predicted Noise Level (dBA)		PSNC $L_{Aeq(15minute)}$ / $L_{Aeq(period)}$ (dBA)
		Calm	Temperature Inversion	
	Night	61	61	

Note: Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am On Sundays and Public Holidays, Daytime 8.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 8.00 am

Results presented in **Table 38** indicated that operational noise levels met the PSNC at all assessment locations.

11.2.4 Operational Noise Modelling Results and Discussion

Table 38 and **Table 39** provide the revised predicted operational noise emission levels from the Project Site for the two operational scenarios of Scenario 1 and Scenario 2 respectively, as described in **Section 11.2.2**.

Noise from all sources that contribute to the total noise from the Project Site have been examined to identify characteristics that may cause greater annoyance (for example tonality, impulsiveness etc). The appropriate modifying factors, as outlined in the INP, have been applied where these characteristics are considered to be present. Noise levels predicted for the Project Site at the nearest sensitive receiver locations are provided in **Table 38**. To determine the amenity level, the intrusive level is adjusted (by -3 dB) for comparison with the relevant amenity criteria for each location.

Table 38 Scenario 1 – Operational Predicted Noise Level Results [Awning cover over receival area with 2.1 m high wall along eastern site boundary]

Location	Period	Predicted Noise Level (dBA)		PSNC $L_{Aeq(15minute)}$ / $L_{Aeq(period)}$ (dBA)
		Calm	Temperature Inversion	
R1	Day	44	N/A	53 dBA $L_{Aeq(15minute)}$
	Evening	41	N/A	49 dBA $L_{Aeq(Period)}$
	Night	41	41	43 dBA $L_{Aeq(Period)}$
R2	Day	39	N/A	49 dBA $L_{Aeq(15minute)}$
	Evening	36	N/A	49 dBA $L_{Aeq(Period)}$
	Night	37	38	42 dBA $L_{Aeq(Period)}$
R3	Day	<30	N/A	49 dBA $L_{Aeq(15minute)}$
	Evening	<30	N/A	49 dBA $L_{Aeq(Period)}$
	Night	<30	<30	42 dBA $L_{Aeq(Period)}$
R4	Day	<30	N/A	49 dBA $L_{Aeq(15minute)}$
	Evening	<30	N/A	49 dBA $L_{Aeq(Period)}$
	Night	<30	<30	42 dBA $L_{Aeq(Period)}$
R5	Day	<30	N/A	49 dBA $L_{Aeq(15minute)}$
	Evening	<30	N/A	49 dBA $L_{Aeq(Period)}$
	Night	<30	<30	42 dBA $L_{Aeq(Period)}$
R6	Day	<30	N/A	53 dBA $L_{Aeq(15minute)}$
	Evening	<30	N/A	49 dBA $L_{Aeq(Period)}$
	Night	<30	<30	43 dBA $L_{Aeq(Period)}$
R7	Day	<30	N/A	53 dBA $L_{Aeq(15minute)}$
	Evening	<30	N/A	49 dBA $L_{Aeq(Period)}$
	Night	<30	<30	43 dBA $L_{Aeq(Period)}$

Location	Period	Predicted Noise Level (dBA)		PSNC $L_{Aeq(15minute)}$ / $L_{Aeq(period)}$ (dBA)
		Calm	Temperature Inversion	
R8	Day	38	N/A	53 dBA $L_{Aeq(15minute)}$
	Evening	35	N/A	49 dBA $L_{Aeq(Period)}$
	Night	35	36	43 dBA $L_{Aeq(Period)}$
I1	Day	58	N/A	70 dBA when is use
	Evening	55	N/A	
	Night	56	56	
I2	Day	53	N/A	70 dBA when is use
	Evening	50	N/A	
	Night	50	50	
I3	Day	54	N/A	70 dBA when is use
	Evening	51	N/A	
	Night	50	51	
I4	Day	69	N/A	70 dBA when is use
	Evening	66	N/A	
	Night	58	58	

Note: Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am On Sundays and Public Holidays, Daytime 8.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 8.00 am

In comparison between the predicted results of noise attenuation Scenario 1 with that of the original assessment per modelled receiver, it can be seen that:

- Receiver 1 – There is a 1 dB decrease in predicted received noise across each day period and the modelled temperature inversion;
- Receiver 2 – There is a 2 dB decrease in predicted received noise across both the day and evening periods, a 1 dB decrease in the night period and a 2 dB decrease for the modelled temperature inversion;
- Receivers 3 through 7 – Predicted results at the modelled receivers all remain less than 30 dBA for all assessed periods and for the modelled temperature inversion;
- Receiver 8 – There is a 2 dB decrease in predicted received noise across the day, evening and night periods and a 1 dB decrease for the modelled temperature inversion;
- Industrial Receivers I1 and I2 – There is a 3 dB decrease in predicted received noise across the evening and night periods and the modelled temperature inversion. No difference is noted within the day period.
- Industrial Receiver I3 – There is a 3 dB decrease in predicted received noise across the evening and night periods and a 2dB decrease for the modelled temperature inversion. No difference is noted within the day period.
- Industrial Receiver I4 – There is a 3 dB decrease in predicted received noise across the evening and night periods and the modelled temperature inversion. There is a 1 dB difference noted within the day period.

Table 39 Scenario 2 – Operational Predicted Noise Level Results [4.0 m high wall along eastern site boundary]

Location	Period	Predicted Noise Level (dBA)		PSNC $L_{Aeq(15minute)}$ / $L_{Aeq(period)}$ (dBA)
		Calm	Temperature Inversion	
R1	Day	44	N/A	53 dBA $L_{Aeq(15minute)}$
	Evening	41	N/A	49 dBA $L_{Aeq(Period)}$
	Night	41	42	43 dBA $L_{Aeq(Period)}$
R2	Day	39	N/A	49 dBA $L_{Aeq(15minute)}$
	Evening	36	N/A	49 dBA $L_{Aeq(Period)}$
	Night	37	38	42 dBA $L_{Aeq(Period)}$
R3	Day	<30	N/A	49 dBA $L_{Aeq(15minute)}$
	Evening	<30	N/A	49 dBA $L_{Aeq(Period)}$
	Night	<30	<30	42 dBA $L_{Aeq(Period)}$
R4	Day	<30	N/A	49 dBA $L_{Aeq(15minute)}$
	Evening	<30	N/A	49 dBA $L_{Aeq(Period)}$
	Night	<30	<30	42 dBA $L_{Aeq(Period)}$
R5	Day	<30	N/A	49 dBA $L_{Aeq(15minute)}$
	Evening	<30	N/A	49 dBA $L_{Aeq(Period)}$
	Night	<30	<30	42 dBA $L_{Aeq(Period)}$
R6	Day	<30	N/A	53 dBA $L_{Aeq(15minute)}$
	Evening	<30	N/A	49 dBA $L_{Aeq(Period)}$
	Night	<30	<30	43 dBA $L_{Aeq(Period)}$
R7	Day	<30	N/A	53 dBA $L_{Aeq(15minute)}$
	Evening	<30	N/A	49 dBA $L_{Aeq(Period)}$
	Night	<30	<30	43 dBA $L_{Aeq(Period)}$
R8	Day	38	N/A	53 dBA $L_{Aeq(15minute)}$
	Evening	35	N/A	49 dBA $L_{Aeq(Period)}$
	Night	35	36	43 dBA $L_{Aeq(Period)}$
I1	Day	55	N/A	
	Evening	56	N/A	70 dBA when is use
	Night	56	56	
I2	Day	50	N/A	
	Evening	50	N/A	70 dBA when is use
	Night	50	50	
I3	Day	51	N/A	
	Evening	50	N/A	70 dBA when is use
	Night	50	51	
I4	Day	66	N/A	
	Evening	58	N/A	70 dBA when is use
	Night	58	58	

Note: Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am On Sundays and Public Holidays, Daytime 8.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 8.00 am

In comparison between the predicted results of noise attenuation Scenario 2 with that of the original assessment per modelled receiver, it can be seen that:

- Receiver 1 – There is a 1 dB decrease in predicted received noise across each day period and no change for the modelled temperature inversion;
- Receiver 2 – There is a 2 dB decrease in predicted received noise across both the day and evening periods, a 1 dB decrease in the night period and a 2 dB decrease for the modelled temperature inversion;
- Receivers 3 through 7 – Predicted results at the modelled receivers all remain less than 30 dBA for all assessed periods and for the modelled temperature inversion;
- Receiver 8 – There is a 2 dB decrease in predicted received noise across the day, evening and night periods and a 1 dB decrease for the modelled temperature inversion;
- Industrial Receiver I1 – There is a 3 dB decrease in predicted received noise across the day and night periods and the modelled temperature inversion. There is a 2 dB decrease predicted for the evening period.
- Industrial Receiver I2 – There is a 3 dB decrease in predicted received noise across all the day periods and the modelled temperature inversion.
- Industrial Receiver I3 – There is a 3 dB decrease in predicted received noise across the day and evening periods, a 4 dB decrease for the evening period and a 2dB decrease for the modelled temperature inversion.
- Industrial Receiver I4 – There is a 3 dB decrease in predicted received noise across the evening and night periods and the modelled temperature inversion. There is a 2 dB difference noted within the day period.

Results presented in both **Table 38** and **Table 39** indicates that operational noise levels meet the PSNC at all assessment locations.

Operational noise levels are predicted to be below the relevant guidelines at the closest residential receivers and therefore additional noise mitigation beyond that investigated is not required. Furthermore, since the noise modelling results presented in **Table 38** and **Table 39** are predicted to meet the PSNC, no dedicated noise abatement measures (such as additional barriers or enclosures for the machines) are required for the operation of the MRF and PCR machinery.

Notwithstanding this, the Project has been designed to ensure that noise levels are minimised by the following:

- Roller door to the buildings will be closed when not in use.
- Broadband reversing alarms fitted to all mobile plant on-site.
- Limit the amount of reversing trucks and fit with broadband reversing alarms wherever possible.
- No loading of glass waste into trucks during the night-time period.

11.3 Sleep Disturbance Analysis

In assessing sleep disturbance, typical L_{Amax} noise levels of acoustically significantly plant and equipment used at the Project Site (refer to **Table 40**) were used as input to the noise model. L_{Amax} noise level predictions were made at the nearest residential locations surrounding the Project Site under worst-case weather condition at night for the two operational scenarios described in Section 11.2.2 and the results are presented **Table 41** and **Table 42** respectively. The use of the L_{Amax} noise level provides a worst-case prediction since the $L_{A1(1minute)}$ noise level of a particular event would be less than the L_{Amax}.

Table 40 L_{Amax} Sound Power Levels

Plant and Equipment	Data Source	Sound Power Level dBA
MRF operations		
Delivery/ pickup Trucks	SLR Database	113 dBA[1]
MRF (Building 1)	Measured data	98 dBA (internal sound pressure level)[2]
Forklift diesel (1)	SLR Database	104 dBA per forklift[1]
Forklift gas (1)	SLR Database	97 dBA per forklift[1]
Frontend loader (1)	SLR Database	110 dBA[1]
Roof ventilation Fans (6) – Building 1	SLR Database	94 dBA per fan
PCR Operations		
Delivery/ pickup Trucks	SLR Database	113 dBA
PCR (Building 2)	Measured data	98 dBA (internal sound pressure level)[2]
Forklift diesel (1)	SLR Database	104 dBA per forklift[1]
Forklift gas (1)	SLR Database	97 dBA per forklift[1]
Frontend loader (1)	SLR Database	110 dBA[1]
General Operations		
Carpark 1 & 2	SLR Database	98 dBA
Delivery Trucks (2)	SLR Database	113 dBA
Pickup (outbound) Trucks (2)	SLR Database	113 dBA

Note 1: Noise levels include reversing alarms.
Note 2: Measured data from similar Polytrade facility located at Rydalmere.

Table 41 Scenario 1 – Predicted Sleep Disturbance Noise Levels

Location	Period	Predicted Sleep Disturbance Noise Level L_{max} (dBA)	Project Specific Sleep Disturbance Noise Goal ($L_{A1\ (1minute)}$) (dBA)
R1	Night-time	55	58 dBA
R2		54	54 dBA
R3		38	54 dBA
R4		35	54 dBA
R5		35	54 dBA
R6		32	58 dBA
R7		37	58 dBA
R8		50	58 dBA
I1		N/A	N/A
I2		N/A	N/A
I3		N/A	N/A
I4		N/A	N/A

Table 41 indicates that operational noise levels meet the sleep disturbance PSNC at all assessment locations.

Table 42 Scenario 2 – Predicted Sleep Disturbance Noise Levels

Location	Period	Predicted Sleep Disturbance Noise Level L_{max} (dBA)	Project Specific Sleep Disturbance Noise Goal ($L_{A1\ (1minute)}$) (dBA)
R1	Night-time	58	58 dBA
R2		54	54 dBA
R3		38	54 dBA
R4		35	54 dBA
R5		35	54 dBA
R6		32	58 dBA
R7		37	58 dBA
R8		50	58 dBA
I1		N/A	N/A
I2		N/A	N/A
I3		N/A	N/A
I4		N/A	N/A

Table 42 indicates that operational noise levels meet the sleep disturbance PSNC at all assessment locations.

11.4 Cumulative Noise Assessment

The INP prescribes detailed calculation routines for establishing "project specific" $L_{Aeq(15minute)}$ intrusive criteria and $L_{Aeq(Period)}$ amenity criteria at potentially affected receivers for a development (in isolation).

Potential cumulative noise impacts from existing and successive developments are embraced by the INP procedures by ensuring that the appropriate noise emission criteria (and consent limits) are established with a view to maintaining acceptable noise *amenity* levels for residences. Therefore, the cumulative impact of the Project with existing industrial noise in the surrounding area has been assessed in the determination of the amenity levels at each receiver location.

12 ROAD TRAFFIC NOISE IMPACT ASSESSMENT

12.1 Methodology and Assumptions

Road traffic noise levels from the Project have been predicted using with the Federal Highway Administration Model – the FHWA. The modelling allows for traffic volume and mix, vehicle speed, reflections off building surfaces, ground absorption and shielding from ground topography and physical noise barriers.

The calculation algorithms are generally considered to be mathematically more rigorous than those of the Calculation of Road Traffic Noise (CoRTN) method, leading to greater accuracy and a wider range of validity at low traffic flows.

All reported noise levels are "facade-corrected", that is, predicted noise levels have been adjusted upwards to include a notional 2.5 dBA reflection within the noise model computation.

The predicted levels are for receiver points 1.5 m above the external ground level.

Two scenarios were modelled for the purposes of this traffic noise impact assessment:

- Scenario 1 (No build) – 2016 assumes existing traffic volumes without the proposed development.
- Scenario 2 (build) – 2016 assumes existing traffic volumes with the proposed development in operation.

12.2 Operational Road Traffic Parameters

Delivery and employee traffic to and from the Project Site associated with operation of the Project will use the following roads:

Madeline Street

Madeline Street is a local road that runs along the western boundary of the Project Site. Madeline Street has been constructed as a single carriageway with a single travel lane and parking lane in each direction. The posted speed limit on Madeline Street is 50 km/h.

Punchbowl Road

Punchbowl road is an arterial road approximately 500 m to the south of the Project Site. Punchbowl Road has been constructed as a single carriageway with two travel lanes in each direction. The posted speed limit on Punchbowl Road in the vicinity of the Project Site is 60 km/h.

Cosgrove Road

Cosgrove Road is a collector road that runs parallel to the west of Madeline Street, it has been constructed as a single carriageway, typically with a single travel lane and parking lane in each direction. The posted speed limit on Cosgrove Road is 60 km/h.

Liverpool Road

Liverpool Road (which forms part of the Hume Highway) is an arterial road approximately one kilometre to the north of the Project Site. Liverpool Road has been constructed as a single carriageway and typically provides three travel lanes in each direction. The posted speed limit on Liverpool Road in the vicinity of the Project Site is 60 km/h.

Road traffic volume information was provided by Solution One Traffic Engineers and reference has been made to the following:

- *Traffic and Parking Impact Report – 14-82 Madeline Street, Strathfield South* August 2015.

Details of parameters utilised in the noise model are provided in **Table 43**.

Table 43 Road Traffic Volumes Utilised in Noise Model

Scenario	Road Description	Road Traffic Speed km/h	Peak Hour Vehicle Movements	AADT	Day (15 hour) Traffic Flow 7am to 10pm	Night (9 hour) Traffic Flow 10pm to 7am	Heavy Vehicle %	
							Day 7am to 10pm	Night 10pm to 7am
Scenario 1 (2016) – no build	Madeline Street	50	67	674	634	40	2%	2%
	Punchbowl Road	60	1787	17874	16802	1072	4%	4%
	Cosgrove Road	60	581	5814	5465	349	12%	12%

Scenario	Road Description	Road Traffic Speed km/h	Peak Hour Vehicle Movements	AADT	Day (15 hour) Traffic Flow 7am to 10pm	Night (9 hour) Traffic Flow 10pm to 7am	Heavy Vehicle %	
							Day 7am to 10pm	Night 10pm to 7am
	Liverpool Road	60	2099	20994	19734	1260	6%	6%
Scenario 2 (2016) – Build	Madeline Street	50	74	737	692	44	9%	9%
	Punchbowl Road	60	1800	18000	16920	1080	5%	5%
	Cosgrove Road	60	588	5877	5514	379	13%	13%
	Liverpool Road	60	2112	21120	19853	1267	6%	6%

12.2.1 Road Traffic Noise Prediction Results

Table 44, **Table 45, Table 46** and **Table 47** provide the modelling results for the operational road traffic noise levels associated with the Project.

Table 44 Operational Road Traffic Noise Prediction Results – Madeline Street

Scenario	Road Description	Receiver Location & offset distance	Prediction Results LAeq (dBA)		Criteria	
			Day (1 hour) 7am to 10pm	Night (1 hour) 10pm to 7am	Day (1 hour) 7am to 10pm	Night (1 hour) 10pm to 7am
Scenario 1 (2016) – no build	Madeline Street	Nearest Receiver (13m)	50	40	55	50
Scenario 2 (2016) – Build		Nearest Receiver (13m)	55	45	55	50

Table 45 Operational Road Traffic Noise Prediction Results – Punchbowl Road

Scenario	Road Description	Receiver Location & offset distance	Prediction Results LAeq, (15 hour)		Criteria LAeq, (9 hour)	
			Day (7 am–10 pm)	Night (10 pm–7 am)	Day (7 am–10 pm)	Night (10 pm–7 am)
Scenario 1 (2016) – no build	Punchbowl Road	Nearest Receiver (13m)	**67.1**	**57.3**	60	55
Scenario 2 (2016) – Build		Nearest Receiver (13m)	**67.5**	**57.7**	60	55

Table 46 Operational Road Traffic Noise Prediction Results – Cosgrove Road

Scenario	Road Description	Receiver Location & offset distance	Prediction Results LAeq, (15 hour)		Criteria LAeq, (9 hour)	
			Day (7 am–10 pm)	Night (10 pm–7 am)	Day (7 am–10 pm)	Night (10 pm–7 am)
Scenario 1 (2016) – no build	Cosgrove Road	Nearest Receiver (7m)	**67.0**	**57.3**	60	55
Scenario 2 (2016) – Build		Nearest Receiver (7m)	**67.3**	**57.6**	60	55

Table 47 Operational Road Traffic Noise Prediction Results – Liverpool Road

Scenario	Road Description	Receiver Location & offset distance	Prediction Results LAeq, (15 hour)		Criteria LAeq, (9 hour)	
			Day (7 am–10 pm)	Night (10 pm–7 am)	Day (7 am–10 pm)	Night (10 pm–7 am)
Scenario 1 (2016) – no build	Liverpool Road	Nearest Receiver (26m)	**65.1**	**55.4**	60	55
Scenario 2 (2016) – Build		Nearest Receiver (26m)	**65.4**	**55.6**	60	55

Based upon the road traffic movements presented in **Table 43**, the predicted road traffic noise levels presented in **Table 44** for Madeline Street at the nearest roadside residential receivers meets the criteria detailed in the RNP under all prediction scenarios.

However, the existing predicted road traffic noise levels without the Project Site for Punchbowl Road, Cosgrove Road and Liverpool Road as presented in **Table 45**, **Table 46** and **Table 47** respectively, already exceed the day and night-time RNP road traffic noise criteria at the nearest affected assessment locations. Additional operational related traffic is predicted to result in a minor increase of up to 0.4 dB during the day and night. An increase of up to 2 dB represents a minor impact that is barely perceptible for an average person. On this basis, the predicted increase of 0.4 dB is considered to be imperceptible.

13 CONSTRUCTION NOISE IMPACT ASSESSMENT

13.1 Construction Equipment Sound Power Levels

To assess the worst case construction noise scenario, this NVIA has assumed all construction activities proposed on site will occur simultaneously. The sound power levels of the major noise generating plant that has been assumed for the construction of the infrastructure as part of the Project are given in **Table 48**. Sound power levels for equipment used in the assessment have been obtained from a SLR database of similar equipment.

Table 48 Acoustically Significant Equipment Sound Power Levels

Plant Equipment	Quantity	Sound Power Level (dBA)
Mobile crane	1	102 dBA
Telehandler	1	92 dBA
Forklift	1	97 dBA
Generator	1	101 dBA

Plant Equipment	Quantity	Sound Power Level (dBA)
Compressor	1	95 dBA
Hand tools	1	96 dBA
Semi-trailer	1	102 dBA

13.2 Construction Noise Modelling Results

Noise levels generated from the proposed construction activities were predicted at the nearest sensitive receiver locations surrounding the Project Site (see **Figure 3**). A summary of the results of these predictions are contained within **Table 49**.

Table 49 Predicted Construction Noise Levels at Residential Receivers

Residential Receiver Location	Predicted $L_{Aeq(15minute)}$ Noise Level (dBA)	Construction Design Goal $L_{Aeq(15minute)}$ (dBA)	
	Calm	Noise Affected	Highly Noise Affected
R1	35	58 dBA	75 dBA
R2	41	54 dBA	
R3	<30	54 dBA	
R4	<30	54 dBA	
R5	<30	54 dBA	
R6	<30	58 dBA	
R7	<30	58 dBA	
R8	<30	58 dBA	
I1	59	75 when is use	
I2	54		
I3	55		
I4	68		

Note: Recommended standard hours of 7.00 am and 6.00 pm Monday to Friday, and 8.00 am to 1.00 pm Saturdays. No construction work on Sundays or Public Holidays.

The modelling results in **Table 49** indicate that the predicted $L_{Aeq(15minute)}$ noise levels from proposed construction activities meet the 'Noise Affected' construction noise goals at all assessed sensitive receivers.

Notwithstanding the above the following recommendations are made with a view to reduce potential noise impacts:

- Respond to community concerns should they arise with noise monitoring on site to determine mitigation measures to ameliorate the noise source.
- Site induction of contractors to include awareness of noise on neighbouring properties.
- Site noisy equipment behind structures that act as barriers or at the greatest distance from the noise-sensitive area or orient the equipment so that noise emissions are directed away from any sensitive areas.
- Keep equipment well maintained.
- Employ "quiet" practices when operating equipment (eg positioning and unloading of trucks in appropriate areas).

With regard to potentially offensive noise events associated with construction activities AS 2436-1981 *Guide to noise control on construction, maintenance and demolition sites* states the following:

"If noisy operations must be carried out, then a responsible person should maintain liaison between the neighbouring community and the contractor. This person should inform the public at what time to expect noisy operations and also inform the contractor of any special needs of the public. Consultation and cooperation between the contractor and his neighbours and the removal of uncertainty and rumour can help to reduce the adverse reaction to noise."

13.3 Construction Traffic

13.3.1 Construction Road Traffic Parameters

The construction phase associated with the proposed recycling facility is expected to have a duration of approximately 4 months.

During this period the subject site is expected to generate 10 inbound and 10 outbound trips per day associated with workers and a single inbound and outbound service vehicle trip per day.

Workers are expected to access the site at approximately 7:00 am and egress the site at approximately 3:00 pm.

Construction Road traffic volume information was provided by Solution One Traffic Engineers and reference has been made to the following:

- *Traffic and Parking Impact Report – 14-82 Madeline Street, Strathfield South* August 2015.

Details of parameters utilised in the noise model are provided in **Table 50**.

Table 50 Construction Road Traffic Volumes Utilised in Noise Model

Scenario	Road Description	Road Traffic Speed km/h	Peak Hour Vehicle Movements	AADT	Day (15 hour) Traffic Flow 7am to 10pm	Night (9 hour) Traffic Flow 10pm to 7am	Heavy Vehicle %	
							Day 7am to 10pm	Night 10pm to 7am
Construction (2016)	Madeline Street	50	68	665	639	N/A	2%	N/A
	Punchbowl Road	60	1789	17100	16812	N/A	4%	N/A
	Cosgrove Road	60	582	5135	5471	N/A	12%	N/A
	Liverpool Road	60	2101	19790	19745	N/A	6%	N/A

13.3.2 Construction Road Traffic Noise Prediction Results

Construction related road traffic noise predictions associated with residential receivers are provided in **Table 51**, **Table 52**, **Table 53** and **Table 54**.

Table 51 Construction Road Traffic Noise Prediction Results – Madeline Street

Scenario	Road Description	Receiver Location & offset distance	Prediction Results LAeq (dBA)		Criteria	
			Day (1 hour) 7am to 10pm	Night (1 hour) 10pm to 7am	Day (1 hour) 7am to 10pm	Night (1 hour) 10pm to 7am
Construction	Madeline Street	Nearest Receiver (13m)	50	N/A	55	50

Table 52 Construction Road Traffic Noise Prediction Results – Punchbowl Road

Scenario	Road Description	Receiver Location & offset distance	Prediction Results LAeq, (15 hour)		Criteria LAeq, (9 hour)	
			Day (7 am–10 pm)	Night (10 pm–7 am)	Day (7 am–10 pm)	Night (10 pm–7 am)
Construction	Punchbowl Road	Nearest Receiver (13m)	**67.1**	N/A	60	55

Table 53 Construction Road Traffic Noise Prediction Results – Cosgrove Road

Scenario	Road Description	Receiver Location & offset distance	Prediction Results LAeq, (15 hour)		Criteria LAeq, (9 hour)	
			Day (7 am–10 pm)	Night (10 pm–7 am)	Day (7 am–10 pm)	Night (10 pm–7 am)
Construction	Cosgrove Road	Nearest Receiver (7m)	**67**	N/A	60	55

Table 54 Construction Road Traffic Noise Prediction Results – Liverpool Road

Scenario	Road Description	Receiver Location & offset distance	Prediction Results LAeq, (15 hour)		Criteria LAeq, (9 hour)	
			Day (7 am–10 pm)	Night (10 pm–7 am)	Day (7 am–10 pm)	Night (10 pm–7 am)
Construction	Liverpool Road	Nearest Receiver (26m)	**65**	N/A	60	55

Based upon the construction road traffic movements presented in **Table 50**, the predicted road traffic noise levels presented in **Table 51** for Madeline Street at the nearest roadside residential receivers meets the criteria detailed in the RNP under all prediction scenarios.

