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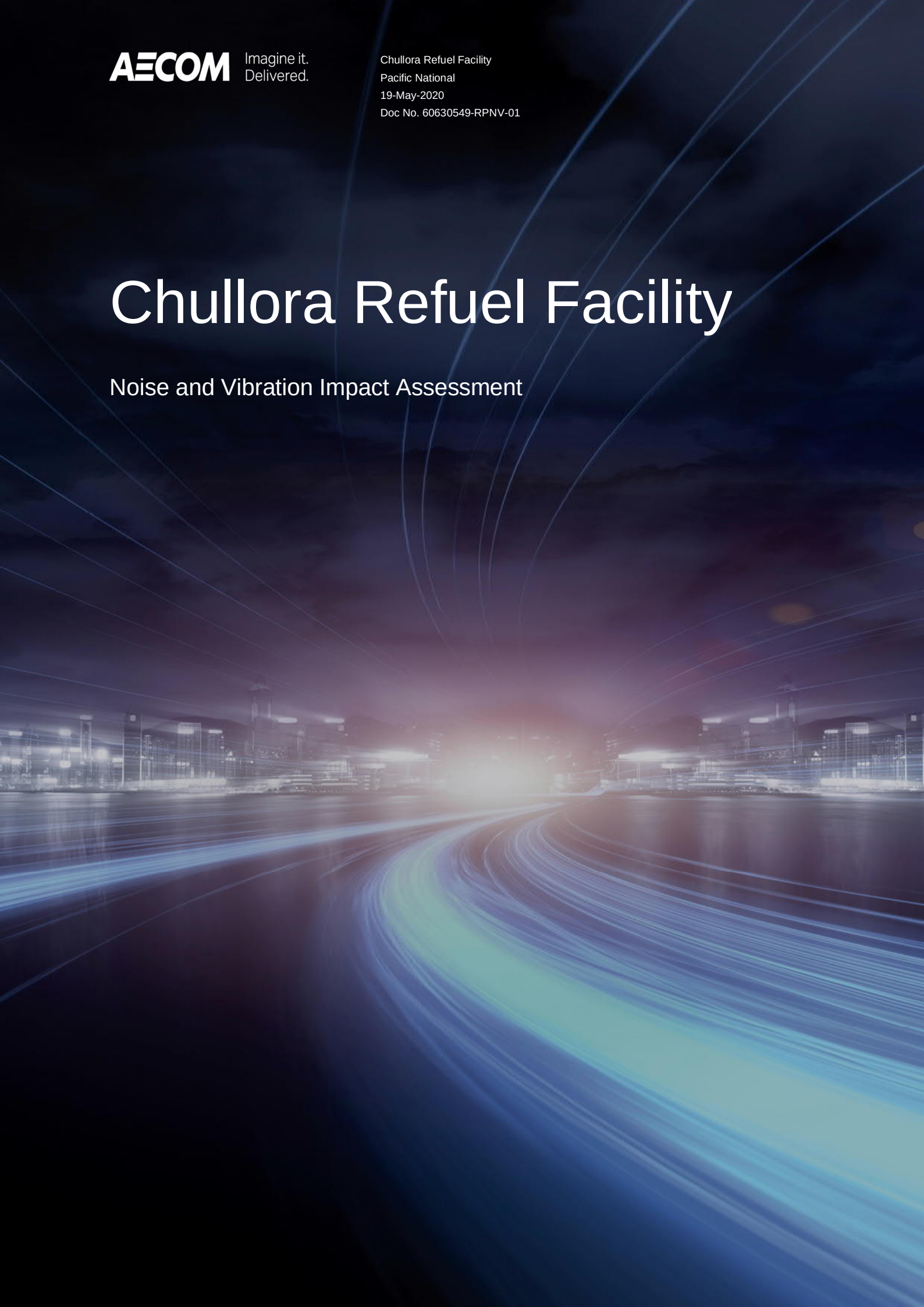
Chullora Refuel Facility
Pacific National
19-May-2020
Doc No. 60630549-RPNV-01

Chullora Refuel Facility

Noise and Vibration Impact Assessment



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Noise and Vibration Impact Assessment

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19-May-2020

Job No.: 60630549

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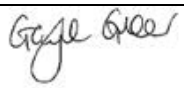
Chullora Refuel Facility

Quality Information

Document	Chullora Refuel Facility
Ref	60630549
Date	19-May-2020
Prepared by	Geoff Lucas
Reviewed by	Gayle Greer

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	30-Apr-2020	Draft for Review	Gayle Greer Acoustics Team Leader – NSW	GG
B	19-May-2020	Final	Gayle Greer Acoustics Team Leader – NSW	

Chullora Refuel Facility

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1.0 Introduction

1.1 Background information

AECOM Australia Pty Ltd (AECOM) has been commissioned by Pacific National to undertake a Noise and Vibration Impact Assessment of the construction and operation of the proposed upgrade of the Locomotive Provisioning Centre (LPC) (the Proposal).

The Proposal site is located within the Sydney Freight Terminal (SFT) in Chullora NSW and is zoned IN1 General Industrial. The broader site is surrounded by industrial properties to the south and east, and a railway line to the north. The closest noise sensitive receivers are located 400 m to the north-west. Heavy vehicle access is to the SFT is via Dasea Street.

The proposal area currently comprises 2 diesel fuel facilities containing 198 kl of diesel and 4 kl of lube oil. The upgrade would relocate these tanks North-West approximately 20 m of their current placement allowing for a new siding to be added between the new tank position and the existing track. The aim of the Proposal is to increase safety for locomotive operators by moving the provisioning facilities to a new siding off the main rail line,

The Proposal will operate in line with the current operating hours of the SFT which are 5am Monday to 5pm Sunday. Construction works would generally be limited to standard hours.

The acoustic terminology used in this report is explained in Appendix A.

1.2 Scope

The scope of this Noise and Vibration Impact Assessment is to:

- Establish the existing background noise levels in the vicinity of the Proposal
- Establish operational noise criteria, construction noise management levels and vibration limits that would apply to the Proposal
- Predict construction noise and vibration levels at nearby residential and other sensitive receivers due to the Proposal
- Predict operational noise levels at nearby noise sensitive receivers due to operation of the Proposal
- Predict noise levels from additional off-site traffic generated by both the operation and construction of the Proposal
- Assess the operational noise in accordance with the established environmental noise emission criteria and provide indicative noise control measures where necessary
- Review the potential impacts of construction noise and vibration in relation to identified sensitive sites. Determine in principle mitigation measures if required including silencing treatment of mechanical and mobile plant, management of mechanical and mobile plant, community consultation and/or other noise mitigation and management measures
- Assess road traffic noise arising from additional traffic generation as a result of operation and construction of the Proposal and if necessary, recommend management and mitigation measures.

1.3 Policies and Guidelines

The following policies and guidelines are relevant for this assessment:

- *Interim Construction Noise Guideline* (ICNG), Department of Environment and Climate Change, 2009

- *Assessing Vibration: A Technical Guideline* (AVATG), Department of Environment and Conservation, 2006
- *NSW Road Noise Policy* (RNP), Department of Environment, Climate Change and Water, 2011
- *Noise Policy for Industry* (NPfI), Environment Protection Authority, 2017
- *Industrial Noise Policy (INP),* Environment Protection Authority, 2000
- *Construction Noise and Vibration Strategy* (CNVS), Transport for NSW, 2019
- DIN Standard 4150: Part 3 1999 *Structural Vibration in Buildings - Effects on Structures*, 1999
- British Standard 7385: Part 2 1993 *Evaluation and Measurement of Vibration in Buildings*, 1993
- British Standard 6472: Part 1 2008 *Evaluation of Human Exposure to Vibration in Buildings*, 2008
- Australian Standard AS 2436-2010, *Guide to noise and vibration control on construction, demolition and maintenance sites*, 2010
- Australian Standard AS 1055:2018 – Acoustics – *Description and measurement of environmental noise*, 2018
- British Standard 5228: Part 1 2009 *Code of practice for noise and vibration control on construction and open sites*, 2009.

Definitions for acoustic terminology used within this report can be found in Appendix A

2.0 Existing Acoustic Environment

2.1 Site description

The Proposal is located within a mainly industrial environment. The closest residential receivers are located to the north of Weeroona Road.

The University of Sydney Cumberland Campus and Rookwood Cemetery are located to the North of the site and the Mary Wade Correctional Centre is located to the West. The Proposal and its surrounding environment are shown in Figure 1.

Dasea Street is considered to be local road as per categories within the Environment Protection Authority's (EPA) NSW *Road Noise Policy*. No residential receivers are located on Dasea Street

Figure 1 Site Map

2.1.1 Heritage items

The Pressure Tunnel, Shaft No 1 and associated infrastructure is listed under the Bankstown Local Environmental Plan 2015 as an item of heritage significance.

2.2 Noise measurement methodology

Long term unattended and short term attended measurements were undertaken to establish the existing ambient and background noise environment at potentially affected receivers.

2.2.1 Unattended noise measurement methodology

Long term unattended noise monitoring was conducted at two locations between 16 and 28 April 2020. One noise logger was placed within each NCA at a representative location at the properties indicated

in Table 1 and shown in Figure 1. The noise loggers were calibrated prior to and after the monitoring period with a drift in calibration not exceeding ± 0.5 dB.

All the acoustic instrumentation employed during the noise measurements comply with the requirements of "*AS IEC 61672.1-2004 Electroacoustics - Sound level meters - Specifications*" and were within their current National Association of Testing Authorities, Australia (NATA) certified in-calibration period (i.e. calibration in the last two years).

Table 1 Noise monitoring details

Logger	Location	Model	Serial number
1	Park - 37 Tallowwood Avenue, Lidcombe	Rion NL21	765701
2	20 Dasea St, Chullora	Rion NL52	553967

In accordance with the EPA's NSW *Noise Policy for Industry*, noise monitoring affected by adverse weather conditions or extraneous noise events was excluded from the monitoring data. The *Noise Policy for Industry* advises that data may be affected where adverse weather, such as wind speeds higher than 5 m/s or rain, occurs. Weather data was acquired from the Bureau of Meteorology's Bankstown AWS weather station (station number 066212) located around 6.5 kilometres north of the Proposal.

The loggers measured the noise levels over the sample period and then determined L_{A1}, L_{A10}, L_{A90}, and L_{Aeq} levels of the noise environment. The L_{A1}, L_{A10} and L_{A90} noise levels are the levels exceeded for 1%, 10% and 90% of the measurement period respectively. The L_{A90} is taken as the background level. The L_{A1} is indicative of the maximum noise levels due to individual noise events such as the pass-by of a heavy vehicle. The L_{Aeq} level is the equivalent continuous sound level and has the same sound energy over the sample period as the actual noise environment with fluctuating sound levels.

The L_{A90} noise levels were analysed to determine a single assessment background level (ABL) for each day, evening and night period in accordance with the *Noise Policy for Industry* for each monitoring location. The ABL is established by determining the lowest ten-percentile level of the L_{A90} noise data acquired over each period of interest. Table 3 presents individual ABLs for each day's assessment periods. The background noise level or rating background level (RBL) representing the day, evening and night-time assessment periods is based on the median of individual ABLs determined over the entire monitoring period.

2.2.2 Attended noise measurement methodology

Attended noise measurements were conducted at the two unattended monitoring locations on 16 April 2020 during the daytime. Each measurement was conducted over a 15 minute period. Weather conditions were overcast on the days of monitoring, with no wind.

Attended noise measurements were conducted using Brüel & Kjær Type 2250 sound level meter. The sound level meter used is designated as a Type 1 instruments and has accuracy suitable for laboratory and field use. The sound level meter was calibrated before and after the measurements with a no drift in calibration exceeding ±0.5 dB.

All the acoustic instrumentation employed during the noise measurements comply with the requirements of "*AS IEC 61672.1-2004 Electroacoustics - Sound level meters - Specifications*" and were within their current National Association of Testing Authorities, Australia (NATA) certified in-calibration period (i.e. calibration in the last two years).

2.3 Site operational noise

2.3.1 Existing situation

AECOM undertook noise measurements and observations at the SFT on 16 April 2020. Based on these measurements and observations a noise model of the SFT was developed. The noise levels predicted using this noise model have been compared to the noise levels measured at logging location 2 for the daytime period. It can be seen from Table 21 that there is good agreement between the predicted and the measured noise levels.

Table 2 Existing operational noise levels of the SFT at logging location 2

Weather conditions	Distance from Proposal (m)	Sound pressure level, L_{Aeq} dB(A)		
		Modelled	Measured	Difference
Daytime	50	53	52	1

2.4 Noise measurement results

2.4.1 Unattended noise measurement results

Table 3 presents the existing overall representative L_{Aeq} ambient noise level and the background L_{A90} noise levels for the day, evening and night-time periods, in accordance with the *Noise Policy for Industry.* The overall representative L_{Aeq} noise levels were determined by logarithmically averaging each assessment period for the entire monitoring period.

In total 13 days of logging were completed, however some periods of noise logging were excluded due to adverse weather. The data were processed in accordance with Fact Sheet B of the *Noise Policy for Industry*.

The results for each day and the graphical noise logging results are presented in Appendix B.

Table 3 Existing background (L_{A90}) and ambient (L_{Aeq}) noise levels

Location	L_{A90} background rating noise level, dB(A)			Log average noise (ambient) L_{Aeq} levels dB(A)		
	Day[1]	Evening[1]	Night[1]	Day[1]	Evening[1]	Night[1]
1	40	40[2]	40	53	52	52
2	43	43[2]	43	52	53	52

Notes:

1. *Day is defined as 7:00 am to 6:00 pm, Monday to Saturday and 8:00 am to 6:00 pm Sundays & Public Holidays. Evening is defined as 6:00 pm to 10:00 pm, Monday to Sunday & Public Holidays. Night is defined as 10:00 pm to 7:00 am, Monday to Saturday and 10:00 pm to 8:00 am Sundays & Public Holidays.*
2. *Evening RBL adjusted to the same as the daytime RBL in accordance with the Noise Policy for Industry. This is because the community generally expects greater control of noise during the more sensitive evening periods than during the daytime period.*

2.4.2 Attended noise measurements

The results of the attended noise monitoring are presented in Table 4. The daytime measurements indicated that residential receivers are affected by existing industrial noise and road traffic noise.

Table 4 Attended noise measurements

Logger	Date	Time	L_{Aeq} dB(A)	L_{A90} dB(A)	Comments
1	16/4/2020	12:03	52	44	Background noise controlled by road traffic hum from Rookwood Road and possibly the Hume Highway. Ambient noise influenced by local traffic pass by (local car pass by 55 dB(A)), train pass by (70 dB(A) loco, 63 dB(A) wagon) and gantry crane operation. Birds also calling at times. Overcast, mild breeze.
2	16/4/2020	10:17	50	45	Background noise controlled by road traffic hum from Rookwood Road and possibly the Hume Highway. Ambient noise controlled by gantry crane moving and operating (around 50 dB(A) when passing in front) and also rail pass by operating to the north (no line of sight). Vehicle pass by along Weeroona Road, audible but not dominant. Bus passby on Weeroona Road clearly audible. Trucks along Rookwood Road audible at times. Insects and birds calling at times. Overcast day.

2.5 Existing noise environment summary

The acoustic environment is dominated by traffic on Rookwood Road, Weeroona Road and to some extent the Hume Highway. Natural sounds such as wind and bird noise are also audible along with some industrial noise.

The area has constant through traffic on Rookwood Road and the Hume Highway which contributes to an urban hum, in addition there is local traffic with intermittent traffic flows and some industrial noise. These characteristics are typical of an urban acoustic environment.

3.0 Construction Noise and Vibration Criteria

3.1 Construction activity noise criteria

3.1.1 Interim Construction Noise Guideline

The potential risk of adverse impact of construction noise on a receiver is determined by the extent of its emergence above the existing background noise level, the duration of the event and the characteristics of the noise.

The *Interim Construction Noise Guideline* is a NSW Government document that sets out ways to deal with the impacts of construction noise on residences and other sensitive land uses. It presents assessment approaches tailored to the scale of the construction project and identifies practices to minimise noise impacts. As the proposed works are expected to continue for a period of more than three weeks and are within relatively close proximity to noise sensitive receivers, a quantitative assessment, based on 'reasonable' worst case construction scenarios, has been carried out for these works.

Noise levels resulting from construction activities are predicted at nearby noise sensitive receivers (e.g. residences, schools, hospitals, places of worship, passive and active recreation areas) are compared to the levels provided in the ICNG. Where an exceedance of the management levels is predicted the ICNG advises that receivers can be considered 'noise affected' and the proponent should apply all feasible and reasonable work practices to minimise the noise impact. The proponent should also inform all potentially affected residents of the nature of the works to be carried out, the expected noise level and duration, as well as contact details should they wish to make a complaint.

Where construction noise levels at the receiver reach 75 dB(A) residential receivers are considered to be 'highly noise affected' and the proponent should, in consultation with the community, consider restrictions to the hours of construction to provide respite periods.

The construction noise management levels (NML) for the residential and other sensitive land uses are detailed in Table 5, Table 6 and Table 7.

Table 5 ICNG Residential noise management levels

Time of day	NML, $L_{Aeq,15min}$, dB(A)[1]	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on 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 $L_{Aeq\ (15\ min)}$ 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 dB(A)	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 dB(A) 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.

Notes:

1. *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 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.*

The ICNG defines what is considered to be feasible and reasonable as follows:

- *"Feasible*

  A work practice or abatement measure is feasible if it is capable of being put into practice or of being engineered and is practical to build given project constraints such as safety and maintenance requirements.

