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Resource Recovery Facility - Mortdale

20 Hearne Street, Mortdale

Noise and Vibration Impact Assessment

State Significant Application

Report Number 610.14692-R9

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Mortdale Recycling Pty Ltd

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1 INTRODUCTION

The site at 20 Hearne Street Mortdale is an existing waste storage and processing facility that accepts waste materials from domestic, municipal, commercial industrial and construction and demolition sources for the purpose of resource recovery.

The site is owned by Mortdale Recycling Pty Ltd and occupied by Hearne Street Pty Ltd. Currently the site accepts material from the above sources, which is delivered to site in skip and hook bins and in bulk in trucks.

The proponent wishes to increase the facility operating capacity from 30,000 tonnes per annum (tpa) to 300,000 tpa.

SLR Consulting Australia Pty Ltd (SLR) has been engaged by APP Corporation Pty Ltd (APP) on behalf of Mortdale Recycling Pty Ltd to prepare a Noise and Vibration Impact Assessment (NVIA) to accompany the EIS to be submitted to the Department of Planning and Environment for the proposed upgrades that include an increase in the processing capacity and building amendments. This NVIA also seeks to address relevant considerations contained in the State Significant Development (SSD 7421) Secretary's Environmental Assessment Requirements (SEARs) dated 16 December 2015.

This report presents the study methodology, assessment criteria, assessment of noise and vibration emissions and noise control recommendations in relation to the following specific areas of acoustic significance:

- Noise and vibration emission from vehicle movements on the premises
- Noise emission from vehicle movements on the surrounding roads
- Noise and vibration emission from operational processes on the premises
- Noise and vibration emission from the construction phases on surrounding receivers

A glossary of acoustic terminology used throughout this report is included as **Appendix A**.

2 PROJECT DESCRIPTION AND SURROUNDING ENVIRONMENT

2.1 Project Description

The facility currently operates under development approval issued by Hurstville City Council on 15 November 1990 (DA 250/90) and NSW Environment Protection Authority (EPA) Environment Protection Licence (EPL 20622) with anniversary date 5 January.

Approval is being sought to increase the processing capacity of the existing waste or resource management facility from 30,000 tonnes per annum to permit up to 300,000 tonnes per annum. The facility will continue to process general solid waste (non-putrescible), as described in with the Waste Classification Guidelines, 2014, prepared by the NSW EPA.

Approval is also sought for the following works on site:

- Demolition of existing structures and earthwork as detailed on the proposed demolition plan including:
  - The 1343 m^2 metal clad shed;
  - The truck wash bay;
  - The office and amenities building;
  - The concrete ramp;
  - Concrete pavement in poor condition;

  - Removal of the existing weigh bridge; and
  - Removal of existing landscaping and several trees across the site.
- Construction of new shed and awning with a combined area of 2,534 m^2 and a ridge height of 14 m from the existing ground level. The shed and awning will house all processing operations including:
  - A processing area containing the following equipment:
    - Volvo ECR145C Excavator;
    - Volvo EC140C Excavator with Magnet;
    - Volvo L110F Wheel Loader;
    - ASC Model 120 Diesel Industrial Sweeper;
    - Fuel Fix 30KL Self Bunded Tank;
    - Liebherr LH22M Hydraulic Excavator;
    - Komatsu 3.5 tonne Forklift Model: FD35AT-17; and
    - In line screening and processing plant incorporating finger screen, magnet, picking station, de-stoner and associated conveyors.
  - Loading, unloading and manoeuvring areas capable of accommodating up to a 15 m articulated vehicle; and
  - Six (6) Material Storage Bays.
- Installation of two new 12 m weighbridges;
- Provision of dedicated bin storage areas along the southwestern property boundary;
- Installation of a refuelling point and diesel fuel storage (28,000 litres) along the southwestern property boundary;
- Construction of an ancillary office building and staff amenities;
- Construction of concrete ramps and associated retaining walls;
- Reinstatement of landscaped areas; and
- Installation of pollution control equipment to mitigate stormwater and dust impacts.

The proposal will seek to utilise existing road infrastructure, other utility installations and will maintain the current site access arrangements and stormwater discharge point. Processing and handling of waste will be undertaken in a manner consistent with the current arrangements.

A Site Plan of the proposed Ground Floor of the facility is presented in **Appendix C**.

2.2 Surrounding Environment

The surroundings are characterised by a mix of industrial developments including factories, automotive servicing, parts, panel beaters and painters, printing facilities, hardware and general supplies, manufacturing and warehousing. The industrial nature of the surrounding developments means they would not be considered as sensitive in the way that an office, school or hospital would be, hence this report focusses on potential impacts at the nearest residential receivers. Notwithstanding, the noise emissions from the operation of the facility to the nearest commercial (eg childcare centre) and Industrial receivers are included in this assessment.

The nearest residential receivers are located 200 m to the southeast along Barry Street and 250 m to the east, on the opposite side of Boundary Road. Sixteen (16) discrete receptor locations were used in this study to assess the potential noise impacts of the site operations at sensitive receptor locations identified in the area surrounding the Project Site and were selected based on their close proximity to the Project Site. The nearest identified childcare centre (New Era Early Education, 38 Anderson Road) is located approximately 223 m to the south east of site and represented by Receiver 17. The nearest industrial receivers immediately to the south boundary of site (36-48 Barry Avenue and 22 Hearne Street) are represented by the Receiver 18.

These locations are presented in **Figure 1** and **Table 1**.

Figure 1 Project Setting and Assessment Locations

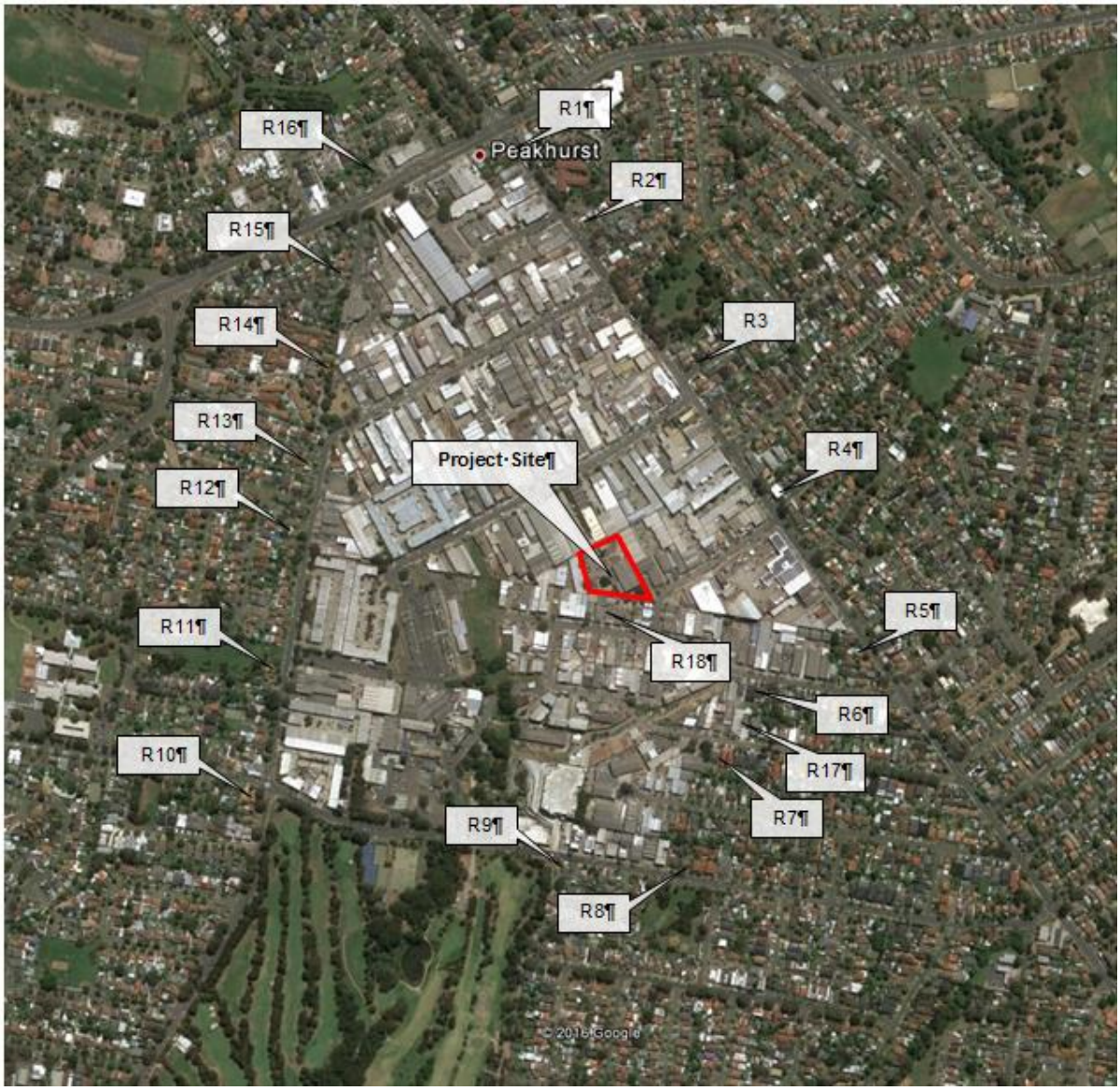


Image courtesy of Google Earth - Photographed approximately 29 November 2014.