However, the existing predicted road traffic noise levels without the Project Site for Punchbowl Road, Cosgrove Road and Liverpool Road as presented in **Section 12.2.1** already exceed the day and night-time RNP road traffic noise criteria at the nearest affected assessment locations. Additional construction related traffic is predicted to result in a minor increase of up to <0.1 dB during the day and night. An increase of up to 2 dB represents a minor impact that is barely perceptible for an average person. On this basis, the predicted increase of <0.1 dB is considered to be imperceptible.

14 VIBRATION ASSESSMENT

The findings of the original vibration impact assessment conducted in November 2015 (610.14992-R1) are still valid. Namely, that vibration generated at the Project site will be significantly below the criteria for "minimal risk of cosmetic damage" at the nearest residences.

15 CONCLUSION

SLR has undertaken a revised noise and vibration impact assessment (NVIA) for the materials recycling facility (MRF) and Paper and cardboard recovery (PCR) unit located at 14-82 Madeline Street, South Strathfield, NSW (Project Site).

The objective of the revised NVIA for the MRF and PCR unit at the Project Site was to address the acoustic requirements of the Sydney East Joint Regional Planning Panel Record of Deferral Notice dated 17 August 2016.

The objective of the NVIA was to also identify the potential impacts of noise and vibration from existing and proposed activities at the Project Site associated with both construction and operation of the facility and to provide recommendations with regard to noise management strategies and mitigation measures, where necessary, with the aim of achieving the project specific noise and vibration criteria.

15.1 Existing Acoustical Environment

An ambient noise monitoring program was conducted by SLR. Ambient noise levels were monitored at two separate locations (refer to **Figure 4**), considered to be representative of the nearest potentially affected receivers to the site. The objective of this survey was to measure $L_{A90(15minute)}$ and $L_{Aeq(15minute)}$ noise levels at the nearest potentially affected residential locations during the day, evening and night-time periods to enable the determination of the intrusiveness and amenity criteria for the proposed development in accordance with the INP.

15.2 Operational Noise Assessment

Results presented in **Table 38** and **Table 39** provide the revised predicted operational noise emission levels from the Project Site for the two noise abatement operational scenarios of Scenario 1 and Scenario 2 respectively, as described in **Section 11.2.2**.

Results presented in **Table 38** and **Table 39** indicates that **operational noise levels are predicted to meet the PSNC at all residential and Industrial locations** considered in the assessment.

Section 11.2.4 provides a comparison between the predicted results of the two noise attenuation Scenarios with that of the original assessment per modelled receiver. It can be seen that for both modelled scenarios the maximum noise attenuation benefit obtained for the modelled Residential receivers is 2 dB and for Industrial receivers, 3 dB.

The only difference of noise attenuation benefit for the modelled Residential receivers is that Scenario 1 provides a 1 dB further predicted attenuation during the night period temperature inversion than Scenario 2.

Again, it is noted that the original 2015 assessment indicated that operational noise levels met the PSNC at all assessment locations.

Sleep Disturbance Assessment

The L_{Amax} noise levels are predicted to meet the project specific sleep disturbance noise goals specified in **Table 27** for night-time period operation at the Project Site at all assessed receiver locations.

15.3 Road Traffic Noise Assessment

The calculated day and night-time road traffic noise level at the nearest roadside residential receivers meets the criteria detailed in the RNP under all prediction scenarios.

15.4 Construction Noise Assessment

The modelling results indicate that the predicted $L_{Aeq(15minute)}$ noise levels from proposed construction activities meet the 'Noise Affected' construction noise goals at all assessed sensitive receivers.

15.5 Construction Road Traffic Noise Assessment

The calculated road traffic noise level at the nearest roadside residential receivers meets the criteria detailed in the NSW Road Noise Policy under all prediction scenarios

15.6 Vibration Assessment

Given the separation distance to the nearest affected residential receptor, the level of vibration caused by operation and construction activities is predicted to be below the level of human perception at any of the nearest receptors and therefore below the criteria for "minimal risk of cosmetic damage" at surrounding residential premises.

16 REFERENCES

- Assessing Vibration: a technical guideline, DEC, 2006.
- AS 1055:1997 Description and Measurement of Environmental Noise Parts 1, 2 and 3, Australian Standard, 1997.
- AS IEC 61672.1—2004 & Electroacoustics—Sound level meters, Part 1: Specifications, Standards Australia, 2004.
- BS 7385 Part 2&1993 Evaluation and measurement for vibration in buildings Part 2, BSI, 1993.
- British Standard BS 6472:2008 Guideline to evaluation of human exposure to vibration in buildings, 2008.
- Environmental Noise Management – Assessing Vibration: a technical guide, EPA, December 2006.
- German Standard DIN 4150: Part 3-1999 Structural vibration – effects of vibration on structures, 1999.
- Industrial Noise Policy, NSW EPA, 2000.
- Interim Construction Noise Guideline, DECC, 2009.
- Road Noise Policy, NSW EPA, 2011.
- SLR Consulting (Australia) Pty Ltd technical report, reference 610.14992-R1, 20 November 2015
- *Traffic and parking impact report – 14-82 Madeline Street, Strathfield South,* Solutions 1 Traffic Engineers , August 2015

1 Sound Level or Noise Level

The terms "sound" and "noise" are almost interchangeable, except that in common usage "noise" is often used to refer to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. The human ear responds to changes in sound pressure over a very wide range. The loudest sound pressure to which the human ear responds is ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or L_P are commonly used to represent Sound Pressure Level. The symbol L_A represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2E-5 Pa.

2 "A" Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an "A-weighting" filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the loudness of that sound. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dBA or 2 dBA in the level of a sound is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120 110	Heavy rock concert Grinding on steel	Extremely noisy
100 90	Loud car horn at 3 m Construction site with pneumatic hammering	Very noisy
80 70	Kerbside of busy street Loud radio or television	Loud
60 50	Department store General Office	Moderate to quiet
40 30	Inside private office Inside bedroom	Quiet to very quiet
20	Unoccupied recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as "linear", and the units are expressed as dB(Z) or dB.

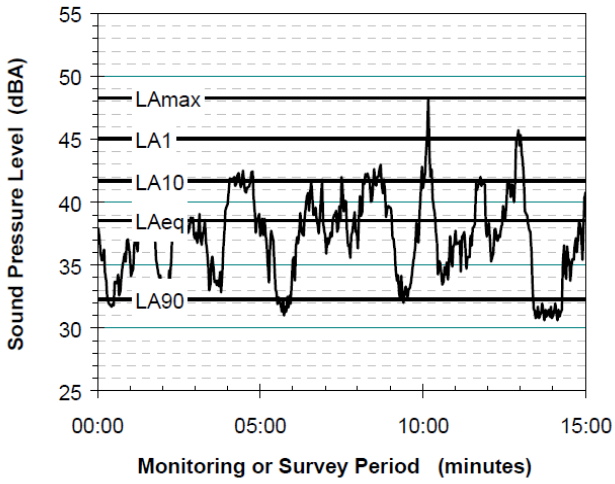
3 Sound Power Level

The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 1E-12 W.
The relationship between Sound Power and Sound Pressure may be likened to an electric radiator, which is characterised by a power rating, but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4 Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels L_{AN}, where L_{AN} is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the L_{A1} is the noise level exceeded for 1% of the time, L_{A10} the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

L_{A1} The noise level exceeded for 1% of the 15 minute interval.

L_{A10} The noise level exceed for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

L_{A90} The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

L_{Aeq} The A-weighted equivalent noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

When dealing with numerous days of statistical noise data, it is sometimes necessary to define the typical noise levels at a given monitoring location for a particular time of day. A standardised method is available for determining these representative levels.

This method produces a level representing the "repeatable minimum" L_{A90} noise level over the daytime and night-time measurement periods, as required by the EPA. In addition the method produces mean or "average" levels representative of the other descriptors (L_{Aeq}, L_{A10}, etc).

5 Tonality

Tonal noise contains one or more prominent tones (ie distinct frequency components), and is normally regarded as more offensive than "broad band" noise.

6 Impulsiveness

An impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.

7 Frequency Analysis

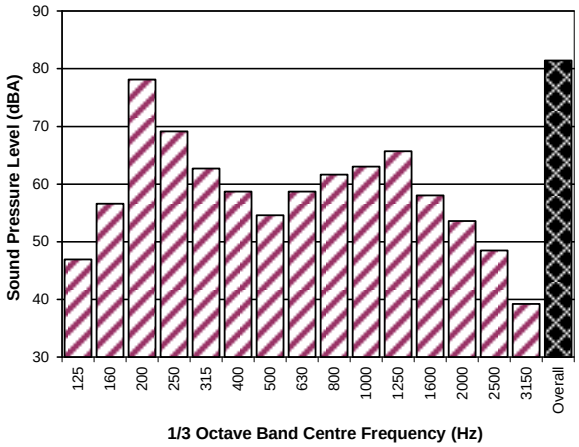
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (3 bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



8 Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of "peak" velocity or "rms" velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as "peak particle velocity", or PPV. The latter incorporates "root mean squared" averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements. Where triaxial measurements are used, the axes are commonly designated vertical, longitudinal (aligned toward the source) and transverse.

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula $20 \log (V/V_o)$, where V_o is the reference level (1E-6 mm/s). Care is required in this regard, as other reference levels are used by some organizations.

9 Human Perception of Vibration

People are able to "feel" vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as "normal" in a car, bus or train is considerably higher than what is perceived as "normal" in a shop, office or dwelling.

10 Over-Pressure

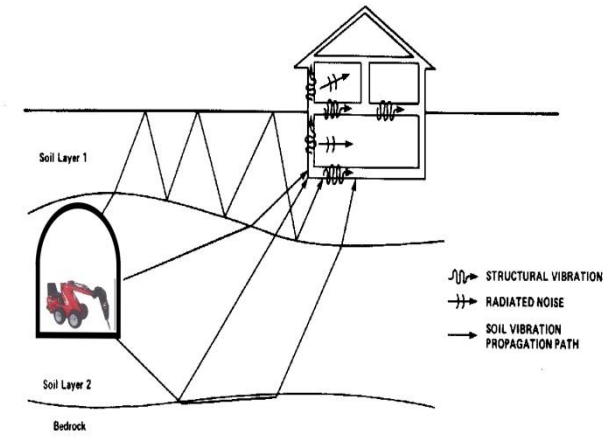
The term "over-pressure" is used to describe the air pressure pulse emitted during blasting or similar events. The peak level of an event is normally measured using a microphone in the same manner as linear noise (ie unweighted), at frequencies both in and below the audible range.

11 Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed "regenerated noise", "structure-borne noise", or sometimes "ground-borne noise". Regenerated noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of regenerated noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

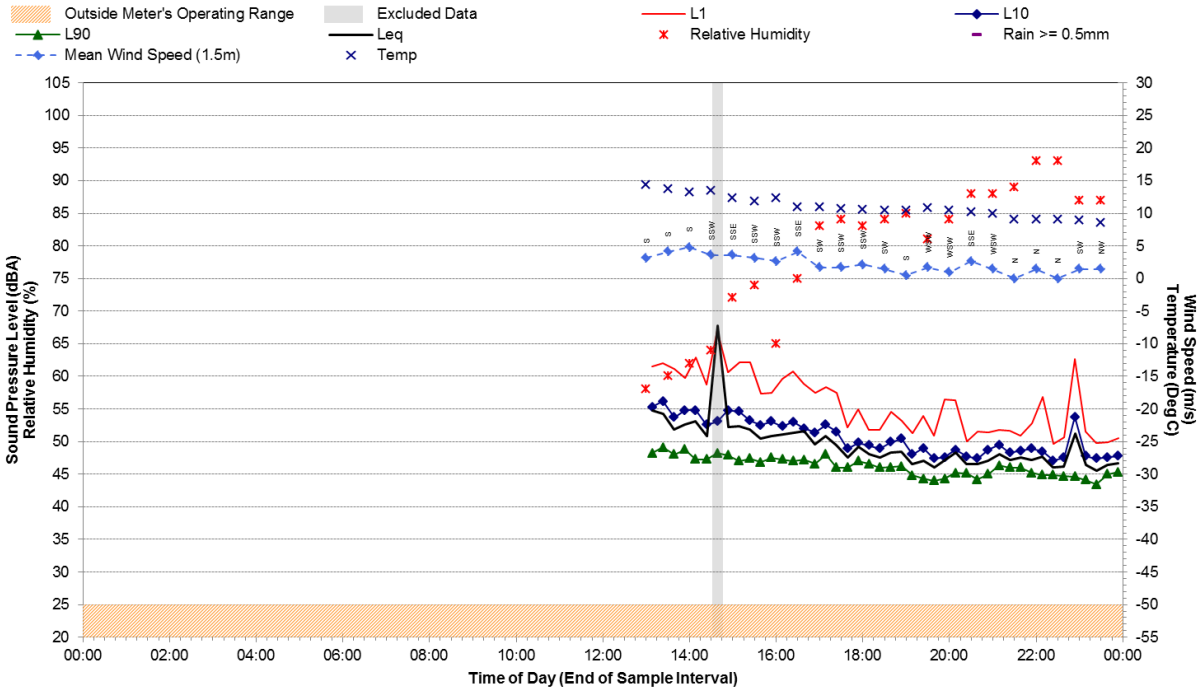
The following figure presents the various paths by which vibration and regenerated noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term "regenerated noise" is also used to describe other types of noise that are emitted from the primary source as a different form of energy. One example would be a fan with a silencer, where the fan is the energy source and primary noise source. The silencer may effectively reduce the fan noise, but some additional noise may be created by the aerodynamic effect of the silencer in the airstream. This "secondary" noise may be referred to as regenerated noise.