- *Reasonable*

  Selecting reasonable measures from those that are feasible involves making a judgment to determine whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the measure."

Table 6 presents the NMLs applicable to residential receivers nearby to this development.

Table 6 Construction noise management levels – Residential receivers

Area	Period	RBL, L_{A90} dB(A)	Standard hours noise management levels, $L_{Aeq,15min}$, dB(A)	Out-of-hours noise management levels, $L_{Aeq,15min}$, dB(A)
Residences north of Weeroona Road	Day	40	50	45
	Evening	40	-	45
	Night	40	-	45

Table 7 presents the NMLs applicable to other noise sensitive receivers such as educational facilities and places of worship and to commercial receivers.

Table 7 Construction noise management levels – Other receivers

Land use	Noise management levels, $L_{Aeq,15min}$ (applies when properties are in use)
Classrooms at schools and other educational institutions	55 dB(A)[1]
Places of worship	55 dB(A)[1]
Childcare centres	55 dB(A)[1]
Community Hall	55 dB(A)[1]
Active Recreation	65 dB(A)
Commercial premises (including offices, retail outlets)	70 dB(A)
Industrial Premises	75 dB(A)

Notes:

1. *These external management levels are based upon a 45 dB(A) internal noise management level and a 10 dB reduction from outside to inside through an open window.*

3.1.2 Sleep disturbance criteria

The ICNG requires a sleep disturbance analysis where construction works are planned to extend over more than two consecutive nights. The L_{A1} noise levels and number of expected L_{A1} noise events should be predicted in order to determine the likelihood of potential sleep disturbance.

The EPA recommends that to minimise the risk of sleep disturbance during the night-time period (10.00 pm to 7.00 am), the $L_{A1(1\ min),}$ noise level outside a bedroom window should not exceed the $L_{A90\ (15\ minute)}$ background noise level by more than 15 dB. If this screening criterion is found to be exceeded then a more detailed analysis must be undertaken and include the extent that the maximum noise level exceeds the background noise level and the number of times this is likely to happen during the night-time period.

Sleep disturbance research presented in the *Road Noise Policy* concludes that *'Maximum internal noise levels below 50-55 dB(A) are unlikely to cause awakening reactions'*. Therefore, given that an open window provides approximately 10 dB in noise attenuation from outside to inside, external noise levels of 60-65 dB(A) are unlikely to result in awakening reactions.

Based on the measured background noise levels during the night, the sleep disturbance criteria for the nearest noise sensitive residential receivers are presented in Table 8.

Table 8 Sleep disturbance criteria

Area	Background noise level (L_{A90}), dB(A)	Sleep disturbance criteria,	$L_{A1(1\ minute)}$, dB(A)
		Screening level	Awakening reaction
Residences north of Weeroona Road	40	55	65

3.2 Construction traffic noise criteria

To assess noise impacts from construction traffic an initial screening test should be undertaken by evaluating whether existing road traffic noise levels would increase by more than 2 dB(A), in line with the *Road Noise Policy*. Where the predicted noise increase is 2 dB(A) or less, then no further assessment is required. However, where the predicted noise level increase is greater than 2 dB(A), and the predicted road traffic noise level exceeds the road category specific criterion then noise mitigation should be considered for those receivers affected. The *Road Noise Policy* does not require assessment of noise impact to commercial or industrial receivers.

Rookwood Road, Muir Road, Dasea Street and the Hume Highway provide the main access roads to the site. These roads are classified as arterial and sub-arterial and are listed in Table 9. The external noise criteria are applied one metre from the external facade of an affected building.

Table 9 Roads used by construction traffic

Road	Type	Residential receivers	Estimated AADT
Rookwood Road	Arterial Road	Yes	>50,000
Muir Road	Sub-arterial Road	No	>2,000
Dasea Street	Local Road	No	>500
Hume Highway	Arterial Road	Yes	60,000

3.3 Construction vibration criteria

The relevant standards/guidelines for the assessment of construction vibration are summarised in Table 10.

Table 10 Standards/guidelines used for assessing construction vibration

Item	Standard/guideline
Structural damage	German Standard DIN 4150 – Part 3 – Structural Vibration in Buildings – Effects on Structures (DIN 4150)
Human comfort (tactile vibration) [1]	*Assessing Vibration: A Technical Guideline* (AVATG)

Note 1: This document is based upon the guidelines contained in British Standard 6472:1992, "Evaluation of human exposure to vibration in buildings (1-80 Hz)". This British Standard was superseded in 2008 with BS 6472-1:2008 "Guide to evaluation of human exposure to vibration in buildings – Part 1: Vibration sources other than blasting" and the 1992 version of the Standard was withdrawn. Although a new version of BS 6472 has been published, the Environment Protection Authority still requires vibration to be assessed in accordance with the 1992 version of the Standard at this point in time.

Vibration, at levels high enough, has the potential to cause damage to structures and disrupt human comfort. Vibration and its associated effects are usually classified as continuous, impulsive or intermittent as follows:

- continuous vibration continues uninterrupted for a defined period and includes sources such as machinery and continuous construction activities
- impulsive vibration is a rapid build up to a peak followed by a damped decay. It may consist of several cycles at around the same amplitude, with durations of typically less than two seconds and no more than three occurrences in an assessment period. This may include occasional dropping of heavy equipment or loading activities
- intermittent vibration occurs where there are interrupted periods of continuous vibration, repeated periods of impulsive vibration or continuous vibration that varies significantly in magnitude. This may include intermittent construction activity, impact pile driving, jack hammers.

3.3.1 Structural damage

At present, no Australian Standards exist for the assessment of building damage caused by vibration.

The German standard (DIN 4150) provides recommended maximum levels of vibration that reduce the likelihood of building damage caused by vibration and are presented in Table 11. DIN 4150 states that buildings exposed to higher levels of vibration than recommended limits would not necessarily result in damage.

Table 11 DIN 4150: Structural damage safe limits for building vibration

Group	Type of structure	At foundation - Less than 10 Hz	At foundation - 10 Hz to 50 Hz	At foundation - 50 Hz to 100 Hz[1]	Vibration at the horizontal plane of the highest floor for all frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20 mm/s	20 to 40 mm/s	40 to 50 mm/s	40 mm/s
2	Dwellings and buildings of similar design and/or use	5 mm/s	5 to 15 mm/s	15 to 20 mm/s	15 mm/s
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order/heritage listed)	3 mm/s	3 to 8 mm/s	8 to 10 mm/s	8 mm/s

Notes:

1. At frequencies above 100 Hz, the values given in this column may be used as minimum values

3.3.2 Human comfort

The assessment of intermittent vibration outlined in the NSW EPA guideline A*ssessing Vibration: A Technical Guideline* (AVTG) is based on Vibration Dose Values (VDVs). The VDV accumulates the vibration energy received over the daytime and night-time periods.

Maximum and preferred VDVs for intermittent vibration arising from construction activities are listed in Table 12. The VDV criteria are based on the likelihood that a person would be annoyed by the level of vibration over the entire assessment period.

Table 12 Preferred and maximum vibration dose values for intermittent vibration (m/s$^{1.75}$)

Location	Daytime[1]		Night-time[1]	
	Preferred	Maximum	Preferred	Maximum
Critical areas	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

Notes:
1. Day is defined as 7:00 am to 10:00 pm. Night is defined as 10:00 pm to 7:00 am

4.0 Operational Noise Criteria

4.1 Noise Policy for Industry

The NSW *Noise Policy for Industry* (NPfI) provides guidance in relation to acceptable noise limits for industrial noise emissions, which includes, but is not limited to, noise emissions from mechanical plant.

The assessment procedure in the *Noise Policy for Industry* has two components:

- controlling **intrusive** noise impacts in the short term for residences
- maintaining noise level **amenity** for residences and other land uses.

Both components are assessed at the boundary of the noise sensitive receiver site, or if the site boundary is more than 30 metres from the noise sensitive building, a distance of 30 metres from the noise sensitive building.

4.1.1 Intrusive noise impacts

The *Noise Policy for Industry* states that the noise from any single noise source should not be greatly above the prevailing background noise level. Industrial noise sources are generally considered acceptable if the A-weighted equivalent continuous sound pressure level of noise from the source, measured over a 15 minute period ($L_{Aeq,15\ min}$) does not exceed the Rating Background Level (RBL) by more than 5 dB(A) for the period under consideration. This is termed the Intrusiveness Criterion.

The RBL is the background noise level to be used for assessment purposes and is determined by the methods given in the *Noise Policy for Industry*.

The RBL and the respective intrusive criteria for the day, evening and night periods are provided in Table 13.

Table 13 Intrusive criteria

Location	Period	RBL (L_{A90}), dB(A)	Intrusive criteria (RBL+5), dB(A)
Residential receivers	Day	40	45
	Evening	40	45
	Night	40	45

4.1.2 Protecting amenity

To limit continuing increase in noise levels, the maximum ambient noise level within an area from all industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.1 of the *Noise Policy for Industry*. That is the noise level should not exceed the level appropriate for the particular locality and land use. This is often termed the “background creep” or “amenity criterion”.

The project amenity level for a project is equal to the recommended amenity level – 5 dB(A). Therefore, relevant noise amenity level from Table 14 is assigned as the project amenity noise level. The project amenity level is then converted to a 15 minute period by adding 3 dB(A).

The project amenity noise levels applicable the Proposal are provided in Table 14.

Table 14 Project amenity noise levels

Type of receiver	Indicative noise amenity area	Time of day	Project amenity noise level, dB(A)	
			$L_{Aeq\ (period)}$	$L_{Aeq\ (15\ minute)}$
Residential receivers	Urban	Day	55[1]	58
		Evening	45[1]	48
		Night	40[1]	43
School classroom	All	Noisiest 1-hour period when in use	45[2]	48
Place of worship	All	When in use	50[2]	53
Commercial premises	All	When in use	65	68
Active recreation area	All	When in use	55	58

Notes:

1 Recommended amenity level minus 5 dB

2 External noise levels are based upon a 10 dB reduction from outside to inside through an open window.

4.1.3 Summary

A summary of the project noise trigger levels is presented in Table 15 below. These trigger levels apply to environmental noise emissions from any activity undertaken or plant installed as part of the Proposal.

Table 15 Summary of environmental noise emission criteria

Location	Time of day	Project noise trigger levels[1] L_{Aeq}, dB(A)
Residential receivers	Day	45
	Evening	45
	Night	43
School classroom	Noisiest 1-hour period when in use	48
Place of Worship	When in use	53
Commercial premises	When in use	68
Active recreation area	When in use	58

Notes:

1. Project Noise Trigger Levels represent the lower of the intrusive and amenity criteria.

4.1.4 Maximum noise level assessment

The *Noise Policy for Industry* requires the potential for sleep disturbance to be assessed by considering maximum noise levels events during the night-time period.

Where the subject development/premises night-time noise levels at a residential location exceed the following screening levels a detailed maximum noise level event assessment should be undertaken:

- $L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or
- L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,

The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period.

Based on the measured background noise levels during the night, the sleep disturbance criteria for the nearest noise sensitive residential receivers are presented in Table 16.

Table 16 Night-time sleep disturbance screening levels

Location	Measured night-time RBL, $L_{A90, 15\ mins}$ dB(A)	Sleep disturbance screening levels	
		$L_{Aeq,15min}$, dB(A)	L_{AFmax}, dB(A)
Residential receivers	40	45	55

5.0 Construction Noise Assessment

5.1 Construction sources

In consultation with Pacific National, the following items of construction equipment have been assumed for the Proposal. These would be confirmed by the construction contractor prior to construction commencing and further assessment would be undertaken if required. Noise sources and their respective L_{Aeq} sound power levels for each work package are shown in Table 17. These sound power levels are typical values taken from data provided in Australian Standard AS2436-2010, *Guide to noise and vibration control on construction, demolition and maintenance sites* and British Standard 5228: Part 1 2009 *Code of practice for noise and vibration control on construction and open sites*, 2009 and assume equipment is modern and in good working order.

Construction works are generally expected to be undertaken during standard construction hours only.

Table 17 Equipment sound power levels

Equipment	Sound power level, dB(A)
Excavator 20T	99
Excavator 10T	98
Truck with float	108
Franna	104
7T Roller	103
Track laying equipment	105

Notes:

1. Sound powers are time weighted (i.e. expected equipment levels per 15 minute period)

5.2 Modelling and meteorological conditions

In order to assess noise impacts from the site during construction, a noise model was created to represent 'reasonable' worst periods of upgrade works.

The construction of the Proposal has been modelled in SoundPLAN Version 8.0. The following features were included in the noise model:

- ground topography
- ground absorption and reflection
- buildings (residential and commercial)
- construction noise sources (listed in Table 17).

Noise emissions from the construction sites have been modelled using an implementation of the CONCAWE propagation algorithm with neutral metrological conditions.

It can be expected that there may be differences between predicted and measured noise levels due to variations in instantaneous operating conditions, plant in operation during the measurement and also the location of the plant equipment. The acoustic shielding calculated in the model due to fixed building structures would also vary as the construction equipment moves around the site.

5.3 Construction noise assessment

The identified residential and non-residential receivers have been assessed against the standard hours noise management levels. The level of impact may change depending on the final construction methodology.

During construction it is likely that all equipment would not be operating simultaneously at all times and in the one location, which would result in reduced noise levels compared with those predicted. As each construction work package would be occurring discretely a cumulative noise impact is unlikely. Mitigation measures have been specified in Section 5.6 which may reduce the impact of these exceedances on receivers.

Noise results are presented graphically in Appendix C.

5.3.1 Summary of impacts during standard hours

Results show construction noise levels are not expected to exceed the noise management levels during standard hours at any noise sensitive receivers.

5.3.2 Summary of impacts outside of standard hours

No works are expected outside of standard hours.

5.4 Construction traffic assessment

The numbers of construction vehicle movements have been estimated to be up to 15 light and 5 heavy vehicles per day during peak construction periods. Vehicles would access the site by Rookwood Road, Muir Road, Dasea Street and the Hume Highway.

The existing traffic flow on all the roads listed above with residential receivers (Rookwood Road and the Hume Highway) is substantially greater than the proposed construction traffic numbers. Therefore, the additional traffic would have a minor impact on existing road traffic noise in the area (traffic noise levels during construction are expected to increase by less than 2 dB).

5.5 Construction vibration assessment

Vibration intensive works may include the use of the following items of equipment:

- Vibrating rollers

The minimum working distances of these items of equipment from off-site receivers are shown in Table 18 which is based on recommendations of the TfNSW *Construction Noise and Vibration Strategy* (CNVS). If these minimum working distances are complied with no adverse impacts from vibration intensive works are likely in terms of human response or cosmetic damage.

Based on the indicative construction activities assessed for the Proposal, it is not considered likely that works would occur within the minimum working distances. If, however, vibration intensive works are required within these minimum working distances, mitigation measures to control excessive vibration would be implemented as outlined in Section 5.6.

Table 18 Minimum working distances of vibration intensive equipment to be used during the Proposal

Plant	Rating/ description	Cosmetic damage		Human response
		Heritage	Residential/ commercial	
Vibratory roller	< 50 kN (typically 1-2t)	8 m	5 m	15 m
	< 100 kN (typically 2-4t)	10 m	6 m	20 m
	< 200 kN (typically 4-6t)	20 m	12 m	40 m
	< 300 kN (typically 7-13t)	25 m	15 m	100 m
	> 300 kN (typically 13-18t)	30 m	20 m	100
	> 300 kN (> 18 t)	38 m	25 m	100 m

5.6 Construction mitigation measures

5.6.1 Construction Noise and Vibration Management Plan

A Construction Noise and Vibration Management Plan (CNVMP) should be developed for the Proposal and implemented prior to commencement of construction activities. The CNVMP should include all reasonable and feasible safeguards to manage the noise emissions from the site and any complaints which may occur due to construction noise. The CNVMP should include, the following:

- identification of nearby residences and other sensitive land uses
- description of approved hours of work
- description and identification of all construction activities, including work areas, equipment and duration
- description of what work practices (generic and specific) would be applied to minimise noise and vibration
- a complaints handling process
- noise and vibration monitoring procedures, including for heritage structures
- overview of community consultation required for identified high impact works.

Construction works should be planned and carried out during standard construction hours wherever possible. Table 19 presents the mitigation measures contained within the which should be considered as mitigation measures as part of the CNVMP.

Table 19 Recommended construction mitigation measures

Action required	Safeguard details
Management measures	
Site inductions	All employees, contractors and subcontractors will receive an environmental induction.
Behavioural practices	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors.
Source controls	
Construction hours and scheduling	Where feasible and reasonable, construction will be carried out during the standard daytime working hours only.
Equipment selection	Quieter and less vibration emitting construction methods will be used where feasible and reasonable (e.g. rubber wheeled instead of steel tracked plant). Equipment will be regularly inspected and maintained to ensure it is in good working order.
Maximum noise levels	The noise levels of plant and equipment will have operating sound power or sound pressure levels that would meet the predicted noise levels.
Rental plant and equipment	Noise emissions will be considered as part of the selection process.