The noise environment is dominated by neighbourhood noise (dogs, birds, etc), distant road traffic noise, and infrequent industrial noise (eg angle grinders, ratchet guns, etc).

Table 1 Sensitive Receiver Locations Used in this Assessment

Receiver	Address	Receiver Type
R1	147 Boundary Road	Residential
R2	164 Boundary Road	Residential
R3	128 Boundary Road	Residential
R4	106 Boundary Road	Residential
R5	55 Boundary Road	Residential
R6	27 Barry Avenue	Residential
R7	41 Anderson Avenue	Residential
R8	64 Roberts Avenue	Residential
R9	45 Roberts Avenue	Residential
R10	72 Lorraine Street	Residential
R11	46 Lorraine Street	Residential
R12	18 Lorraine Street	Residential
R13	27 Hannons Street	Residential
R14	12 Turpentine Avenue	Residential
R15	6 Pritchard Place	Residential
R16	824 Forest Road	Residential
R17	38 Anderson Road	Childcare Centre
R18	48 Barry Avenue	Industrial

3 BACKGROUND NOISE ENVIRONMENT

3.1 Unattended Noise Monitoring

In order to characterise the existing acoustical environment at the nearest sensitive receivers, unattended noise monitoring was conducted at Receiver R6 between Wednesday 11 February and Wednesday 18 February 2015 at the location shown in **Figure 1**.

Instrumentation for the survey comprised of one ARL EL-316 environmental noise logger (serial number 16-207-047) fitted with a microphone windshield. Calibration of the logger was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dBA. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

Charts presenting summaries of the measured daily noise data are attached in **Appendix B**. The charts present each 24 hour period by incorporating the L_{Amax}, L_{Aeq} and L_{A90} noise levels for the corresponding 15 minute periods.

The measured data has been filtered to remove periods affected during adverse weather conditions following consultation of weather reports recorded at the Bureau of Meteorology (BOM) Sydney Airport weather station. The filtered data is shown in **Appendix B**.

It was observed that several evening periods have been excluded from the monitoring data due to wind speeds over 5 m/s. To determine the effect of this on the parameters shown in **Table 3**, the data was reprocessed without any weather filtering. An insignificant 0.3 dB change was observed and it is therefore concluded that weather conditions during monitoring were suitable and data is considered acceptable.

3.1.1 INP Rating Background Level

The data obtained from the noise logging was processed in accordance with the procedures contained in the NSW *"Industrial Noise Policy"* (INP, January 2000) to establish Rating Background Level (RBL, background noise level) at the nearest sensitive receivers. The results of this analysis are presented in **Table 2**.

Table 2 Measured Ambient Noise Levels Corresponding to INP Assessment Time Periods

Daytime [1]		**Evening** [1]		**Night-time** [1]	
RBL [2]	**LAeq** [3]	**RBL**	**LAeq**	**RBL**	**LAeq**
42	57	38	55	34	54

Note 1: For Monday to Saturday, Daytime 7:00 am - 6:00 pm; Evening 6:00 pm - 10:00 pm; Night-time 10:00 pm - 7:00 am.
On Sundays and Public Holidays, Daytime 8:00 am - 6:00 pm; Evening 6:00 pm - 10:00 pm; Night-time 10:00 pm - 8:00 am.

Note 2: The RBL noise level is representative of the "average minimum background sound level" (in the absence of the source under consideration), or simply the background level.

Note 3: The L_{Aeq} is essentially the "average sound level". It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

3.2 Attended Noise Monitoring

In order to identify noise sources contributing to the ambient noise environment at the nearest sensitive receivers, operator attended noise measurements were conducted at Receivers R4 and R6 presented in **Figure 1**.

Instrumentation for the survey comprised a Larson Davis 831 sound level meter (serial number 0001028) fitted with a microphone windshield. Calibration of the sound level meter was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dBA. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

Measurements were conducted in accordance with AS 1055.1-1997: *"Acoustics - Description and measurement of environmental noise – General procedures".*

The result of the operator attended noise survey is presented in **Table 3**, together with a description of the contributed noise levels at the time of the measurement. The number of vehicle pass bys was also noted during measurements.

Table 3 Attended Noise Survey Results

Receiver Location	Date / Start Time	Primary Noise Descriptor			Typical Maximum Levels dBA and Vehicle Counts
		L_{Aeq}	L_{A1}	L_{A90}	
R6 - Barry Avenue	11/2/2015 12:12 pm 15 Minute Measurement	56	68	43	Aircraft: 60-64 Urban/Industrial hum: 42-45 Insects/cicadas: 40-42 Birds: 51-53 Car passby: 55-65 Truck passby: 60-70 Compressor: 55-57 Cars count: 13 Trucks count: 2
R4 - Corner of Boundary Road and Treloar Avenue	11/2/2015 12:32 pm 15 Minute Measurement	69	79	57	Car passbys: 60-66 Truck passbys: 70-80 Cicadas: 68-71 Breaks in traffic: 52-55 Cars count: 207 Trucks count: 31

4 NOISE CRITERIA

4.1 Onsite Operational Noise - NSW Industrial Noise Policy

Responsibility for the control of noise emissions in New South Wales is vested in Local Government and the NSW EPA.

The EPA oversees the INP which provides a framework and process for deriving noise criteria. The INP criteria for industrial noise sources have two components:

- Controlling the intrusive noise impacts for residents and other sensitive receivers in the short term; and
- Maintaining noise level amenity for particular land uses for residents and sensitive receivers in other land uses.

4.1.1 Intrusiveness Criterion

For assessing intrusiveness, the background noise generally needs to be measured. The intrusiveness criterion essentially means that the equivalent continuous noise level (L_{Aeq}) of the source should not be more than 5 dBA above the measured Rated Background Level (RBL), over any 15 minute period.

4.1.2 Amenity Criterion

The amenity criterion is based on land use and associated activities (and their sensitivity to noise emission). The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. The criteria relate only to other industrial-type noise sources 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 industrial-type noise sources, (including air-conditioning mechanical plant) need to be designed so that the cumulative effect does not produce total noise levels that would significantly exceed the criterion.

4.1.3 Amenity Area Classification

The INP, for the purposes of determining the appropriate noise amenity criteria, characterises an "Urban" noise environment as an acoustical environment that:

- Is dominated by "urban hum" or industrial source noise.
- Has through traffic with characteristically heavy and continuous traffic flows during peak periods.
- Is near commercial districts or industrial districts.
- Has any combination of the above.

Where "urban hum" means the aggregate sound of many unidentifiable, mostly traffic-related sound sources.

For the purposes of this assessment, the area surrounding the nearest sensitive receivers falls under the "Urban" area classification.

4.1.4 Sleep Disturbance

Intermittent noise, in particular those occurring over short durations, due to activities such as impacts or hydraulic brake releases are not directly addressed by the INP. A definitive noise level above which sleep disturbance is likely to occur has not been determined and research in the area is ongoing.

As a screening assessment, in order to minimise the risk of sleep disturbance resulting from these sources, the *INP Application Notes* recommend that the $L_{A1(60second)}$ noise level outside a bedroom window should not exceed the prevailing background L_{A90} noise level by more than 15 dBA during the 10:00 pm to 7:00 am night-time period.

Additionally, summary of research included in the EPA *"Road Noise Policy"* (RNP, March 2011) concludes that:

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

Corresponding external criteria of L_{Amax} 60-65 dBA and 75-80 dBA respectively result, if a 10 dBA loss through open windows is adopted (as suggested in the policy).

The wide discrepancy in sleep disturbance screening criteria (refer **Table 4**) reflects the uncertainty regarding definitive noise levels whereby sleep disturbance may occur. Nonetheless, this assessment considers the INP and RNP sleep disturbance screening criteria, as well as the frequency of exposure to the intermittent noise.