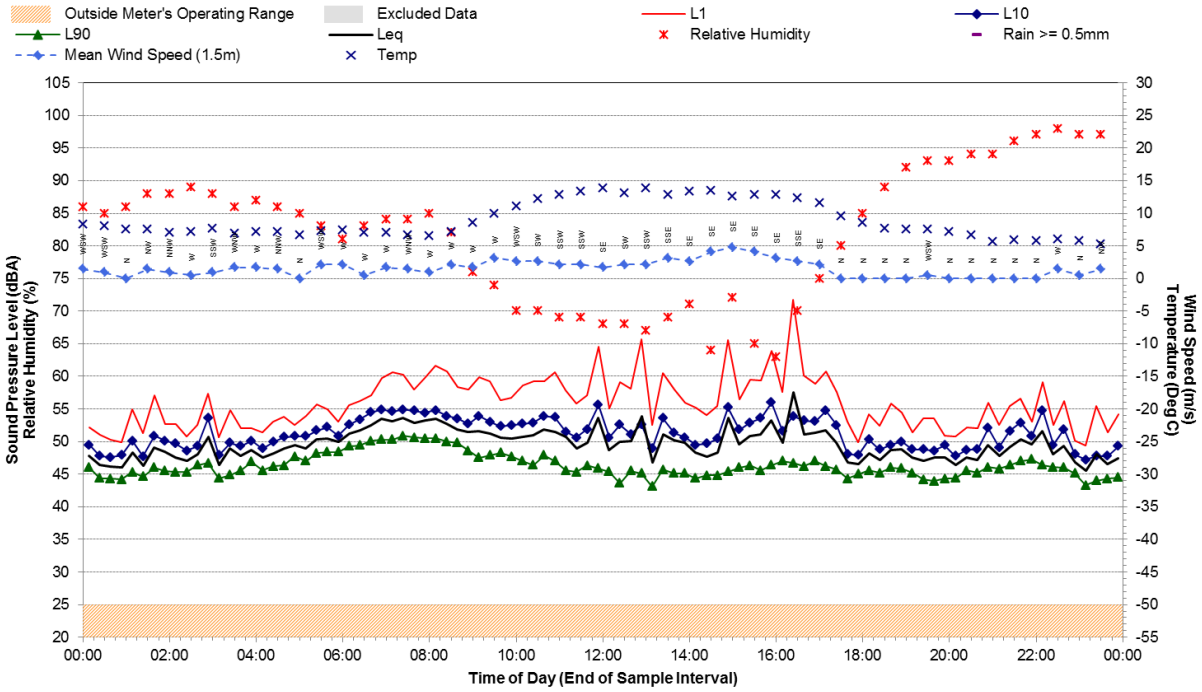
Statistical Ambient Noise Levels

Noise Monitoring Location M1 - 148 Dean Street - Tuesday, 7 July 2015



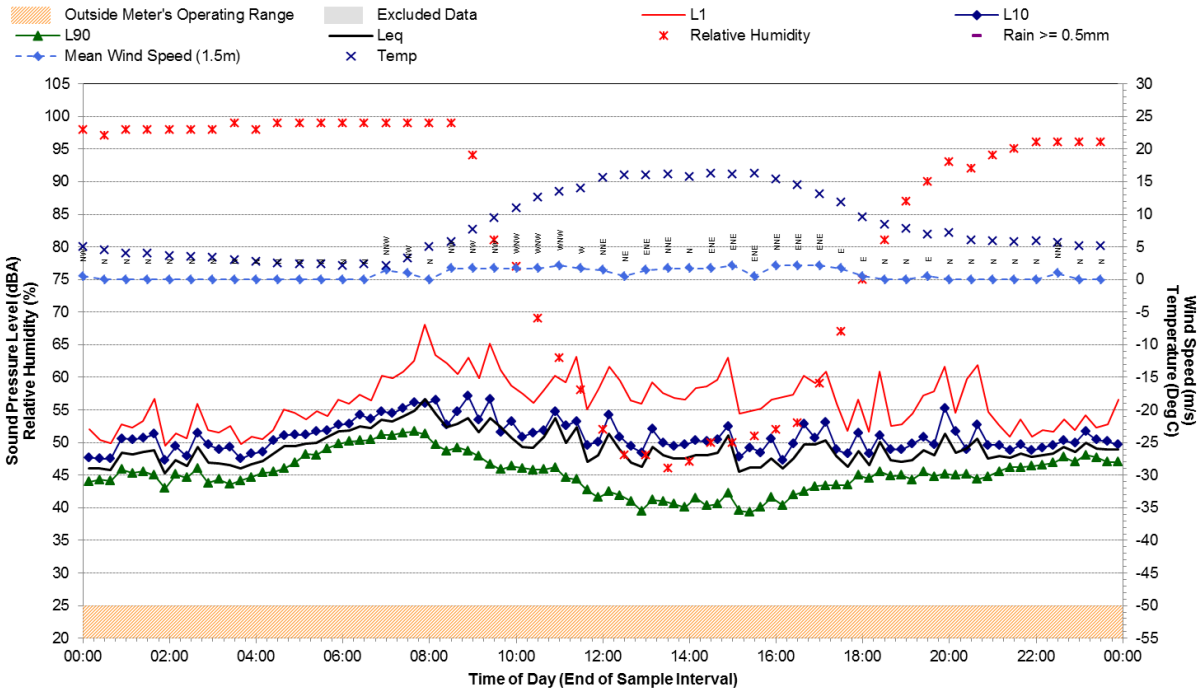
Statistical Ambient Noise Levels

Noise Monitoring Location M1 - 148 Dean Street - Wednesday, 8 July 2015



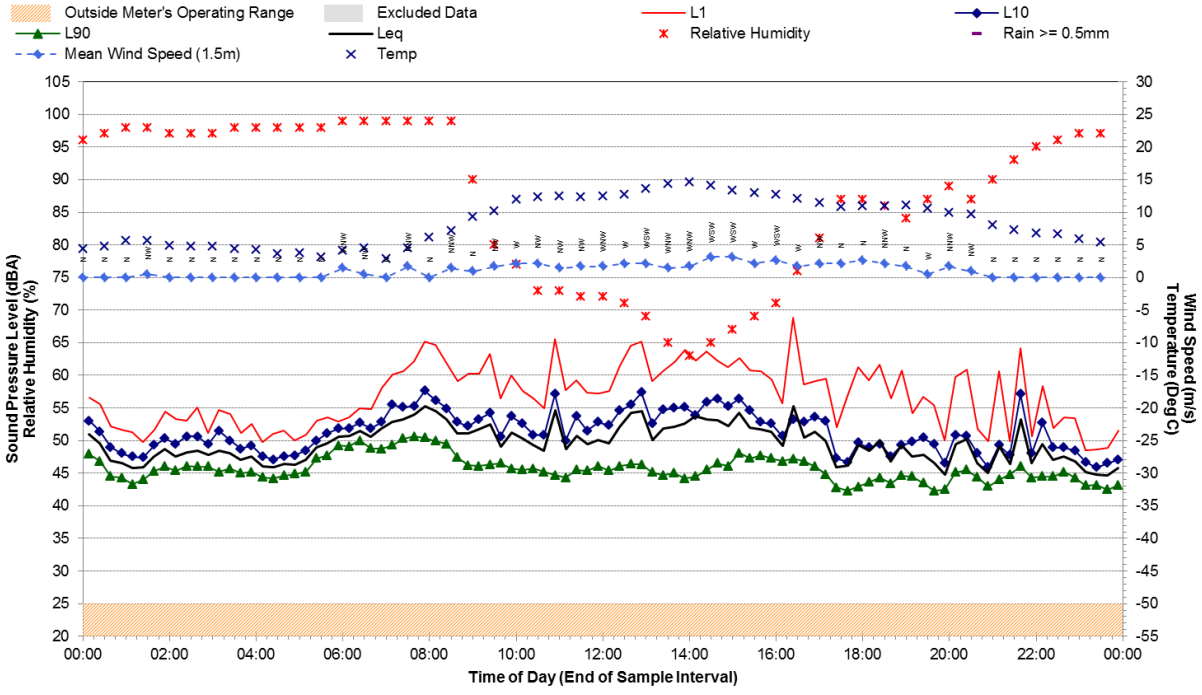
Statistical Ambient Noise Levels

Noise Monitoring Location M1 - 148 Dean Street - Thursday, 9 July 2015



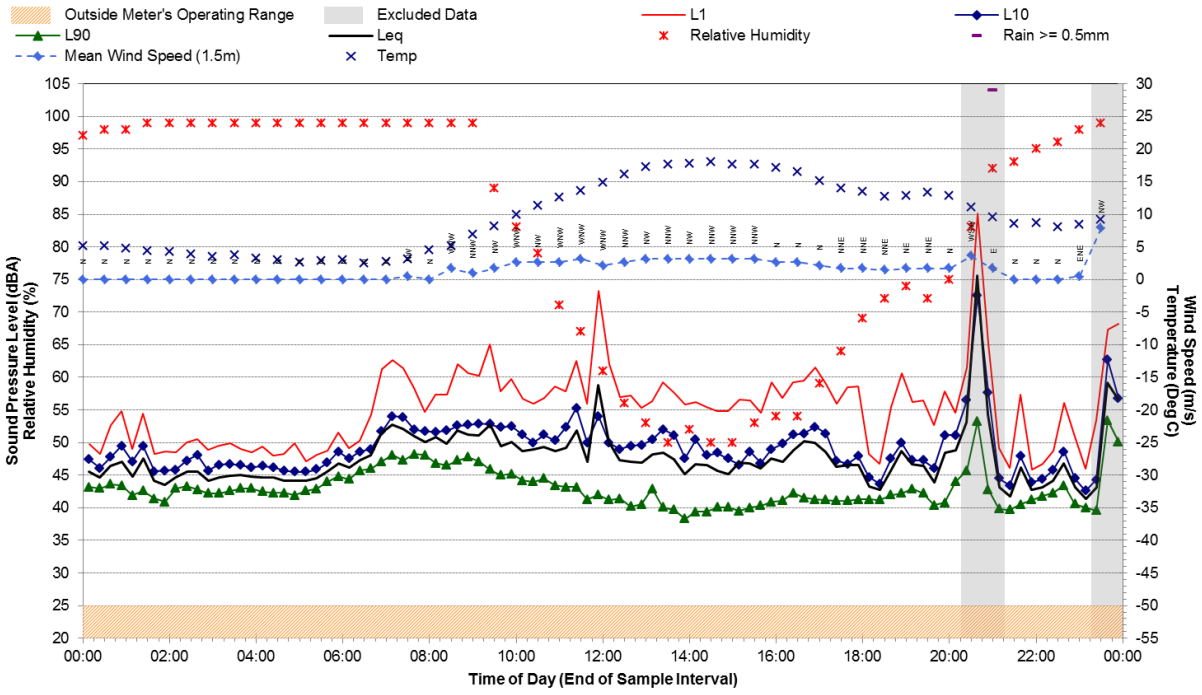
Statistical Ambient Noise Levels

Noise Monitoring Location M1 - 148 Dean Street - Friday, 10 July 2015



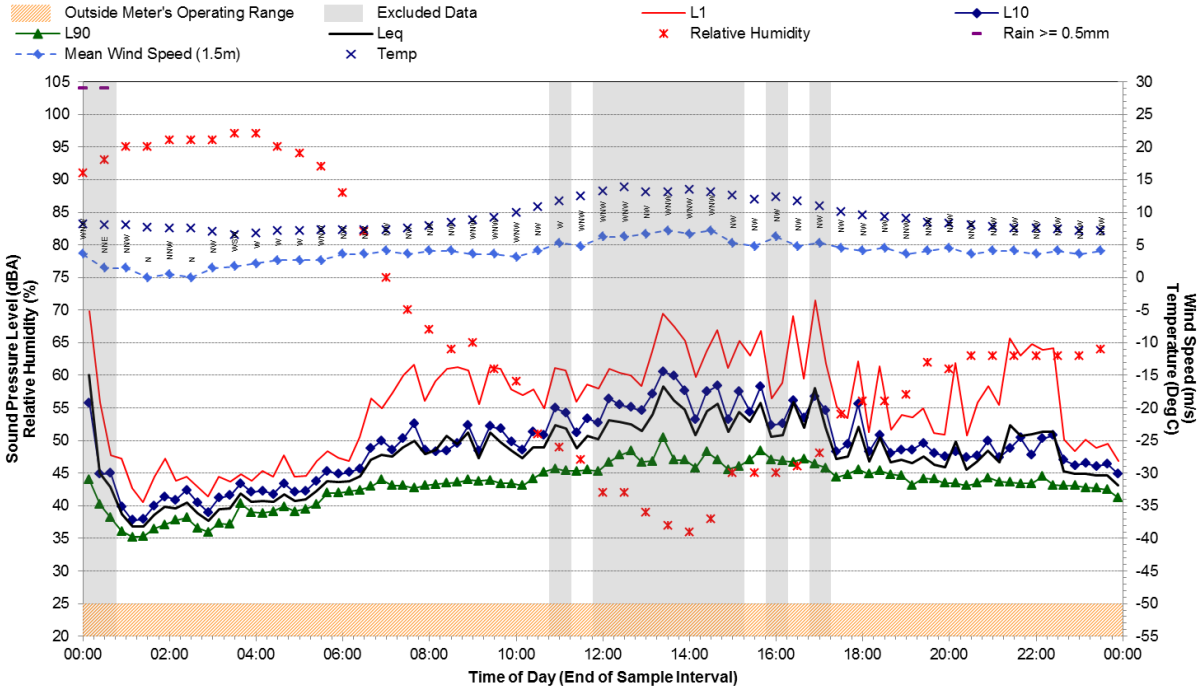
Statistical Ambient Noise Levels

Noise Monitoring Location M1 - 148 Dean Street - Saturday, 11 July 2015



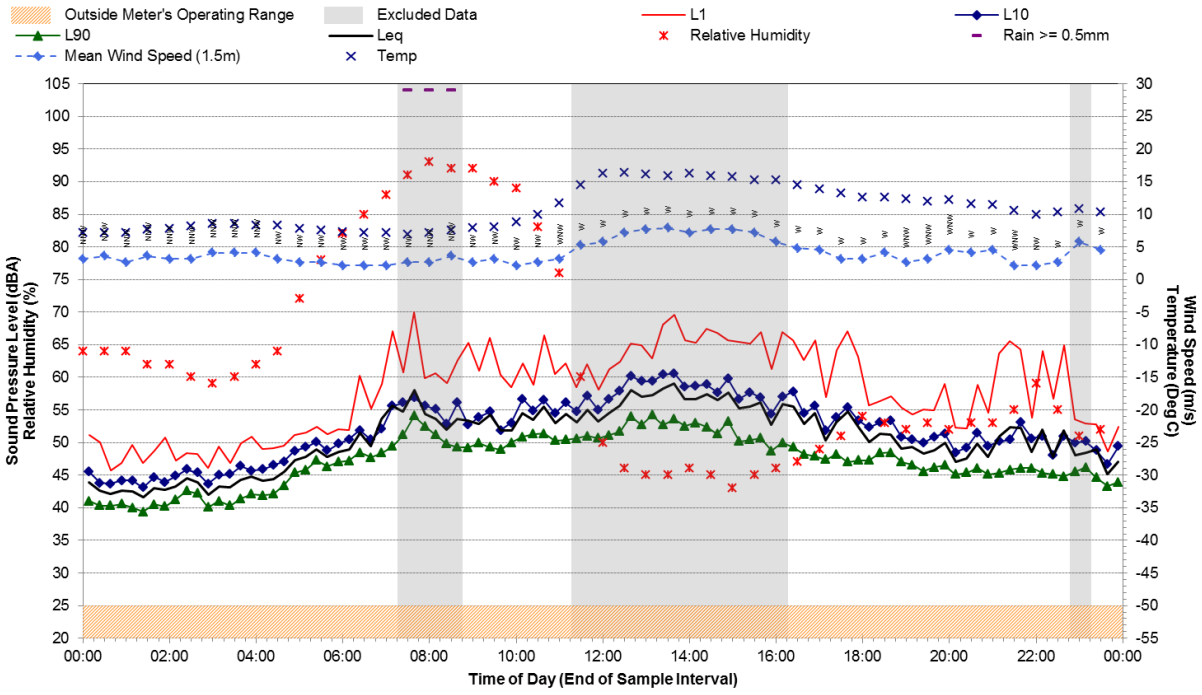
Statistical Ambient Noise Levels

Noise Monitoring Location M1 - 148 Dean Street - Sunday, 12 July 2015



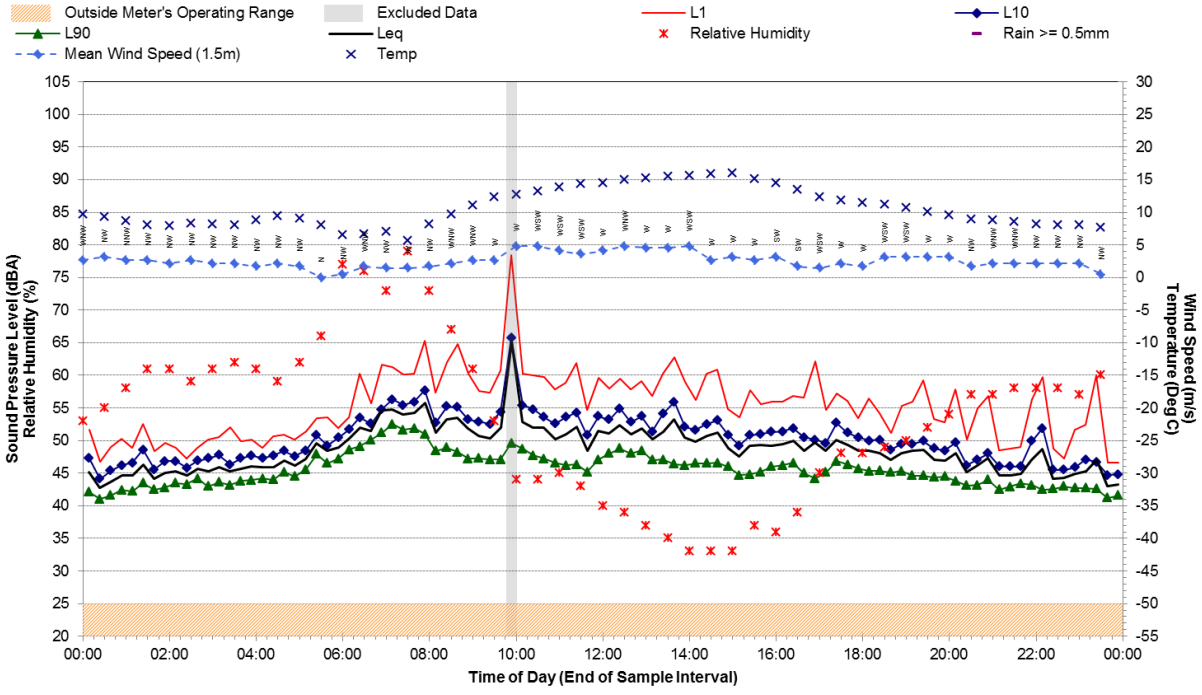
Statistical Ambient Noise Levels

Noise Monitoring Location M1 - 148 Dean Street - Monday, 13 July 2015



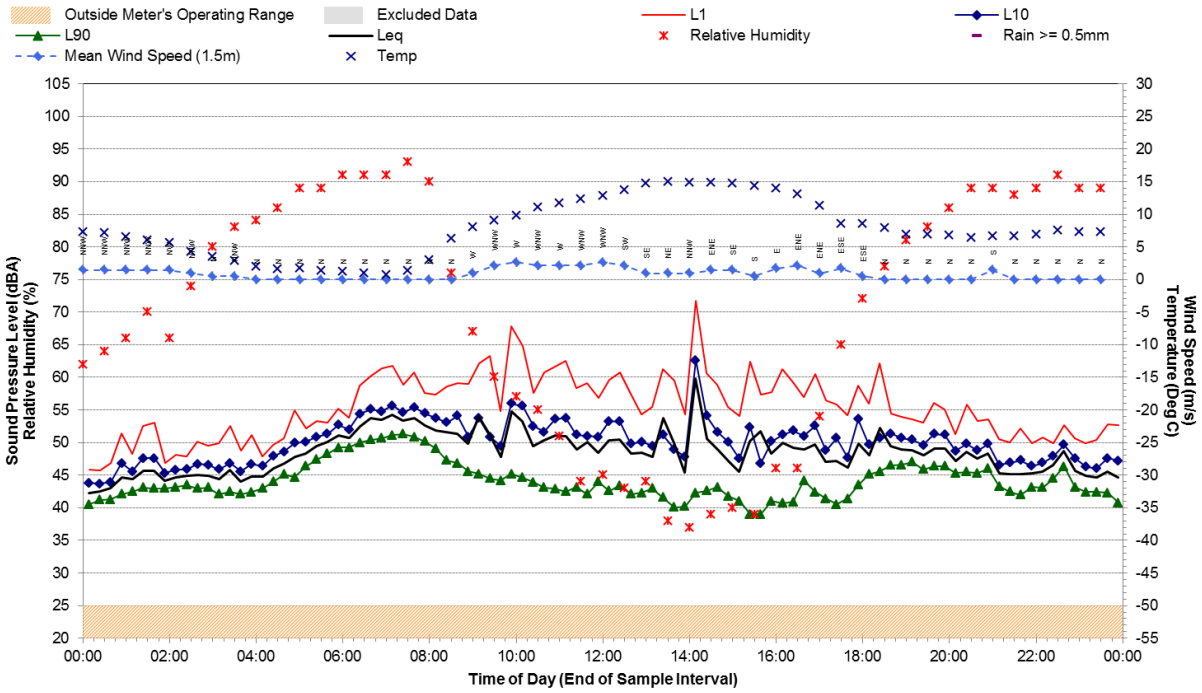
Statistical Ambient Noise Levels

Noise Monitoring Location M1 - 148 Dean Street - Tuesday, 14 July 2015



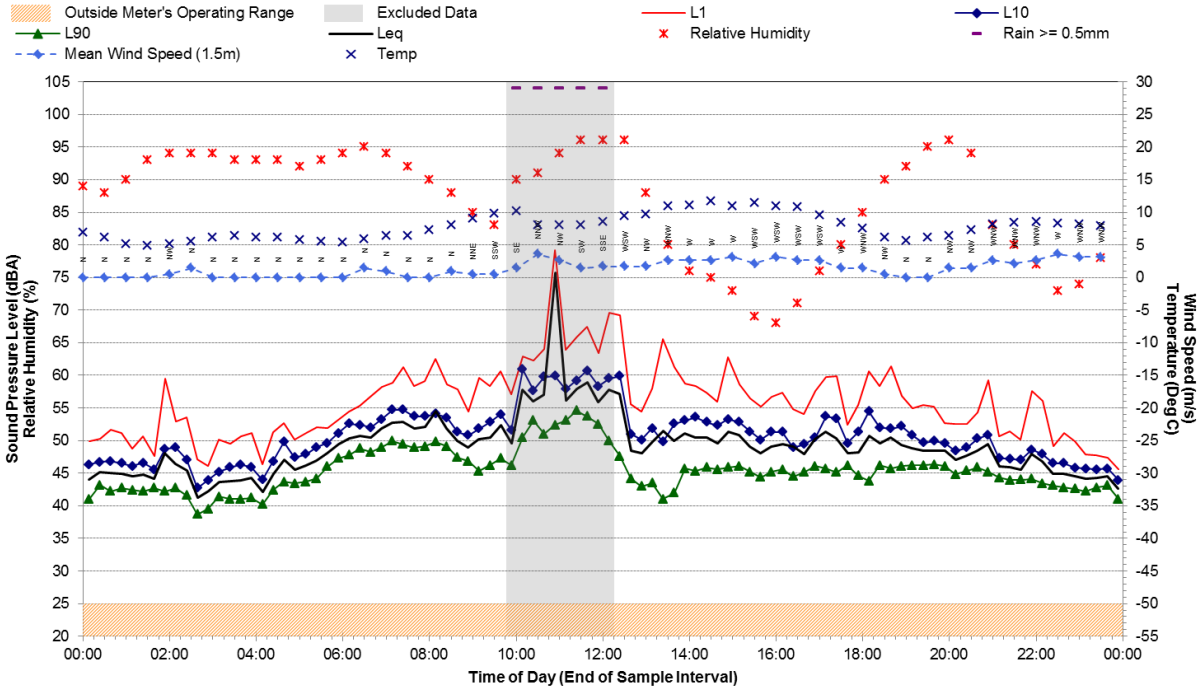
Statistical Ambient Noise Levels

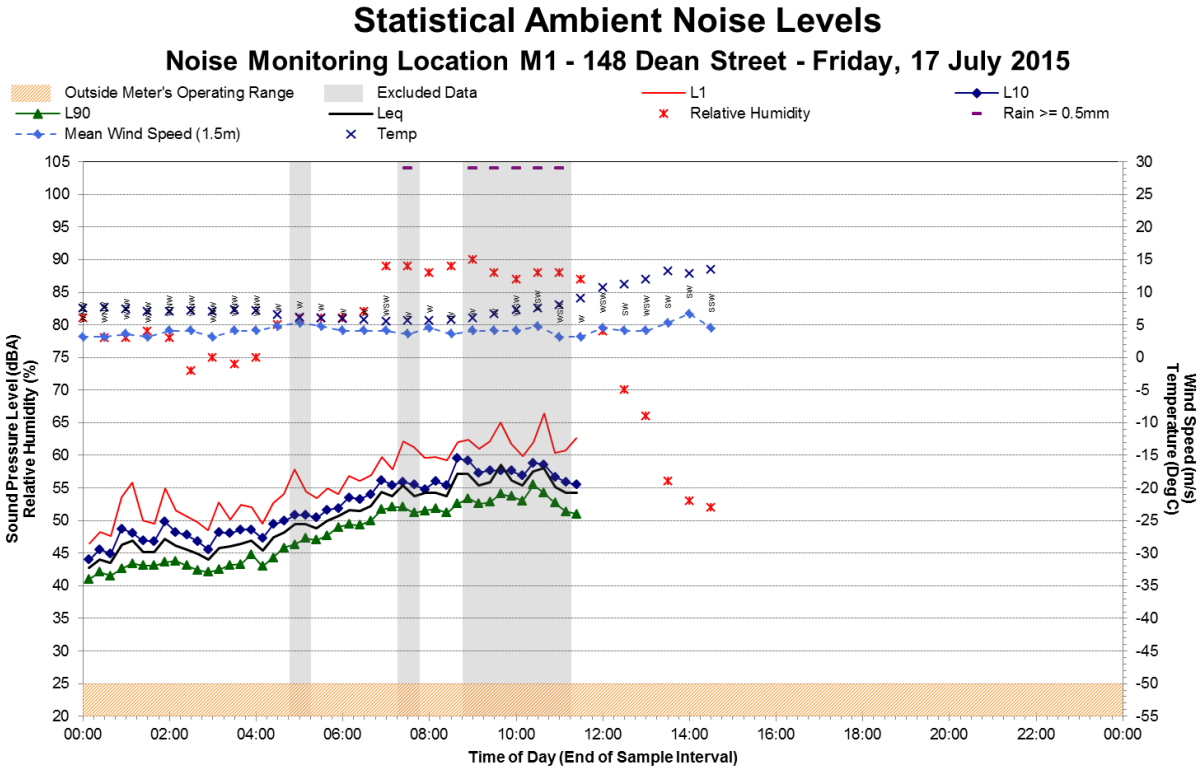
Noise Monitoring Location M1 - 148 Dean Street - Wednesday, 15 July 2015



Statistical Ambient Noise Levels

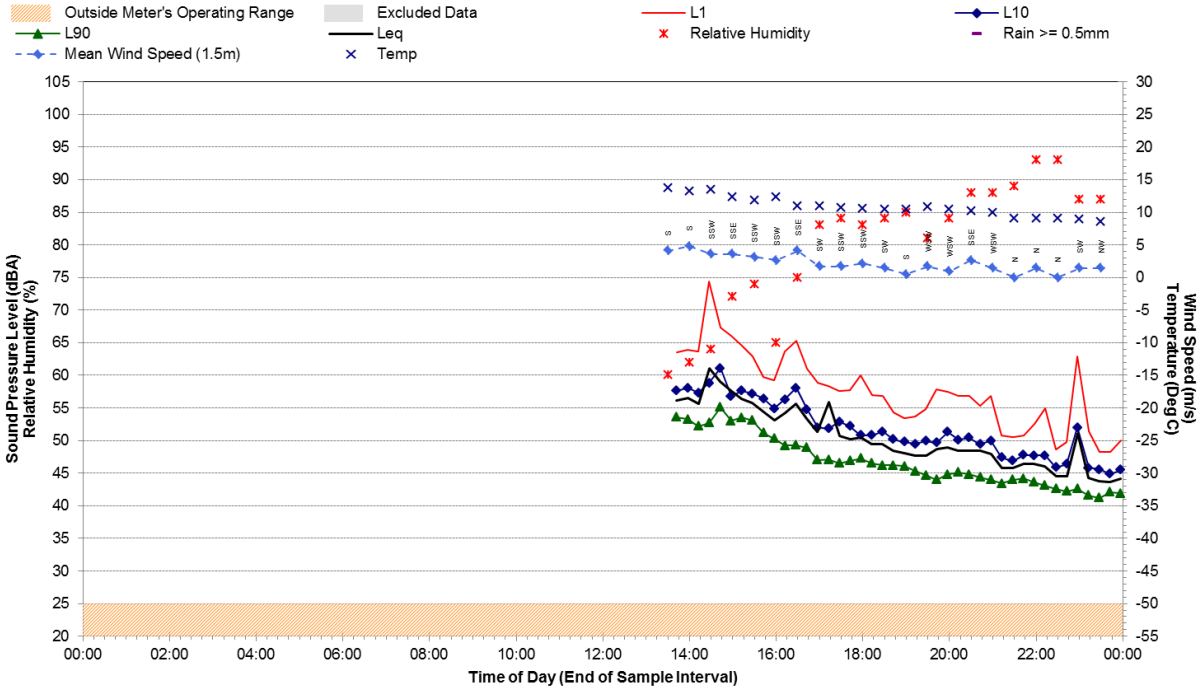
Noise Monitoring Location M1 - 148 Dean Street - Thursday, 16 July 2015




Statistical Ambient Noise Levels
Noise Monitoring Location M1 - 148 Dean Street - Friday, 17 July 2015
Outside Meter's Operating Range
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Temp
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (m/s)
Temperature (Deg C)
Time of Day (End of Sample Interval)