Action required	Safeguard details
Use and siting of plant	Simultaneous operation of noisy plant within discernible range of a sensitive receiver will be avoided. The offset distance between noisy plant and adjacent sensitive receivers will be maximised. Plant used intermittently will be throttled down or shut down. Plant and vehicles will be turned off when not in use. Noise-emitting plant will be directed away from sensitive receivers where reasonable and feasible.
Plan works site and activities to minimise noise and vibration	Traffic flow, parking and loading/unloading areas will be planned to minimise reversing movements within the site. Truck drivers will be advised of designated vehicle routes, parking locations, acceptable delivery hours or other relevant practices (i.e. minimising the use of engine brakes, and no extended periods of engine idling).
Non-tonal reversing alarms	Non-tonal reversing beepers (or an equivalent mechanism) will be fitted and used on all construction vehicles and mobile plant regularly used on site and for extended work hours construction work.
Minimise disturbance arising from delivery of goods to construction sites	Loading and unloading of materials/deliveries will occur as far as possible from sensitive receivers. Site access points and roads will be selected as far as possible away from sensitive receivers. Dedicated loading/unloading areas will be shielded if close to sensitive receivers. Delivery vehicles will be fitted with straps rather than chains for unloading, wherever possible.
Silencers on Mobile Plant	Where possible noise from mobile plant will be reduced through additional fittings including: • Residential grade mufflers • Air Parking brake engagement is silenced.
Construction Related Traffic	Vehicle movements will be routed away from sensitive receivers and scheduled during less sensitive times. The speed of vehicles will be limited and the use ofengine compression brakes limited. On-site storage capacity will be maximised to reduce the need for truck movements during sensitive times.

Action required	Safeguard details
Vibration safe working distances	If vibration intensive equipment is to be used within the safe working distances for cosmetic damage, as presented in Table 18, then it is recommended that attended vibration measurements are undertaken when work commences, to determine “site specific safe working distances”. The safe working distances for cosmetic damage from Table 18 are generally considered to be conservative and working within them would not necessarily result in damage however as factors such as work practices and intervening structures can affect vibration levels. In addition, vibration intensive work should not proceed within the site specific safe working distances unless a permanent vibration monitoring system is installed approximately one metre from the building footprint, to warn operators (e.g. via flashing light, audible alarm, SMS) when vibration levels are approaching the peak particle velocity objective. It is also advisable to carry out building condition surveys of sensitive historical structures before construction works begins.
Path controls	
Shield stationary noise sources such as pumps, compressors, fans etc.	Stationary noise sources will be enclosed or shielded to the greatest extent possible whilst ensuring that the occupational health and safety of workers is maintained.
Shield sensitive receivers from noisy activities	Structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable) will be used.

6.0 Operational noise

6.1 Noise modelling

6.1.1 Topography

The operational noise model has been based upon topographical information (contours provided at 1.0 m intervals). The surface of the hardstand areas has been modelled using the 'ground absorption' function in SoundPLAN to replicate an acoustically 'hard' surface (i.e. reflective), with an absorption coefficient of 0.1. Areas other than the hardstand area have been modelled with a ground absorption of 0.75.

6.1.2 Buildings

Buildings have been incorporated into the model as follows:

- Existing buildings beyond the site boundaries including industrial, commercial and residential buildings (obtained from digital survey information and/or digitisation of aerial photography)
- Proposed buildings within the site boundary (refuelling shed).

6.1.3 Meteorological conditions

AECOM has undertaken modelling of industrial noise emission from the site under the following meteorological conditions:

- Neutral weather conditions – 0.5 m/s winds and D class stability
- 3 m/s winds in the worst case direction and D class stability (night and evening only)
- Temperature inversion – 2 m/s winds and F class stability (night only).

6.2 Noise sources

Currently at the SFT containers are loaded onto and unloaded from trains and heavy vehicles. These containers are transferred to designated container storage areas by mobile container handling equipment (forklifts). Typically, full containers arrive by train where they are stored and distributed by heavy vehicles. Empty containers will be transported back to the SFT.

The proposed diesel fuel facility will allow locomotives to be fuelled off the main line.

6.2.1 Industrial noise sources

Currently a container forklift, two gantry cranes and another small forklift are used on the site. The proposed fuelling facility will add a diesel pump and an oil pump to the site. Octave band sound power levels for this equipment are presented in Table 20. The locations of the noise sources are presented in Appendix D.

The following existing industrial noise sources were included in the model:

- One container forklift; Two gantry cranes
- One small forklift
- Metal 'clangs' around the site
- Shunting
- Two idling trucks
- Two truck air brake releases around the site
- One idling locomotive
- The following proposed industrial noise sources were included in the model:
- An additional idling locomotive

- Diesel pump
- Oil pump

Idling trucks have been modelled as a point source with the octave band and overall sound power levels as presented in Table 20.

Moving trucks have been modelled as line sources, with the sound power expressed as power per metre. This has been derived from the sound power of a moving vehicle and adjusted to account for:

- The number of trucks traversing the line source path in the assessment period (15 truck trips per hour)
- The length of the line source
- Trucks are transporting 1-2 containers at low speed (up to 20 km/h).

6.2.2 Metal 'clang' L_{A1} sound power levels

The potential for high-level, short-duration noise events to cause sleep disturbance was assessed. The predominant source of such events was the 'clangs' which can occur when containers are picked up and put down by lifting equipment (reach stackers with soft-landing technology enabled). Other high-level, short-duration noise events include truck air brake releases. The L_{A1} sound power of such events are shown in Table 20.

6.2.3 Noise model sound power levels

Table 20 presents the sound power levels which were used in the operational noise model. These sound power levels are based upon measurements that AECOM made on the 16 April 2020 at the SFT and AECOMs library of sound power data.

Table 20 Summary of L_{Aeq} sound power levels

Source	Sound power level (SWL, dB) at octave band centre frequency, Hz								Overall SWL dB(A)
	63	125	250	500	1000	2000	4000	8000	
Container Forklift	98	103	104	105	99	94	92	91	105
Gantry Crane	94	91	92	89	84	83	75	71	91
Small Forklift	92	97	98	99	93	88	86	85	99
Metal 'bang' L_{A1}	115	115	106	106	104	97	91	84	108
Shunting	109	112	110	113	111	106	105	97	115
Idling Truck	94	98	92	91	92	91	86	82	97
Moving Truck	95	100	103	98	96	93	87	81	101
Truck Air Release L_{A1}	108	105	107	105	101	101	102	96	107
Idling Loco	106	102	96	100	92	89	88	86	100
Moving Loco L_{A1}	111	107	101	105	97	94	93	91	105
Diesel Pump	80	81	83	83	86	83	79	73	90
Oil Pump	80	81	83	83	86	83	79	73	90

6.3 Site operational noise

6.3.1 Existing

As noted in section 2.2.2 AECOM undertook noise measurements and observations at the SFT on 16 April 2020. Based on these measurements and observations a SoundPLAN noise model of the SFT was developed. The noise levels predicted using the noise model have been compared to the noise levels measured at logging location 2 for the daytime period. It can be seen from Table 21 that there is good agreement between the predicted and the measured noise levels.

Table 21 Existing operational noise levels of the SFT at logging location 2

Period	Distance from Proposal (m)	Sound pressure level, L_{Aeq} dB(A)		
		Modelled	Measured	Difference
Daytime	50	53	52	1

6.3.2 Results

Based on the assumptions and modelling parameters as set out in the previous sections, the typical operational noise levels were predicted at the receiver most likely to be affected. The operational noise levels were predicted under neutral and adverse meteorological conditions. The results of the modelling are presented in Table 22 and Table 23. It is noted that while a single night-time operational scenario has been assessed it is representative of the likely worst case.

An assessment of the resultant noise levels at receivers for tonality and low frequency noise indicated that no corrections were required to be applied in accordance with the *Noise Policy for Industry*.

The results are presented at the worst affected receiver, 28 Herdsmans Avenue Lidcombe.

Noise contour plots for normal operational scenarios are presented in Appendix E for night-time neutral and adverse weather conditions (wind 3 m/s source to receiver and an F class inversion).

The predicted noise levels due to the proposed diesel fuelling facility have been compared to the NPfI criteria in Table 22. It can be seen that the L_{Aeq} level from the operation of the refuelling facility is well under the project trigger level.

Table 22 Predicted operational noise levels due to the Proposal – 28 Herdsmans Avenue, Lidcombe

Weather conditions	Distance from Proposal (m)	Sound pressure level, L_{Aeq} dB(A)		
		Result	Project trigger level	Exceedance
Night neutral conditions	500	36	43	-
Night south-easterly wind		38	43	-
Night temperature inversion		38	43	-

For an existing facility (in operation for more than 10 years) where there is a proposed discrete development the NPfI notes that the proposal should not increase the overall noise emissions from the entire site. The increase in noise from the SFT due to the proposed diesel fuelling facility has been considered in Table 23.

Table 23 Predicted operational noise level increases due to the Proposal – 28 Herdsmans Avenue, Lidcombe

Weather conditions	Distance from Proposal (m)	Sound pressure level, L_{Aeq} dB(A)		
		Current	Proposed	Increase
Night neutral conditions	500	48.3	48.5	0.2
Night south-easterly wind		48.8	49.1	0.3
Night temperature inversion		49.6	49.9	0.3

It can be seen that the likely increase in L_{Aeq} noise emissions due to the refuelling facility is less than 1 dB(A).

6.3.3 Sleep disturbance results

The sleep disturbance noise levels associated with the typical operation of the Proposal were predicted at nearby receivers under calm meteorological conditions and worst case weather conditions. The results are presented in Table 24.

Table 24 Predicted night-time L_{Amax} operational noise levels and sleep disturbance criteria – 28 Herdsmans Avenue, Lidcombe

Weather conditions	Distance from Proposal (m)	Sound pressure level, L_{Amax} dB(A)		
		Result	Criterion	Exceedance
Night neutral conditions	500	39	55	-
Night south-easterly wind		41	55	-
Night temperature inversion		41	55	-

Table 25 Predicted night-time L_{Aeq} operational noise levels and sleep disturbance criteria – 28 Herdsmans Avenue, Lidcombe

Weather conditions	Distance from Proposal (m)	Sound pressure level, L_{Aeq} dB(A)		
		Result	Criterion	Exceedance
Night neutral conditions	500	36	45	-
Night south-easterly wind		38	45	-
Night temperature inversion		38	45	-

It can be seen that the L_{Amax} and L_{Aeq} levels from the operation of the refuelling facility is well under the project sleep disturbance criterion.

6.3.4 Discussion

Operational noise from the Proposal is not expected to exceed the project noise trigger levels at nearby sensitive receivers. In addition, noise levels from the SFT are not expected to increase significantly with the addition of the Proposal. A maximum increase of 0.3 dB(A) is predicted.

No exceedances of the sleep disturbance criteria are predicted as a result of the Proposal.

6.4 Operational traffic

Once operational the Proposal is not expected to generate additional heavy vehicle movements.

7.0 Conclusions

7.1 Construction noise impacts

A construction and operational Noise and Vibration Impact Assessment has been completed for the proposed upgrade of the Locomotive Provisioning Centre (LPC) located within the Sydney Freight Terminal (SFT). Nearby noise and vibration sensitive receivers were identified. Attended and unattended noise measurements were completed to characterise the existing noise environment. The measured noise levels were used to establish operational and construction noise management levels.

The construction works are expected to be undertaken during standard construction hours only. Construction work packages have been developed in consultation with Pacific National and the proposed equipment has been detailed within this report. Construction noise impacts were assessed at all nearby residential and other noise sensitive receivers.

The predicted construction noise levels are not expected to exceed the construction noise management levels at the closest noise sensitive receivers.

7.2 Operational noise impacts

7.2.1 Site operational noise

During the operation of the Proposal, there may be changes to the existing noise levels due to the operation of the LPC. Noise levels have been assessed in accordance with the *Noise Policy for Industry* and are predicted to comply with the operational noise criteria at all noise sensitive receivers.

7.2.2 Operational road traffic noise

The Proposal is not expected to generate additional heavy vehicle movements.

Appendix A

Acoustic Terminology

Appendix A Acoustic Terminology

The following is a brief description of acoustic terminology used in this report.

Sound power level	The total sound emitted by a source.
Sound pressure level	The amount of sound at a specified point.
Decibel [dB]	The measurement unit of sound.
A Weighted decibels [dB(A)]	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).
Decibel scale	The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:

0dB(A)	Threshold of human hearing
30dB(A)	A quiet country park
40dB(A)	Whisper in a library
50dB(A)	Open office space
70dB(A)	Inside a car on a freeway
80dB(A)	Outboard motor
90dB(A)	Heavy truck pass-by
100dB(A)	Jackhammer/Subway train
110 dB(A)	Rock Concert
115dB(A)	Limit of sound permitted in industry
120dB(A)	747 take off at 250 metres

Frequency [f]	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.
Equivalent continuous sound level [L_{eq}]	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.
L_{max}	The maximum sound pressure level measured over the measurement period.
L_{min}	The minimum sound pressure level measured over the measurement period.
L_{10}	The sound pressure level exceeded for 10% of the measurement period. For 10% of the measurement period it was louder than the L_{10}.

Chullora Refuel Facility

L_{90}	The sound pressure level exceeded for 90% of the measurement period. For 90% of the measurement period it was louder than the L_{90}.
Ambient noise	The all-encompassing noise at a point composed of sound from all sources near and far.
Background noise	The underlying level of noise present in the ambient noise when extraneous noise (such as transient traffic and dogs barking) is removed. The L_{90} sound pressure level is used to quantify background noise.
Traffic noise	The total noise resulting from road traffic. The L_{eq} sound pressure level is used to quantify traffic noise.
Day	The period from 0700 to 1800 h Monday to Saturday and 0800 to 1800 h Sundays and Public Holidays.
Evening	The period from 1800 to 2200 h Monday to Sunday and Public Holidays.
Night	The period from 2200 to 0700 h Monday to Saturday and 2200 to 0800 h Sundays and Public Holidays.
Noise catchment area [NCA]	The noise environment at each of the sensitive receivers within a noise catchment area is considered to be similar to the unattended monitoring location within that NCA.
Assessment background level [ABL]	The overall background level for each day, evening and night period for **each day** of the noise monitoring.
Rating background level [RBL]	The overall background level for each day, evening and night period for the **entire length** of noise monitoring.

*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 *"Acoustics – Glossary of terms and related symbols"*, the EPA's *Noise Policy for Industry* and the EPA's *Road Noise Policy*.

Appendix B

Noise Logging

Noise Logger Report

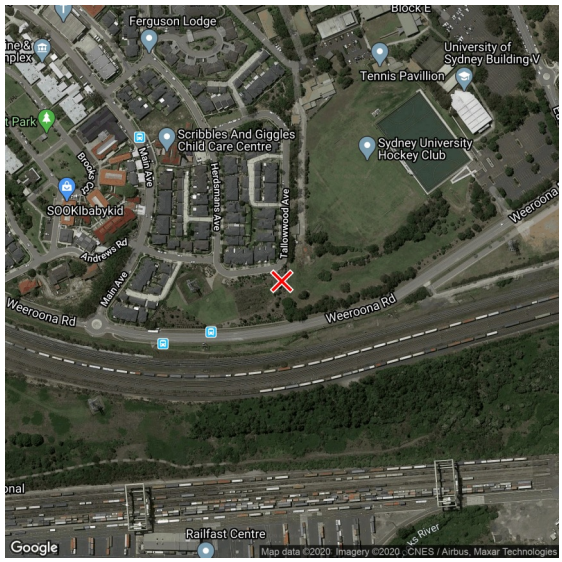
37 Tallowwood Avenue, Lidcombe

Item	Information
Logger Type	Rion NL21
Serial number	765701
Address	37 Tallowwood Avenue, Lidcombe
Location	Park
Facade / Free Field	Free Field
Environment	Background noise controlled by road traffic hum from Rookwood Road and possibly the Hume Highway. Ambient noise influenced by local traffic pass by (local car pass by 55 dBA), train pass by (70 dBA loco, 63 dBA wagon) and gantry crane operation Birds also calling at times. Overcast, mild breeze.

Measured noise levels

Logging Date	L_{Aeq} Day	Eve	Night	ABL Day	Eve	Night	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$
Thu Apr 16 2020	53	51	48	-	43	-	52	48
Fri Apr 17 2020	53	54	51	43	44	40	53	51
Sat Apr 18 2020	53	48	52	40	41	43	52	52
Sun Apr 19 2020	51	53	50	37	43	38	51	50
Mon Apr 20 2020	54	52	53	47	48	40	53	53
Tue Apr 21 2020	53	53	53	40	43	42	53	53
Wed Apr 22 2020	54	52	53	44	44	41	53	53
Thu Apr 23 2020	52	53	52	38	44	40	53	52
Fri Apr 24 2020	54	52	52	40	46	39	54	52
Sat Apr 25 2020	53	55	53	38	40	42	54	53
Sun Apr 26 2020	52	49	51	-	41	37	51	51
Mon Apr 27 2020	54	54	52	44	45	42	54	52
Tue Apr 28 2020	51	-	53	-	-	-	51	53
Summary	**53**	**52**	**52**	**40**	**43**	**40**	**53**	**52**

Note: Results denoted with '-' do not contain enough valid data for a value to be calculated. The data has been excluded either manually or automatically as a result of adverse weather conditions.