4.1.5 Project Specific Noise Criteria

Having defined the area type, the processed results of the unattended noise monitoring have been used to determine project specific noise criteria. The intrusive and amenity criteria for nearby residential premises and industrial boundaries are presented in **Table 4**. These criteria are nominated for the purpose of assessing potential noise impacts from the proposed development.

Despite being near an industrial area, the ambient noise environment measured at the logger location is not controlled by industrial noise sources (but rather distant traffic noise and neighbourhood noise) and therefore the amenity criteria are the recommended amenity criteria for residences in an urban area (ie the "ANL" or Acceptable Noise Level). For each assessment period, the lower (ie the more stringent) of the amenity or intrusive criteria are adopted. These are shown in bold text in **Table 4**.

It is understood that the project site will commence processing operations at 6 am Monday to Saturday, therefore it would be overly stringent to expect such operation to be assessed against the night-time criteria. In accordance with Section 3.3 of the INP, a morning shoulder period has been included as part of the assessment, the hours of which are detailed in **Table 4**.

For the purpose of this assessment, it is conservatively assumed that all buildings have openable windows. The internal noise levels are then assumed to be 10 dB lower than external noise levels when windows are open, and up to 25 dB lower than external noise levels with windows closed.

Table 4 Operational Noise Criteria for at Nearest Residential Receivers

Receiver	Time of Day	ANL [1] LAeq(period)	Measured RBL [2] LA90(15minute)	Measured LAeq(period) Noise Level)	Criteria for New Sources		
					Intrusive LAeq(15minute)	Amenity [3] LAeq(period)	Sleep Disturbance LAmax Screening Criteria
Residential	Morning Shoulder[5] Period (6am-7am)		39	55	**44**	45	INP 54 RNP 60-65[4] and 75-80[5]
	Day	60	42	57	**47**	57	-
	Evening	50	38	55	**43**	45	-
	Night	45	34	54	**39**	44	INP 49 RNP 60-65[4] and 75-80[5]
Childcare centre	When in use	Peak hour LAeq(1hour, internal) [7] 40	-	-		LAeq(1hour, external) [7] **65**	-
Industrial	When in use	Acceptable 70 Maximum 75	-	-	**-**	**70-75**	-

Note 1: ANL = "Acceptable Noise Level" for residences in Suburban areas, and acceptable and maximum noise level for industrial receivers in accordance with INP.

Note 2: RBL = "Rating Background Level".

Note 3: Assuming existing noise levels are unlikely to decrease in the future.

Note 4: Unlikely to awaken people.

Note 5: One or two noise events per night are not likely to affect health and wellbeing significantly.

Note 6: Shoulder period defined as per Section 3.3 of the INP ie 6.00 am to 7.00 am.

Note 7: The internal criterion for school classrooms has been adopted for the childcare centre. The internal ANL has been set to $L_{Aeq(1hour,internal)}$ 40 dBA as determined that the premises is currently affected by noise from existing industrial noise sources. Accordingly, it is appropriate to adopt an **external** L_{Aeq} noise criterion of 65 dBA based on the assumption that windows would be closed.

4.2 Offsite Vehicle Noise - NSW Road Noise Policy

The NSW RNP was released by the (now) EPA to replace the *"Environmental Criteria for Road Traffic Noise"* (ECRTN) from 1 July 2011. The key provisions of the new policy are an emphasis on the use of land use planning, better road design and vehicle noise emission control to avoid or minimise road traffic noise impacts. The assessment criteria for residences potentially affected by additional traffic generated by land use developments on local roads are summarised in **Table 5**.

Table 5 NSW RNP Road Traffic Noise Assessment Criteria for Residences

Road category	Type of project/land use	Assessment criteria[1]	
		Day (7:00 am to 10:00 pm)	**Night (10:00 pm to 7:00 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(15hour) 60 dBA	LAeq(9hour) 55 dBA
Local Roads	Existing residences affected by **additional traffic** on existing local roads generated by land use developments	LAeq(1hour) 55 dBA	LAeq(1hour) 50 dBA

Note 1: The criteria are for assessment against façade-corrected noise levels when measured at 1 m in front of a building facade.

In relation to the noise criteria in **Table 5**, the RNP notes that an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person. Where existing residences and other sensitive land uses are potentially affected by additional traffic on existing roads due to land use developments, any increase in the total traffic noise level should be limited to 2 dB above the corresponding 'no build option'.

4.3 Vibration - Human Comfort

The EPA's *Assessing Vibration: a technical guideline* provides guideline values for continuous, transient and intermittent events that are based on a Vibration Dose Value (VDV) rather than a continuous vibration level. The VDV is dependent upon the level and duration of the short-term vibration event, as well as the number of events occurring during the daytime or night-time period.

The recommended VDVs for vibration of an intermittent nature (eg construction works where more than three distinct vibration events occur) are presented in **Figure 2**.

Figure 2 Acceptable Vibration Dose Values for Intermittent Vibration (m/s$^{1.75}$) (EPA *Assessing Vibration: a technical guideline)*

Location	Daytime[1]		Night-time[1]	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas[2]	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

1 Daytime is 7.00 am to 10.00 pm and night-time is 10.00 pm to 7.00 am.
2 Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous or impulsive criteria for critical areas.
Source: BS 6472–1992

5 NOISE ASSESSMENT

5.1 Noise Model

In order to predict noise levels associated with the Project at noise sensitive receivers, a SoundPLAN computer model was developed for the facility. SoundPLAN is a software package which enables compilation of a sophisticated computer model comprising a digitised ground map (containing ground contours and significant structures, where appropriate), the location and acoustic power levels of significant noise sources, and the location of sensitive receptors.

5.1.1 Operational Noise Standard

The Conservation of Clean Air and Water Europe (CONCAWE) prediction methodology was utilised within SoundPLAN. This prediction method was specially designed for large industrial facilities and incorporates the influence of wind and the stability of the atmosphere on the propagation of noise.

5.1.2 Modelling Inputs

The computer model generates noise emission levels taking into account such factors as the source sound power levels, distance attenuation, ground absorption, air absorption and shielding attenuation, as well as meteorological conditions.

The proposed project site land and surrounds is essentially flat and has been modelled as such. All ground was modelled as "hard ground" that mostly reflects noise. Significant man-made structures such as the industrial sheds on site were incorporated into the noise model.

5.1.3 Plant and Equipment Sound Power Levels

From previous studies of noise emissions from similar facilities as well as site specific measurements, the major noise sources associated with the facility are shown in **Table 6**, together with their relevant maximum L_{Aeq} sound power levels (calculated from measured sound pressure levels).

Table 6 Plant and Equipment Noise Levels

Noise Source or Activity	Sound Power Level, dBA (per item)		Equipment Operating Times			
	L_{Aeq}	L_{Amax}	Morning Shoulder 6am -7am	Daytime 7am-6pm	Evening 6pm-10pm	Night-time 10pm-6am
Loaded Finger and Finlay Screen	112[1]	123[1]	Yes	Yes	Yes	No
Volvo ECR145C Excavator	103	110	Yes	Yes	Yes	No
Volvo EC140C Excavator	103	110	No	Yes	No	No
Volvo L110F Wheel Loader	108	115	No	Yes	No	No
Liebherr LH22M Excavator	99	102	No	Yes	No	No
Komatsu 3.5 tonne Forklift	101	106	No	Yes	No	No
Trucks idling	100	103	Yes	Yes	No	No
Round trip truck entry, dump and exit	108	111	Yes	Yes	Yes	Yes

Note 1: The Finger and Finlay Screen will be wholly located within the shed.

5.1.4 Operational Scenarios

The facility operates on the following trading hours:

- Monday to Friday - Site opens at 5:30am and trucks leave site from 6:00am. Processing plant commences at 6:00am and is finished by 10:00pm. Heavy vehicle access is to occur 24 hours per day, however, heavy vehicles will access the facility via Boundary Road and Hearne Street and avoid using Barry Avenue during night-time period. It has been predicted that the bulk of heavy vehicle movements are to occur between 11.30am to 12.30pm.
- Saturdays - As per Monday to Friday.
- Sundays and Public Holidays - No trade.

The operational scenarios incorporated into the noise model to reflect the above operations are discussed in **Table 7**.