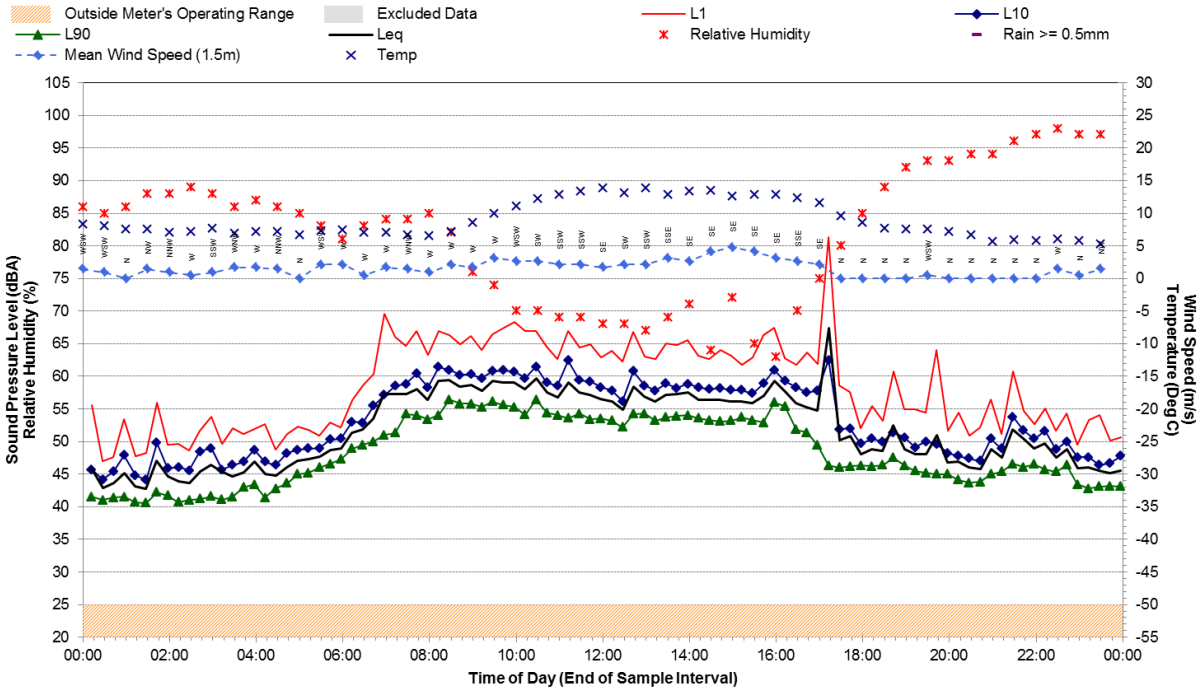
Statistical Ambient Noise Levels

Noise Monitoring Location M2 - 2 Chrisholm Street - Tuesday, 7 July 2015



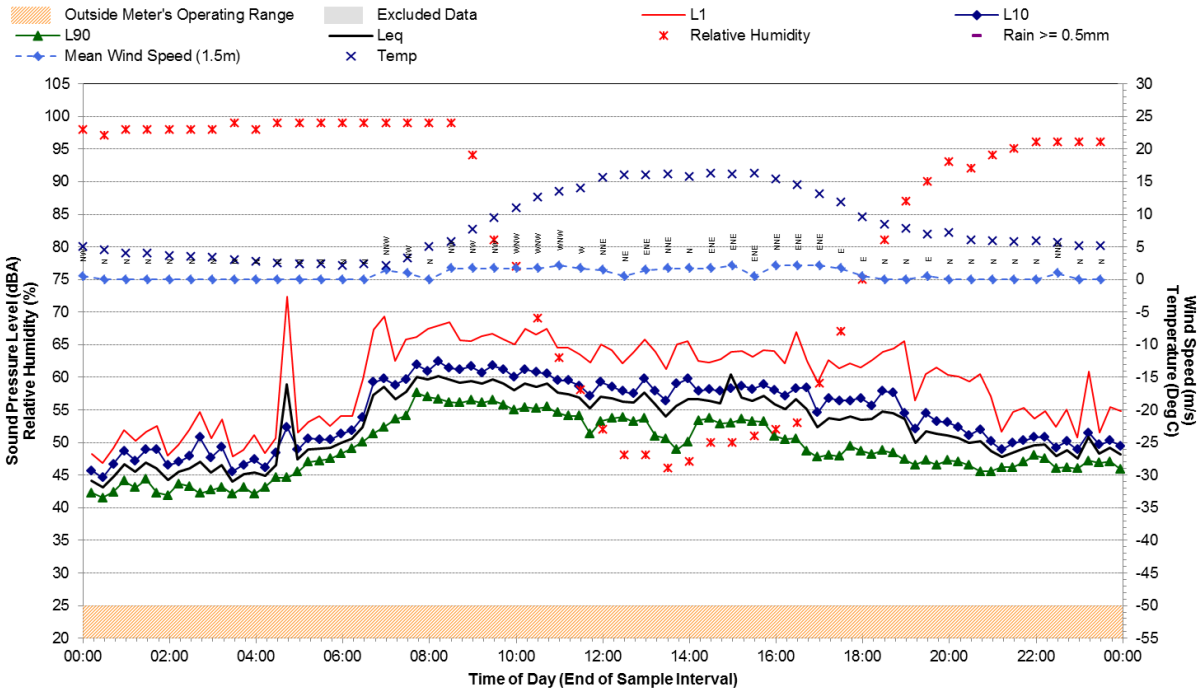
Statistical Ambient Noise Levels

Noise Monitoring Location M2 - 2 Chrisholm Street - Wednesday, 8 July 2015



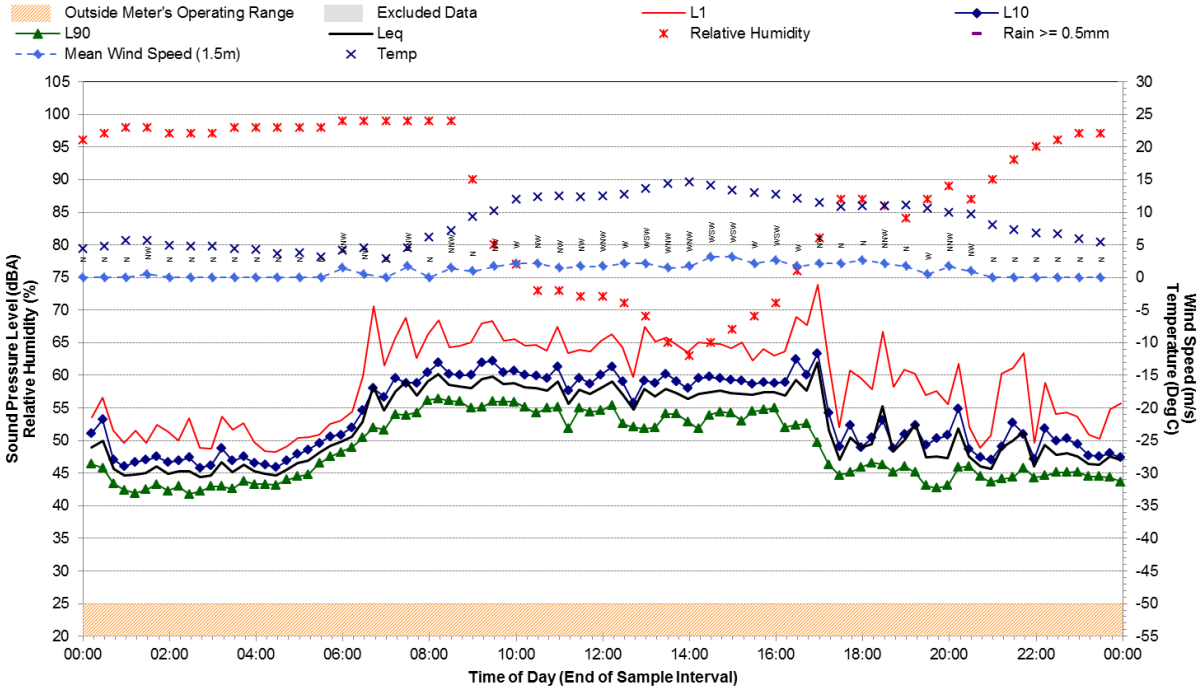
Statistical Ambient Noise Levels

Noise Monitoring Location M2 - 2 Chrisholm Street - Thursday, 9 July 2015



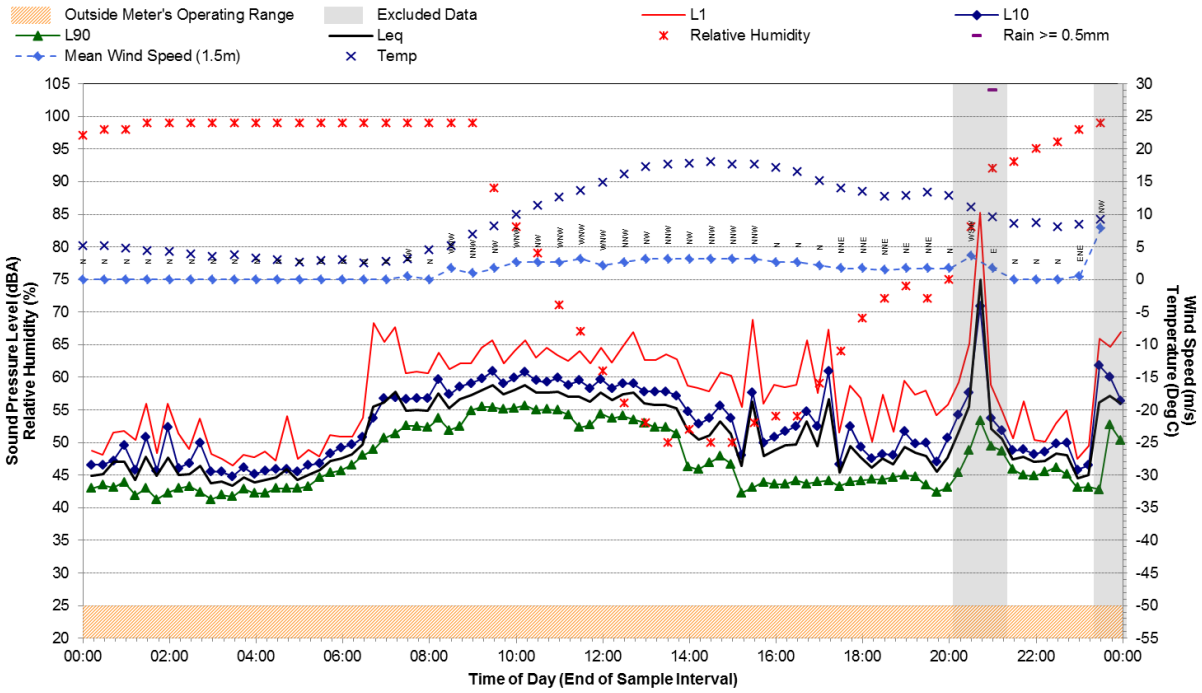
Statistical Ambient Noise Levels

Noise Monitoring Location M2 - 2 Chrisholm Street - Friday, 10 July 2015



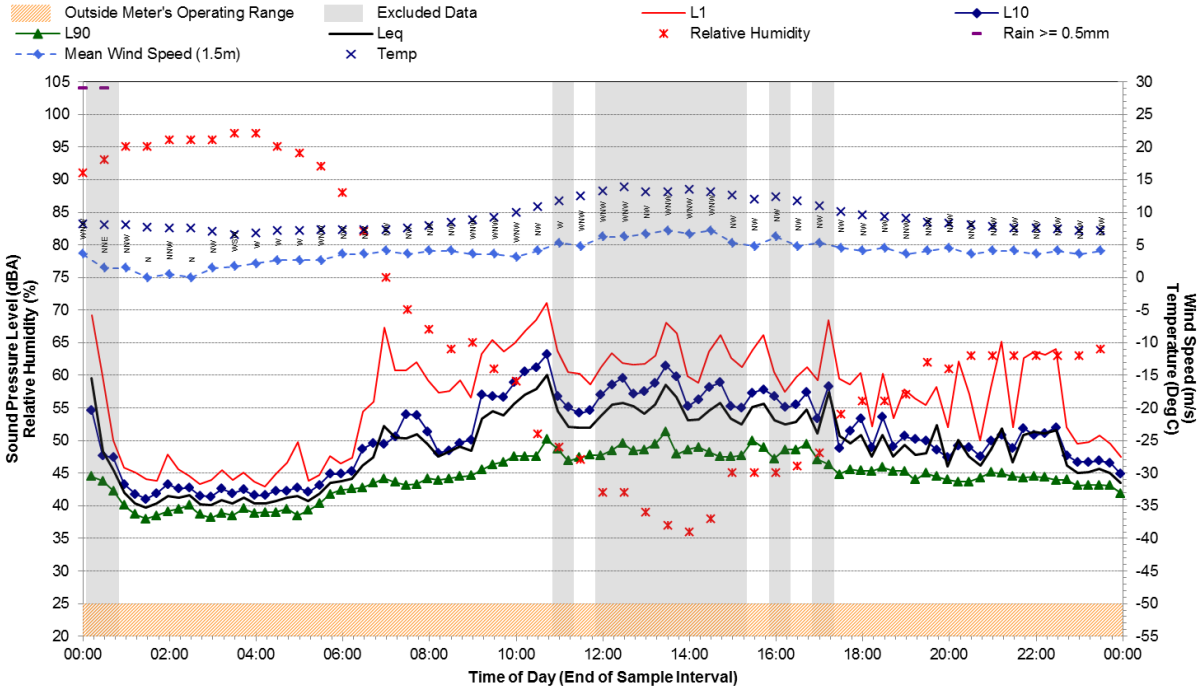
Statistical Ambient Noise Levels

Noise Monitoring Location M2 - 2 Chrisholm Street - Saturday, 11 July 2015



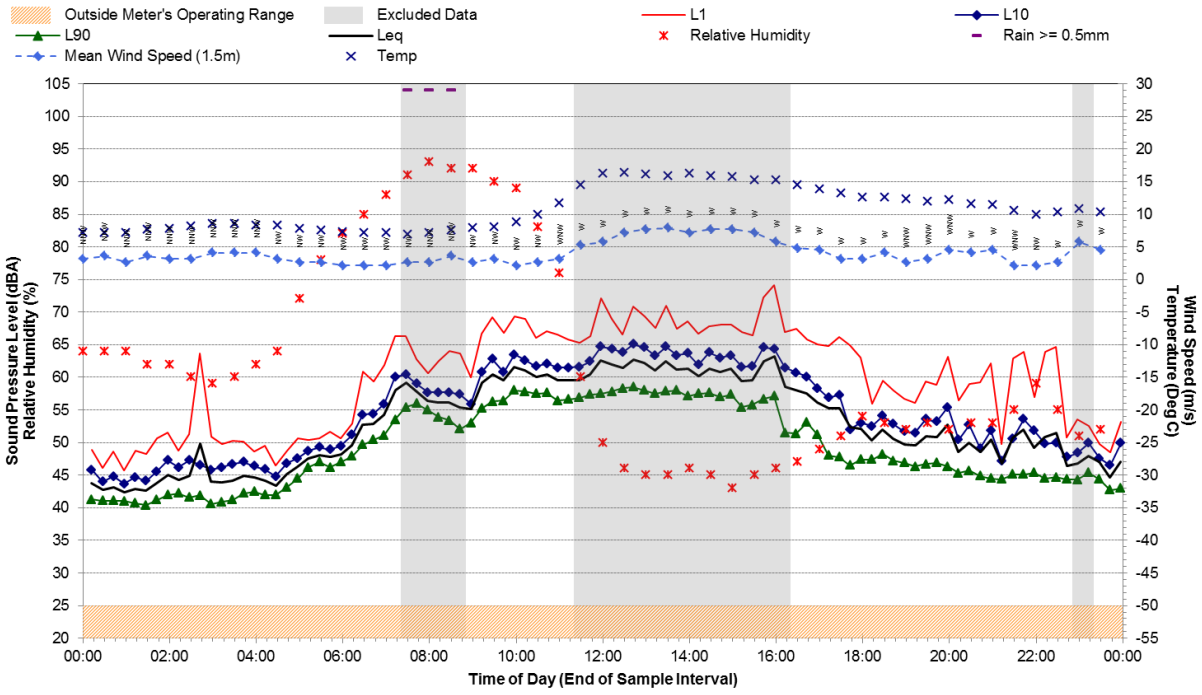
Statistical Ambient Noise Levels

Noise Monitoring Location M2 - 2 Chrisholm Street - Sunday, 12 July 2015



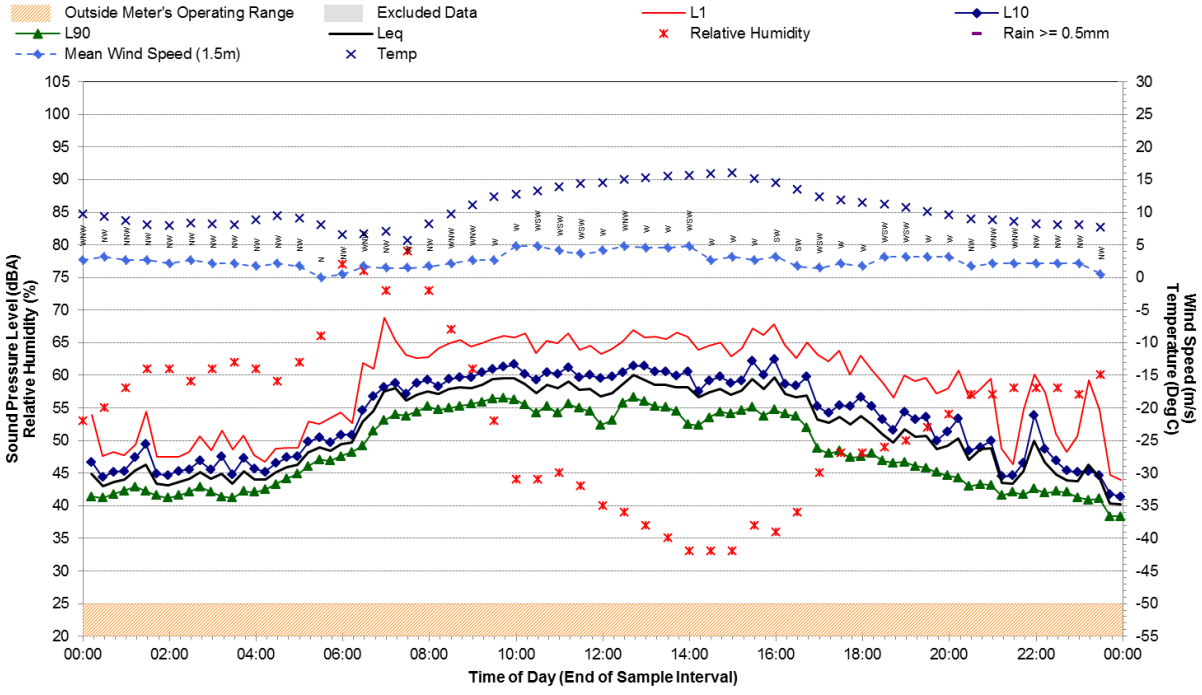
Statistical Ambient Noise Levels

Noise Monitoring Location M2 - 2 Chrisholm Street - Monday, 13 July 2015



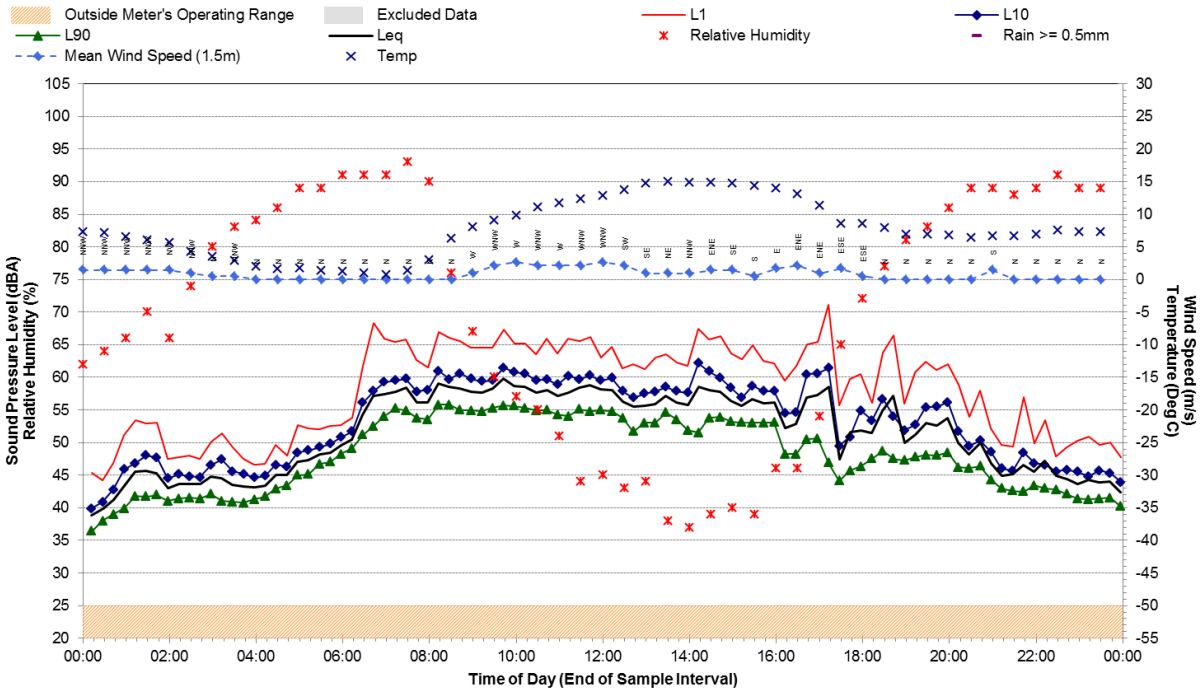
Statistical Ambient Noise Levels

Noise Monitoring Location M2 - 2 Chrisholm Street - Tuesday, 14 July 2015



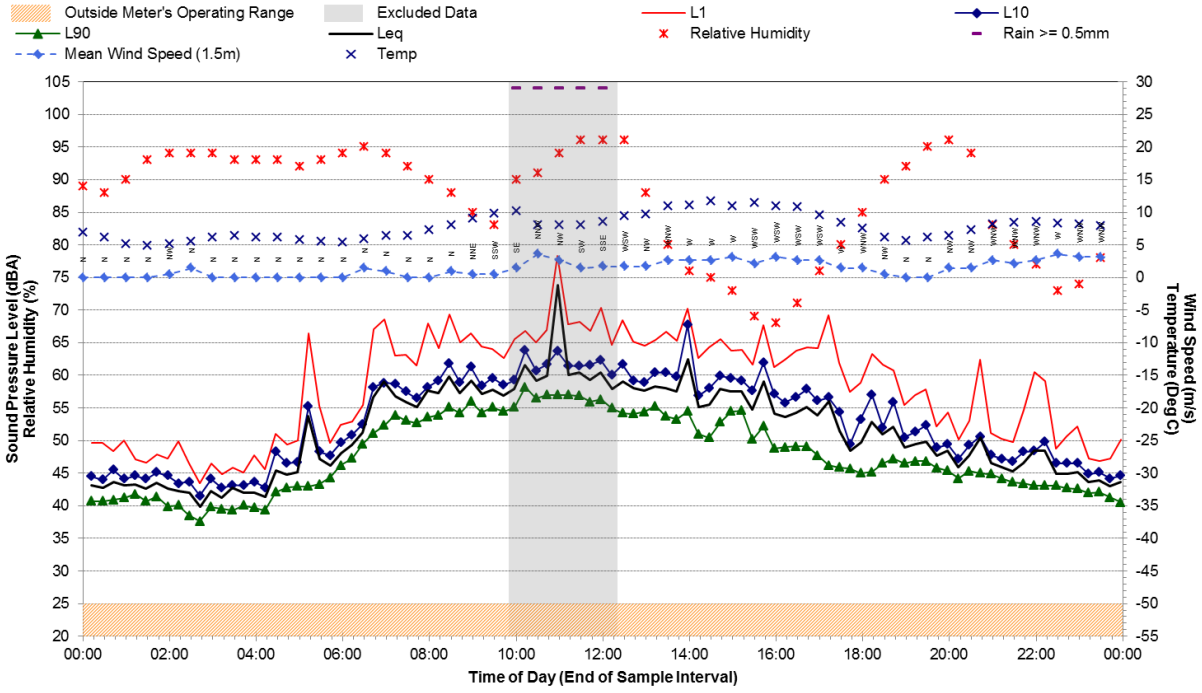
Statistical Ambient Noise Levels

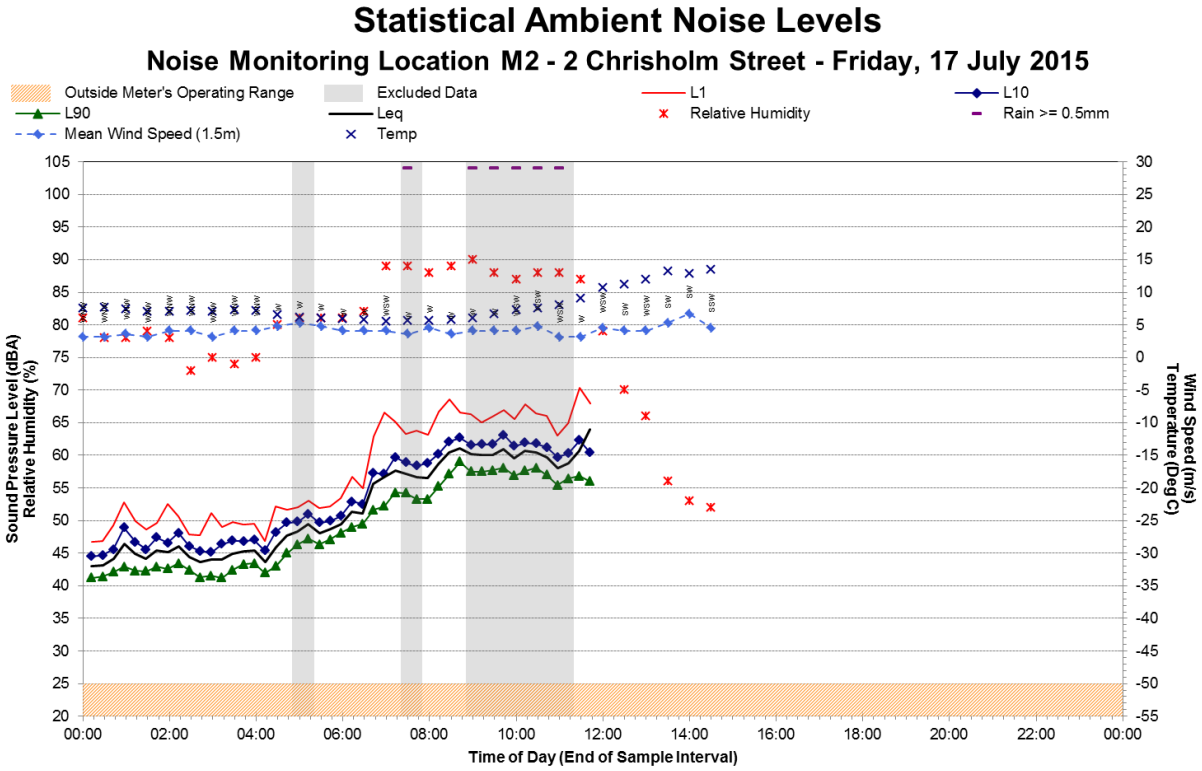
Noise Monitoring Location M2 - 2 Chrisholm Street - Wednesday, 15 July 2015



Statistical Ambient Noise Levels

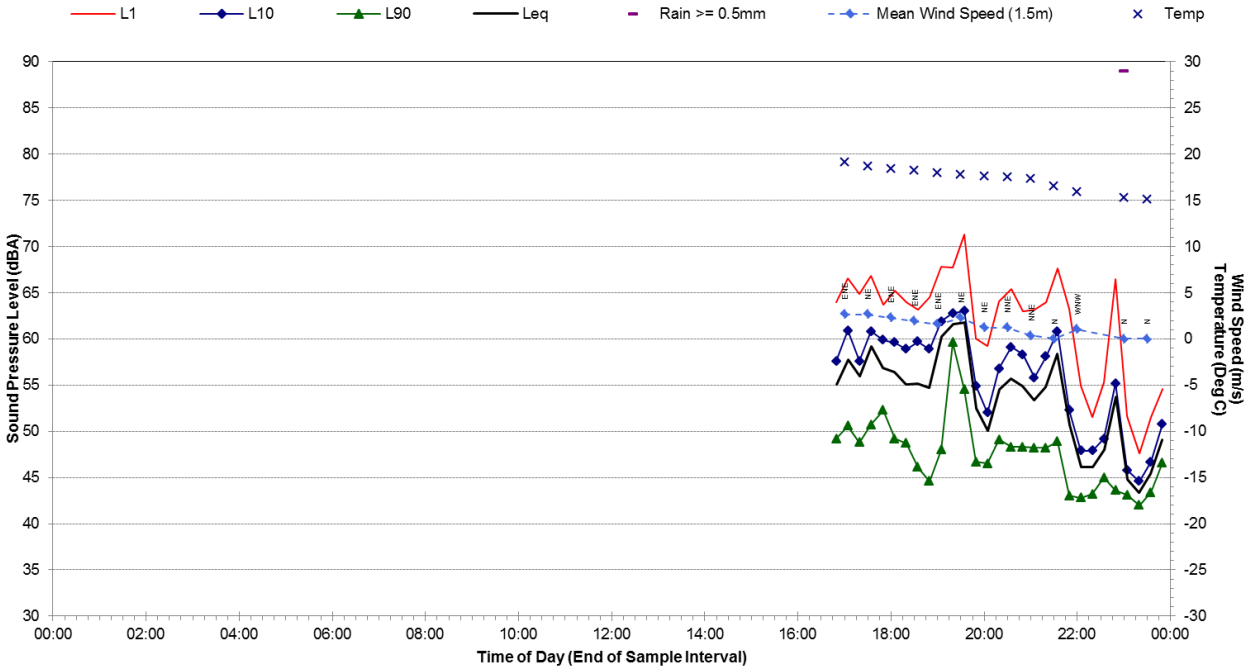
Noise Monitoring Location M2 - 2 Chrisholm Street - Thursday, 16 July 2015




Statistical Ambient Noise Levels
Noise Monitoring Location M2 - 2 Chrisholm Street - Friday, 17 July 2015
Outside Meter's Operating Range
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Temp
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (m/s)
Temperature (Deg C)
Time of Day (End of Sample Interval)