Logger Location	Logger Deployment Photo
	

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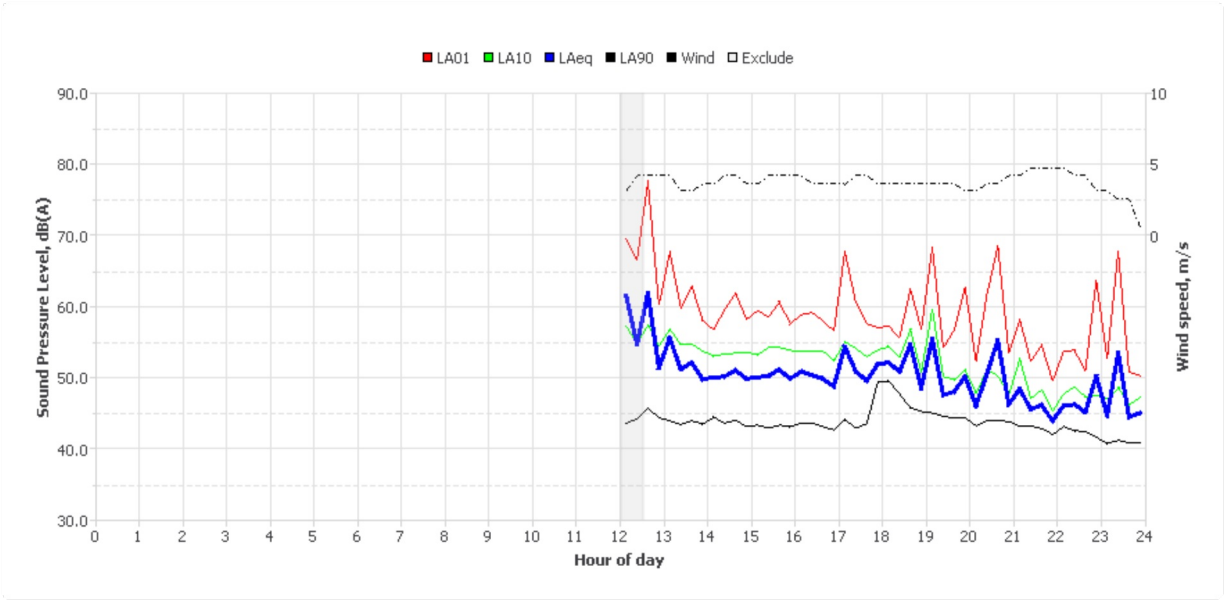
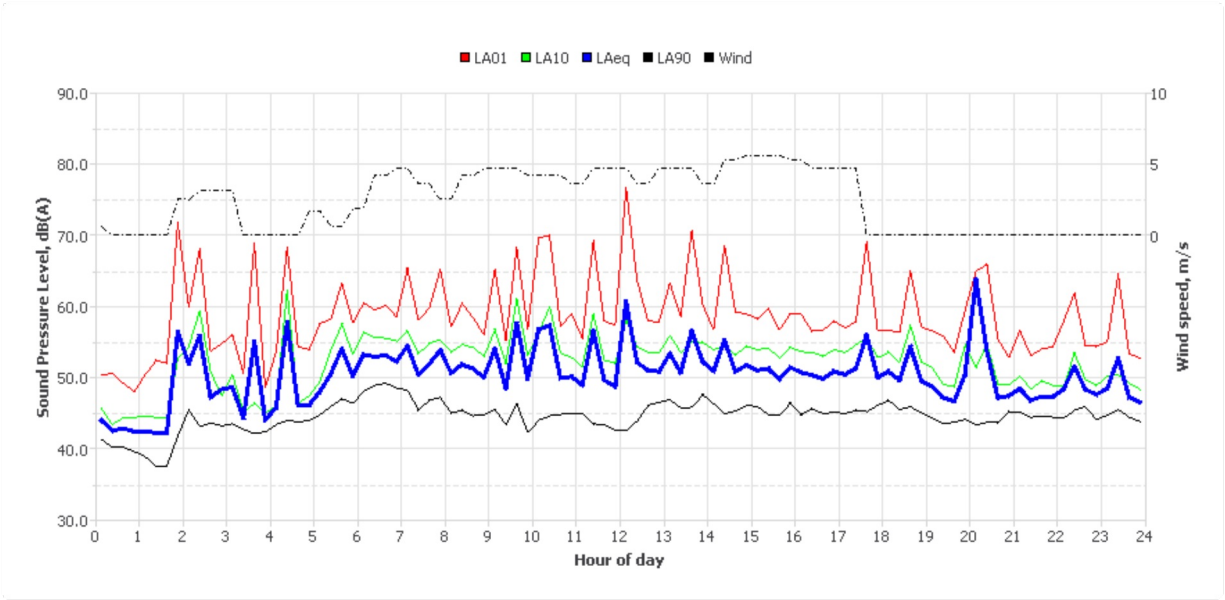
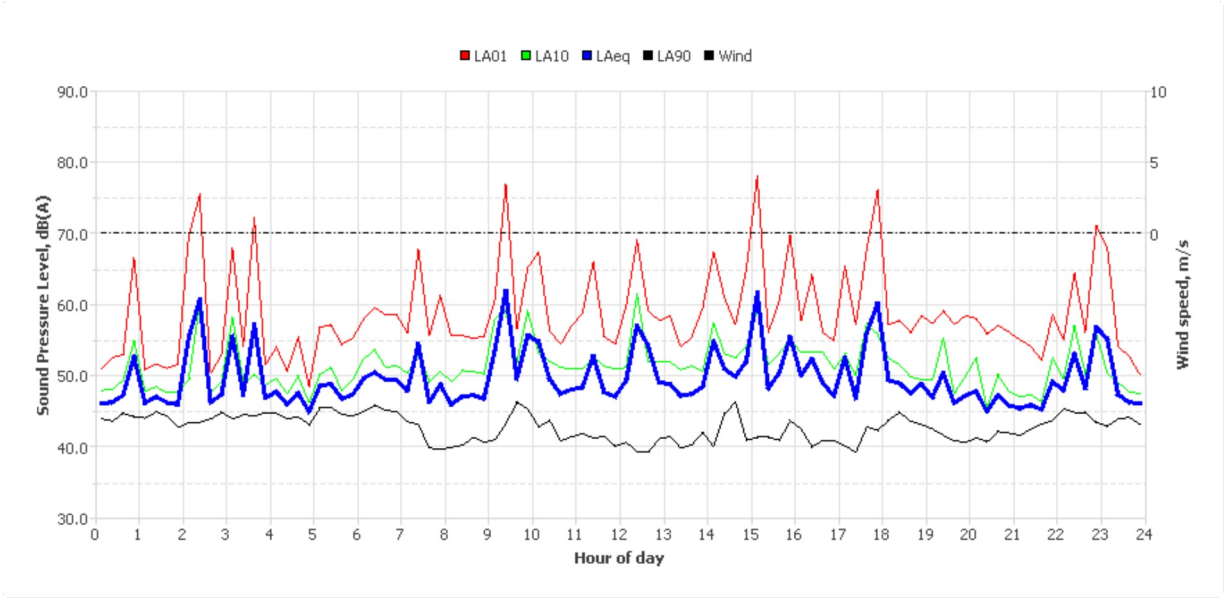


Friday, 17 Apr 2020



Saturday, 18 Apr 2020



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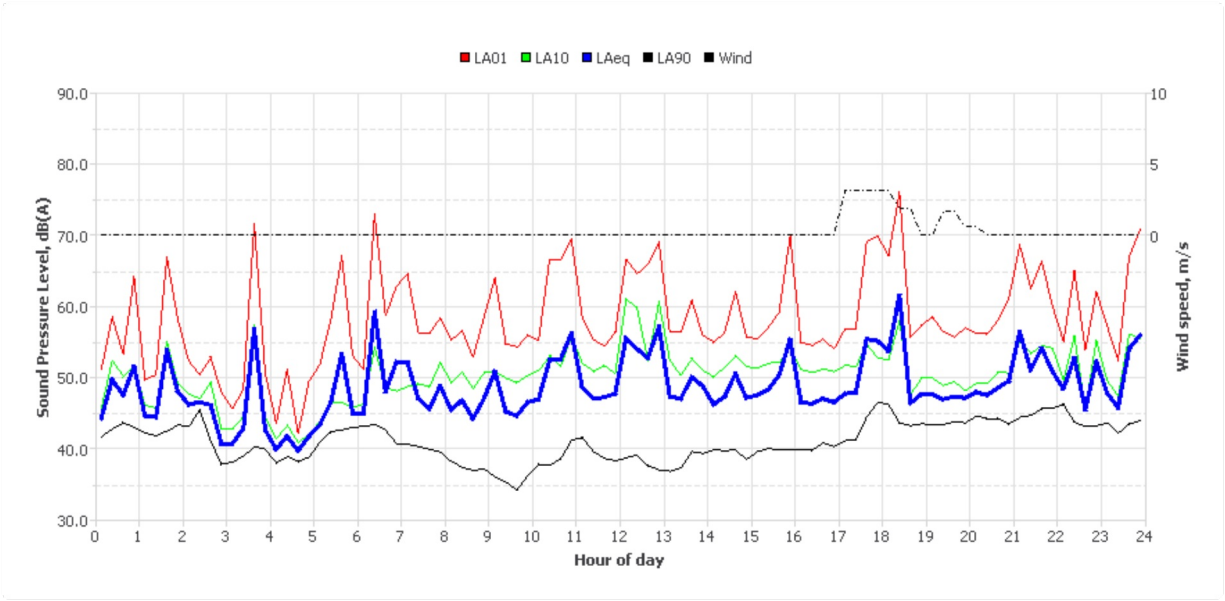

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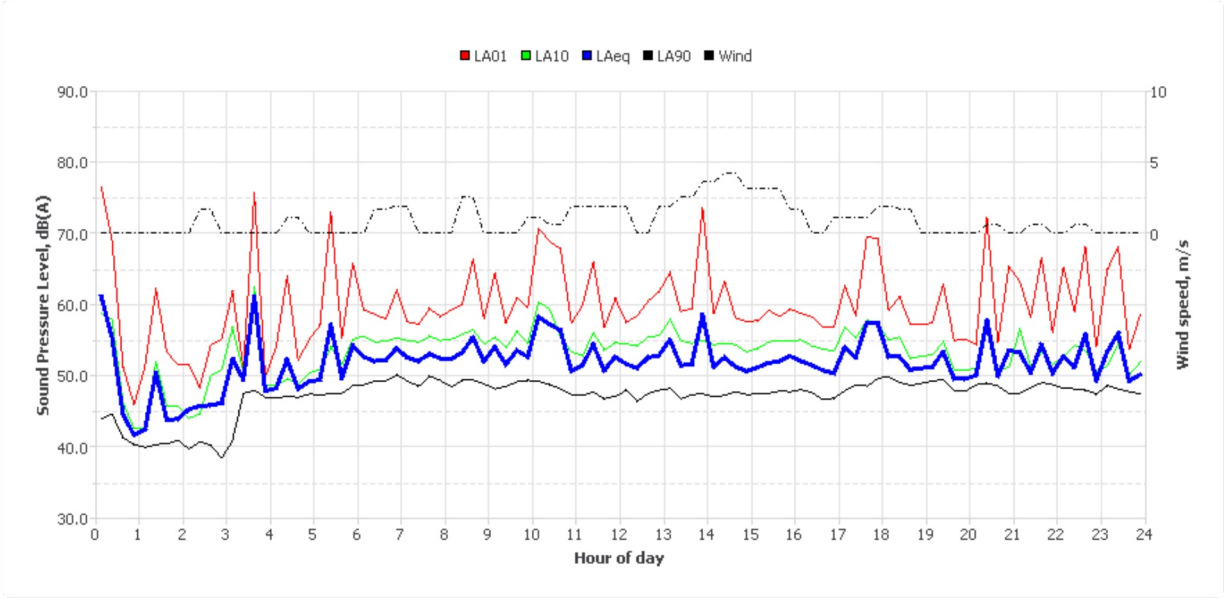
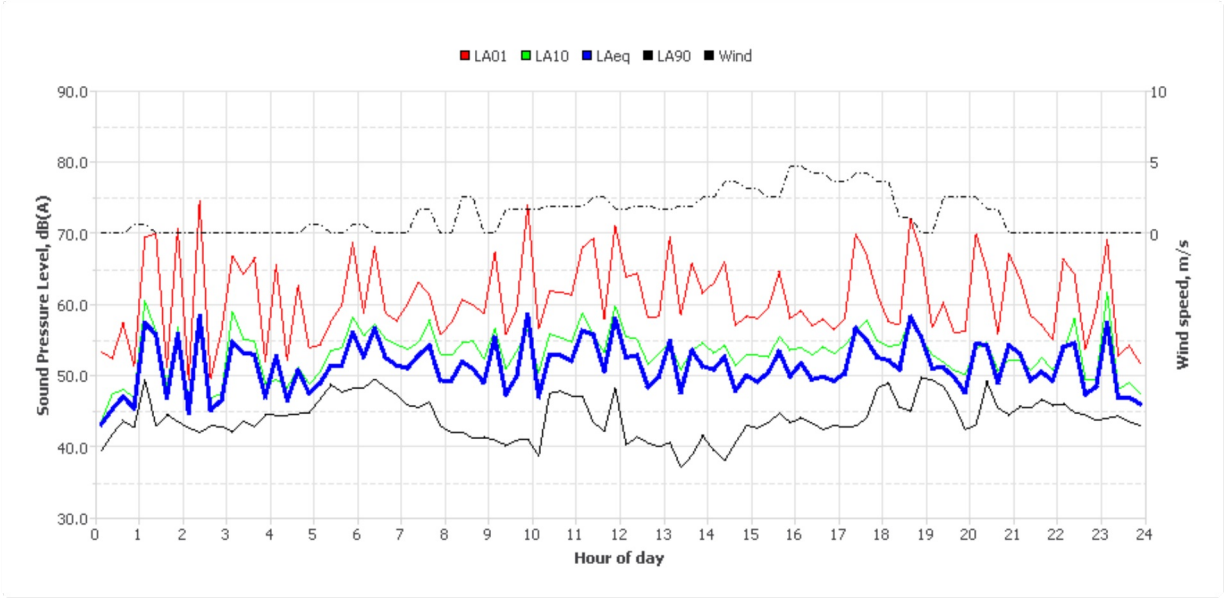


Tuesday, 21 Apr 2020



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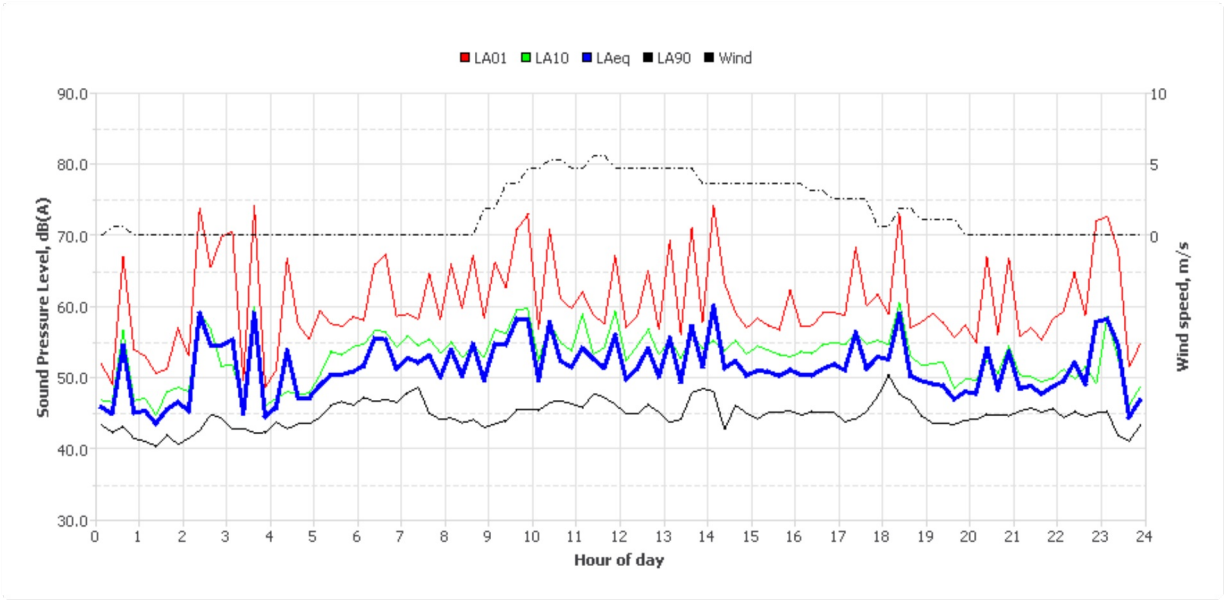

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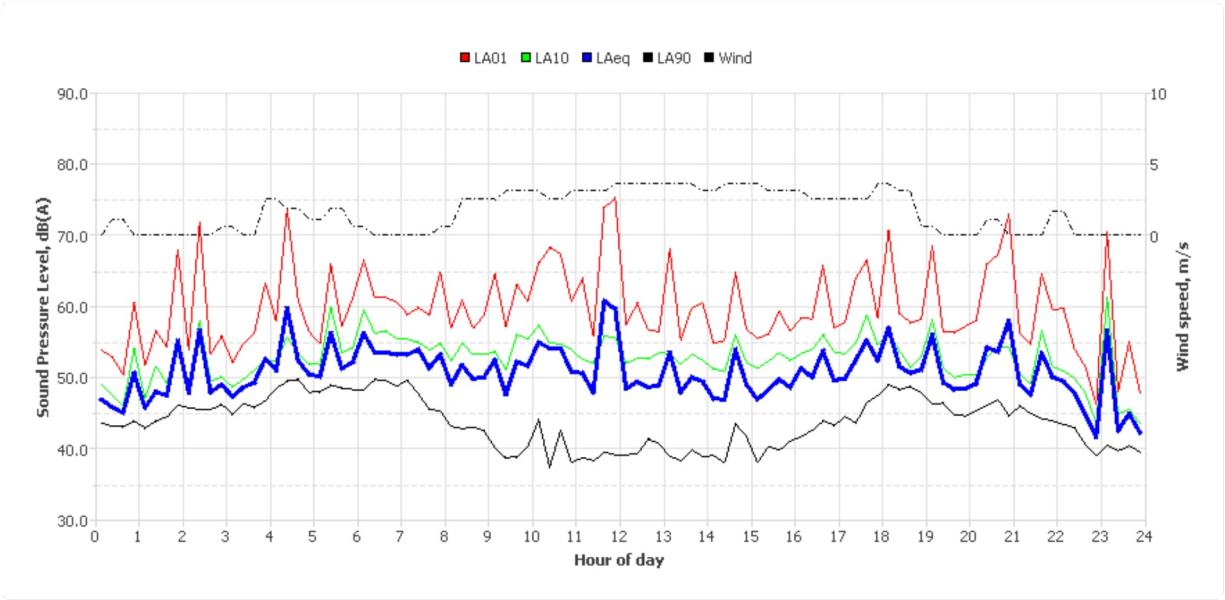