Table 7 Operational Scenarios over a 24 Hour Period

INP Assessment Time Period	Operational Characteristics
Morning Shoulder Period (6:00 am to 7:00 am)	Processing and sorting of waste only • Finger Screen operational • Waste processing vehicles[1] fully operational • Trucks dropping off / picking up waste
Daytime (7:00 am to 6:00 pm)	Busiest operational period • Finger Screen operational • Waste processing vehicles[1] fully operational • Trucks dropping off / picking up waste • Up to four trucks waiting in hardstand area
Evening (6:00 pm to 10:00 pm)	• Finger Screen operational • Trucks entering site, loading and unloading within the site area
Night-time (10:00pm to 6:00 am)	• Trucks entering site, loading and unloading within the site area

Note 1: Skidsteer, front end loaders, excavators + grabber attachment.

In the order for the facility to be able to operate in compliance with the project specific noise criteria the following noise mitigation and management measures have been including in this assessment:

- The building layout and orientation is such that building openings will not direct noise towards sensitive receivers.
- 175 mm concrete reinforced tilt panel construction of wall on east, south and western facades.
- Heavy vehicles access the facility via Boundary Road and Hearne Street and avoid using Barry Avenue.

5.2 Predicted Operational Noise Levels

A summary of the predicted operational noise levels is shown in **Table 8**. The predicted noise levels are based on relevant noise sources presented in **Table 7** and include modifications to the finger screen shed discussed in **Section 5.3.3**.

Table 8 Predicted Operational Noise Levels (dBA)

Receiver	Morning Shoulder	Day	Evening	Night	Sleep Disturbance	
					Night	Morning Shoulder
	LAeq	LAeq	LAeq	LAeq	LAmax	LAmax
R1	30	36	34	16	32	36
R2	32	40	38	31	34	38
R3	38	46	41	26	38	44
R4	39	45	42	27	39	45
R5	36	42	40	36	39	41
R6	41	46	43	35	41	47
R7	39	45	42	32	40	45
R8	37	43	40	28	36	43
R9	33	39	38	25	35	39
R10	27	33	31	10	28	33
R11	40	45	41	21	38	46
R12	34	40	38	21	36	40
R13	32	38	36	19	33	38

Receiver	Morning Shoulder	Day	Evening	Night	Sleep Disturbance	
					Night	Morning Shoulder
	LAeq	LAeq	LAeq	LAeq	LAmax	LAmax
R14	30	36	34	28	31	36
R15	28	34	31	26	29	34
R16	24	30	28	23	23	30
R17	41	46	42	N/A	N/A	N/A
R18	59	64	53	N/A	N/A	N/A

From the predicted noise levels shown in **Table 8**, the facility operations would comply with project specific noise criteria presented in **Table 4**.

5.3 Operational Vibration

Precise details of the mechanical plant selection are unknown at this stage, as this will take place during the detailed design stage of the project.

The external vibration emissions and location of vibration generating plant and activities should be controlled so that the operation does not adversely impact upon neighbouring receivers and occupants within the proposed development. The criteria for vibration emissions from mechanical plant and equipment are nominated in **Section 4.3**. Detailed assessment and verification of vibration emissions would be carried out prior to construction in accordance with the SKALA Detailed Design Vibration Emission Considerations presented in **Appendix D**.

Notwithstanding the proposed Project Site layout has been reviewed and vibration control recommendations are presented below. Further, vibration measurements of the proposed plant were measured at another site and the findings are included in this assessment.

5.3.1 Truck unloading

All loading and unloading of truck activities are to be carried out within the processing shed or under the awning. Heavy products, i.e. concrete waste are accepted within the facility and may pose a concern to adjacent tenants regarding vibratory impacts if dropped from a height onto paved areas. It is recommended that the loading and unloading of heavy materials are addressed within the Operational Environmental Management Plan (OEMP) with protocols to ensure that such products are handled through the use of appropriate plant to minimise vibration.

5.3.2 Speed Humps

It has been noted that within the Project Site, the three (3) existing speed humps near the entry towards the weighbridge on the southern boundary are to be removed. Speed humps would cause undue vibration and additional noise associated with metal to metal contact. Speed humps will therefore be removed and replaced with posted speed limit signs along the driveway and entry of the development.

5.3.3 Finger Screen

The Finger Screen located within the enclosed shed has been identified as the primary potential source of vibratory concern. It should be noted that the Finger Screen will impose static and dynamic loads during operation and operate at frequencies between 6-13Hz. It is therefore essential that the finger screen isolation and foundation of the slab are designed by a structural dynamics engineer to account for the dynamic and static loads as per the SKALA Detailed Design Vibration Emission Considerations presented in **Appendix D**.

SLR undertook a broad spectrum (1Hz to 20kHz) noise and vibration survey of finger and finlay screen currently in operation at a similar facility in Auburn, which is the same design proposed to be installed at the Mortdale facility. The survey found the screen to be operating in the dominant third octave band of 6.3Hz with overall rms (root mean square) vibration levels of 0.09 mm/s and 0.01 m/s^2 measured at 5 m. The corresponding vibration dose being 0.17 $m/s^{1.75}$, which is significantly lower than the preferred vibration dose value of 0.8 $m/s^{1.75}$ for workshops associated with the neighbouring properties.

Consequently, there will be no vibration impact to the surrounding industrial developments from the Project operation, particularly the from the trucks and finger screen.

5.4 Construction Noise

The proposed project site is approximately 200 m form nearest residential receptors. To represent the temporary impacts from the transient construction works, the range in predicted noise levels represents potential noise levels for works undertaken at the nearest work locations from the receivers.

Where construction works are predicted to exceed the noise management level (NML), the investigation and implementation of feasible and reasonable construction noise management and mitigation measures would be required.

Predicted noise levels do not trigger the 51 dBA $L_{Aeq(15minute)}$ NML for residential premises at the nearest residential receivers and land uses. Notwithstanding, any noise mitigation measures implemented to control noise at adjacent residences will have a reciprocal benefit to reducing noise levels at commercial premises.

Table 9 Predicted Construction Equipment

Activity	Plant/Equipment Item	Number of items per 15 minute
Construction	Elevated Working Platform	1
	Hand Tools	1
	Grinder	1
	Circular Saw	1
	Truck (10 tonne)	1
	Dozer	1
	Bobcat	1
	Excavator (20 tonne)	1
	Front End Loader (FEL) 962	2
	Tipper Truck	4
	Franna Crane	2
	Concrete Truck / Agitator	1
	Water Tanker (8000 litre)	2

5.5 Off-site Heavy Vehicle Noise Emission

Heavy vehicles accessing the site would travel via Boundary Road and Hearne Street. Heavy vehicles would be restricted from travelling along Barry Avenue.

The existing traffic flows on Boundary Road are presented in **Table 10**, along with the Project-generated traffic flows. For the purposes of this noise impact assessment, the peak hour traffic flow for morning and afternoon are shown, together with the relative percentage increase associated with the Project traffic.

Table 10 Weekly Average Traffic Flow on Boundary Road[1,6]

Road	Period	Existing[2,3]			Project-generated (Proposed)[1,2]			Cumulative			Increase due to Project		
		LV	HV	Total	LV	HV	Total	LV	HV	Total	LV	HV	Total
Boundary Road	Daytime[4]	14075	921	14996	12	774	786	14087	1695	15782	0%	84%	5%
	Night-time[5]	1792	140	1932	12	86	98	1804	226	2030	1%	61%	5%

Note 1: Traffic flows are for two way traffic movements. To determine the number of vehicles accessing the Project Site divide Project-generated (Proposed) flow by 2.

Note 2: Existing and proposed traffic flows based on information presented in The Transport Planning Partnership Pty Ltd letter *Response to Submissions Letter - Traffic/Vehicle Movements* dated 18 November 2016 (TTPP Letter).

Note 3: Existing traffic flow is based on the traffic count survey conducted on 19 September 2016 presented in TTPP Letter.

Note 4: Average 7 day traffic flow for daytime period (7am to 10pm) from the traffic count survey conducted on 19 September 2016 presented in TTPP Letter. Divide by 15 to get average hourly daytime period traffic flow.

Note 5: Average 7 day traffic flow for night-time period (10pm to 7am) from the traffic count survey conducted on 19 September 2016 presented in TTPP Letter. Divide by 9 to get average hourly night-time period traffic flow.

Note 6: LV – number of light vehicles. HV – Number of heavy vehicles.

The relevant criteria for residents on Boundary Road are the $L_{Aeq(15hour)}$ and $L_{Aeq(9hour)}$ criteria in **Table 5**.