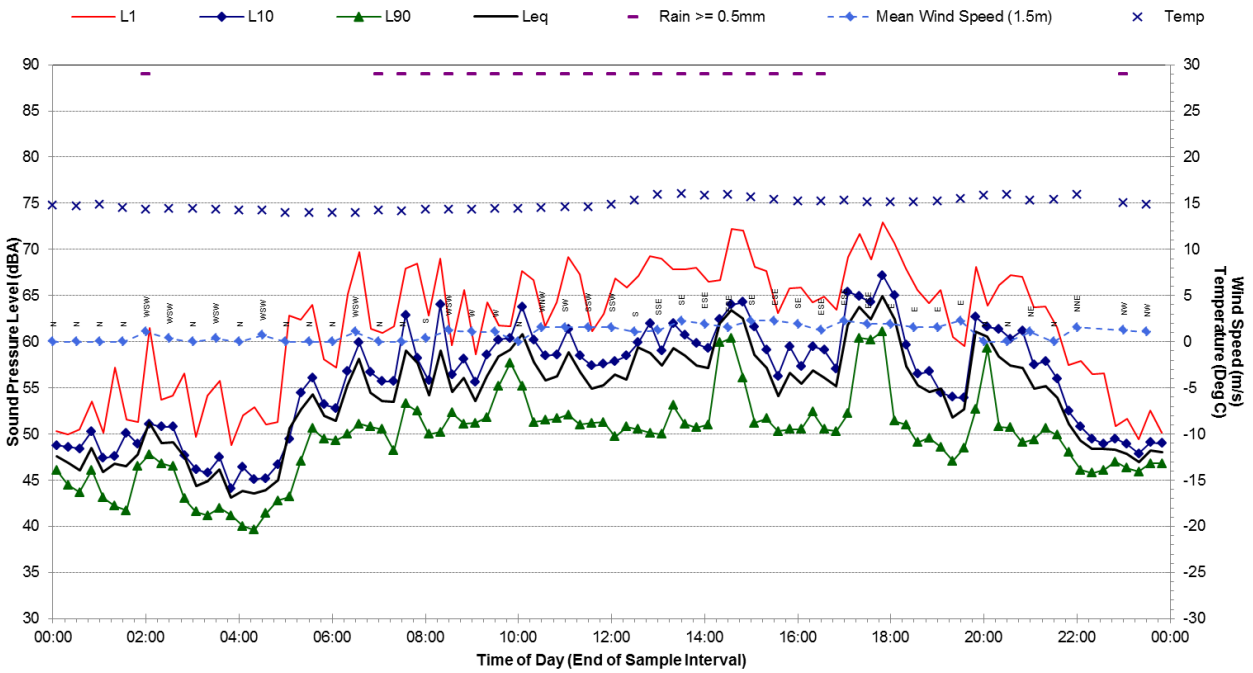
Statistical Ambient Noise Levels

Noise Monitoring Location 1 - North East Boundary - Thursday, 1 September 2016



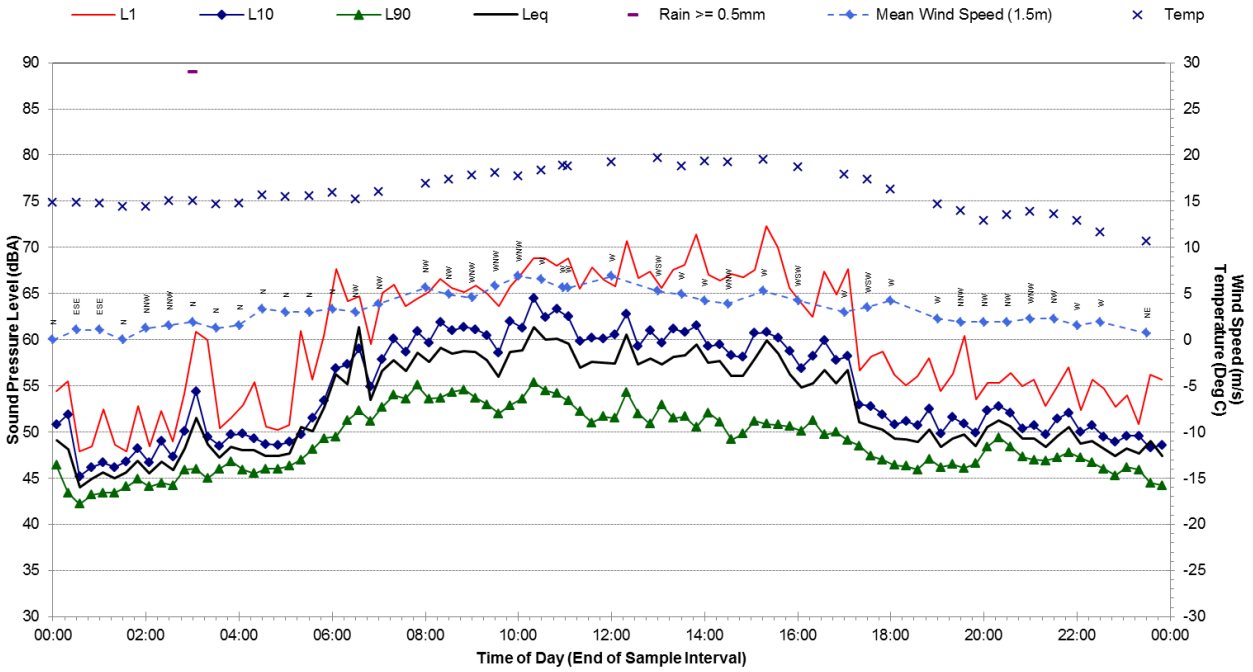
Statistical Ambient Noise Levels

Noise Monitoring Location 1 - North East Boundary - Friday, 2 September 2016



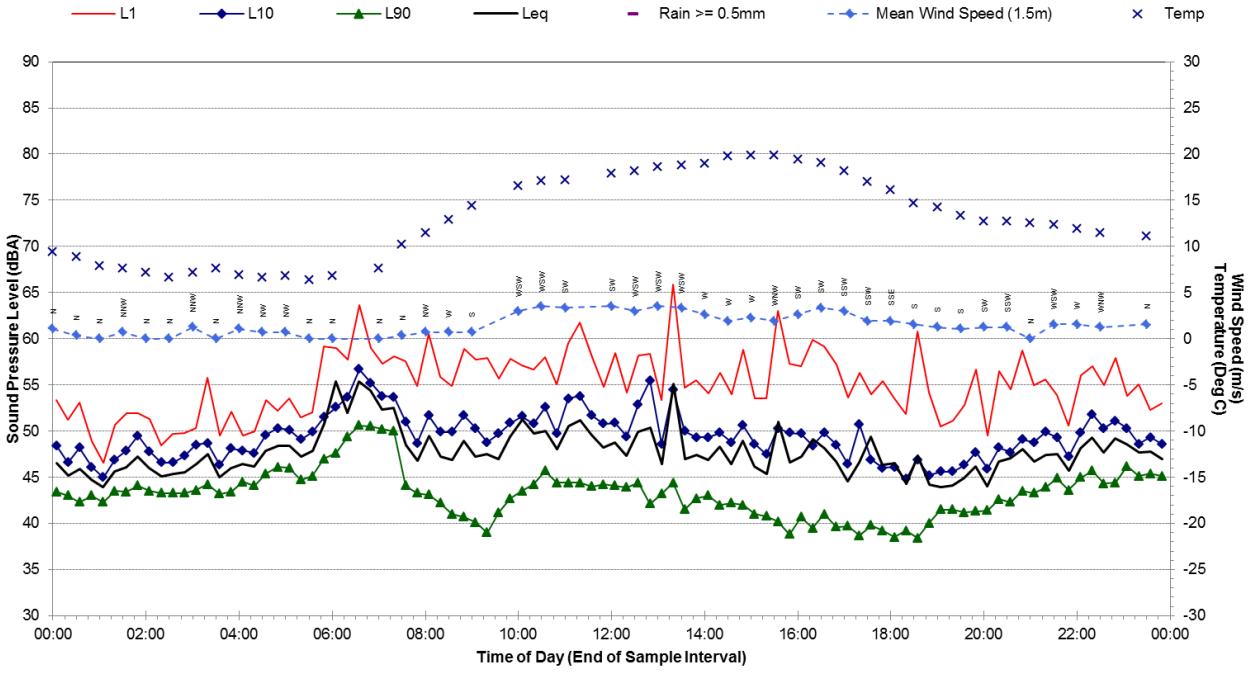
Statistical Ambient Noise Levels

Noise Monitoring Location 1 - North East Boundary - Saturday, 3 September 2016



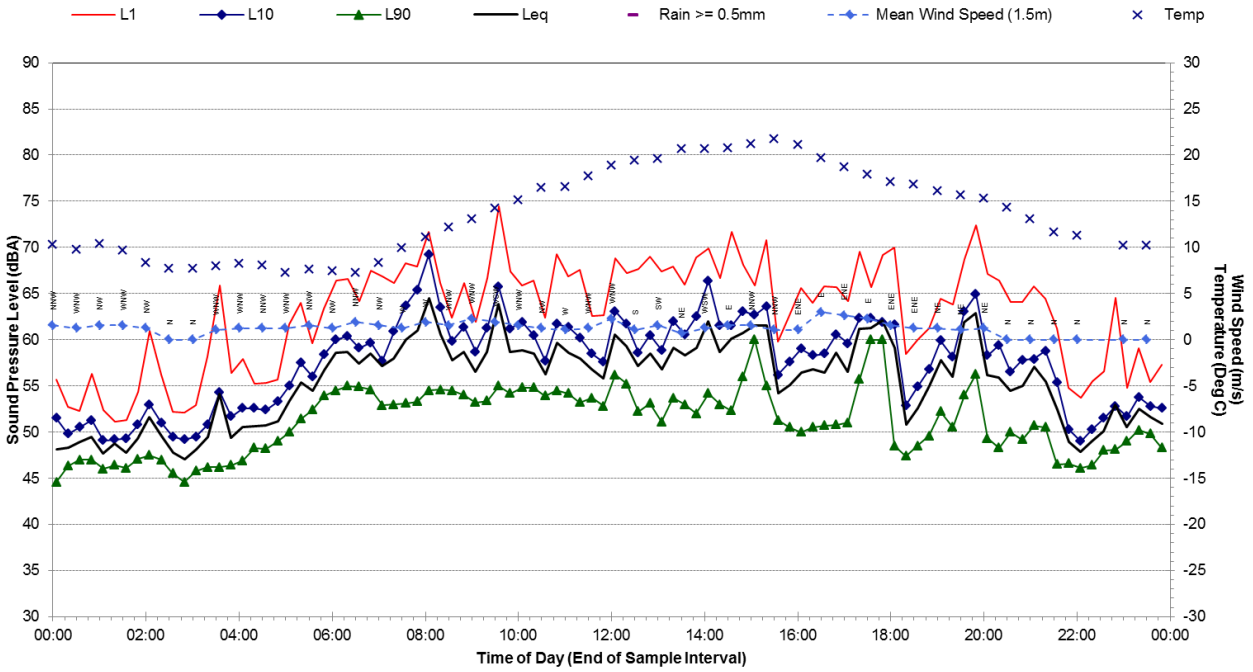
Statistical Ambient Noise Levels

Noise Monitoring Location 1 - North East Boundary - Sunday, 4 September 2016



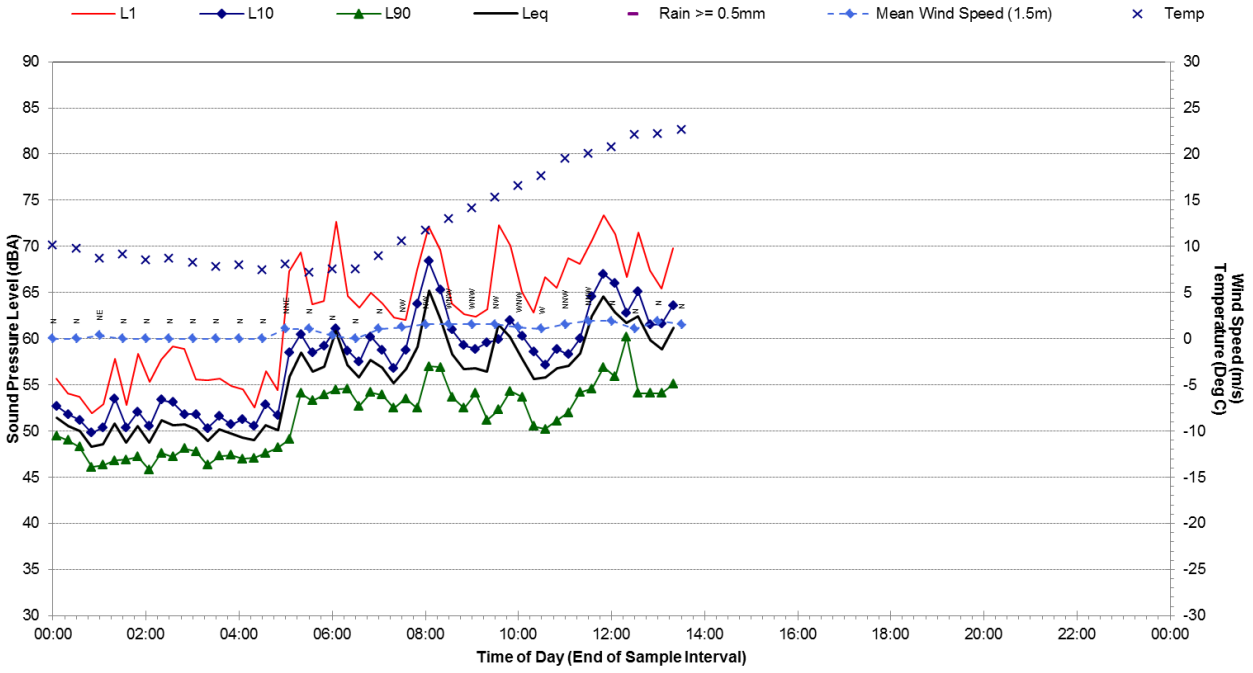
Statistical Ambient Noise Levels

Noise Monitoring Location 1 - North East Boundary - Monday, 5 September 2016



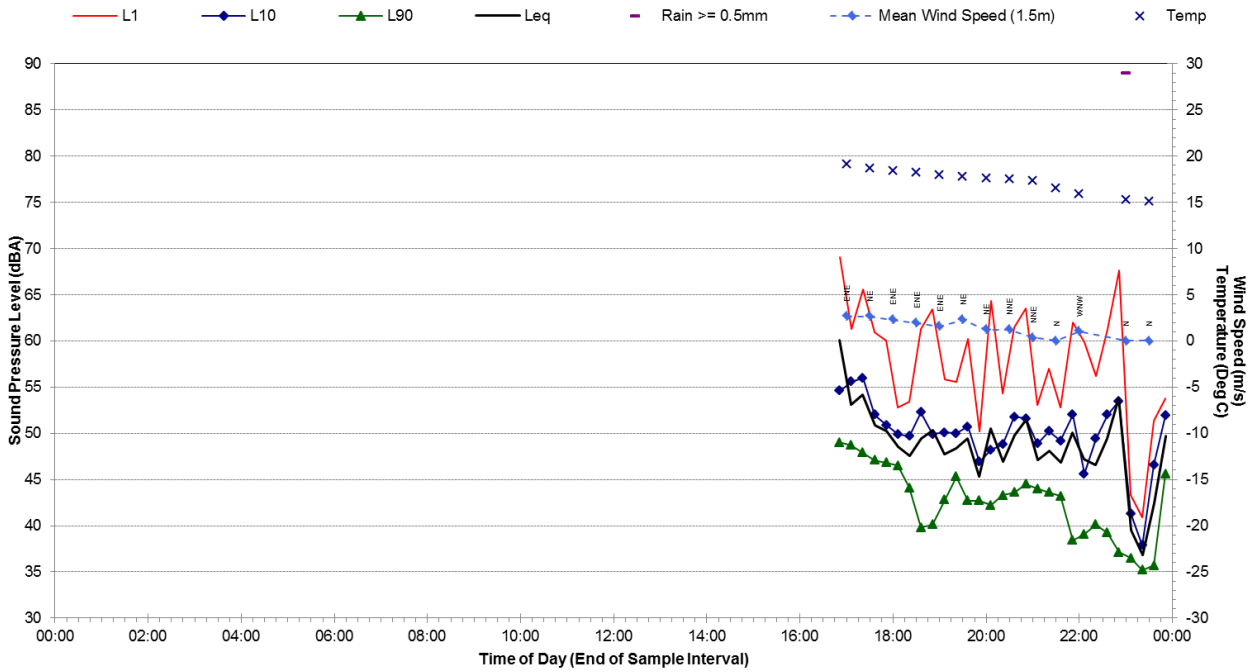
Statistical Ambient Noise Levels

Noise Monitoring Location 1 - North East Boundary - Tuesday, 6 September 2016



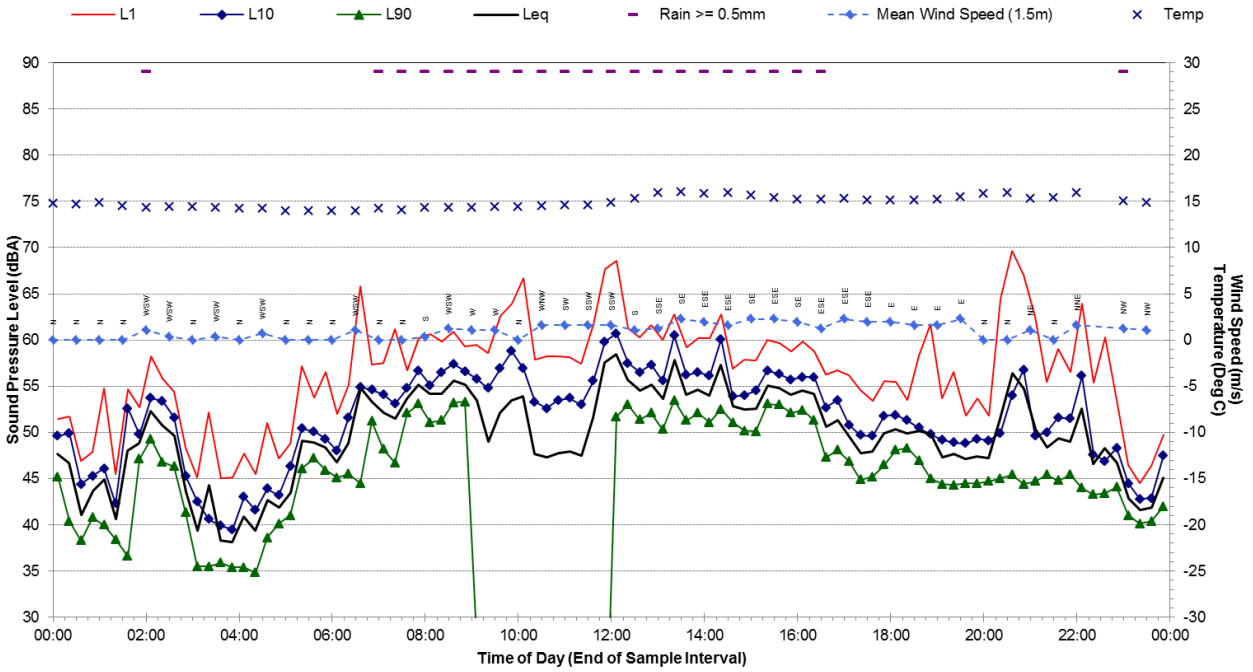
Statistical Ambient Noise Levels

Noise Monitoring Location 2 - Southern Boundary - Thursday, 1 September 2016



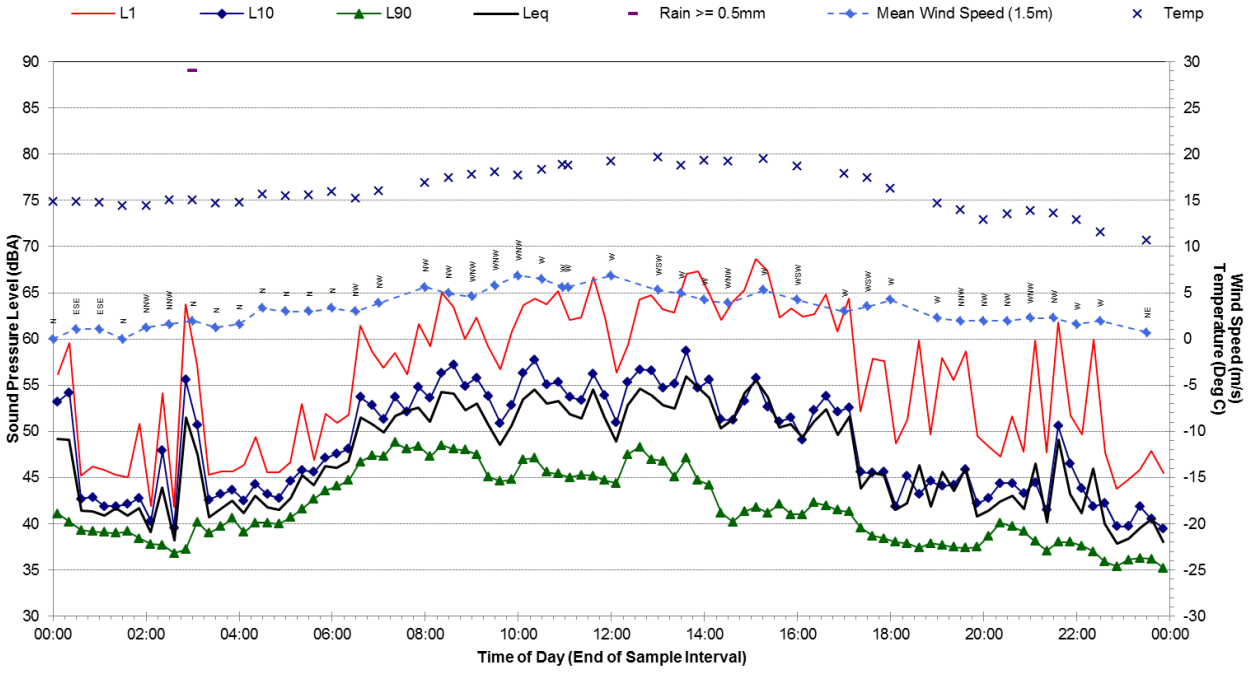
Statistical Ambient Noise Levels

Noise Monitoring Location 2 - Southern Boundary - Friday, 2 September 2016



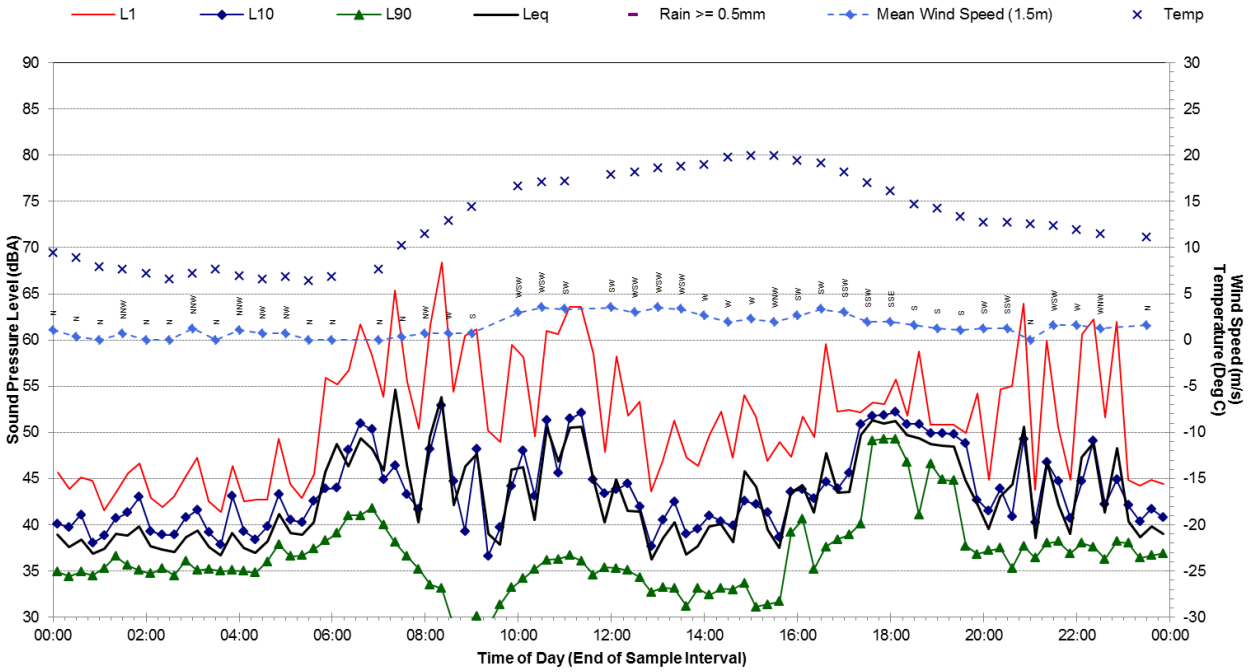
Statistical Ambient Noise Levels

Noise Monitoring Location 2 - Southern Boundary - Saturday, 3 September 2016



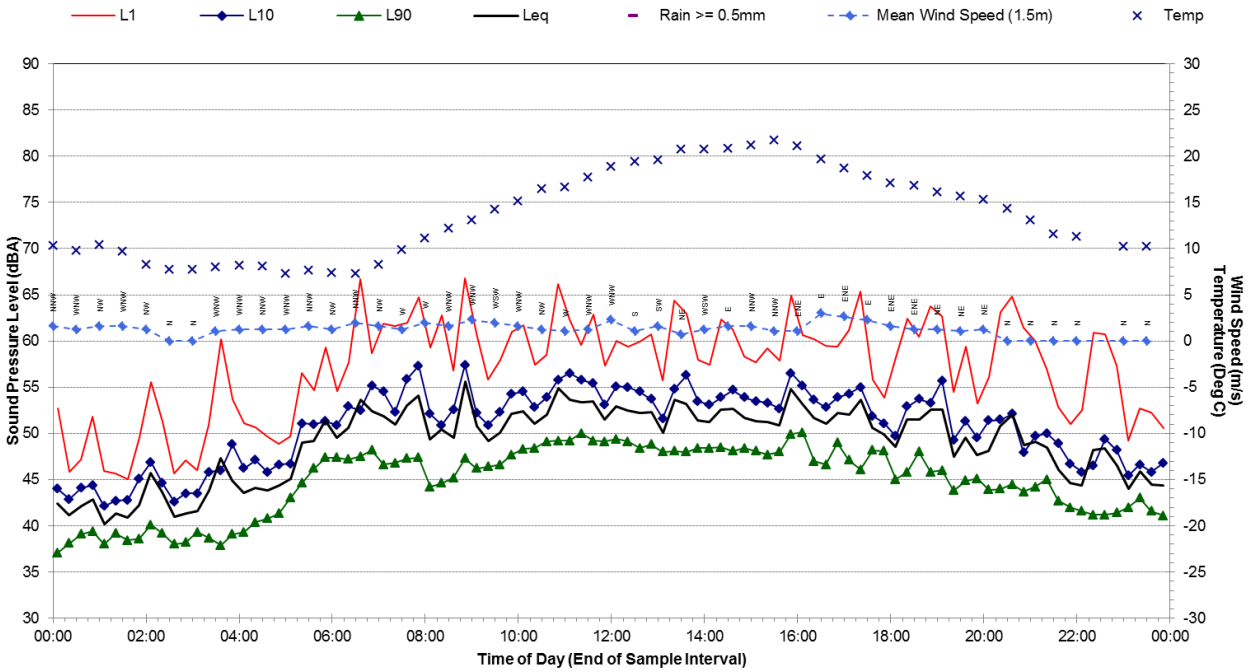
Statistical Ambient Noise Levels

Noise Monitoring Location 2 - Southern Boundary - Sunday, 4 September 2016



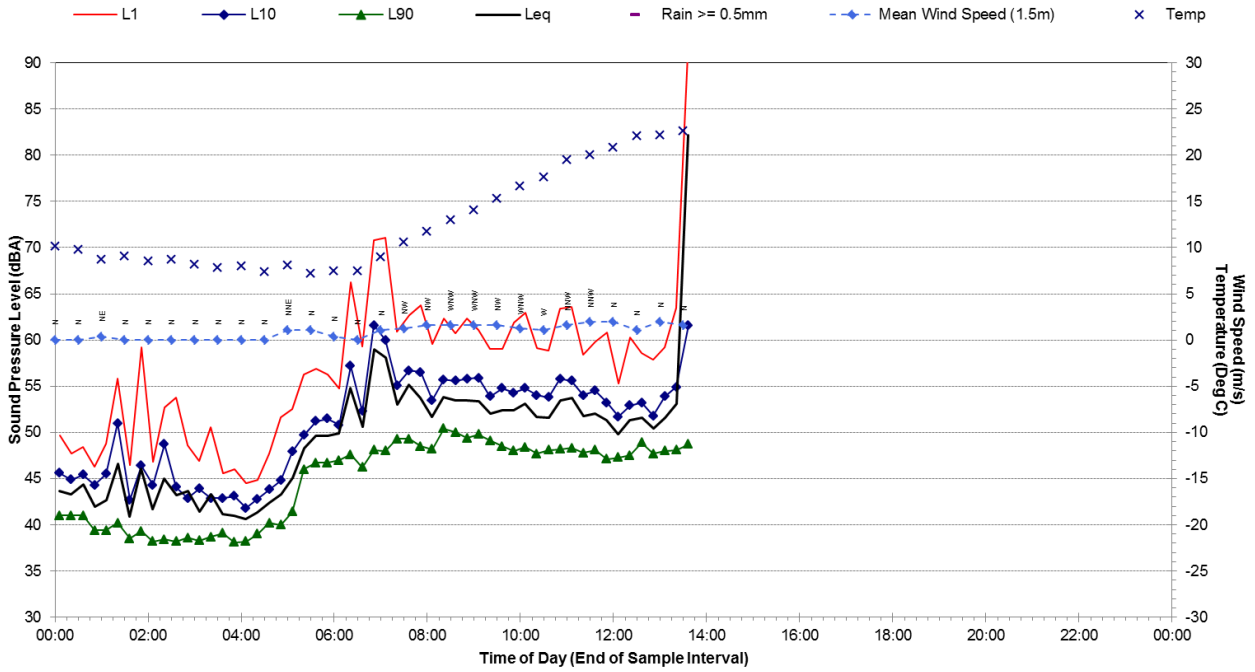
Statistical Ambient Noise Levels

Noise Monitoring Location 2 - Southern Boundary - Monday, 5 September 2016



Statistical Ambient Noise Levels

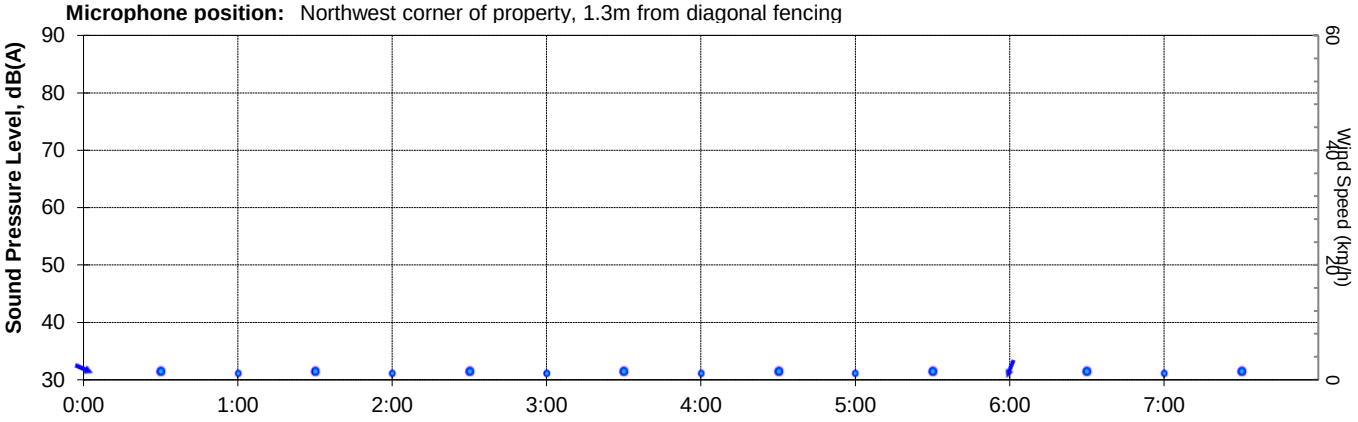
Noise Monitoring Location 2 - Southern Boundary - Tuesday, 6 September 2016