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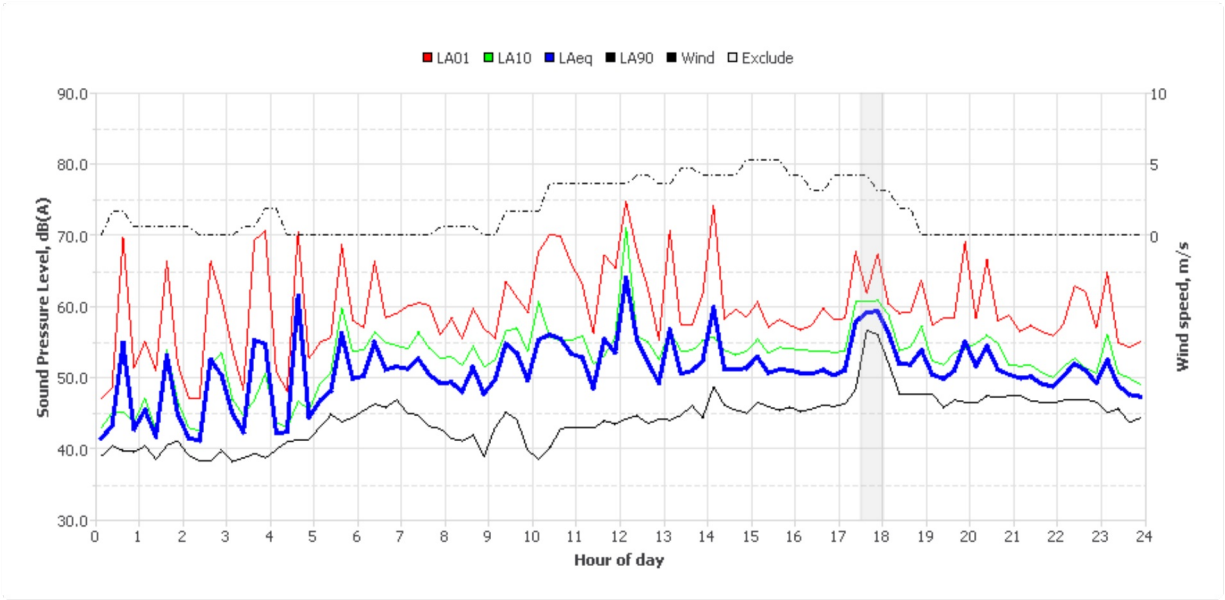

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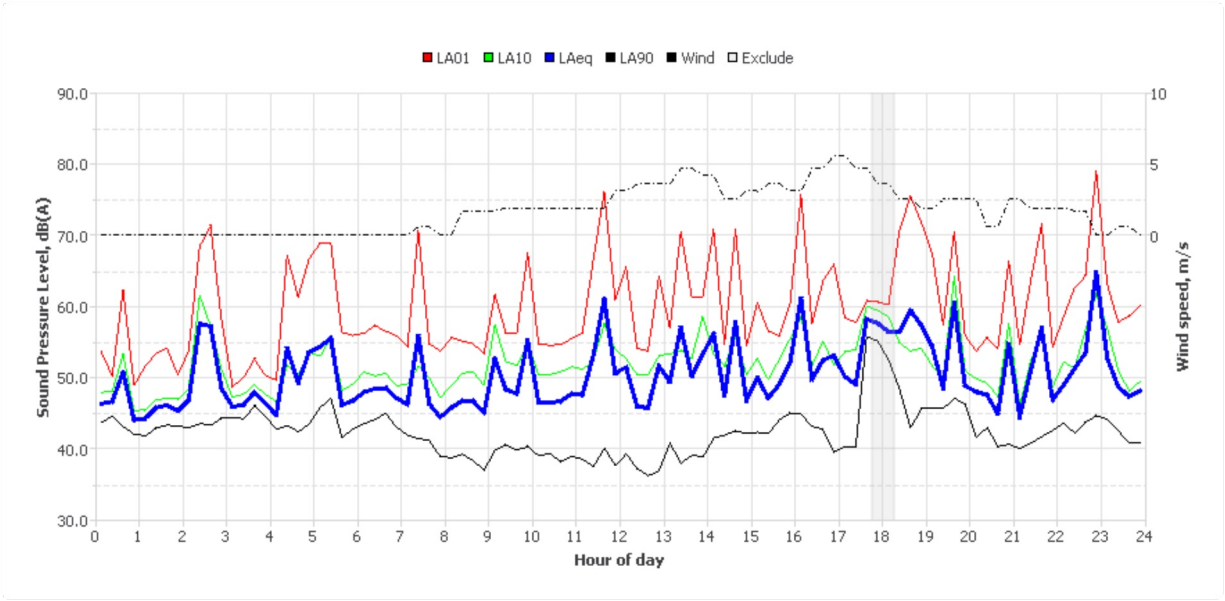

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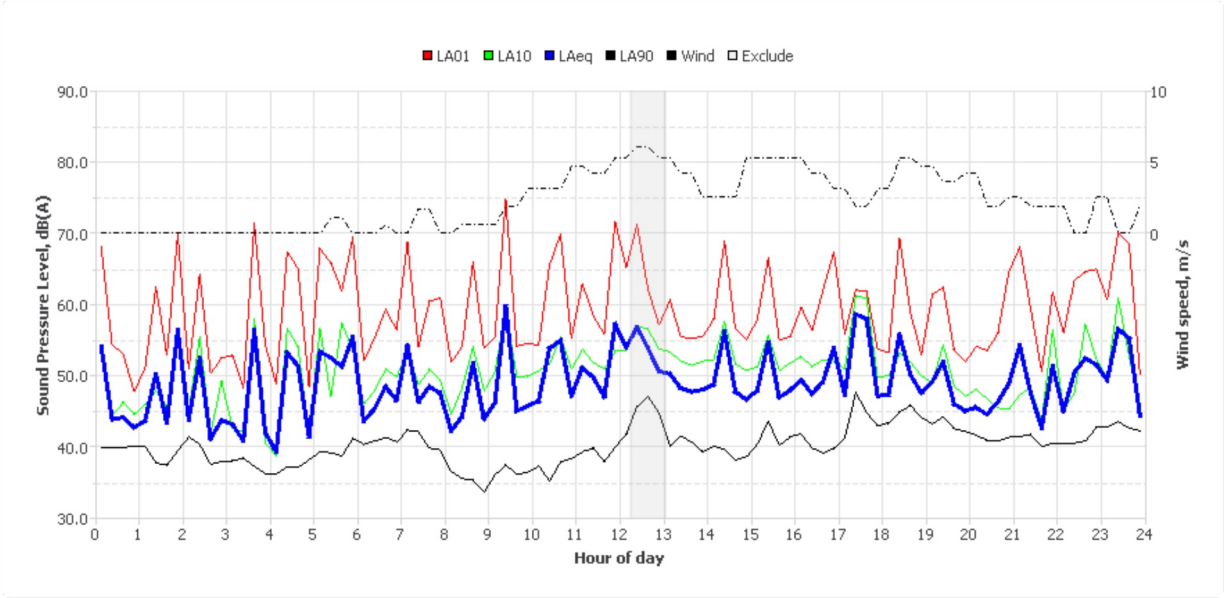

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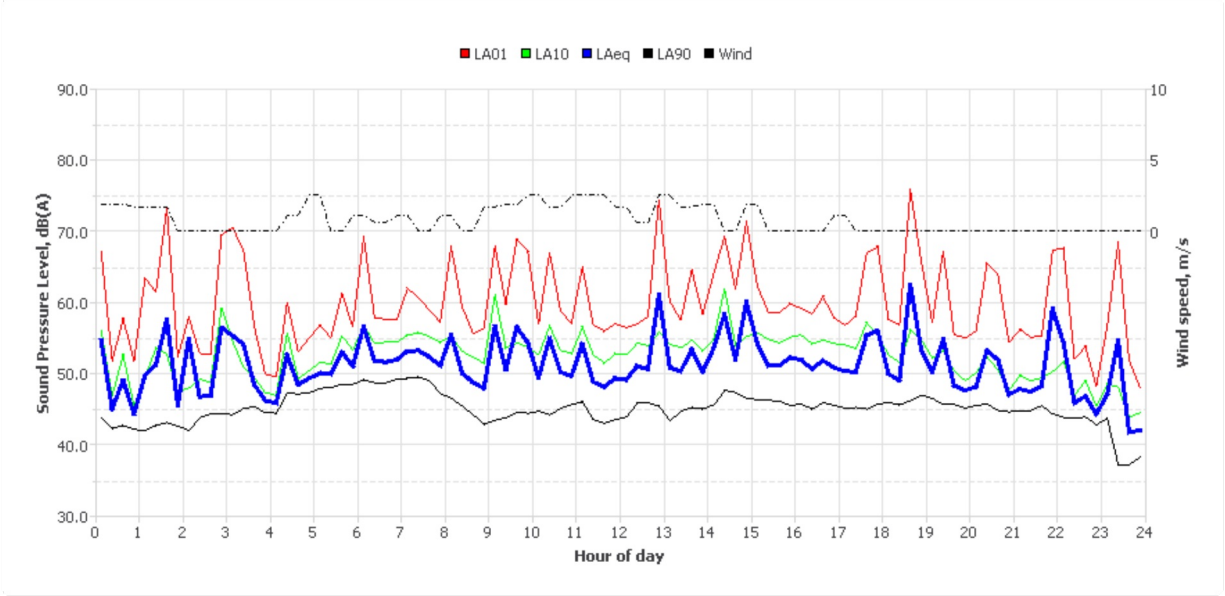

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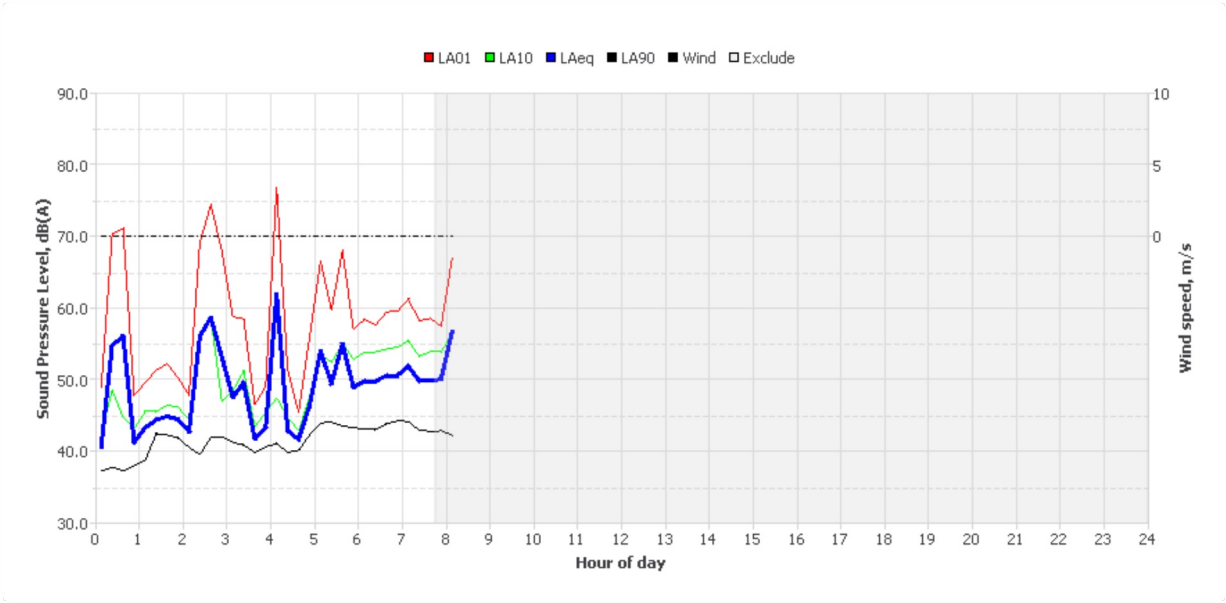


Noise Logger Report

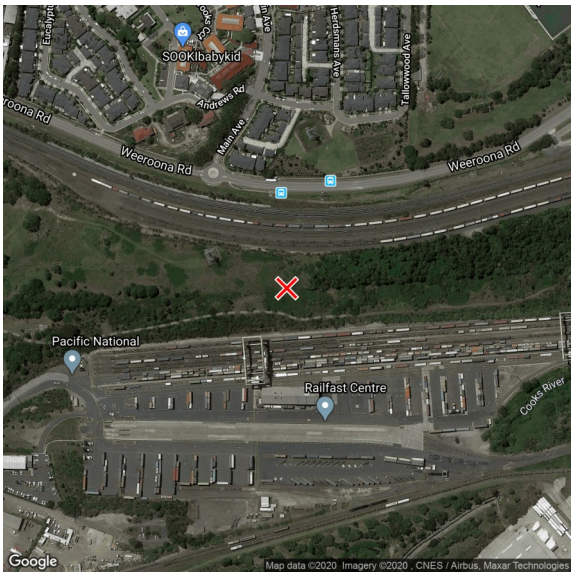
20 Dasea St, Chullora

Item	Information
Logger Type	Rion NL52
Serial number	553967
Address	20 Dasea St, Chullora
Location	Onsite
Facade / Free Field	Free Field
Environment	Background noise controlled by road traffic hum from Rookwood Road and possibly the Hume Highway. Ambient noise controlled by gantry crane moving and operating (around 50 when passing in front) and also rail pass by operating to the north (no line of sight). Vehicle pass by audible along Weeroona Road, but not dominant. Bus passby on Weeroona Road clearly audible. Trucks along Rookwood Road audible at times. Overcast day. Insects and birds calling at times.

Measured noise levels

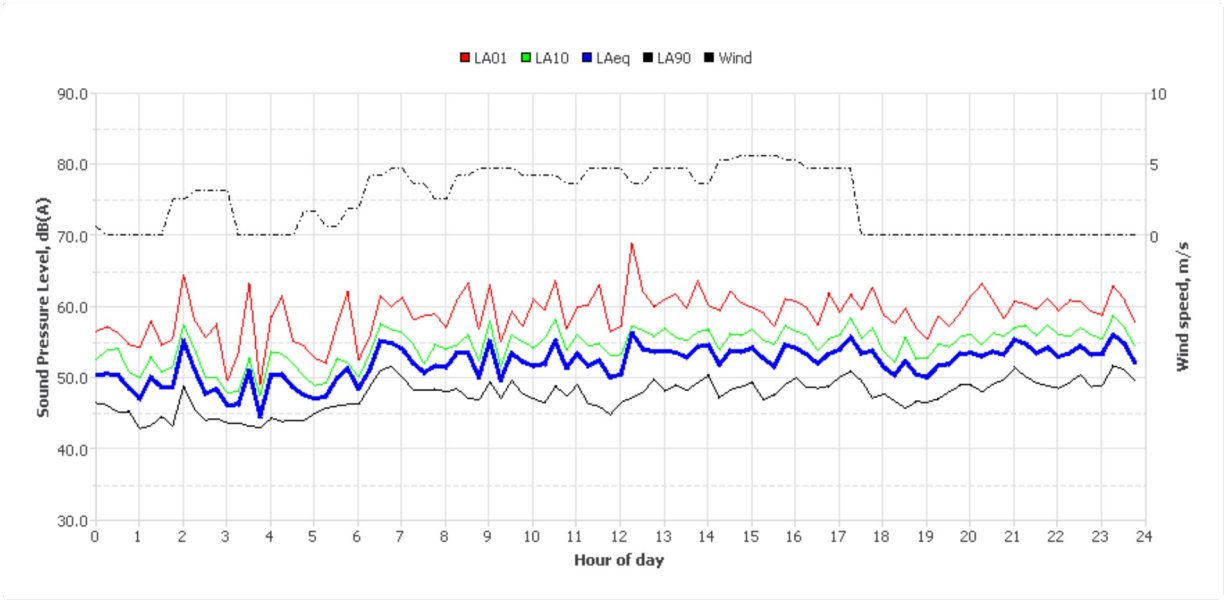
Logging Date	L_{Aeq} Day	Eve	Night	ABL Day	Eve	Night	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$
Thu Apr 16 2020	54	53	50	-	47	-	53	50
Fri Apr 17 2020	53	53	51	46	47	43	53	51
Sat Apr 18 2020	51	49	51	41	41	43	50	51
Sun Apr 19 2020	45	50	50	39	43	40	47	50
Mon Apr 20 2020	53	53	52	48	49	43	53	52
Tue Apr 21 2020	51	54	52	42	45	44	52	52
Wed Apr 22 2020	52	53	52	45	45	43	52	52
Thu Apr 23 2020	52	54	52	43	48	45	53	52
Fri Apr 24 2020	52	54	52	44	48	40	53	52
Sat Apr 25 2020	53	56	54	42	53	47	54	54
Sun Apr 26 2020	48	46	50	-	44	43	48	50
Mon Apr 27 2020	52	54	51	43	47	44	52	51
Tue Apr 28 2020	52	-	50	-	-	-	52	50
Summary	**52**	**53**	**52**	**43**	**47**	**43**	**52**	**52**

Note: Results denoted with '-' do not contain enough valid data for a value to be calculated. The data has been excluded either manually or automatically as a result of adverse weather conditions.