The maximum 84% and 5% increase in heavy vehicle and total traffic flows, respectively, due to the Project related vehicles on Boundary Road would result in less than a 2 dBA increase in the existing traffic noise levels. Specifically, the traffic noise levels would increase by 1.5 dBA and 1.3 dBA during the daytime and night-time periods, respectively. As discussed in **Section 4.2** the noise increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person. Where existing residences and other sensitive land uses are potentially affected by additional traffic on existing roads due to land use developments, any increase in the total traffic noise level should be limited to 2 dB above the corresponding 'no build option'.

Accordingly, no Project related traffic noise impacts are anticipated at residential receivers adjacent to the surrounding road network, including Boundary Road and Barry Avenue.

5.6 On-site Vehicle Heavy Vehicle Noise Emission

Night-time noise emissions from truck activities within the Project Site have been have been included in the onsite operational noise assessment presented in **Section 5.2**.

6 SUMMARY OF MITIGATION MEASURES

In the order for the facility to be able to operate in compliance with the project specific noise criteria the following noise mitigation and management measures were including in this assessment:

- The proposed building layout is such that the location of openings to the building will not direct noise generated from plant towards sensitive receivers.
- 175 mm concrete reinforced tilt panel construction of wall on east, south and western facades.
- Heavy vehicles access the facility via Boundary Road and Hearne Street and avoid using Barry Avenue.

7 RECOMMENDATIONS

As discussed in **Section 5**, the facility will be able to operate in compliance with the project specific noise criteria based on the following recommendations:

- Heavy vehicles shall access the facility via Boundary Road and Hearne Street and shall avoid using Barry Avenue.

- Construction works are to be restricted to 7:00 am to 6:00 pm Monday to Friday and 8:00 am to 1:00 pm Saturdays.
- Speed humps are to be removed and replaced with posted speed limit signs.

8 CONCLUSION

SLR Consulting Australia Pty Ltd has conducted an assessment of the noise and vibration impacts associated with the proposed upgrade to the existing waste transfer facility at 20 Hearne Street, Mortdale. This assessment has been carried out in accordance with NSW regulatory requirements and will form part of the State Significant Development (SSD 7421) application to the NSW Department of Planning and Environment in support of the development. Once the SSD approval has been granted, an application will be made to the Environment Protection Authority to vary the Environment Protection Licence (EPL 20622) to reflect the changes to the approved project.

The scope of the assessment involved a survey of the existing noise environment; derivation and establishment of project specific noise and vibration criteria; a noise and vibration impact assessment relative to appropriate criteria; and, where required, recommendations for noise and vibration control measures.

The assessment has demonstrated that the site will be able to operate at a rate of 300,000 tonnes per annum in an acoustically compliant manner with the operational procedures recommended in **Section 6** and **Section 7**.

ACOUSTIC TERMINOLOGY

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 LP are commonly used to represent Sound Pressure Level. The symbol LA 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(lin) or dB.

3 Sound Power Level

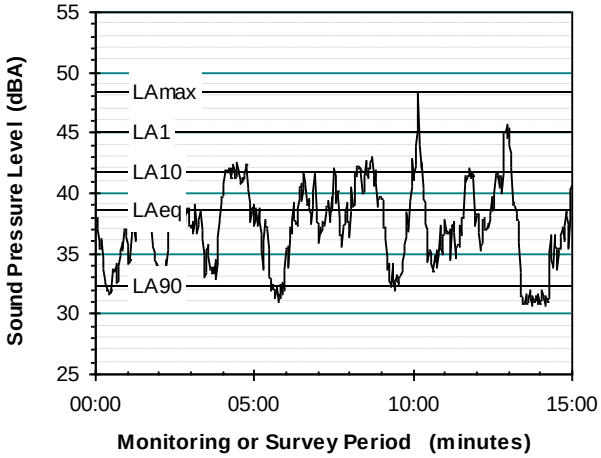
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 1E-12 W.

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 LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating the statistical indices.



Of particular relevance, are:

LA1 The noise level exceeded for 1% of the 15 minute interval.

LA10 The noise level exceed for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

LA90 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.

LAeq Is the A-weighted equivalent continuous 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" LA90 noise level over the daytime and night-time measurement periods, as required by the DECCW. In addition the method produces mean or "average" levels representative of the other descriptors (LAeq, LA10 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

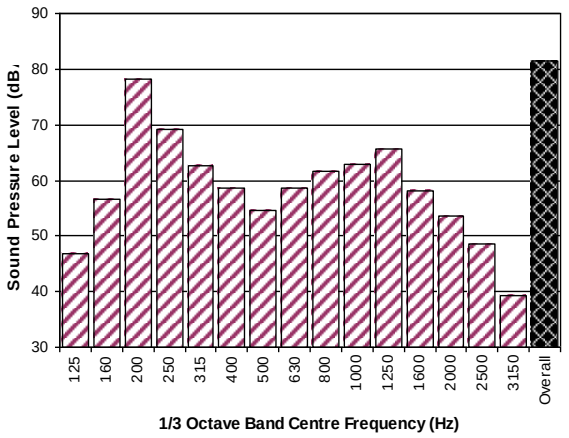
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers.

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 incorporate “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/Vo), where Vo is the reference level (1E-6 mm/s). Care is required in this regard, as other reference levels are used by some organisations.

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 Overpressure

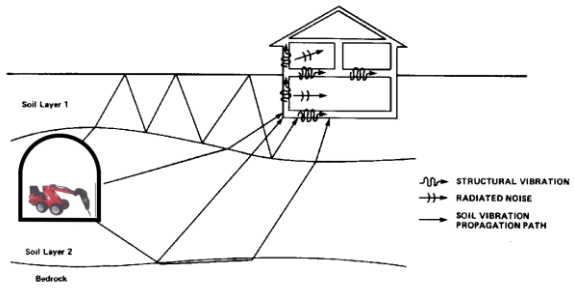
The term “over-pressure” is used to describe the air pressure pulse emitted during blasting or similar events. The peak level of an event is normally measured using a microphone in the same manner as linear noise (ie unweighted), at frequencies both in and below the audible range.

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.

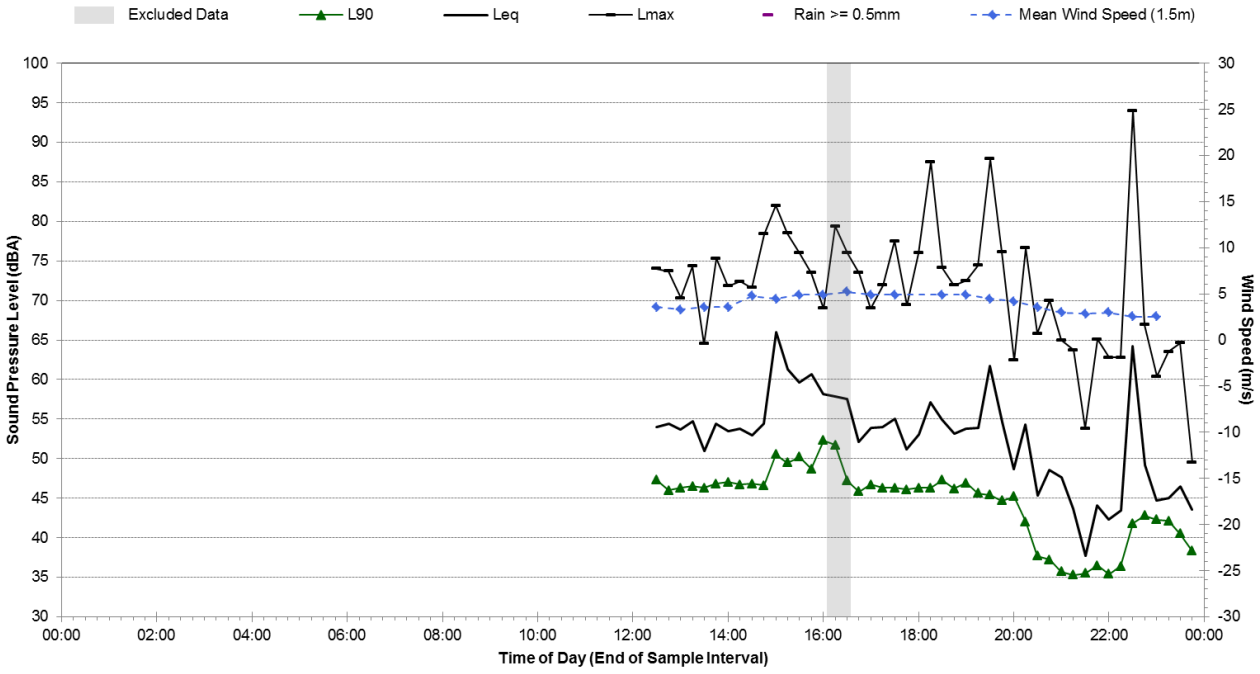


The term “regenerated noise” is also used to describe other types of noise that are emitted from the primary source as a different form of energy. One example would be a fan with a silencer, where the fan is the energy source and primary noise source. The silencer may effectively reduce the fan noise, 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.