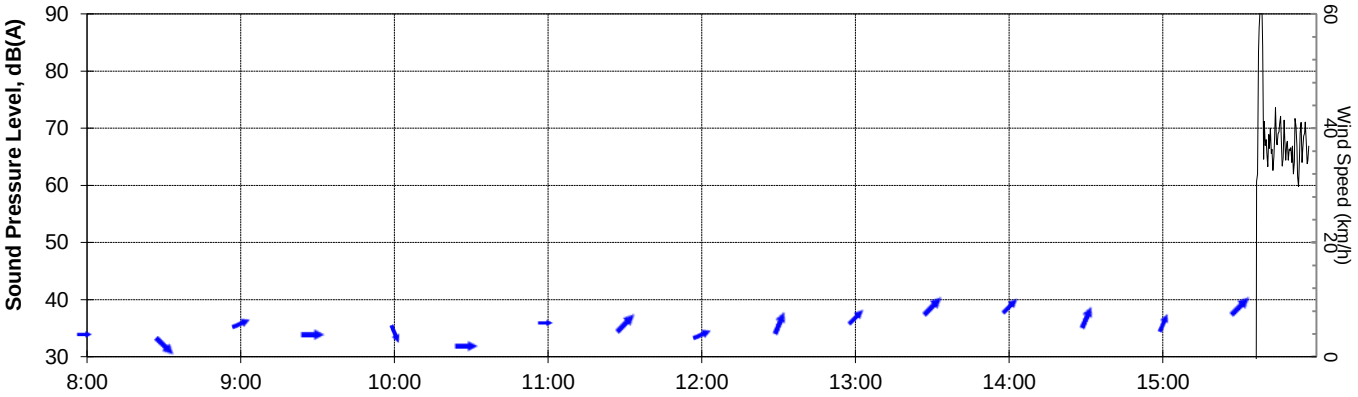
Results of Noise Monitoring

Client: MRA Consulting **Location** 126-134 Thomas Murrell Cres, Dandenong South **Date:** Thursday 01 Sep 2016

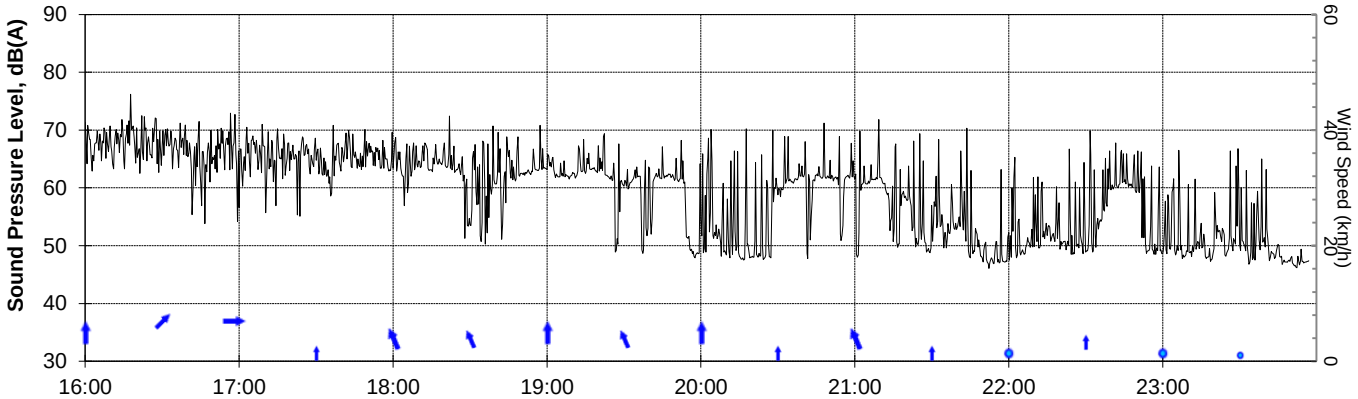
Microphone position: Northwest corner of property, 1.3m from diagonal fencing



Lmax =	Lmax =	Lmax =	Lmax =	Lmax =	Lmax =	Lmax =	Lmax =
L01 =	L01 =	L01 =	L01 =	L01 =	L01 =	L01 =	L01 =
L05 =	L05 =	L05 =	L05 =	L05 =	L05 =	L05 =	L05 =
L10 =	L10 =	L10 =	L10 =	L10 =	L10 =	L10 =	L10 =
L50 =	L50 =	L50 =	L50 =	L50 =	L50 =	L50 =	L50 =
L75 =	L75 =	L75 =	L75 =	L75 =	L75 =	L75 =	L75 =
L90 =	L90 =	L90 =	L90 =	L90 =	L90 =	L90 =	L90 =
L95 =	L95 =	L95 =	L95 =	L95 =	L95 =	L95 =	L95 =
Leq =	Leq =	Leq =	Leq =	Leq =	Leq =	Leq =	Leq =



Lmax =	Lmax =	Lmax =	Lmax =	Lmax =	Lmax =	Lmax =	Lmax = 104.5
L01 =	L01 =	L01 =	L01 =	L01 =	L01 =	L01 =	L01 = 93.7
L05 =	L05 =	L05 =	L05 =	L05 =	L05 =	L05 =	L05 = 85.5
L10 =	L10 =	L10 =	L10 =	L10 =	L10 =	L10 =	L10 = 74.2
L50 =	L50 =	L50 =	L50 =	L50 =	L50 =	L50 =	L50 = 65.3
L75 =	L75 =	L75 =	L75 =	L75 =	L75 =	L75 =	L75 = 62.6
L90 =	L90 =	L90 =	L90 =	L90 =	L90 =	L90 =	L90 = 61.0
L95 =	L95 =	L95 =	L95 =	L95 =	L95 =	L95 =	L95 = 56.0
Leq =	Leq =	Leq =	Leq =	Leq =	Leq =	Leq =	Leq = 80.6



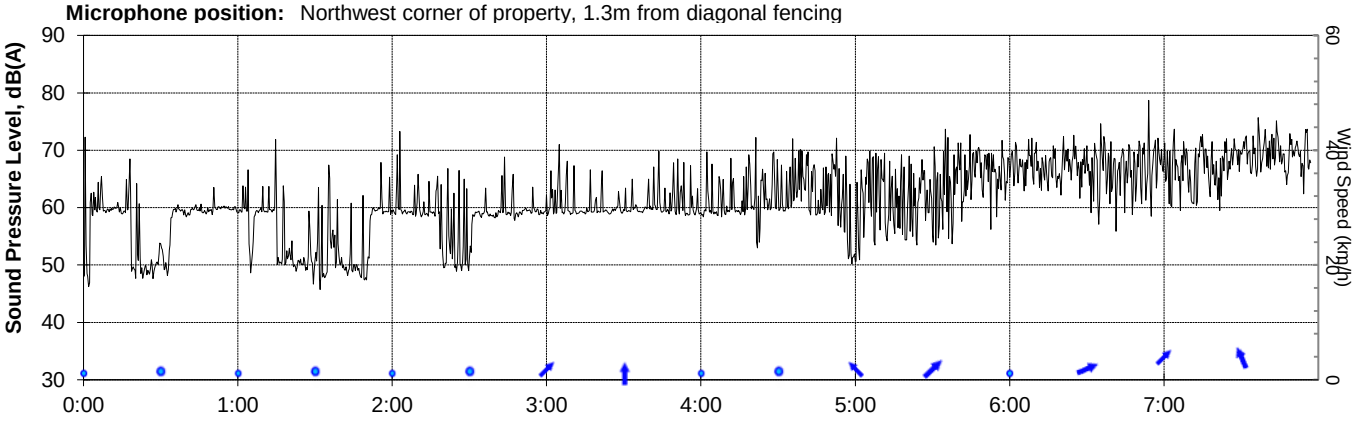
Lmax =	85.3	Lmax =	83.4	Lmax =	81.9	Lmax =	76.5	Lmax =	79.6	Lmax =	80.1	Lmax =	77.9	Lmax =	76.4
L01 =	76.3	L01 =	73.4	L01 =	72.9	L01 =	70.6	L01 =	72.8	L01 =	71.1	L01 =	70.6	L01 =	67.5
L05 =	72.5	L05 =	70.6	L05 =	69.0	L05 =	65.3	L05 =	64.9	L05 =	63.4	L05 =	63.9	L05 =	58.9
L10 =	70.8	L10 =	69.2	L10 =	66.8	L10 =	63.8	L10 =	62.6	L10 =	61.6	L10 =	60.9	L10 =	53.6
L50 =	65.8	L50 =	63.8	L50 =	62.8	L50 =	61.7	L50 =	57.6	L50 =	52.7	L50 =	51.4	L50 =	48.7
L75 =	63.4	L75 =	62.2	L75 =	61.1	L75 =	60.5	L75 =	49.0	L75 =	49.1	L75 =	49.1	L75 =	47.5
L90 =	61.7	L90 =	58.3	L90 =	54.9	L90 =	49.8	L90 =	47.9	L90 =	47.5	L90 =	48.0	L90 =	46.8
L95 =	53.4	L95 =	52.7	L95 =	49.7	L95 =	47.7	L95 =	47.1	L95 =	46.1	L95 =	46.6	L95 =	45.9
Leq =	68.0	Leq =	66.0	Leq =	64.4	Leq =	62.5	Leq =	61.3	Leq =	59.9	Leq =	58.9	Leq =	54.8

Graph based on Leq at 20s intervals,
Hourly percentiles based on Lp at 0.1s intervals.

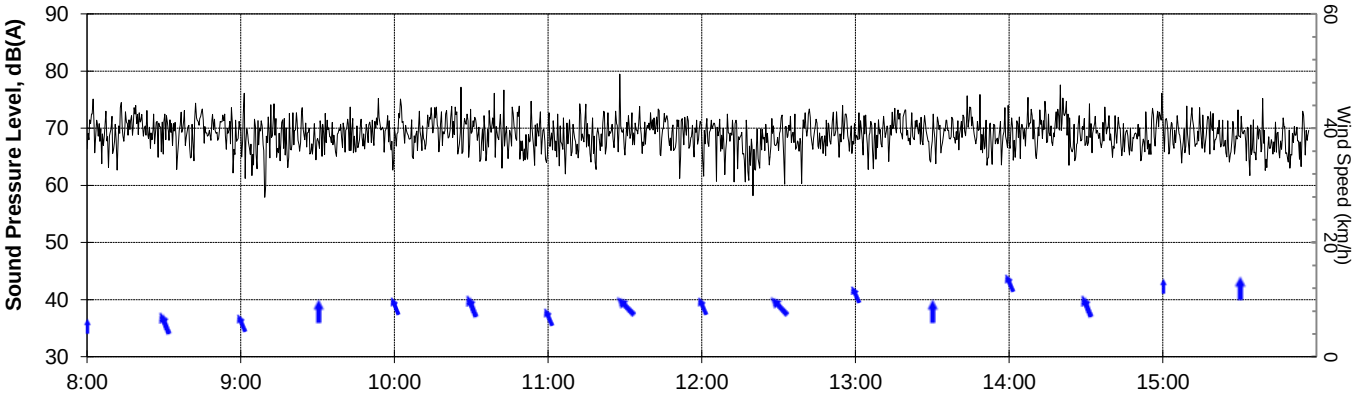
Results of Noise Monitoring

Client: MRA Consulting **Location** 126-134 Thomas Murrell Cres, Dandenong South **Date:** Friday 02 Sep 2016

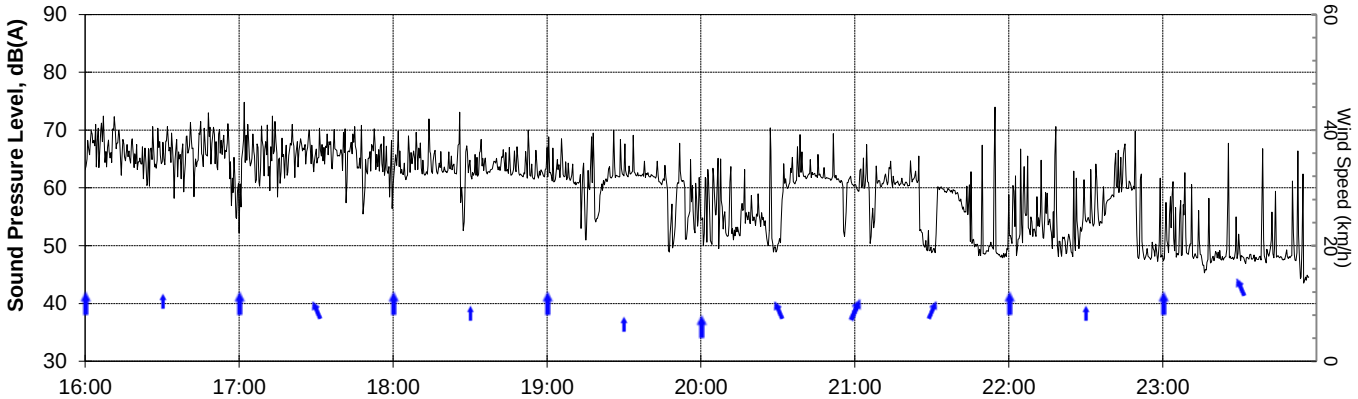
Microphone position: Northwest corner of property, 1.3m from diagonal fencing



Lmax =	82.3	Lmax =	79.0	Lmax =	81.0	Lmax =	80.9	Lmax =	79.8	Lmax =	84.6	Lmax =	88.0	Lmax =	86.5
L01 =	68.3	L01 =	68.9	L01 =	70.2	L01 =	71.6	L01 =	74.1	L01 =	75.2	L01 =	76.0	L01 =	76.8
L05 =	61.6	L05 =	61.0	L05 =	63.1	L05 =	65.4	L05 =	70.3	L05 =	71.8	L05 =	73.2	L05 =	74.1
L10 =	60.5	L10 =	60.0	L10 =	60.4	L10 =	62.1	L10 =	67.3	L10 =	69.8	L10 =	71.7	L10 =	72.5
L50 =	59.0	L50 =	52.0	L50 =	58.8	L50 =	59.3	L50 =	59.6	L50 =	59.7	L50 =	65.0	L50 =	66.9
L75 =	51.9	L75 =	49.3	L75 =	58.0	L75 =	58.9	L75 =	58.7	L75 =	55.3	L75 =	62.0	L75 =	64.0
L90 =	48.2	L90 =	47.9	L90 =	50.6	L90 =	58.5	L90 =	57.8	L90 =	52.8	L90 =	59.0	L90 =	60.5
L95 =	46.2	L95 =	45.9	L95 =	48.0	L95 =	58.0	L95 =	50.5	L95 =	49.6	L95 =	54.5	L95 =	56.8
Leq =	59.6	Leq =	58.4	Leq =	60.5	Leq =	61.6	Leq =	64.1	Leq =	65.7	Leq =	68.2	Leq =	69.2



Lmax =	85.7	Lmax =	90.3	Lmax =	90.0	Lmax =	90.5	Lmax =	81.5	Lmax =	84.3	Lmax =	91.8	Lmax =	87.1
L01 =	77.6	L01 =	76.9	L01 =	77.9	L01 =	77.2	L01 =	76.5	L01 =	76.8	L01 =	77.1	L01 =	77.2
L05 =	74.7	L05 =	74.1	L05 =	74.7	L05 =	74.4	L05 =	73.8	L05 =	74.3	L05 =	74.4	L05 =	73.9
L10 =	73.3	L10 =	72.5	L10 =	73.1	L10 =	72.7	L10 =	72.4	L10 =	72.8	L10 =	72.9	L10 =	72.1
L50 =	68.5	L50 =	66.9	L50 =	67.8	L50 =	67.2	L50 =	67.0	L50 =	68.0	L50 =	67.7	L50 =	66.8
L75 =	65.7	L75 =	64.6	L75 =	65.6	L75 =	65.0	L75 =	64.2	L75 =	65.7	L75 =	65.6	L75 =	64.7
L90 =	63.8	L90 =	63.0	L90 =	63.9	L90 =	63.5	L90 =	61.0	L90 =	64.1	L90 =	64.1	L90 =	63.3
L95 =	60.7	L95 =	58.0	L95 =	62.1	L95 =	61.0	L95 =	56.6	L95 =	60.1	L95 =	61.6	L95 =	58.0
Leq =	70.3	Leq =	69.4	Leq =	70.2	Leq =	69.7	Leq =	69.1	Leq =	69.8	Leq =	70.0	Leq =	69.2



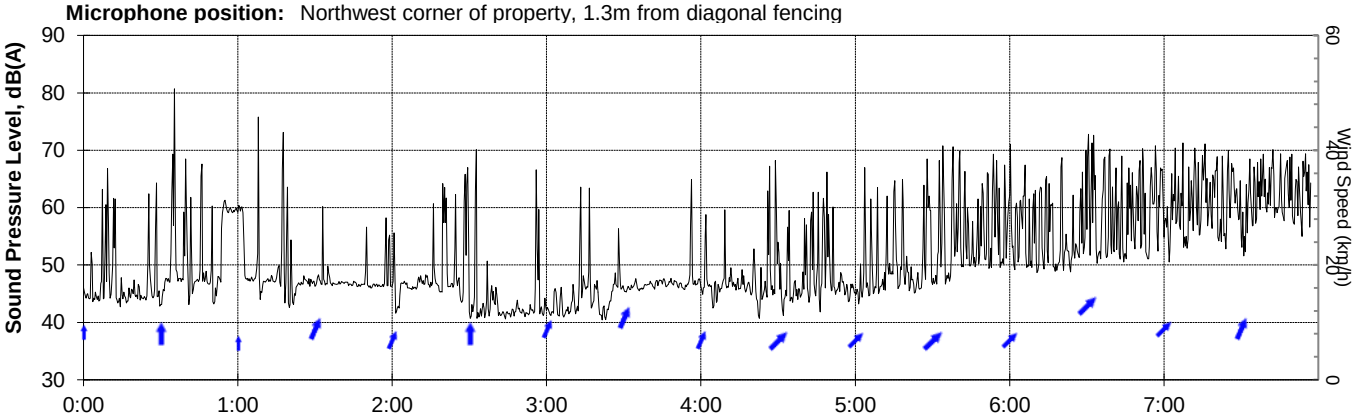
Lmax =	80.9	Lmax =	82.8	Lmax =	83.1	Lmax =	78.6	Lmax =	78.9	Lmax =	85.3	Lmax =	85.2	Lmax =	75.8
L01 =	75.0	L01 =	75.1	L01 =	72.2	L01 =	71.6	L01 =	69.9	L01 =	68.1	L01 =	70.5	L01 =	65.3
L05 =	71.7	L05 =	71.2	L05 =	68.7	L05 =	65.7	L05 =	63.7	L05 =	62.4	L05 =	63.4	L05 =	57.2
L10 =	70.1	L10 =	69.6	L10 =	66.4	L10 =	63.4	L10 =	62.5	L10 =	61.5	L10 =	60.5	L10 =	52.2
L50 =	64.9	L50 =	64.1	L50 =	62.6	L50 =	61.3	L50 =	57.7	L50 =	59.0	L50 =	53.2	L50 =	48.0
L75 =	62.8	L75 =	62.4	L75 =	61.9	L75 =	59.8	L75 =	52.2	L75 =	50.1	L75 =	49.4	L75 =	47.4
L90 =	59.6	L90 =	58.7	L90 =	61.3	L90 =	52.4	L90 =	50.0	L90 =	48.5	L90 =	48.0	L90 =	46.6
L95 =	53.6	L95 =	53.6	L95 =	52.7	L95 =	49.1	L95 =	48.5	L95 =	47.4	L95 =	47.0	L95 =	43.3
Leq =	67.1	Leq =	66.6	Leq =	64.5	Leq =	62.4	Leq =	60.6	Leq =	60.0	Leq =	58.9	Leq =	53.8

Graph based on Leq at 20s intervals,
Hourly percentiles based on Lp at 0.1s intervals.

Results of Noise Monitoring

Client: MRA Consulting **Location** 126-134 Thomas Murrell Cres, Dandenong South **Date:** Saturday 03 Sep 2016

Microphone position: Northwest corner of property, 1.3m from diagonal fencing



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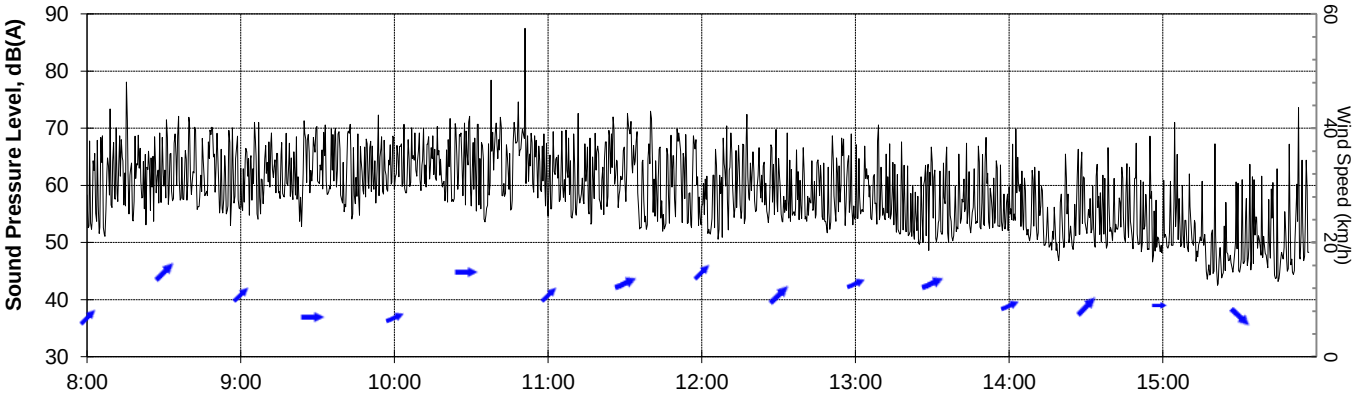
L10 =	59.4	L10 =	50.8	L10 =	48.8	L10 =	47.5	L10 =	50.7	L10 =	59.1	L10 =	65.6	L10 =	67.5				
L50 =	46.5	L50 =	46.7	L50 =	45.0	L50 =	45.9	L50 =	45.9	L50 =	48.9	L50 =	52.8	L50 =	58.6				
L75 =	44.0	L75 =	46.2	L75 =	41.6	L75 =	43.1	L75 =	44.6	L75 =	46.3	L75 =	50.6	L75 =	55.7				
L90 =	43.2	L90 =	45.7	L90 =	40.9	L90 =	41.3	L90 =	43.2	L90 =	44.7	L90 =	49.1	L90 =	53.5				
L95 =	42.2	L95 =	42.2	L95 =	39.9	L95 =	40.1	L95 =	40.8	L95 =	42.9	L95 =	47.3	L95 =	51.1				
Leq =	60.3	Leq =	56.7	Leq =	54.1	Leq =	49.3	Leq =	53.6	Leq =	59.4	Leq =	62.4	Leq =	64.1				



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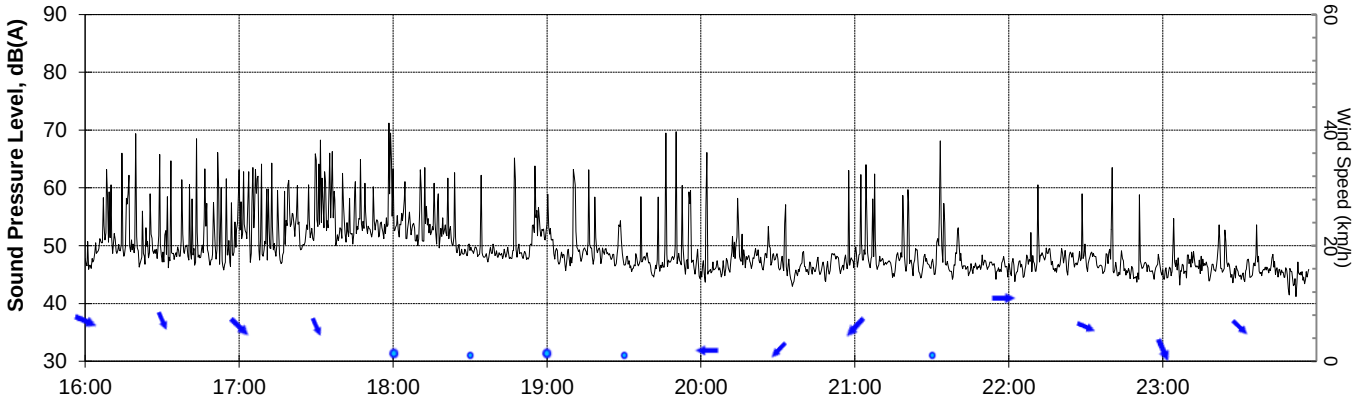
L10 =	68.4	L10 =	68.6	L10 =	69.9	L10 =	68.0	L10 =	65.6	L10 =	63.1	L10 =	60.3	L10 =	55.9				
L50 =	58.0	L50 =	59.3	L50 =	60.7	L50 =	57.8	L50 =	55.7	L50 =	53.7	L50 =	51.7	L50 =	47.7				
L75 =	55.8	L75 =	57.1	L75 =	58.2	L75 =	55.0	L75 =	53.5	L75 =	51.8	L75 =	49.7	L75 =	45.3				
L90 =	53.5	L90 =	55.1	L90 =	56.2	L90 =	53.2	L90 =	52.2	L90 =	50.6	L90 =	48.2	L90 =	43.8				
L95 =	50.8	L95 =	52.4	L95 =	53.6	L95 =	51.3	L95 =	50.2	L95 =	48.8	L95 =	45.9	L95 =	41.9				
Leq =	65.1	Leq =	64.9	Leq =	68.8	Leq =	64.7	Leq =	62.2	Leq =	60.2	Leq =	58.4	Leq =	57.2				



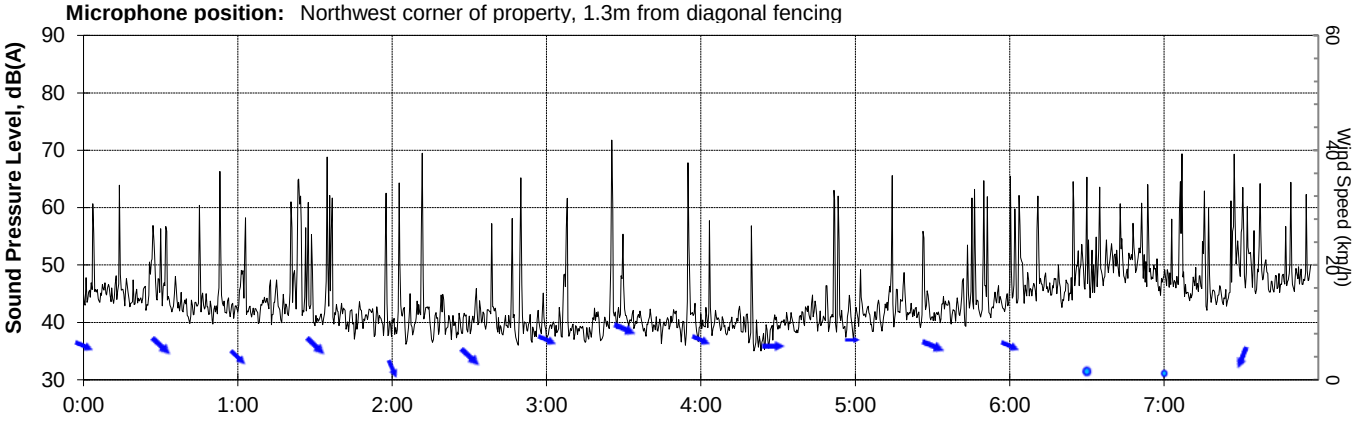
Lmax =	77.5	Lmax =	77.5	Lmax =	74.3	Lmax =	79.3	Lmax =	75.0	Lmax =	73.9	Lmax =	70.5	Lmax =	63.4				
L01 =	68.1	L01 =	70.4	L01 =	66.5	L01 =	64.3	L01 =	58.2	L01 =	63.4	L01 =	56.4	L01 =	53.4				
L05 =	59.9	L05 =	64.1	L05 =	56.8	L05 =	55.1	L05 =	50.3	L05 =	52.2	L05 =	49.9	L05 =	49.1				
L10 =	54.7	L10 =	59.5	L10 =	54.9	L10 =	51.8	L10 =	49.1	L10 =	49.9	L10 =	49.0	L10 =	48.0				
L50 =	48.4	L50 =	51.8	L50 =	50.2	L50 =	47.8	L50 =	46.5	L50 =	46.8	L50 =	46.5	L50 =	45.5				
L75 =	47.1	L75 =	49.6	L75 =	48.6	L75 =	46.6	L75 =	45.3	L75 =	45.8	L75 =	45.4	L75 =	44.4				
L90 =	46.2	L90 =	47.8	L90 =	47.7	L90 =	45.7	L90 =	44.4	L90 =	44.8	L90 =	44.4	L90 =	43.4				
L95 =	44.9	L95 =	46.0	L95 =	46.7	L95 =	44.1	L95 =	42.6	L95 =	43.4	L95 =	43.0	L95 =	41.1				
Leq =	55.7	Leq =	58.3	Leq =	54.1	Leq =	53.8	Leq =	49.8	Leq =	51.7	Leq =	48.9	Leq =	46.6				

Graph based on Leq at 20s intervals,
Hourly percentiles based on Lp at 0.1s intervals.

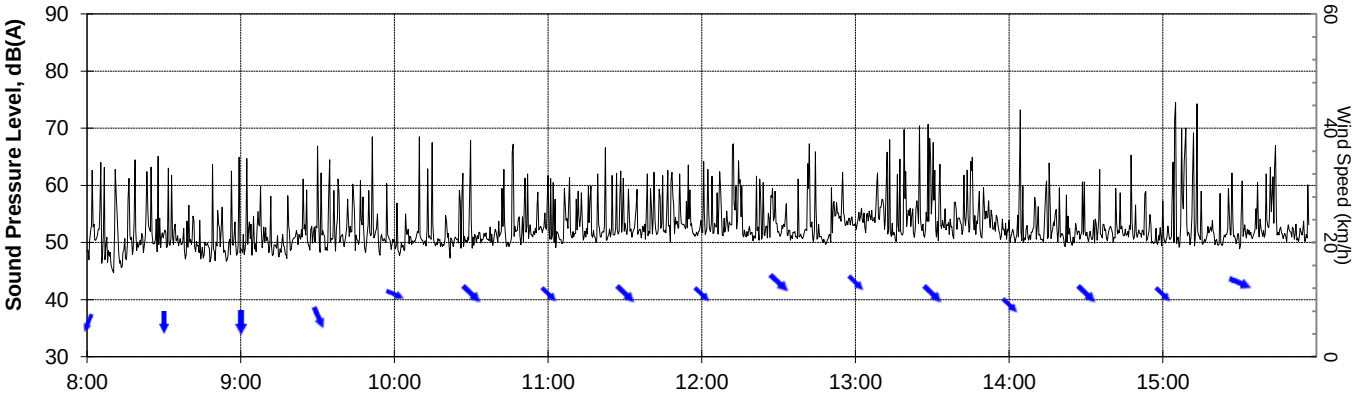
Results of Noise Monitoring

Client: MRA Consulting **Location** 126-134 Thomas Murrell Cres, Dandenong South **Date:** Sunday 04 Sep 2016

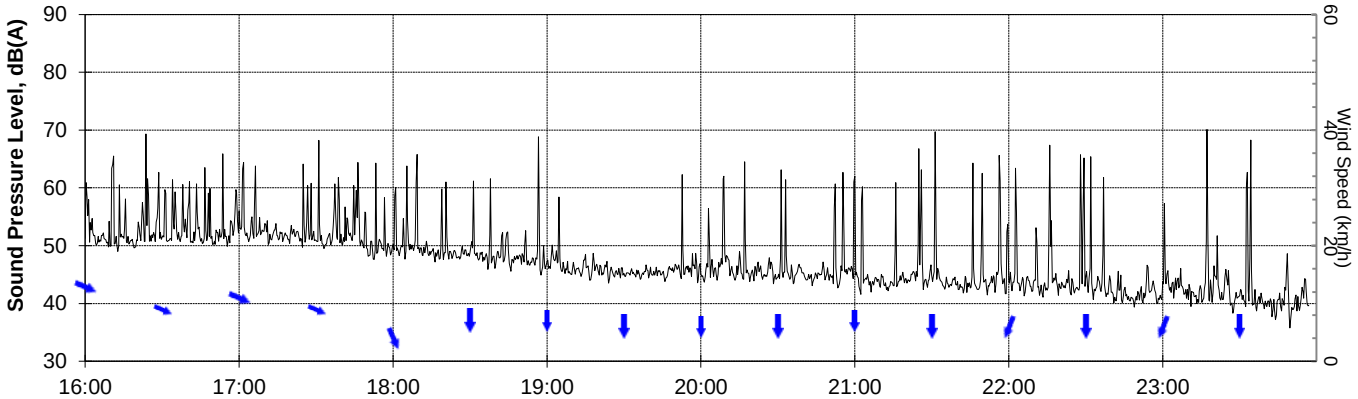
Microphone position: Northwest corner of property, 1.3m from diagonal fencing



Lmax =	74.7	Lmax =	79.6	Lmax =	77.9	Lmax =	80.3	Lmax =	73.6	Lmax =	76.9	Lmax =	74.4	Lmax =	76.2	Lmax =	77.6	Lmax =	75.5	Lmax =	77.6	Lmax =	81.0
L01 =	60.2	L01 =	66.6	L01 =	60.0	L01 =	59.0	L01 =	56.0	L01 =	60.5	L01 =	65.8	L01 =	67.8	L01 =	66.1	L01 =	67.7	L01 =	66.1	L01 =	67.8
L05 =	51.0	L05 =	53.8	L05 =	46.4	L05 =	47.1	L05 =	44.7	L05 =	48.9	L05 =	56.8	L05 =	57.5	L05 =	58.5	L05 =	58.3	L05 =	58.5	L05 =	57.2
L10 =	47.9	L10 =	47.8	L10 =	43.9	L10 =	43.4	L10 =	43.1	L10 =	46.3	L10 =	53.3	L10 =	53.2	L10 =	55.2	L10 =	55.1	L10 =	55.2	L10 =	54.1
L50 =	43.7	L50 =	41.6	L50 =	39.8	L50 =	39.4	L50 =	39.4	L50 =	41.9	L50 =	46.3	L50 =	46.1	L50 =	49.8	L50 =	48.6	L50 =	49.8	L50 =	50.4
L75 =	42.2	L75 =	40.1	L75 =	38.1	L75 =	38.0	L75 =	37.8	L75 =	40.3	L75 =	44.4	L75 =	44.4	L75 =	48.3	L75 =	46.7	L75 =	48.3	L75 =	49.3
L90 =	41.0	L90 =	38.7	L90 =	36.9	L90 =	36.9	L90 =	36.4	L90 =	38.8	L90 =	43.1	L90 =	43.2	L90 =	47.3	L90 =	45.3	L90 =	47.3	L90 =	48.5
L95 =	39.2	L95 =	36.7	L95 =	35.4	L95 =	35.2	L95 =	34.4	L95 =	36.3	L95 =	41.3	L95 =	41.4	L95 =	45.6	L95 =	43.2	L95 =	45.6	L95 =	46.9
Leq =	49.7	Leq =	52.3	Leq =	50.2	Leq =	51.8	Leq =	46.6	Leq =	49.6	Leq =	53.2	Leq =	54.5	Leq =	54.8	Leq =	54.5	Leq =	54.8	Leq =	55.6



Lmax =	75.4	Lmax =	80.6	Lmax =	80.8	Lmax =	85.3	Lmax =	89.7	Lmax =	81.1	Lmax =	75.7	Lmax =	76.3	Lmax =	69.6	Lmax =	73.9	Lmax =	77.9	Lmax =	75.6	Lmax =	78.4
L01 =	67.6	L01 =	68.1	L01 =	70.7	L01 =	65.2	L01 =	69.4	L01 =	67.8	L01 =	66.9	L01 =	65.3	L01 =	52.0	L01 =	61.9	L01 =	66.9	L01 =	62.9	L01 =	59.7
L05 =	60.6	L05 =	59.9	L05 =	61.4	L05 =	57.7	L05 =	62.4	L05 =	58.4	L05 =	57.3	L05 =	53.3	L05 =	48.3	L05 =	49.4	L05 =	51.1	L05 =	49.9	L05 =	47.1
L10 =	56.2	L10 =	56.2	L10 =	58.0	L10 =	55.0	L10 =	55.8	L10 =	55.1	L10 =	54.1	L10 =	50.9	L10 =	47.4	L10 =	47.6	L10 =	46.6	L10 =	45.9	L10 =	44.9
L50 =	51.6	L50 =	51.9	L50 =	53.0	L50 =	50.8	L50 =	51.0	L50 =	51.1	L50 =	51.2	L50 =	48.4	L50 =	45.5	L50 =	45.1	L50 =	43.7	L50 =	42.5	L50 =	40.8
L75 =	50.7	L75 =	50.8	L75 =	51.5	L75 =	49.8	L75 =	50.1	L75 =	50.3	L75 =	50.2	L75 =	47.4	L75 =	44.7	L75 =	44.2	L75 =	42.8	L75 =	41.4	L75 =	39.5
L90 =	50.0	L90 =	50.1	L90 =	50.5	L90 =	49.0	L90 =	49.3	L90 =	49.7	L90 =	49.1	L90 =	46.6	L90 =	44.0	L90 =	43.4	L90 =	42.0	L90 =	40.4	L90 =	38.3
L95 =	49.0	L95 =	49.1	L95 =	49.3	L95 =	47.8	L95 =	48.2	L95 =	48.6	L95 =	47.3	L95 =	44.9	L95 =	42.9	L95 =	42.2	L95 =	40.8	L95 =	39.0	L95 =	36.3
Leq =	55.9	Leq =	56.5	Leq =	58.4	Leq =	55.7	Leq =	59.3	Leq =	55.8	Leq =	55.0	Leq =	52.9	Leq =	47.2	Leq =	50.4	Leq =	53.0	Leq =	51.5	Leq =	51.1

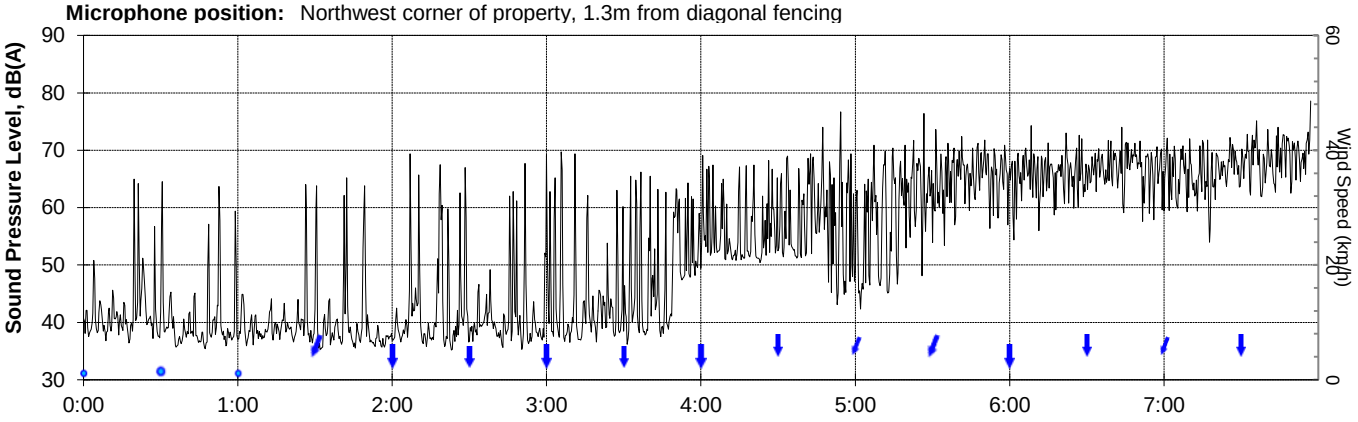


Graph based on Leq at 20s intervals,
Hourly percentiles based on Lp at 0.1s intervals.

Results of Noise Monitoring

Client: MRA Consulting **Location** 126-134 Thomas Murrell Cres, Dandenong South **Date:** Monday 05 Sep 2016

Microphone position: Northwest corner of property, 1.3m from diagonal fencing



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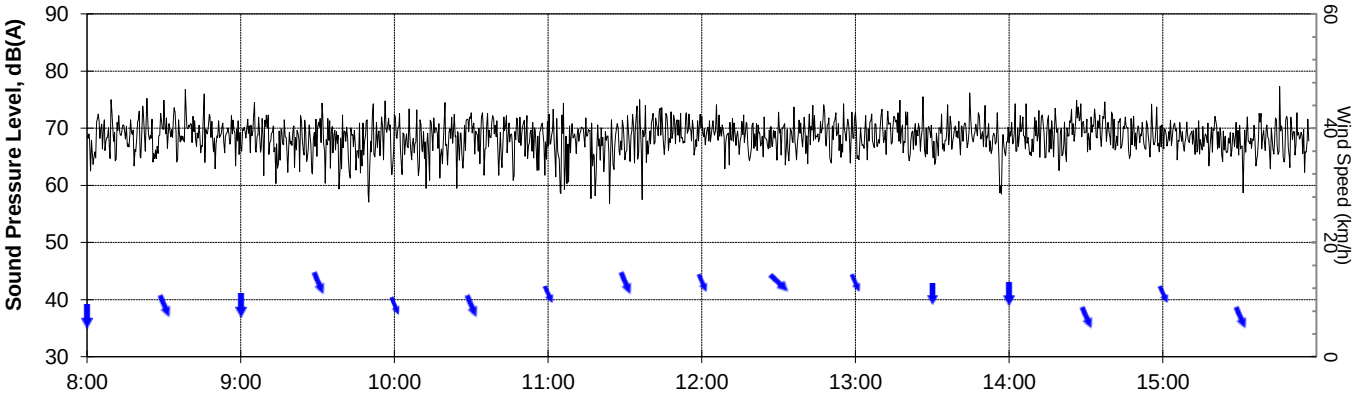
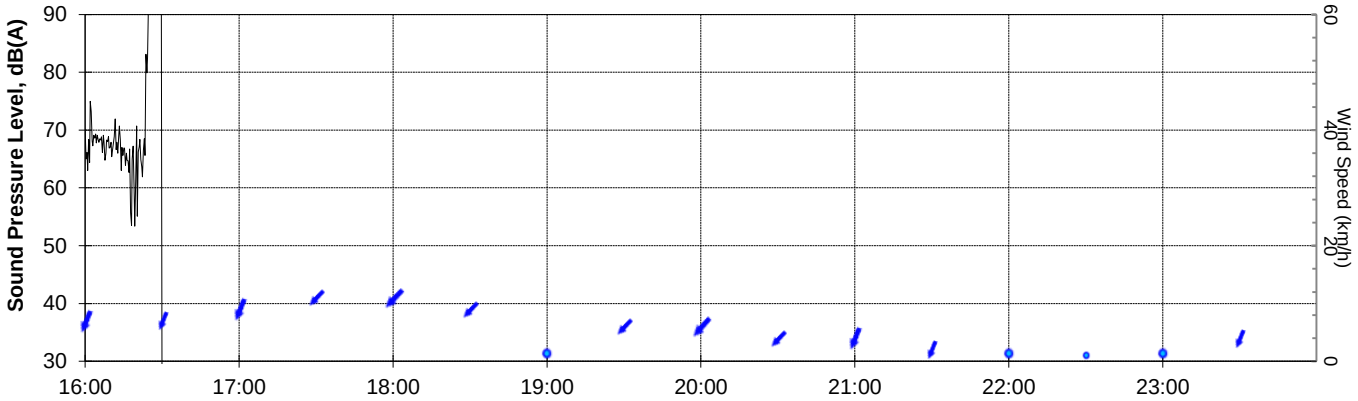
L01 =	63.0	L01 =	63.3	L01 =	67.6	L01 =	70.8	L01 =	74.2	L01 =	75.6	L01 =	76.0	L01 =	76.8
L05 =	49.0	L05 =	47.3	L05 =	53.7	L05 =	61.1	L05 =	69.1	L05 =	71.9	L05 =	72.9	L05 =	73.8
L10 =	45.2	L10 =	43.1	L10 =	47.7	L10 =	56.1	L10 =	65.1	L10 =	69.8	L10 =	71.2	L10 =	72.2
L50 =	38.7	L50 =	37.9	L50 =	38.7	L50 =	41.3	L50 =	52.9	L50 =	60.3	L50 =	63.9	L50 =	65.8
L75 =	37.3	L75 =	36.7	L75 =	37.1	L75 =	38.5	L75 =	51.2	L75 =	53.5	L75 =	60.5	L75 =	62.8
L90 =	36.2	L90 =	35.8	L90 =	36.0	L90 =	37.2	L90 =	50.2	L90 =	46.9	L90 =	57.8	L90 =	59.4
L95 =	34.8	L95 =	34.6	L95 =	34.7	L95 =	35.5	L95 =	44.0	L95 =	43.3	L95 =	54.9	L95 =	53.7
Leq =	49.7	Leq =	49.8	Leq =	53.8	Leq =	56.7	Leq =	62.5	Leq =	65.9	Leq =	67.5	Leq =	68.8



Lmax =	89.5	Lmax =	84.4	Lmax =	84.4	Lmax =	84.5	Lmax =	85.6	Lmax =	85.7	Lmax =	83.8	Lmax =	86.8
L01 =	77.2	L01 =	76.6	L01 =	76.6	L01 =	77.1	L01 =	76.6	L01 =	77.2	L01 =	77.1	L01 =	76.0
L05 =	74.3	L05 =	73.9	L05 =	74.1	L05 =	74.5	L05 =	74.0	L05 =	74.0	L05 =	74.5	L05 =	73.2
L10 =	72.9	L10 =	72.4	L10 =	72.7	L10 =	72.9	L10 =	72.7	L10 =	72.5	L10 =	73.0	L10 =	71.7
L50 =	67.5	L50 =	66.3	L50 =	66.5	L50 =	66.5	L50 =	67.2	L50 =	67.4	L50 =	67.9	L50 =	66.7
L75 =	64.5	L75 =	62.8	L75 =	62.9	L75 =	63.3	L75 =	65.0	L75 =	65.2	L75 =	65.5	L75 =	64.3
L90 =	62.8	L90 =	60.4	L90 =	59.8	L90 =	59.5	L90 =	63.5	L90 =	63.6	L90 =	63.9	L90 =	63.1
L95 =	60.1	L95 =	56.2	L95 =	56.9	L95 =	55.8	L95 =	61.4	L95 =	58.3	L95 =	60.8	L95 =	58.3
Leq =	69.7	Leq =	68.9	Leq =	69.0	Leq =	69.2	Leq =	69.4	Leq =	69.6	Leq =	69.9	Leq =	68.8



Lmax =	Lmax =	Lmax =	Lmax =	Lmax =	Lmax =	Lmax =	Lmax =
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L95 =	L95 =	L95 =	L95 =	L95 =	L95 =	L95 =	L95 =
Leq =	Leq =	Leq =	Leq =	Leq =	Leq =	Leq =	Leq =

Graph based on Leq at 20s intervals,
Hourly percentiles based on Lp at 0.1s intervals.

1 Introduction

This Appendix explains SLR Consulting's approach towards the analysis of meteorological conditions required for the noise impact assessment.

The meteorological data inputs required to estimate potential noise impacts vary from those required for other specific environmental impact assessments such as air quality or soil and land assessments.

For example, air quality models generally require a spatially and time varying meteorological field which takes into consideration surrounding land use and topography over an entire year to encompass meteorological variability on timescales appropriate to the air quality criteria (e.g. 1 hour, 24 hour and Annual). Noise impact assessments generally do not require this level of detail and require only the prevailing (dominant) meteorological characteristics during specific times of day and seasons.

Whilst the starting point for each assessment may be similar, the requirements for meteorological data vary as stated in guidance documentation from the appropriate regulatory authorities.

2 Meteorological Overview – Noise Impact Assessment

The NSW Industrial Noise Policy (INP) provides the methodology used for assessing meteorological conditions for noise impact assessments. The following excerpt is from the INP which describes the two approaches to assessing meteorological effects:

In assessing noise impacts, the criteria are expected to apply under weather conditions that would be expected to occur at a particular site for a significant period of time. These include conditions of calm, wind and temperature inversions. As the criteria are expected to apply under weather conditions characteristic of the area, it is important at the start of a noise assessment to assess the potential for such meteorological effects occurring, thus enabling better prediction of potential noise impacts.

Essentially, there are two underlying approaches to assessing these effects: the simple and the more detailed approach.

Simple approach

With the simple approach, the proponent may forego detailed analyses of meteorological data and simply apply given default meteorological parameters to predict noise levels. This approach assumes that meteorological effects are present for a significant amount of time, avoiding the need to quantify these effects in detail. It is conservative, in that it is likely to predict the upper range of increases in noise levels. Actual noise levels may be less than predicted. This approach is generally used to test whether further analyses are warranted.

Detailed approach

The detailed approach involves analysing meteorological data to determine whether inversion and/or wind effects are significant features warranting assessment. Where assessment is warranted, default parameters are available for use in predicting noise or, where preferred, measured values may be used instead. The detailed approach gives a more accurate prediction of noise increases due to meteorological factors—as a tradeoff for the additional work involved.

The INP recommends that for weather data to be suitable for the purpose of a noise impact assessment it should be collected within a 30km radius of the subject site and in the same topographical basin.

2.1 Assessing Temperature Inversions

Temperature inversions, when they occur, have the ability to increase noise levels by focusing sound waves. Temperature inversions occur predominantly at night during the winter months. For a temperature inversion to be a significant characteristic of the area it needs to occur for approximately 30% of the total night-time during winter, or about two nights per week.

Meteorological data from the nearest weather station to the project site, if available, is analysed in determining the percentage occurrence of temperature inversions during winter nights. It is typical that data relating to the occurrence of temperature inversions is not available from the nearest weather station. In this case, default values for inversion strength and corresponding wind speed for the purpose of noise modelling are provided in the INP and are reproduced here:

Non-arid areas (annual average rainfall greater than 500 mm):

Moderate (F-class stability category) inversions

- *3 °C/100 m temperature inversion strength for all receivers, plus a 2 m/s source-to-receiver component drainage-flow wind speed for those receivers where applicable. (See below for applicability of drainage-flow wind.)*

Arid and semi-arid areas (annual average rainfall less than 500 mm):

Strong (G-class stability category) inversions

- *8°C/100 m temperature inversion strength for all receivers, plus a 1 m/s source-to receiver component drainage-flow wind speeds for those receivers where applicable. (See below for applicability of drainage-flow wind.)*

Applicability of drainage-flow wind

The drainage-flow wind default value should generally be applied where a development is at a higher altitude than a residential receiver, with no intervening higher ground (for example, hills). In these cases, both the specified wind and temperature inversion default values should be used in the noise assessment for receivers at the lower altitude.

Furthermore, the INP states: '*Temperature inversions occur during E, F and G stability categories. These three categories are considered to represent weak, moderate and strong inversions, respectively. For noise-assessment purposes, only moderate and strong inversions are considered significant enough to require assessment'*.

2.2 Assessing Wind effects

Wind has the potential to increase noise at a receiver when it is light and stable and blows from the direction of the source of the noise. As the strength of the wind increases the noise produced by the wind will obscure noise from most industrial and transport sources.

Wind effects need to be considered when wind is a feature of the area under consideration (in accordance with the INP). Where wind blows from the source to the receiver at speeds up to 3 m/s for 30% (or more) of the time in any assessment period (day, evening, night) in any season, then wind is considered to be a feature of the area and noise level predictions should be made under these conditions.

There are two ways to assess wind effects:

1. Use a wind rose to determine whether wind is a feature of the area based on the frequency occurrence and wind speed. Care should be taken to assess the source-to-receiver components of wind that are relevant.
2. Simply assume that wind is a feature of the area and apply a 'maximum impact' scenario.

A default wind speed of 3 m/s (at 10 m height) is proposed for assessing noise impacts. Where there is 30% or more occurrence of wind speeds below 3 m/s (source-to-receiver component), then use the highest wind speed (below 3 m/s) instead of the default.

3 Project Specific Approach

Wind data is readily available for the BoM AWS at Bankstown Airport (Station Number 066137) automatic weather station and has been recorded at this location for many years. Hence, the NVIA has used the 'detailed approach' in assessing winds and potential effects of temperature inversion relevant to the Project site.

Weather data was obtained from the BoM AWS at Bankstown Airport (Station Number 066137) automatic weather station for the period of five years of weather data (2010 to 2014).

Wind speed and direction data was analysed to determine the frequency of occurrence of winds up to speeds of 3 m/s for daytime, evening and night in each season. A summary of the most frequently occurring winds is contained within the NIA.

Meteorological data was available from the BoM AWS at Bankstown Airport (Station Number 066137) to allow the determination of the percentage occurrence of temperature inversions during winter nights. The most complete temperature inversion data was contained in the years 2010 to 2014.

Appendix D

Operational Noise Contour Plot

Equipment Description	Octave Band Centre Frequency (Hz) - dBA re 1pW									dBA	Lmax
	31.5	63	125	250	500	1k	2k	4k	8k	Overall	Overall
MRF operations											
Delivery/ pickup Trucks	71	79	87	90	95	98	96	92	85	102	113
MRF (Building 1)	40	50	64	73	78	79	78	75	66	85	98
Forklift diesel (1)	65	81	80	87	90	92	89	85	78	97	104
Forklift gas (1)	-	63	67	77	82	86	88	81	73	91	107
Frontend loader (1)	90	89	102	94	86	86	89	83	74	104	110
Roof Ventilation Fan (per fan)	-	61	71	74	78	84	83	79	64	88	94
PCR Operations											
Delivery/ pickup Trucks	71	79	87	90	95	98	96	92	85	102	113
PCR (Building 2)	40	50	64	73	78	79	78	75	66	85	98
Forklift diesel (1)	65	81	80	87	90	92	89	85	78	97	104
Forklift gas (1)	-	63	67	77	82	86	88	81	73	91	107
Frontend loader (1)	90	89	102	94	86	86	89	83	74	104	110
General Operations											
Carpark 1 & 2	-	46	58	50	55	55	55	53	47	63	98
Idling Delivery Trucks	54	62	70	73	78	81	79	75	68	85	113
Idling Pickup (outbound) Trucks	54	62	70	73	78	81	79	75	68	85	113

Appendix C Storm Consulting Flooding Assessment

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SUSTAINABLE WATER
STORMWATER & RUNOFF
STREAMS & WATERWAYS
CIVIL & INFRASTRUCTURE

9th September 2016

Sheelagh Laguna
Principal Consultant
MRA Consulting Group
Suite 409 Henry Lawson Building
19 Roseby Street, Drummoyne NSW 2047

Dear Sheelagh

RE: Flooding Assessment for 14-82 Madeline Street, South Strathfield

MRA Consulting have requested a fluvial flooding assessment for the site in support of Development Application (DA 2015/177) with Strathfield Council. The Application is for installation of a Materials Recovery Facility primarily within the existing buildings as well as renewal of the weighbridge and addition of external glass bunkers. The relevant flooding information is available in existing documents and therefore the assessment is more a literature review supported by a site inspection that was conducted on 7th September 2016.

The documents relied upon in this assessment are:

1. *Soil and Water Assessment* for MRA Consulting Group by SLR Consulting dated December 2015
2. *Cooks River Flood Study* for Sydney Water Corporation by MWH+PB (joint venture) dated February 2009

It should be noted that this assessment is limited to fluvial flooding and does not examine stormwater management within the property or emanating from neighbouring properties.

Development Description

The site is located in an industrial area adjacent Cooks River and is just upstream of the confluence with Coxs Creek (refer Figure 1). Both of these waterways are concrete lined in the vicinity of the site. Lot 1 is located to the north between the site and Cooks River and is currently under construction comprising primarily of 3 large buildings.

It is understood that the proposed development is primarily confined to the building internals. The proposed external works are the renewal of a weighbridge and addition of two glass bunkers all in the vicinity of Building 3 in the Southern part of the site on higher ground. There is also potential for inclusion of a fixed awning and a sound wall on the Eastern boundary pending further assessment by others.

The stormwater design drawings by Intelara (10293.01-C302) indicate that the building floor levels on the site are RL12.34 to RL13.2m AHD. The lowest ground level is approximately RL12.2m AHD.

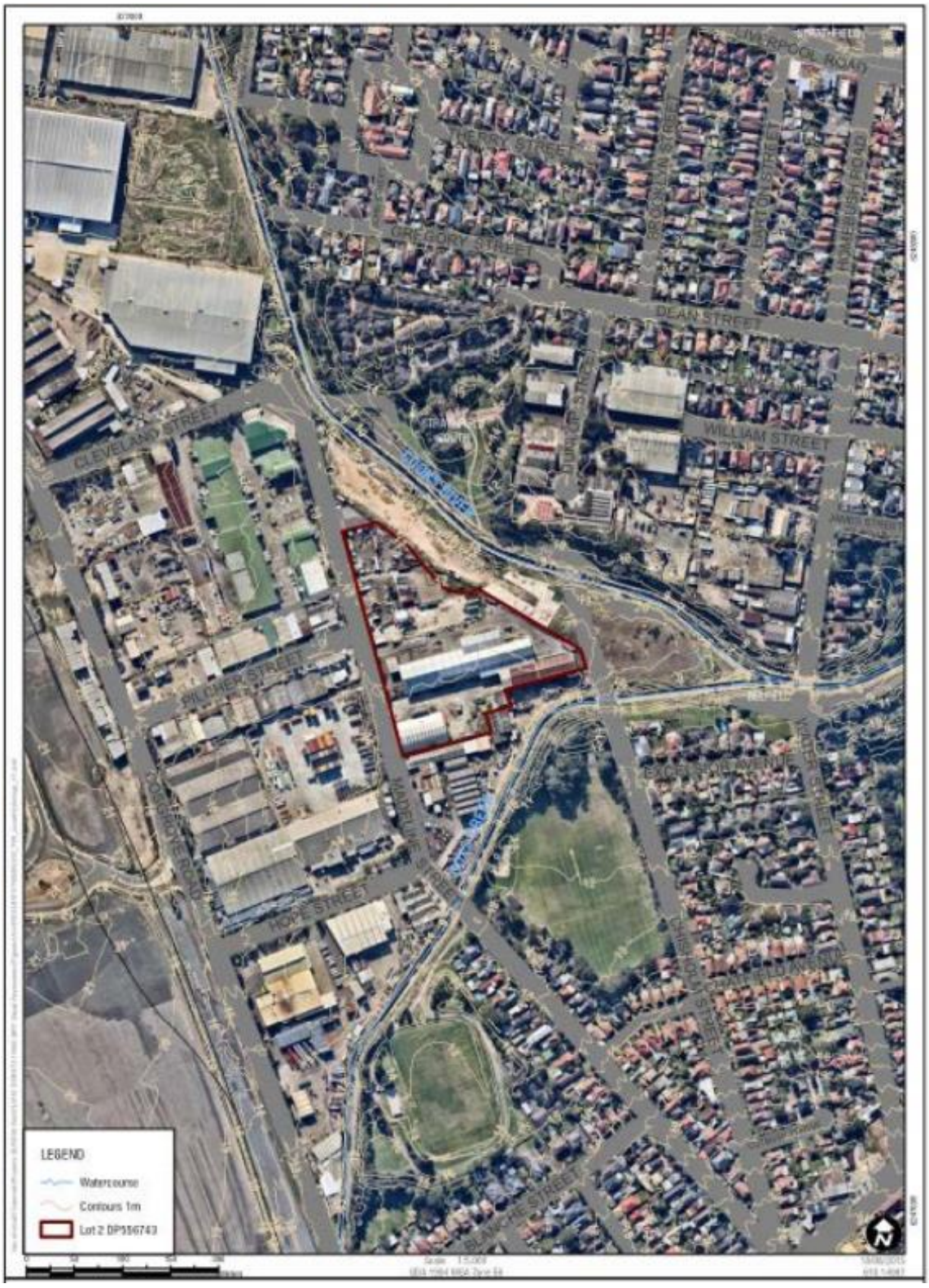


Figure 1 – Site location (extract from SLR report)

Review of Reports

In the first instance, the Soil and Water Assessment report prepared by SLR was reviewed. Section 2.7 and 4.3.2 of this report discusses the flooding risks to the site and draws primarily from the Cooks River Flood Study prepared by MWH+PB. In order to provide an independent assessment, this review focuses on the source document which is the Cooks River Flood Study (CRFS).

The CRFS study is undertaken in two primary parts; hydrology to determine the runoff volume and hydraulics to determine the flood heights.

The hydrological model adopted in the CRFS was the Watershed Bounded Network Model (WBNM) software program. Imperviousness adopted is typical for flooding modelling as well as the initial and continuing losses is the catchments.

Calibration was undertaken by comparison with other flood models for the Cooks River and known flooding events and subsequently described as a "semi-calibration". The key comparative model is the WMA study for Cooks River in 1994 where the increase in imperviousness and associated increase in peak flow rates and flow volumes are consistent with expectation and appear to be reasonable.

The climate change scenario considered increases in rainfall intensity by 10%, 20% and 30% in combination with sea level rise of 180mm (low), 550mm (medium) and 910mm (high). The site flooding would not be influenced by tide.

The hydraulic model adopted is TUFLOW which is a 2-dimensional hydraulic modelling software with both Coxs Creek and Cooks River channels in the vicinity of the site being modelling in 1-dimension. There was apparently some instability in the 2-dimensional modelling of Coxs Creek due to backwater from this confluence however the 1-dimensional modelling of Coxs Creek apparently resolved this.

Major blockages of openings less than 6m was not included in the modelling. This was justified on the basis of potential blocking elements being limited in the catchment combined with low channel grades. The argument has apparently been accepted by Sydney Water.

The CRFS is considered the best available study with appropriate conservatism to assess potential flooding on the site.

The modelling simulations relevant to this site are the fluvial 100 year ARI and the probable maximum flood (PMF) as well as the 100 year ARI with climate change of 20% increase in rainfall intensity.

A review of Council's website did not reveal any additional information on flooding in this area.

Flood Modelling Results

A floodmap extracted from the SLR report has been provided in Figure 2. It is understood that this map was provided by Council's Drainage Engineer and indicate that the 100 year ARI flood level is approximately 10.3m AHD. It is not known who undertook this study nor the date it was undertaken.

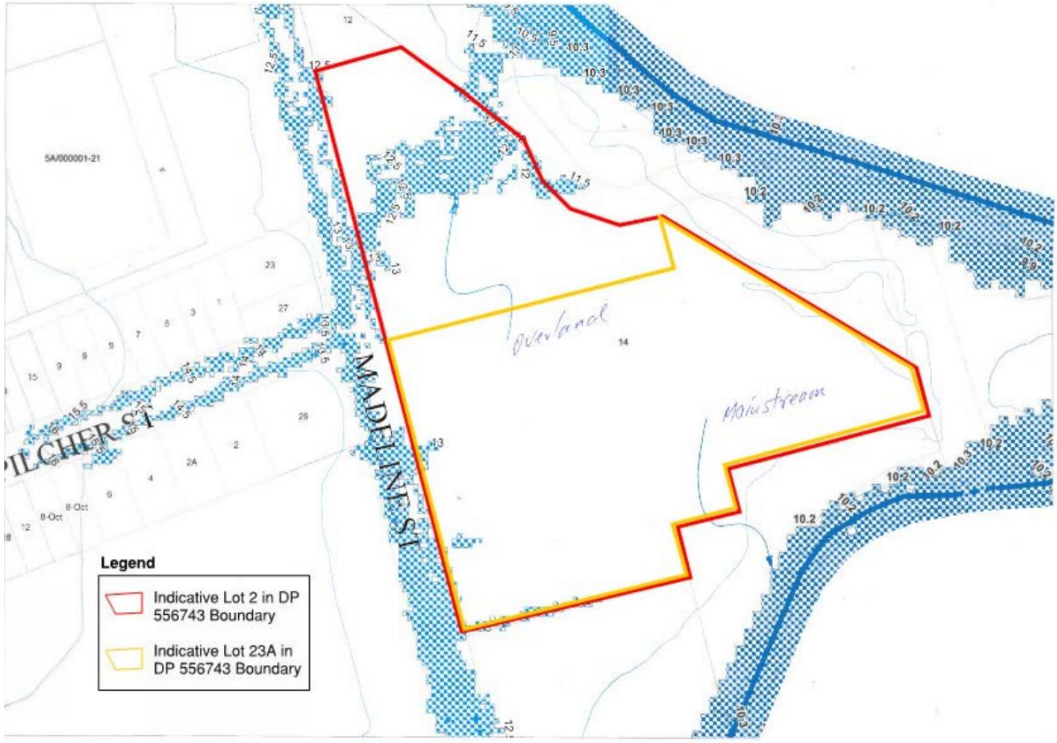


Figure 2 – Flooding from Council (estimated to be RL 10.3m AHD)

Extracts of the Cooks River Flood Study are provided in Figures 3, 4, 5 and 6 representing the 100 year ARI flood level, 100 year ARI including climate change and the PMF respectively. The Cooks River Flood Study appears to estimate the 100 year ARI flood to be almost 1m higher than the Council floodmap (Figure 2). Attempts were made to contact Council to gain an explanation however this was not successful.

Figure 3 – 100 year ARI (estimated to be RL 11.1m AHD)

The climate change scenario adopting 20% increase in rainfall intensity increases the flood levels for the 100 year ARI slightly and is estimated to be RL 11.4m AHD.

Figure 4 – 100 year ARI with Climate Change (RL 11.4m AHD)

The PMF is the only event that appears to inundate any of the property from riverine flooding with flooding levels estimated to be RL 12.9m AHD.

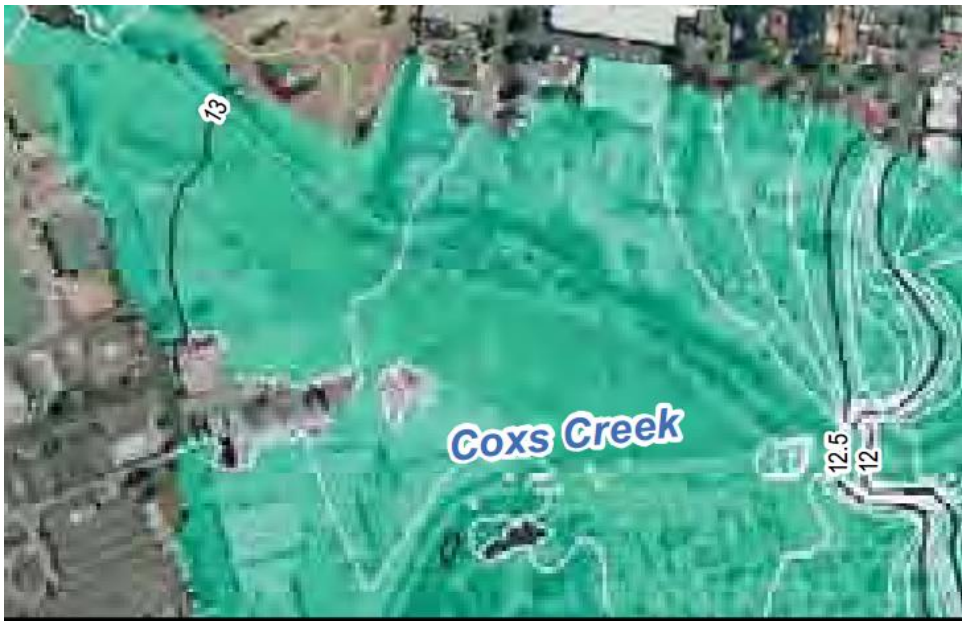


Figure 5 – PMF event (RL 12.9m AHD)

The longitudinal profile of the flooding scenarios allows for easy comparison.

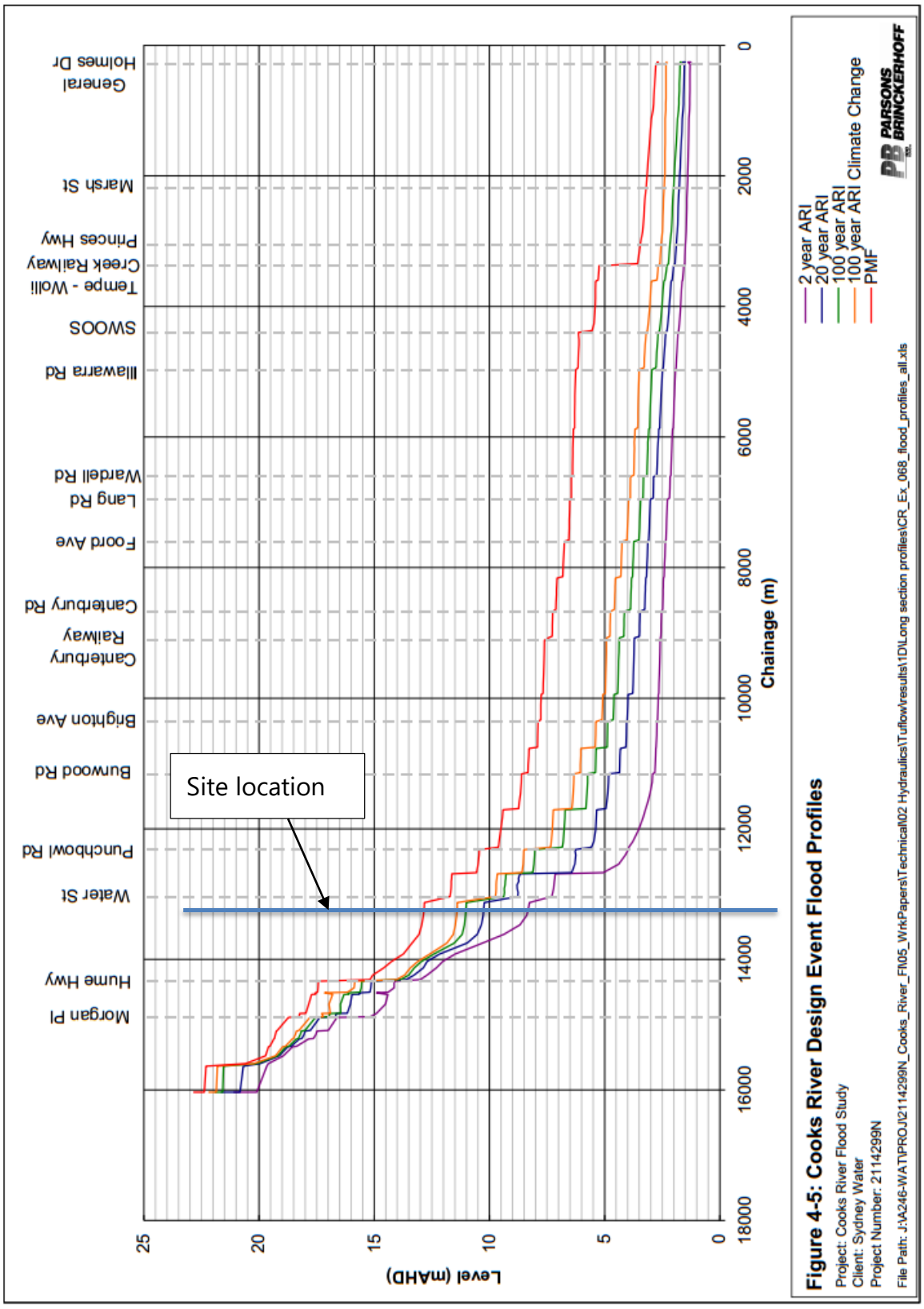


Figure 6 – Longitudinal elevation of flooding scenarios

Conclusion

The CRFS is considered the most appropriate report to assess the potential site flooding from Cooks River. It reports higher flooding levels than the flood map that was understood to be provided by Council will a difference of 0.8m.

The minimum floor level within the site buildings is RL 12.34m AHD. There is adequate freeboard for all scenarios except for the PMF. Approximately half the floors are inundated in the PMF with the depth of inundation ranging from 0.25m to 0.56m.

The site is prone to flooding in a PMF event but has adequate freeboard to the 100 year ARI flood level for industrial developments.

The freeboard for the various scenarios are provided in the Table 1 below.

Table 1: Summary of results

Scenario	Source	Freeboard to lowest floor
100 year ARI	Council Floodmap	2.04m
100 year ARI	Cooks River Flood Study	1.24m
100 year ARI + climate change	Cooks River Flood Study	0.94m
PMF	Cooks River Flood Study	-0.56m

Yours sincerely

Rod Wiese
Principal Engineer
Storm Consulting Pty Ltd

Appendix D Approximate Line of Sight from Bike Path to the Site

MRA Consulting Group

POLYTRADE

SITE AND ANNOTATIONS
SELECTED SITE FOR CONSIDERATION: SHEET 1 OF 1

LEGEND

- SITE BOUNDARIES
- BIKE PATH
- SIGHT PATH AREA
- NOISE ABATEMENT AND LINE OF SIGHT BARRIER

(Note: Annotations are indicative only. This map is representative of the general areas of sites and services)

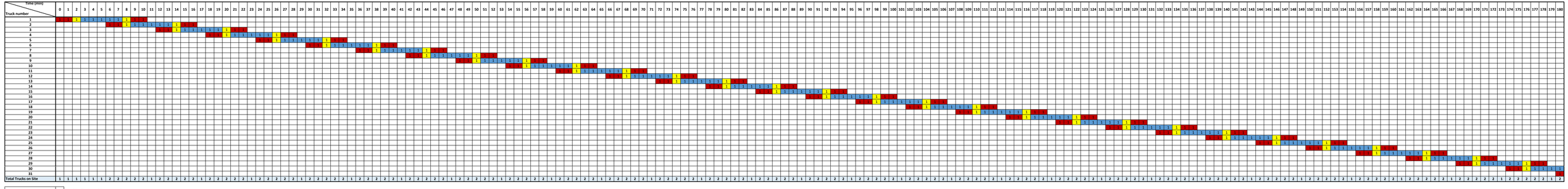
REV.	AUTHOR	DETAILS	DATE
0	NEARMAP	IMAGE	2016
1	MRA	SITE INPUT	09-09-2016
2	MRA	FEATURE REVISION	14-09-2016

14 SEPTEMBER 2016

0 20 40
metres (approx)

N W E S

Appendix E Modelled Traffic Movements



Key
Truck on weighbridge
Truck travelling on site
Truck waiting on site
Truck unloading

Max Trucks on Site 2

NORMAL OPERATIONS

Appendix F Schematic Representation of the MRF

OUR HOUSES

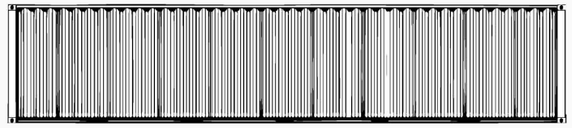
YELLOW LID
RECYCLING BIN

COUNCIL COLLECTION VEHICLE

ENTER
SITE

EXIT
SITE

WEIGHBRIDGE #1
Accept at MRF paperwork



CONTAINER LOADING OF
BALED PRODUCT

DISPATCH
TO LANDFILL

SKIP FOR
RESIDUAL WASTE

CONTAINERS
TEMPORARY
STORAGE

BALER

RTT
OPTICAL
SORT FOR
PLASTIC

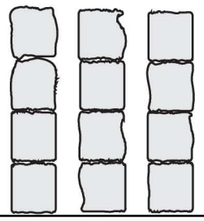
OVERBELT
MAGNET
STEEL

ALUMINIUM
EDDY
CURRENT

PAPER AND
CARDBOARD
TEMPORARY
STORAGE

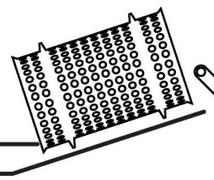
P&C
BALER

SHORT TERM
STORAGE OF
BALED P+C, AI,
STEEL, PLASTIC



GLASS SORTING
FACILITY

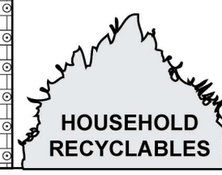
MAIN SEPARATION
TROMMEL

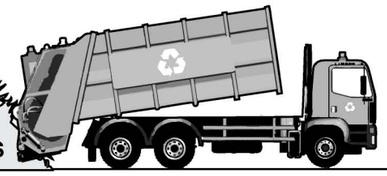


CONTAINER SORTING LINE

RECEIVAL AREA
Visual Inspection

Unload only
within
building





HOUSEHOLD
RECYCLABLES

BOUNDARY FENCE

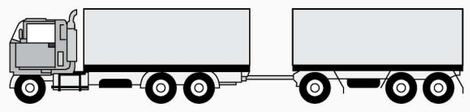
YARD

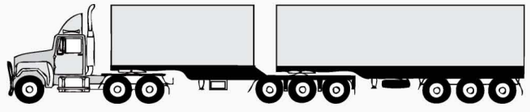
FULLY ENCLOSED GLASS BUNKERS

LOADER

EXIT
SITE

WEIGHBRIDGE #2





Glass ⟶ Truck and dog or B-double dispatch to market

MRA Consulting Group

MRF OPERATIONS

SCHEMATIC REPRESENTATION
DIAGRAM AND ANNOTATIONS: SHEET 1 OF 1

LEGEND

NONE

REV.	AUTHOR	DETAILS	DATE
0	MRA	DIAGRAM	02-09-2016

2 SEPTEMBER 2016

NO SCALE