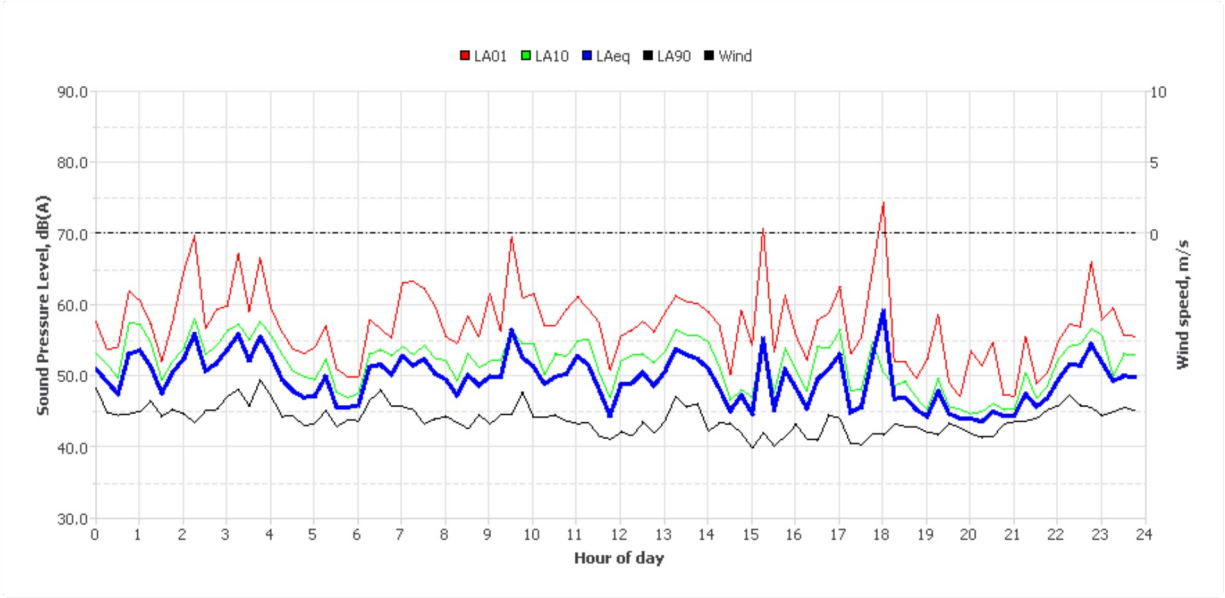
Logger Location	Logger Deployment Photo
	

Thursday, 16 Apr 2020

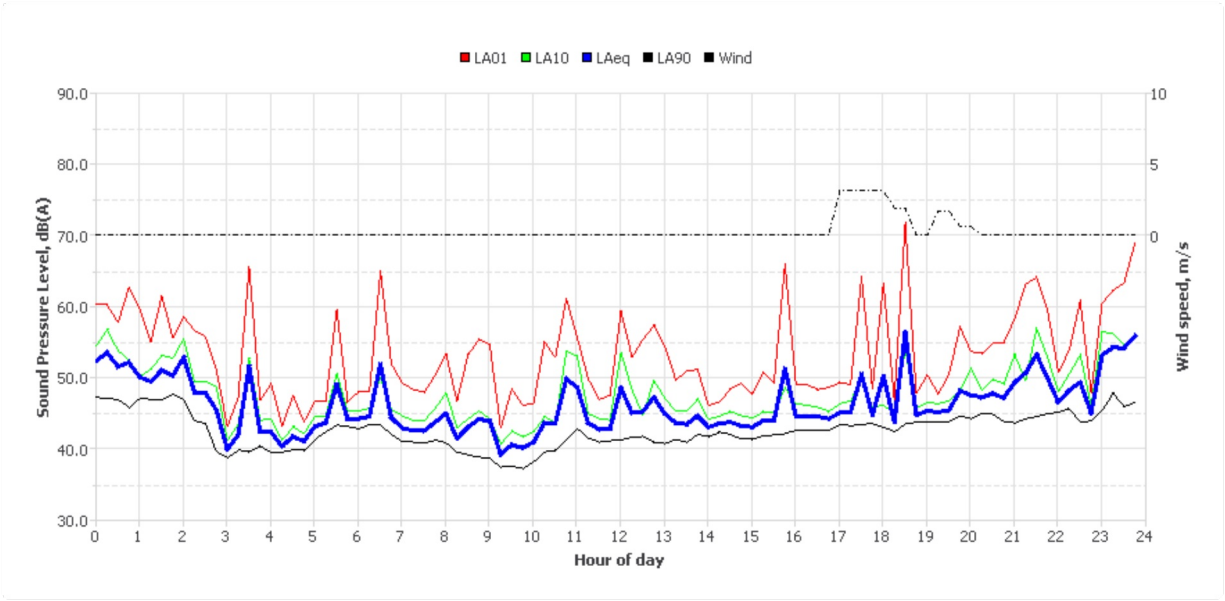
Friday, 17 Apr 2020



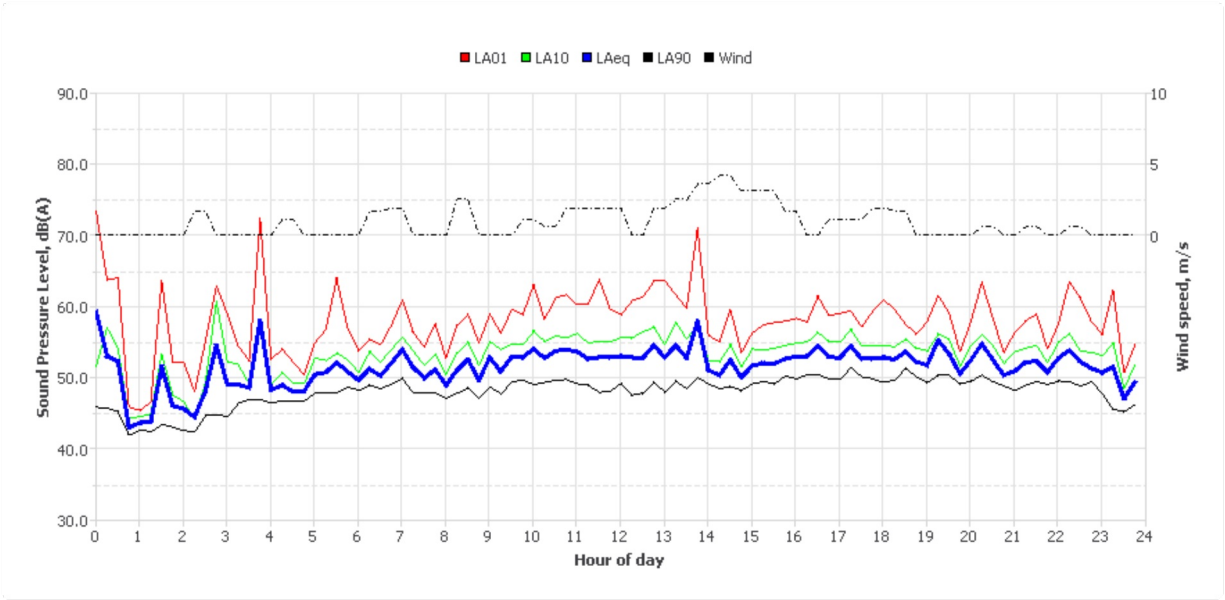
Saturday, 18 Apr 2020



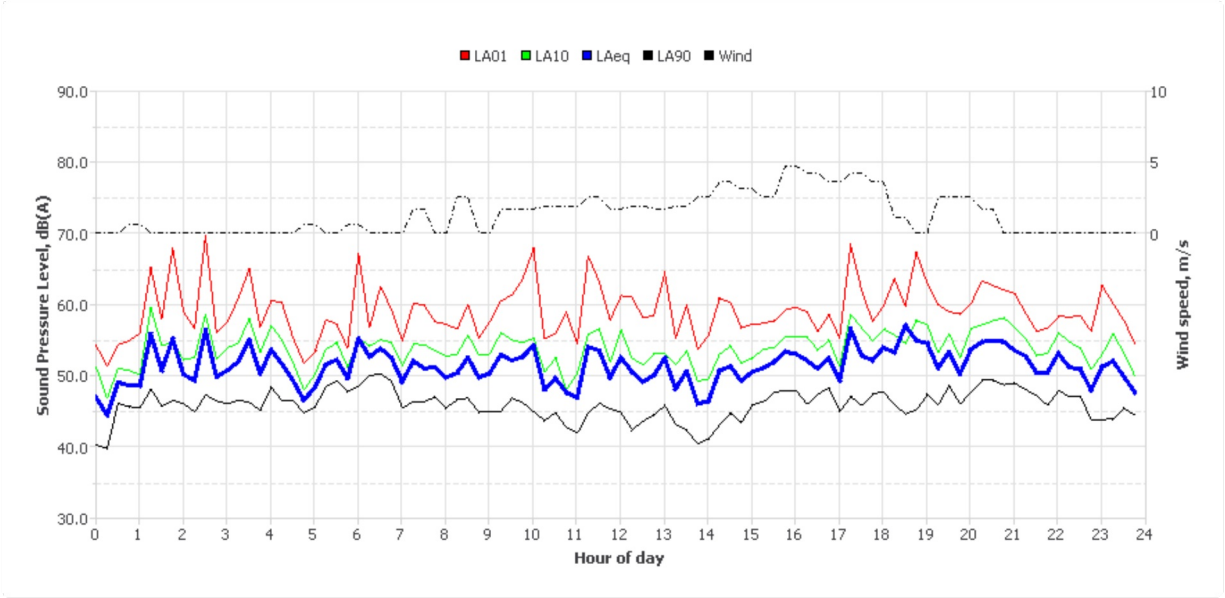
Sunday, 19 Apr 2020



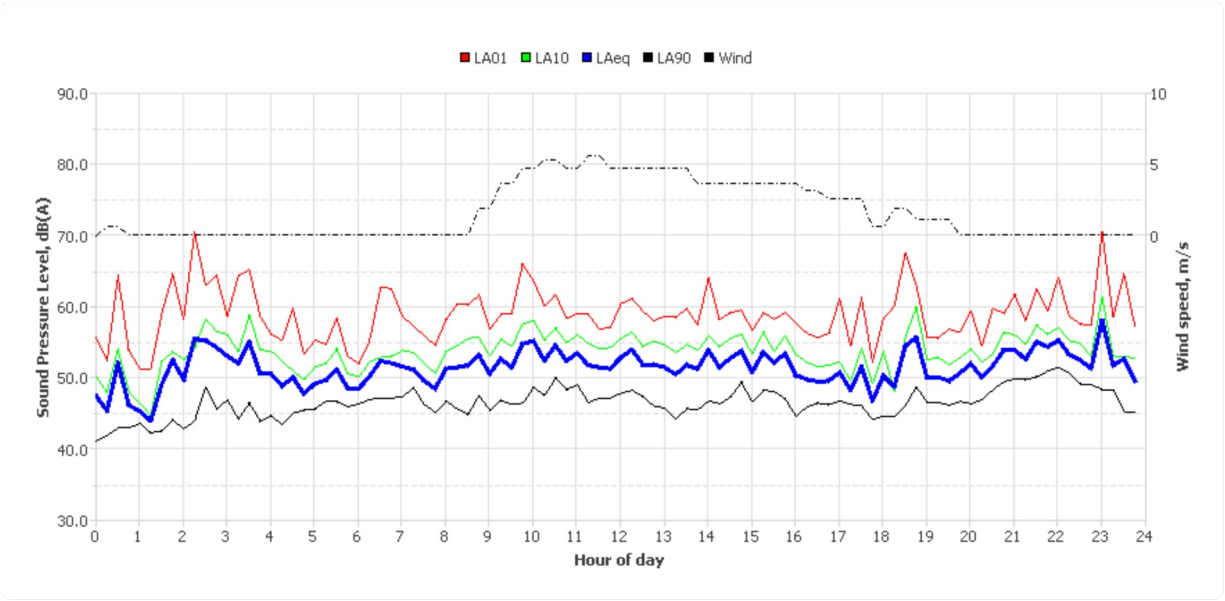
Monday, 20 Apr 2020



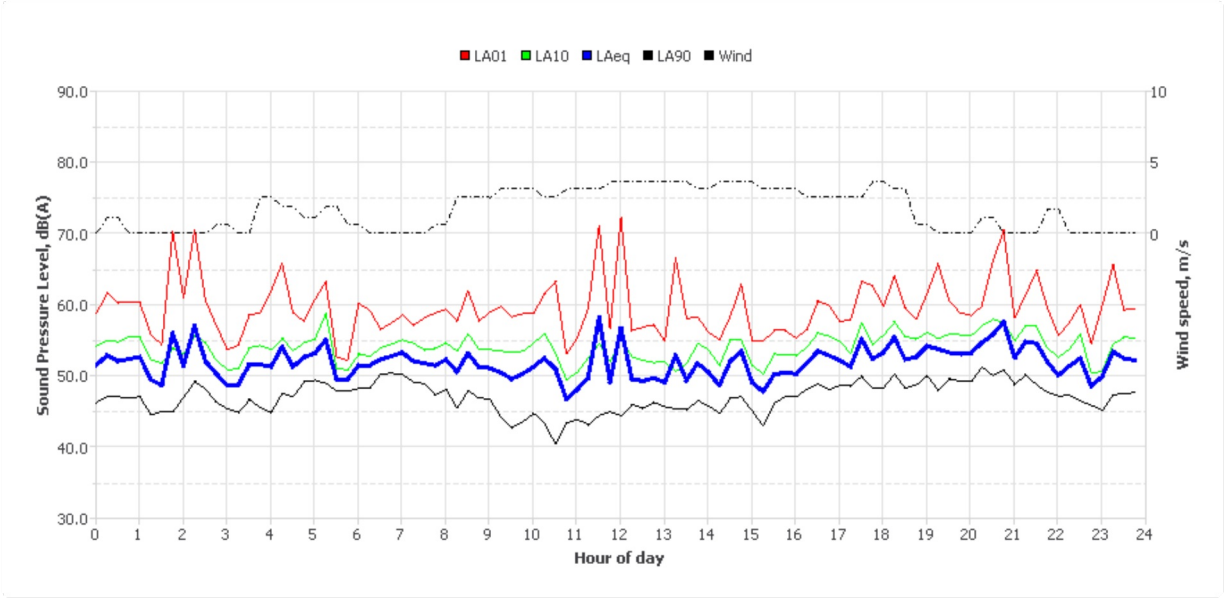
Tuesday, 21 Apr 2020



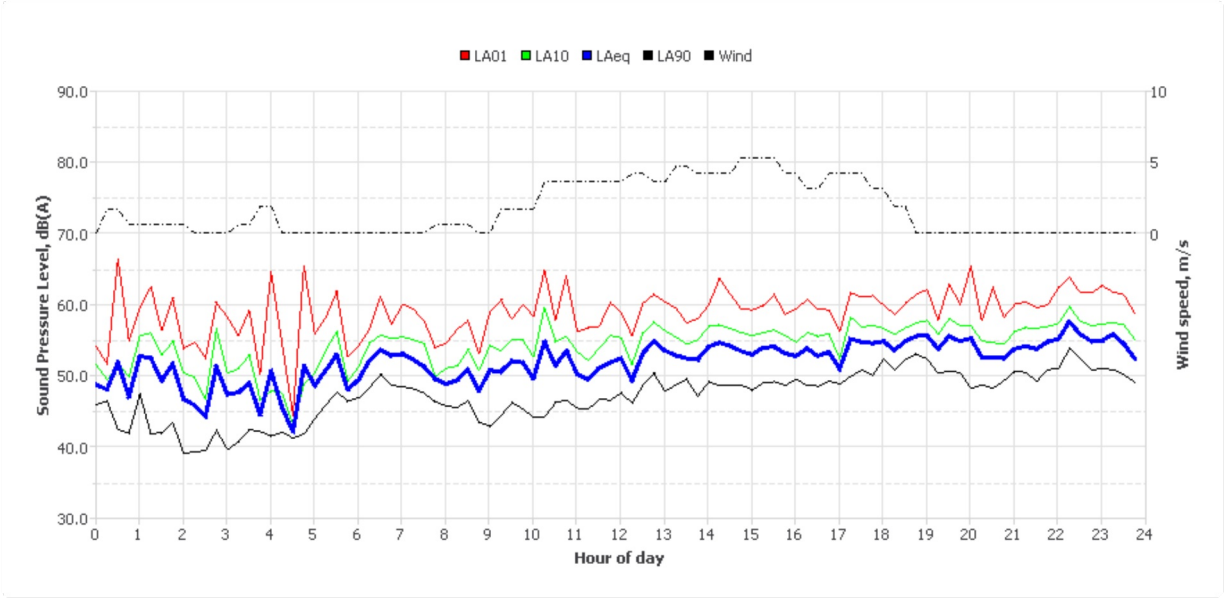
Wednesday, 22 Apr 2020



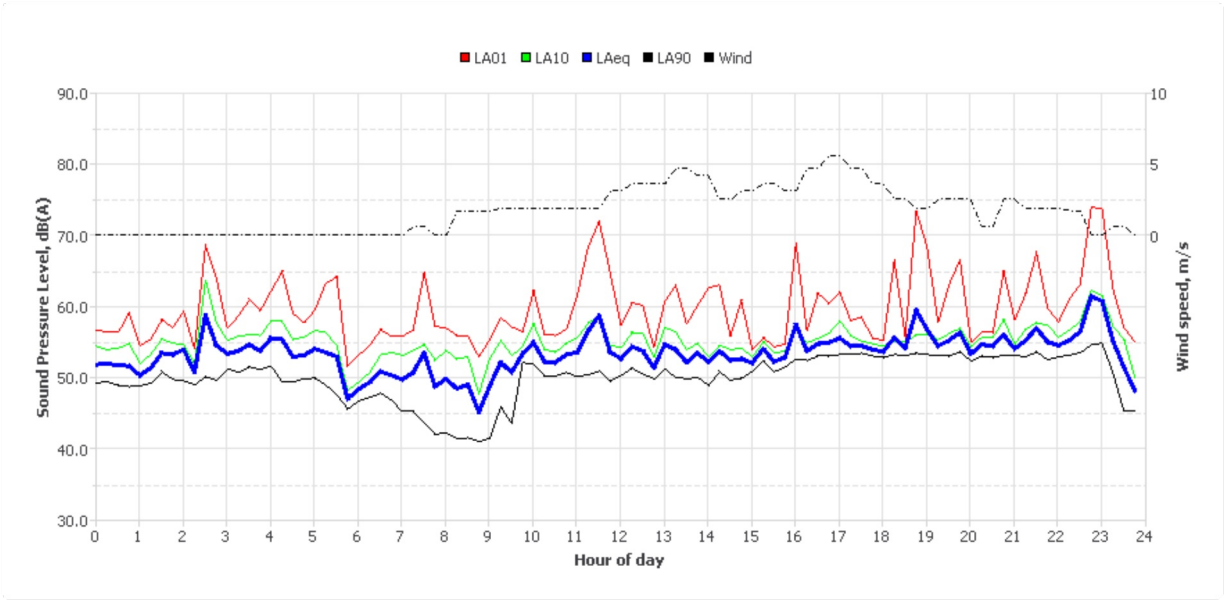
Thursday, 23 Apr 2020