DAILY NOISE MONITORING GRAPHS

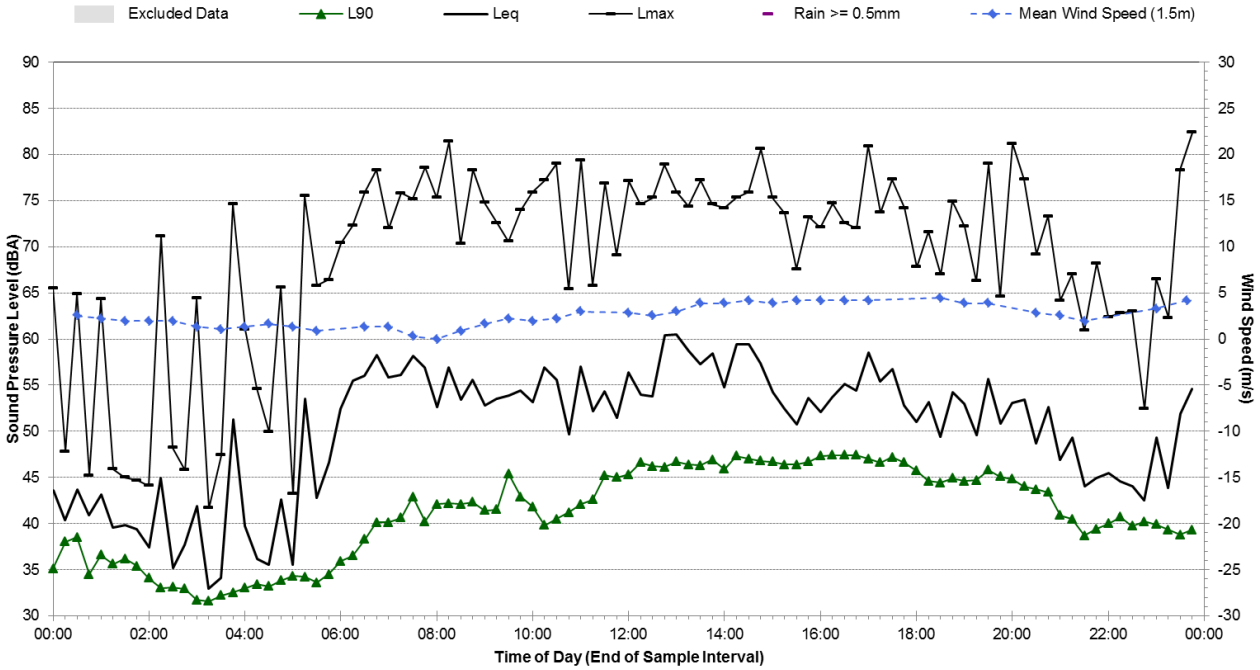
Statistical Ambient Noise Levels

Mortdale Waste Transfer Facility - Wednesday, 11 February 2015



Statistical Ambient Noise Levels

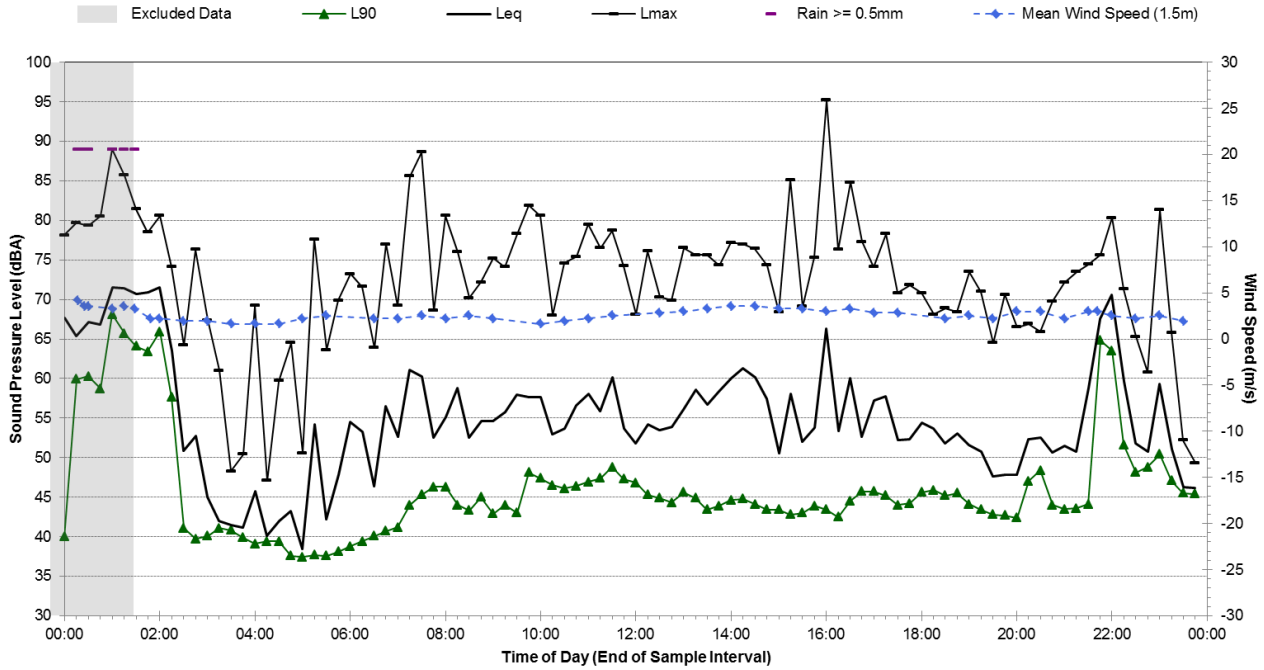
Mortdale Waste Transfer Facility - Thursday, 12 February 2015



DAILY NOISE MONITORING GRAPHS

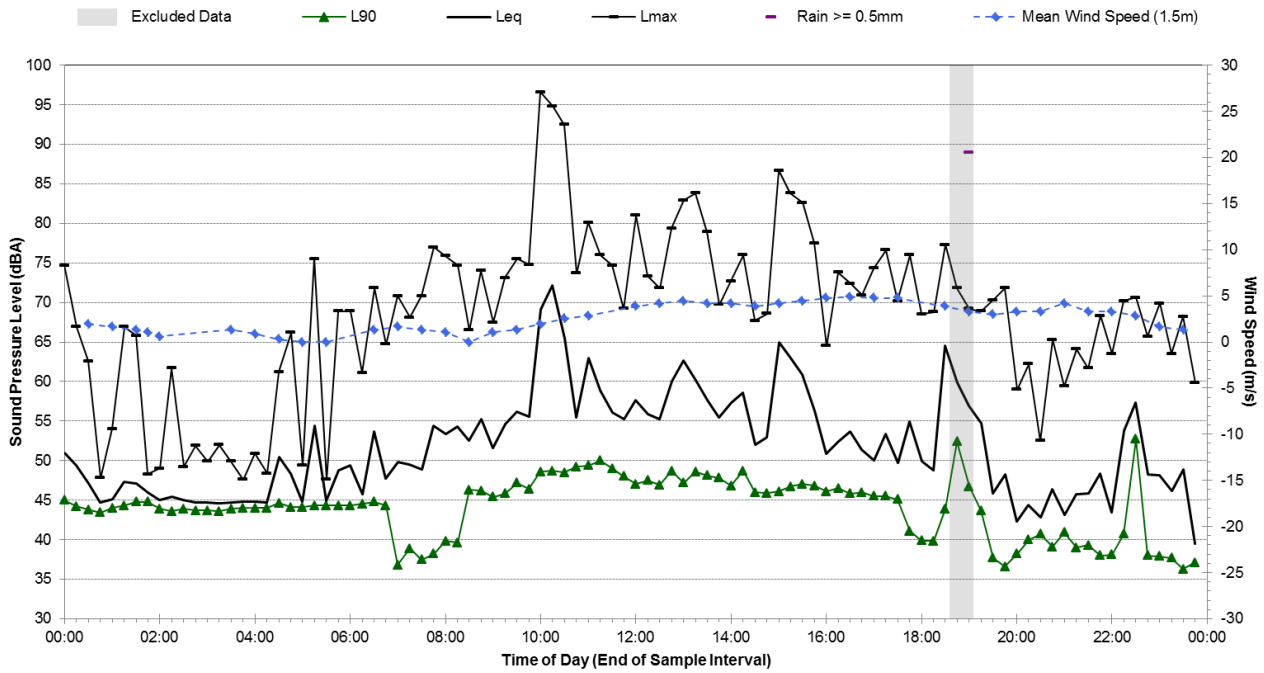
Statistical Ambient Noise Levels

Mortdale Waste Transfer Facility - Friday, 13 February 2015



Statistical Ambient Noise Levels

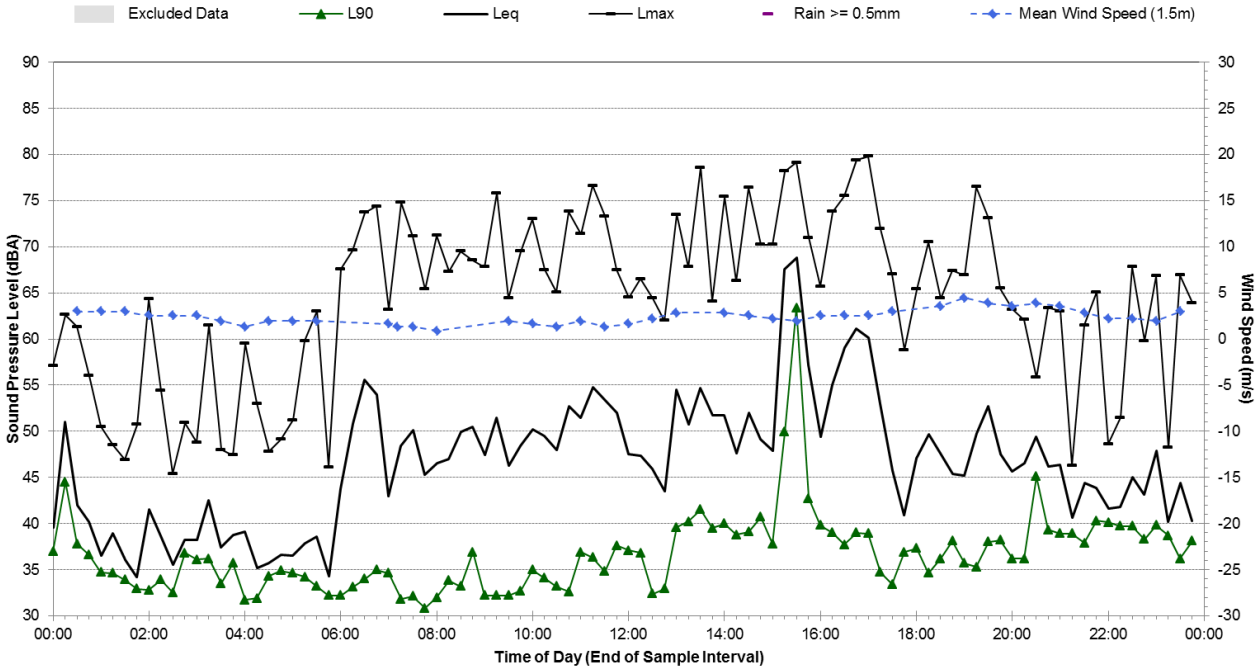
Mortdale Waste Transfer Facility - Saturday, 14 February 2015



DAILY NOISE MONITORING GRAPHS

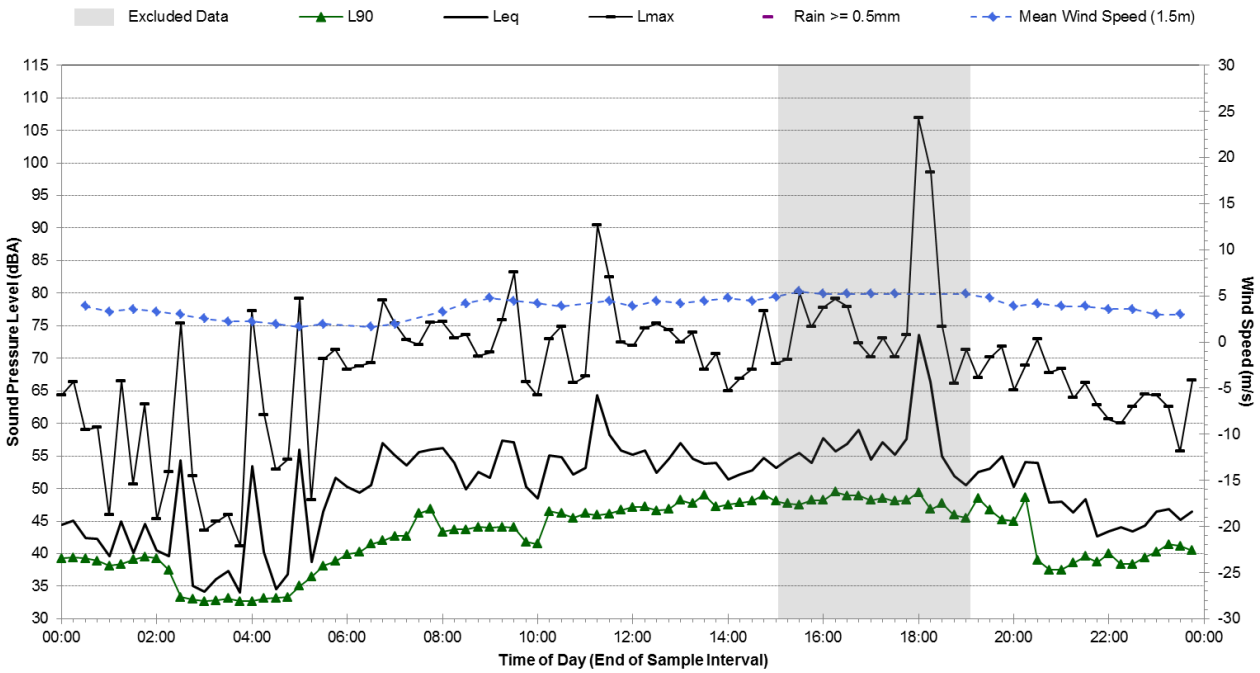
Statistical Ambient Noise Levels

Mortdale Waste Transfer Facility - Sunday, 15 February 2015



Statistical Ambient Noise Levels

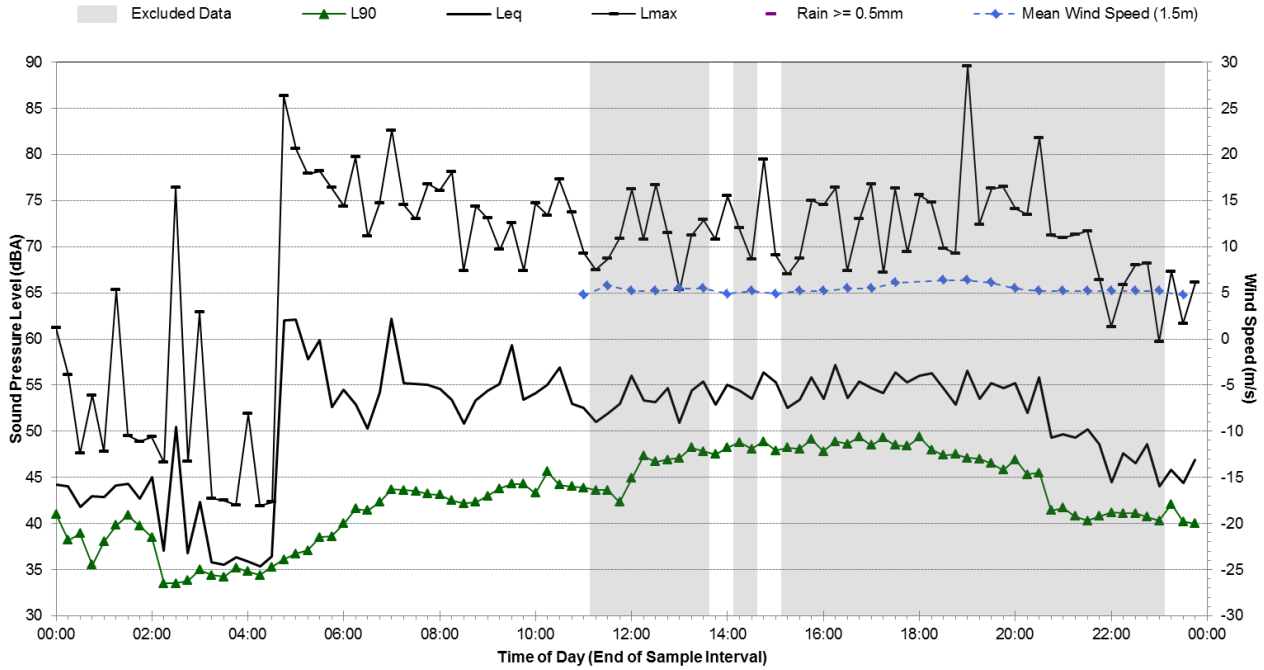
Mortdale Waste Transfer Facility - Monday, 16 February 2015



DAILY NOISE MONITORING GRAPHS

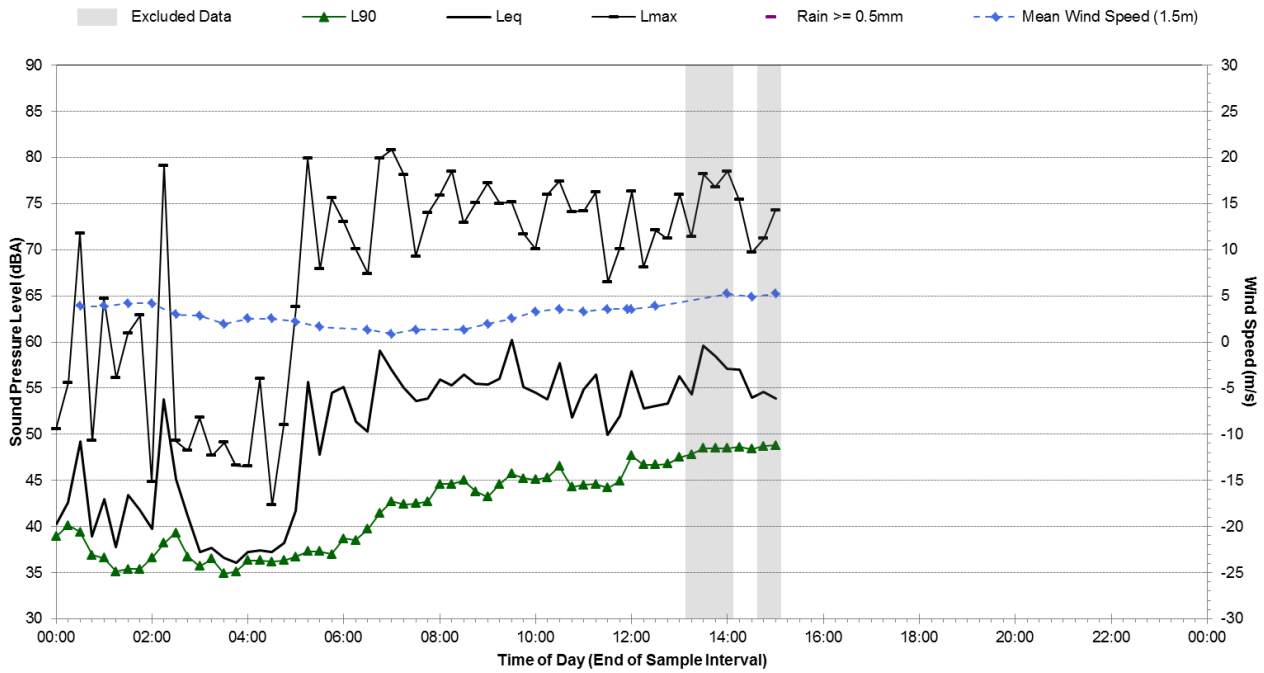
Statistical Ambient Noise Levels

Mortdale Waste Transfer Facility - Tuesday, 17 February 2015

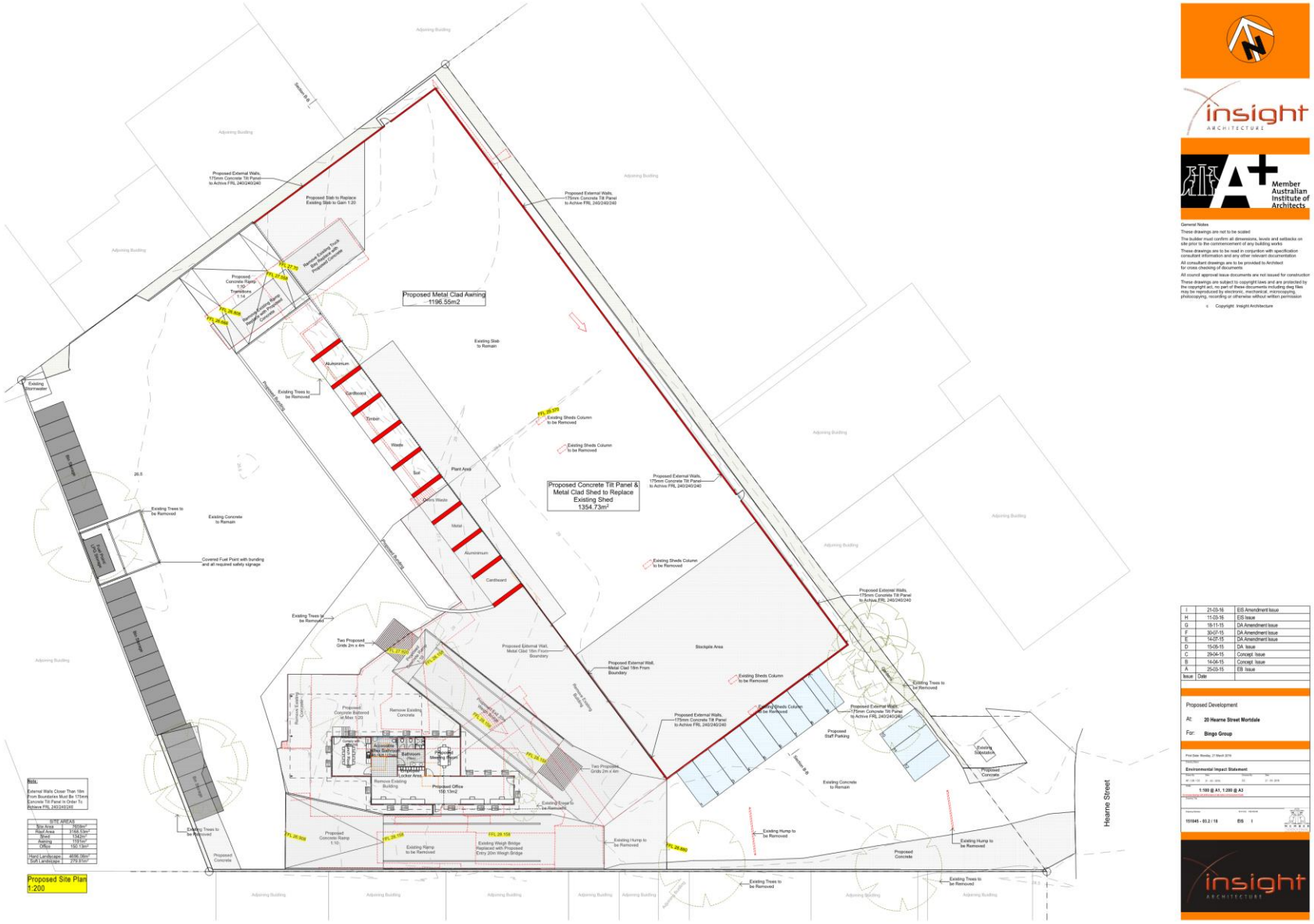


Statistical Ambient Noise Levels

Mortdale Waste Transfer Facility - Wednesday, 18 February 2015



SITE PLAN - GROUND FLOOR



Skala Australasia Pty Ltd
PO Box 52 Newcastle NSW 2300
13/21 Babilla Close Beresfield NSW 2322
t +61 2 4905 0650 I www.skala.com.au

12th May 2016

Re: Mortdale C&D Plant for Bingo Industries.

To whom it may concern,

During the detailed design and planning of the Mortdale C&D recycling system, Skala select the most efficient and effective equipment available in the current market place. Particular attention and emphasis is placed on reduction and elimination of vibration transmission and reduction of noise emission's.

The machinery chosen has very few moving parts, is energy efficient and has an inherent design that isolates vibration transmission and noise transmission through the use of counterbalance motion, isolation, Isolation springs and design. In addition to this, the foundations for the machinery are totally isolated from the building and surrounding floor slabs thus taking all steps to stop vibration transmission. With all these measures in place external vibration & noise emissions will be controlled to ensure the operation will not adversely impact on neighbouring properties.

Yours sincerely

Brook Griffiths
Skala Australasia Pty Ltd
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