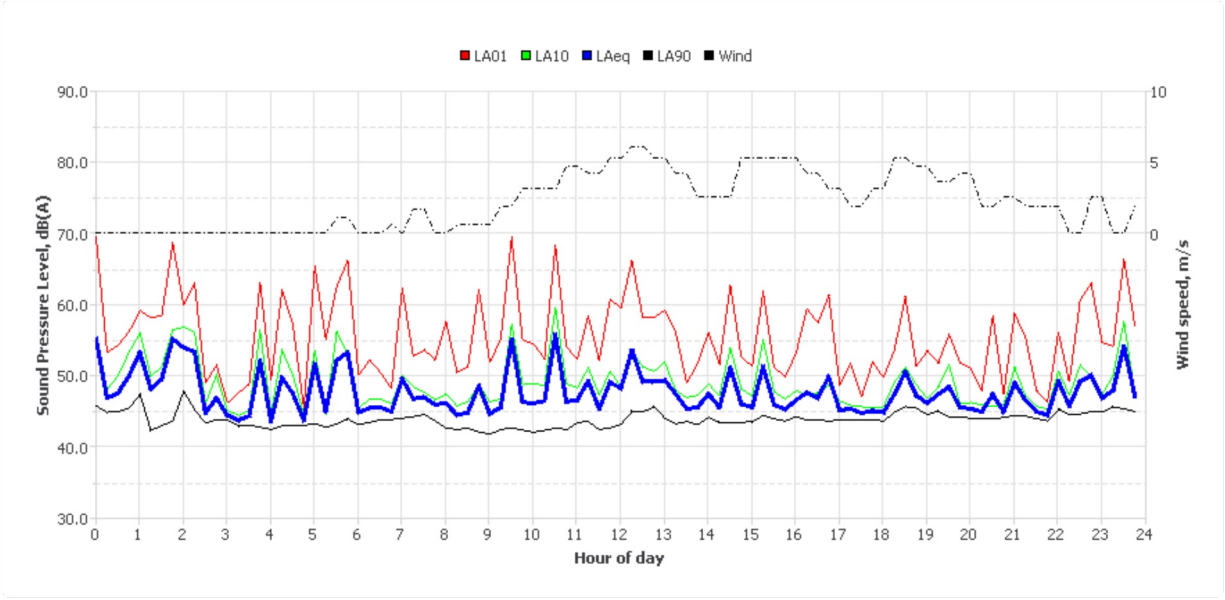
Friday, 24 Apr 2020



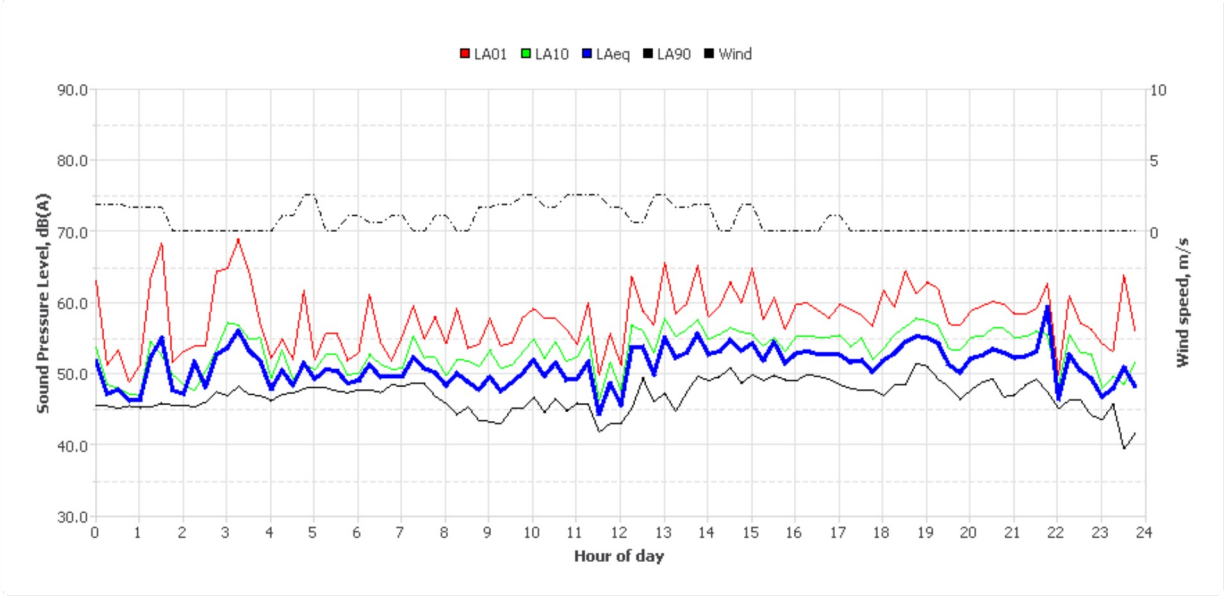
Saturday, 25 Apr 2020



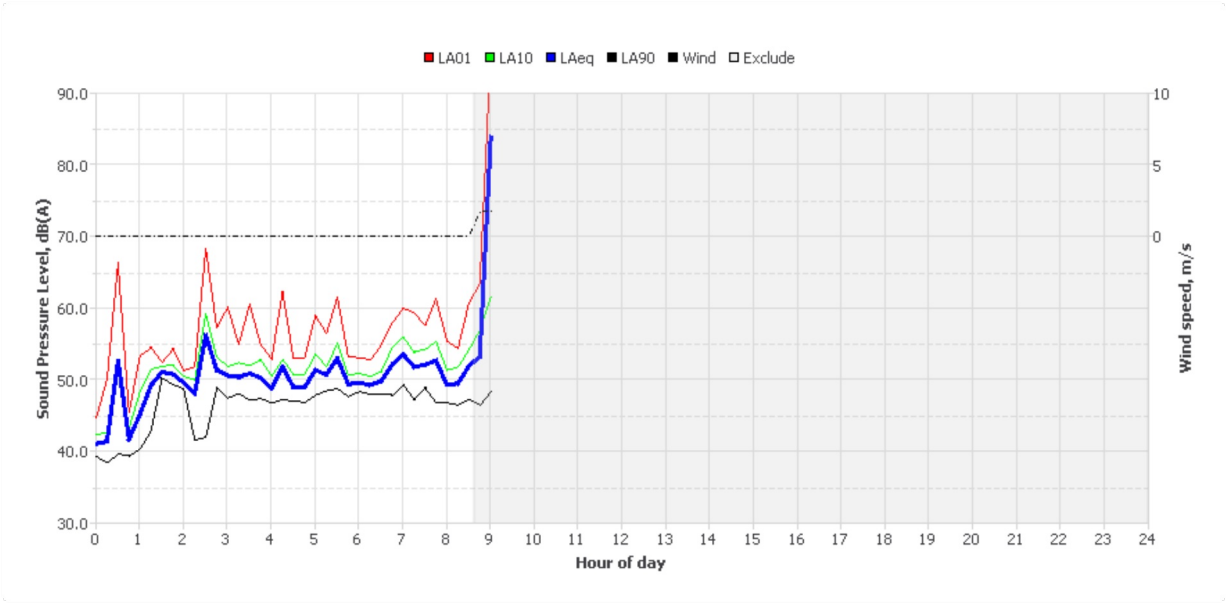
Sunday, 26 Apr 2020



Monday, 27 Apr 2020

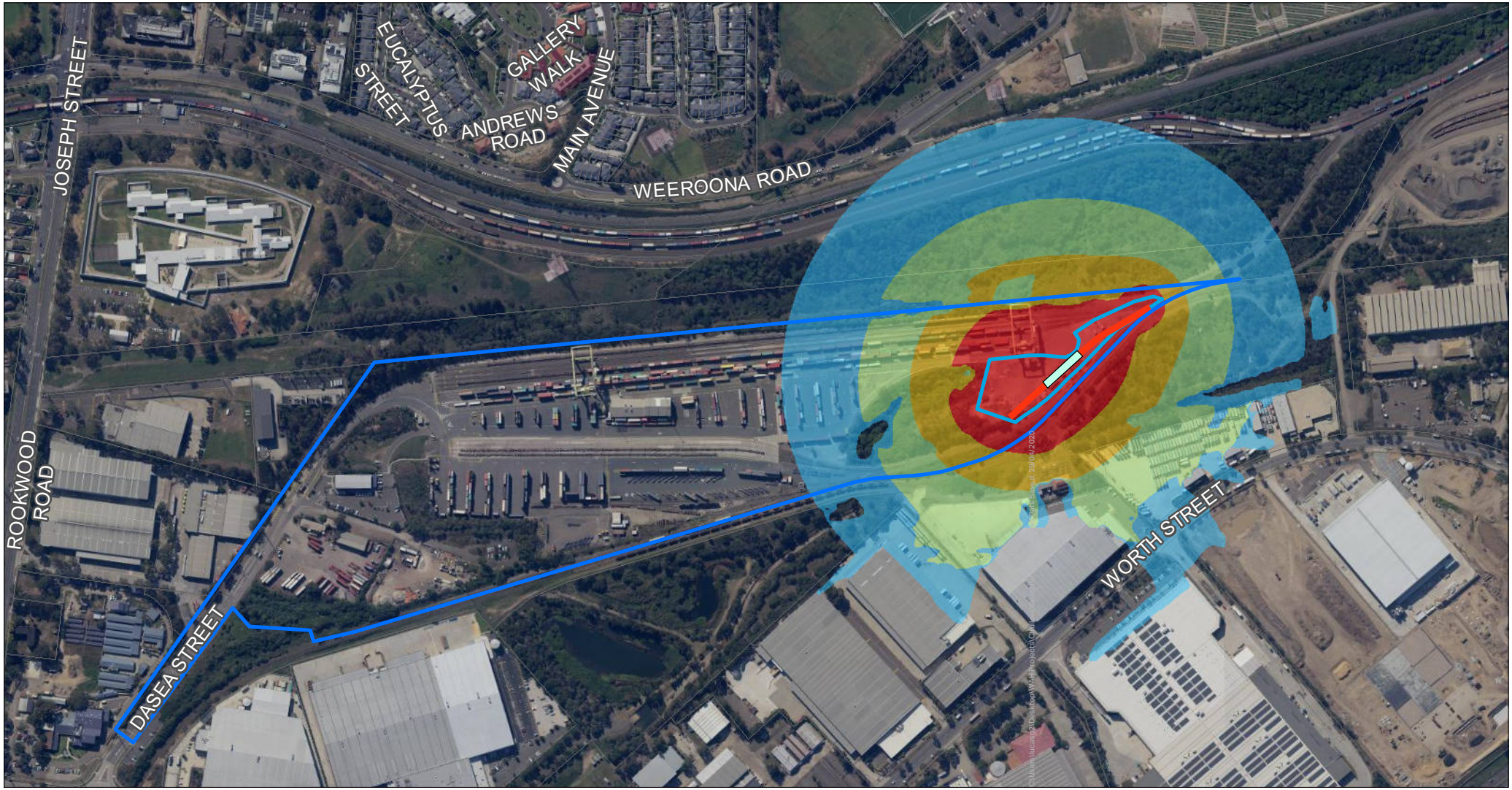


Tuesday, 28 Apr 2020



Appendix C

Construction Noise Contour Plots



Locomotive Provisioning Centre - Construction Noise

N

0 80 160 Meters

AECOM

Freight Terminal

Project Area

Siding

Refueling Shed

Sound Pressure Level, L_{Aeq} dB(A)

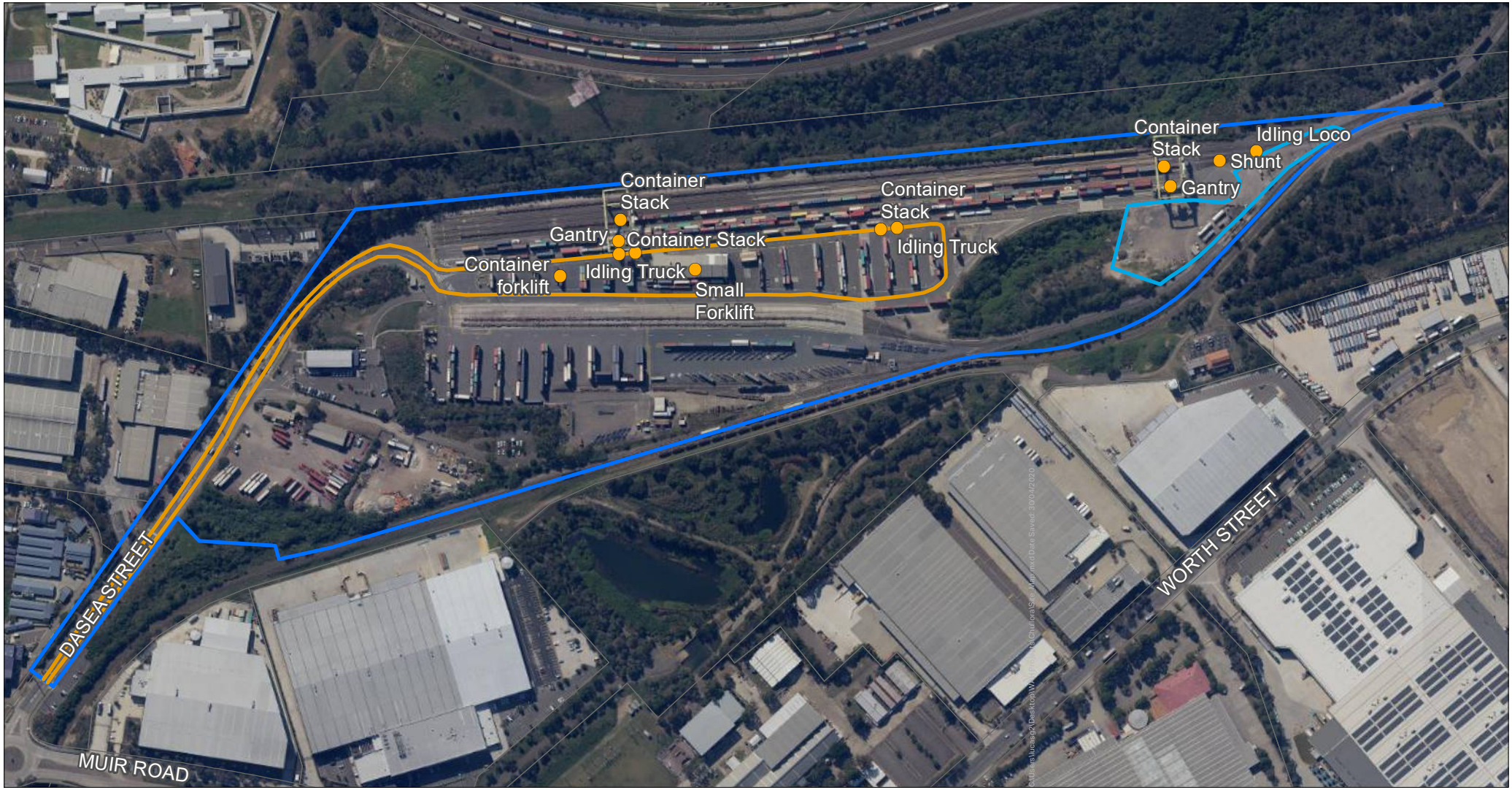
< 50 | 50 - 54 | 55 - 59 | 60 - 64 | > 64

Source:

Chullora Refuel Facility

Appendix D

Site Layout and Noise Sources



Locomotive Provisioning Centre - Current SFT

N

0 50 100 Meters

AECOM

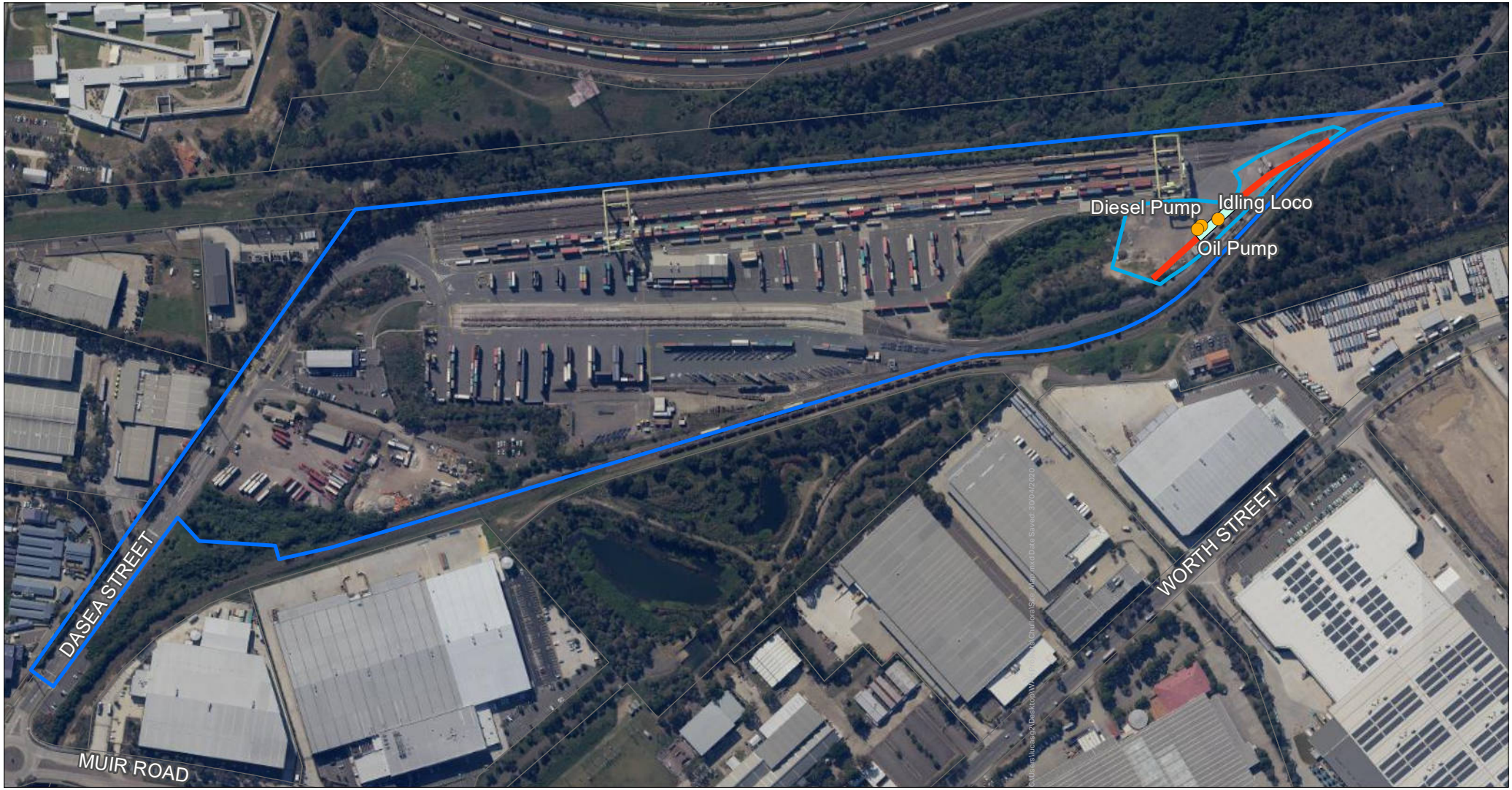
Truck Route

Freight Terminal

Project Area

Point Sources

Source:



Locomotive Provisioning Centre - Proposed LPC

- Freight Terminal
- Project Area
- Siding
- Refuelling Shed
- Point Sources

Source:

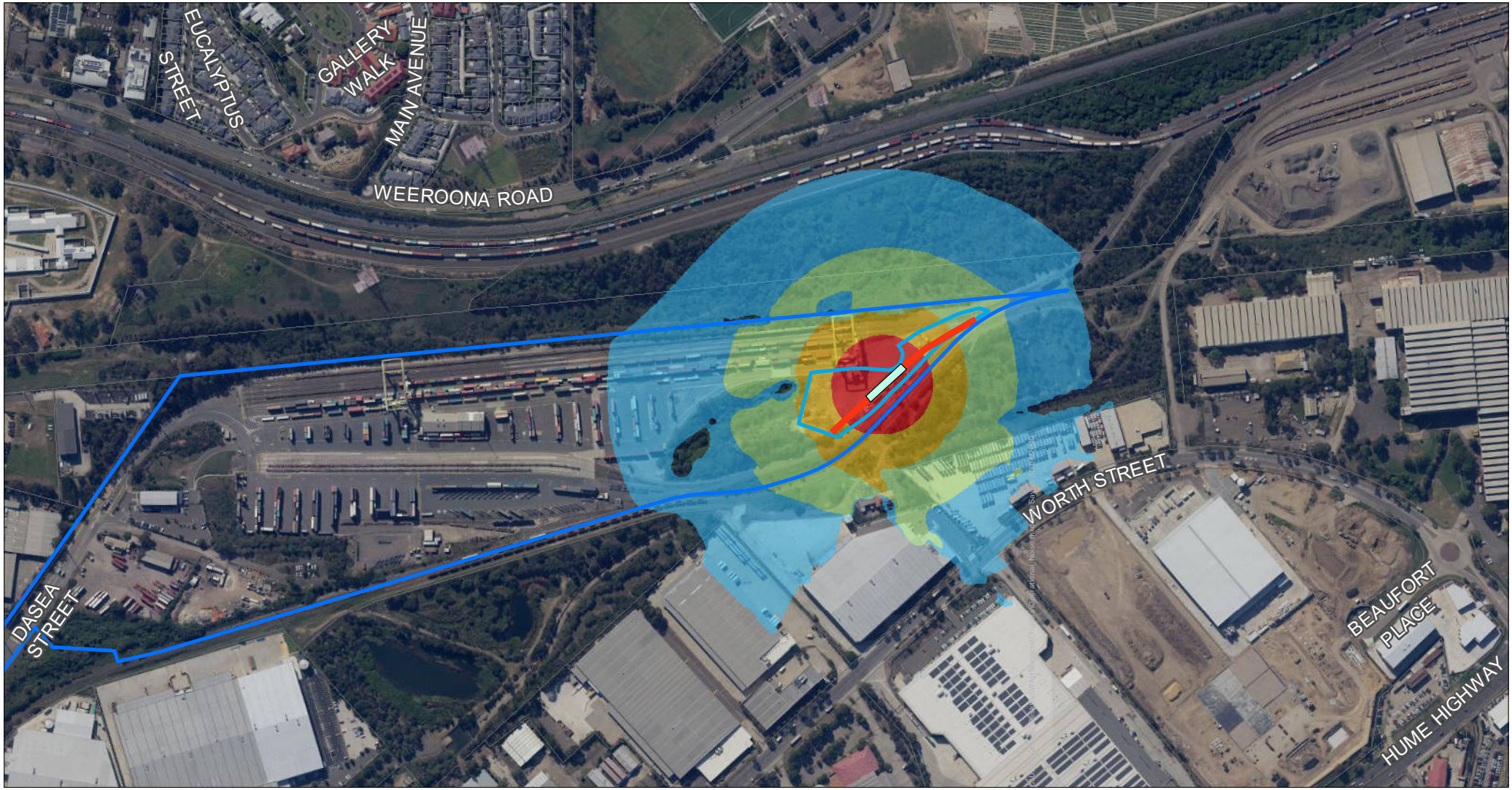
N

0 50 100 Meters

AECOM

Appendix E

Operational Noise Contour Plots



Locomotive Provisioning Centre - Operational Noise Levels - Neutral Conditions

N 0 90 180 Meters

AECOM

Freight Terminal

Project Area

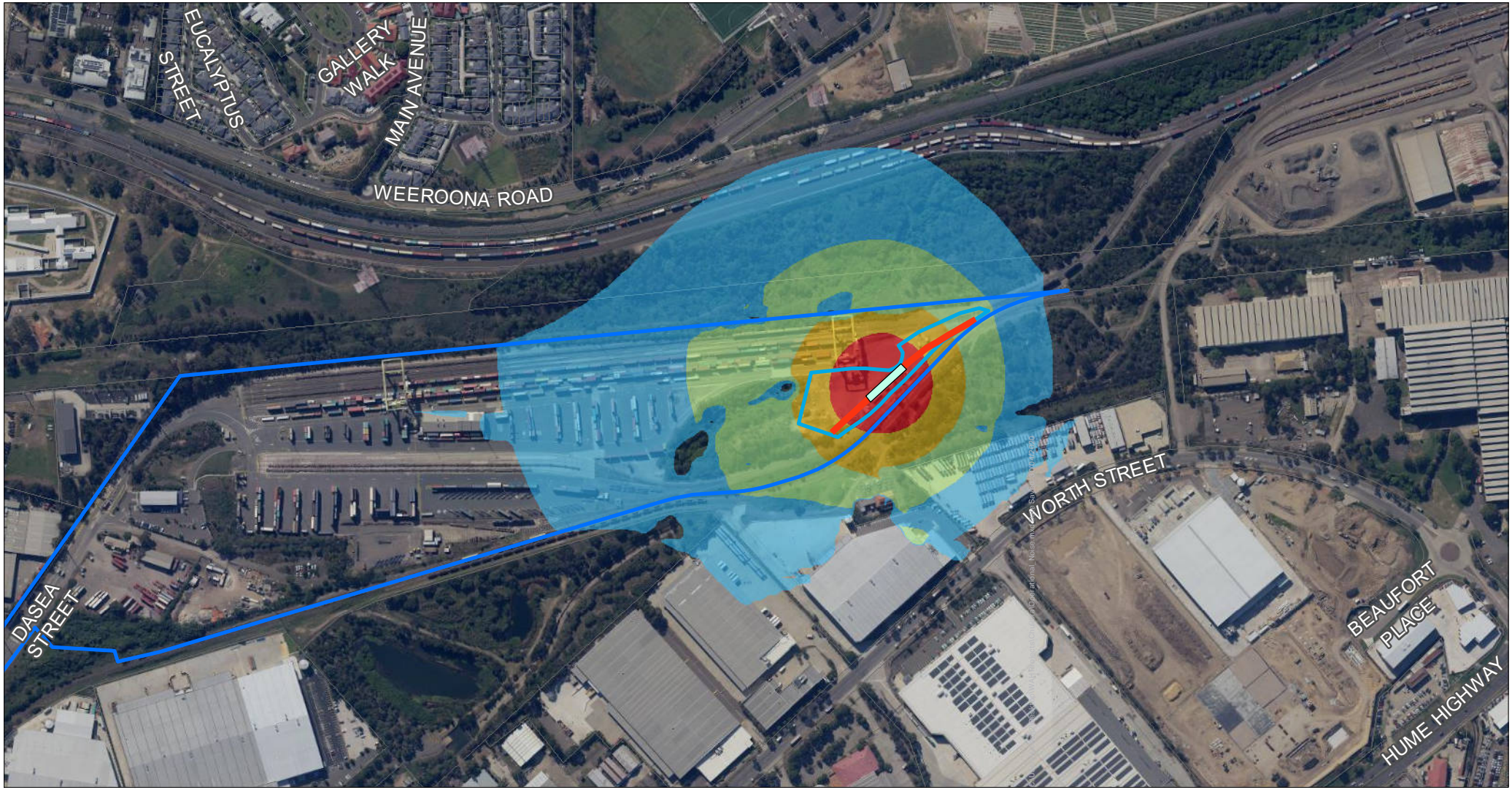
Siding

Refueling Shed

Sound Pressure Level, L_{Aeq} dB(A)

< 43 | 43 - 47 | 48 - 52 | 53 - 57 | > 57

Source:



Locomotive Provisioning Centre - Operational Noise Levels - 3m/s Wind

N

0 90 180 Meters

AECOM

Freight Terminal

Project Area

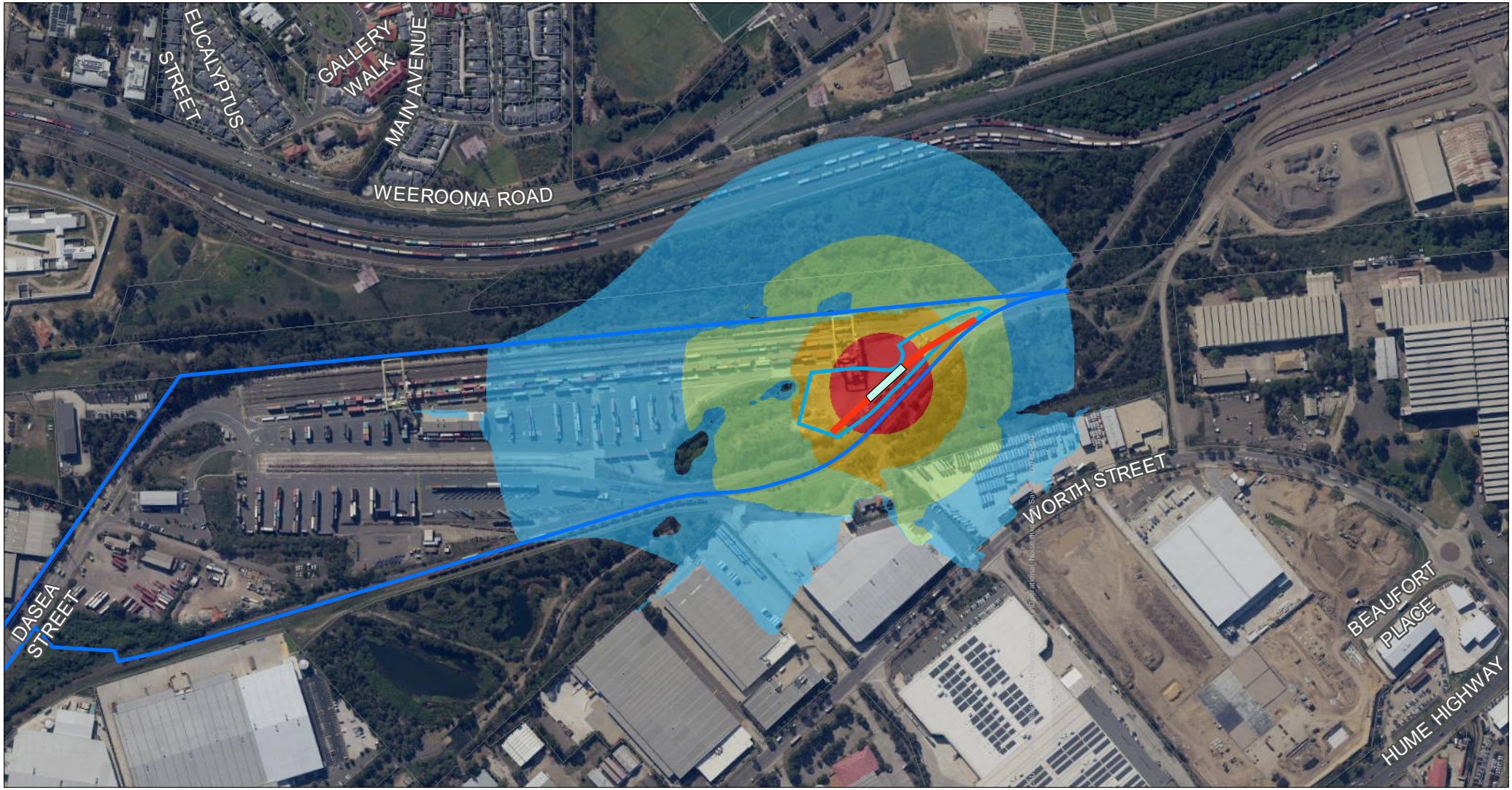
Siding

Refueling Shed

Sound Pressure Level, L_{Aeq} dB(A)

< 43 | 43 - 47 | 48 - 52 | 53 - 57 | > 57

Source:



Locomotive Provisioning Centre - Operational Noise Levels - Temperature Inversion

N

0 90 180 Meters

AECOM

Freight Terminal

Project Area

Siding

Refueling Shed

Sound Pressure Level, L_{Aeq} dB(A)

< 43 | 43 - 47 | 48 - 52 | 53 - 57 | > 57

Source:

Locomotive Provisioning Centre - Maximum Noise Levels - Neutral Conditions

N

0 90 180 Meters

AECOM

Freight Terminal

Project Area

Siding

Refueling Shed

Sound Pressure Level, L_{Amax} dB(A)

< 55 | 55 - 59 | 60 - 64 | 65 - 69 | > 69

Source:

Locomotive Provisioning Centre - Maximum Noise Levels - 3m/s Wind

N

0 90 180 Meters

AECOM

Freight Terminal

Project Area

Siding

Refueling Shed

Sound Pressure Level, L_{Amax} dB(A)

< 55 | 55 - 59 | 60 - 64 | 65 - 69 | > 69

Source:

Locomotive Provisioning Centre - Maximum Noise Levels - Temperature Inversion

N 0 90 180 Meters

AECOM

Freight Terminal

Project Area

Siding

Refueling Shed

Sound Pressure Level, L_{Amax} dB(A)

< 55 | 55 - 59 | 60 - 64 | 65 - 69 | > 69

Source: