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CONSTRUCTION NOISE AND VIBRATION PLAN OF MANAGEMENT WITH REGARDS TO THE SYDNEY METRO INFRASTRUCTURE

PROPOSED MIXED-USE DEVELOPMENT

2 MANDALA PARADE, CASTLE HILL NSW 2154

(DORAN DRIVE PRECINCT)

Date: Wednesday, 30 June 2021

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CONSTRUCTION NOISE AND VIBRATION PLAN OF MANAGEMENT

WITH REGARDS TO THE SYDNEY METRO INFRASTRUCTURE

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2 MANDALA PARADE, CASTLE HILL NSW 2154

(DORAN DRIVE PRECINCT)

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1.0 INTRODUCTION

Koikas Acoustics Pty Ltd was engaged to prepare a construction noise and vibration plan of management for the proposed mixed-use development at 2 Mandala Parade, Castle Hill NSW 2154 seeking approval for the construction of four buildings up to twenty storeys with associated basement level parking.

A construction noise and vibration plan of management has been prepared in accordance with the Interim Construction Noise Guidelines (NSW DECCW, 2009) and Sydney Metro – Technical Services.

This report presents the results and findings of an acoustic assessment for the subject proposal. In-principle acoustic treatments and noise control recommendations are included (where required) so that the premises may operate in compliance with the nominated Sydney Metro – Technical Services acoustic planning levels.

2.0 THE PROPOSAL

The development known as Doran Drive Precinct is proposed to occupy the following sites at 2 Mandala Parade, Castle Hill NSW 2154.

The application is for a mixed-use development consisting of approximately 431 residential units and 10,935 m^2 commercial/retail/community uses over 4 buildings with a maximum of 20 storeys with associated basement parking levels.

The current development design can be seen in architectural drawings as prepared by Turner Studio, detailed in Table 1. All calculations and noise modelled scenarios conducted for this assessment are based on the architectural drawings detailed in the drawing list.

The development location is situated in a primarily rural area with the following zoning:

- R4 high-density residential zoning to the distant south;
- Currently B2 local centre zoning west, south and subject site;
- R1 general residential to the east, and
- RE1 public recreation to the north.

The development is surrounded by the following:

- Hills Showground Station to the south;
- Castle Hill Showground to the North;
- Public car park and commercial premises to the west (across Doran Drive);
- Proposed mixed-use building to the west (Hills Showground Precinct West) and east (Hills Showground Precinct East) and, and
- Existing residential premises to the south.

Prevailing ambient noise conditions on-site and in the local area are generally the result of typical environmental noise such as traffic and localised commercial/domestic noise sources.

Table 1. Design drawings used in the assessment					
Drawing Title	**Drawing No.**	**Revision**	**Scale**	**Date**	**Job No.**
Basement 06	DA-110-002	-	1:200	25/06/2021	19068
Basement 05	DA-110-003	-	1:200	25/06/2021	19068
Basement 04	DA-110-004	-	1:200	25/06/2021	19068
Basement 03	DA-110-005	-	1:200	25/06/2021	19068
Basement 02	DA-110-006	-	1:200	25/06/2021	19068
Basement 01	DA-110-007	-	1:200	25/06/2021	19068
Ground Level	DA-110-008	-	1:200	25/06/2021	19068
Upper Level	DA-110-009	-	1:200	25/06/2021	19068
Level 01	DA-110-010	-	1:200	25/06/2021	19068
Level 02	DA-110-020	-	1:200	25/06/2021	19068
Level 03	DA-110-030	-	1:200	25/06/2021	19068
Level 04	DA-110-040	-	1:200	25/06/2021	19068
Level 05	DA-110-050	-	1:200	25/06/2021	19068
Level 06	DA-110-060	-	1:200	25/06/2021	19068
Level 07	DA-110-070	-	1:200	25/06/2021	19068
Level 08	DA-110-080	-	1:200	25/06/2021	19068
Level 09	DA-110-090	-	1:200	25/06/2021	19068
Level 10	DA-110-100	-	1:200	25/06/2021	19068
Level 11	DA-110-110	-	1:200	25/06/2021	19068
Level 12	DA-110-120	-	1:200	25/06/2021	19068
Level 13	DA-110-130	-	1:200	25/06/2021	19068
Level 14	DA-110-140	-	1:200	25/06/2021	19068
Level 15	DA-110-150	-	1:200	25/06/2021	19068
Level 16	DA-110-160	-	1:200	25/06/2021	19068
Level 17	DA-110-170	-	1:200	25/06/2021	19068
Level 18	DA-110-180	-	1:200	25/06/2021	19068
Level 19	DA-110-190	-	1:200	25/06/2021	19068
Level 20	DA-110-200	-	1:200	25/06/2021	19068
Level 21	DA-110-210	-	1:200	25/06/2021	19068
Roof	DA-110-220	-	1:200	12/05/2021	19068
North Elevation	DA-210-101	-	1:200	28/04/2021	19068
East Elevation	DA-210-201	-	1:200	28/04/2021	19068
South Elevation	DA-210-301	-	1:200	28/04/2021	19068
West Elevation	DA-210-401	-	1:200	28/04/2021	19068
Internal Elevation A&B	DA-310-101	-	1:200	-	19068
Internal Elevation C&D	DA-310-201	-	1:200	-	19068
Internal Elevation A&C	DA-310-301	-	1:200	-	19068
Internal Elevation B&D	DA-310-401	-	1:200	-	19068

The subject site and surrounding properties are identified on the aerial photograph included as Figure 1.

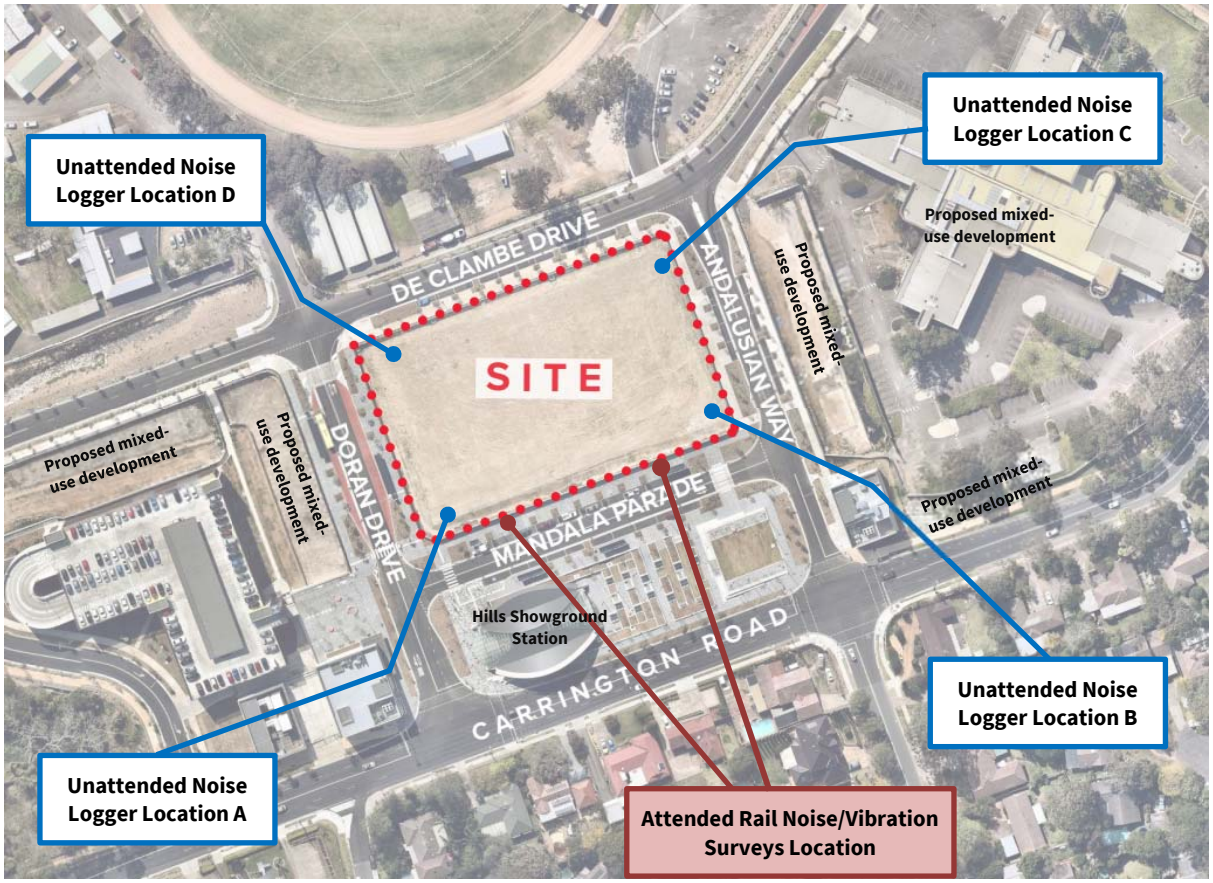


Figure 1. Aerial photo of the subject site, surrounding area and logger locations (image source – Turner Studio)

3.0 UNATTENDED AMBIENT NOISE SURVEY

Existing external ambient noise levels were measured by installing a sound level meter data logger in the following locations (see Figure 1):

- Monitoring Location A – Corner Mandala Parade and Doran Drive;
- Monitoring Location B – Corner Andalusian Way and Mandala Parade;
- Monitoring Location C – Corner De Clamb Drive and Andalusian Way, and
- Monitoring Location D – Corner Doran Drive and De Clamb Drive.

Two Type 1 precision Svantek 977, one Type 1 precision Svantek 949 and one Type 1 precision BSWA 801 noise loggers were used for the survey. The installed locations meant that the microphones were approximately 1.5 metres above the ground level in free field conditions. These meters were placed to measure existing ambient and traffic noise levels pertaining to the surrounding area.

The instrument was set-up to measure A-frequency and 'Fast' time-weighted noise levels. Noise level data was stored within the logger memory at 15-minutes intervals for about one week between Friday 10th and Thursday 16th July 2020. BOM weather records for the nearest available weather station indicate that inclement weather conditions did not adversely impact on the noise survey.

Calibration readings were taken before and after each survey with a NATA calibrated and certified Larson Davis CAL200 precision acoustic calibrator. No system drift was observed for this meter.

Table 2. Summary of noise logger results [dB]

Location	Period, T [1]	Ambient noise level LAeq	Rating background level LA90	Traffic noise level LAeq,Period
Monitoring Location A (Cnr Mandala Parade & Doran Drive)	Day	55	49	54
	Evening	51	42	
	Night	47	32	47
Monitoring Location B (Cnr Andalusian Way & Mandala Pde)	Day	57	49	56
	Evening	52	44	
	Night	47	34	47
Monitoring Location C (Cnr DeClamb Drive & Andalusian Wy)	Day	60	52	59
	Evening	57	46	
	Night	52	35	52
Monitoring Location D (Cnr Doran Drive & De Clamb Drive)	Day	60	50	59
	Evening	57	44	
	Night	52	33	52
Notes 1. 2.	The NSW EPA NPI refers to Night as 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays. Refer to **Appendix A** for unattended noise logger graphs.			

4.0 CONSTRUCTION NOISE AND VIBRATION PLAN OF MANAGEMENT

4.1 ACOUSTICAL REQUIREMENTS

Noise and vibration generated during excavation and construction works are assessed at surrounding residential receivers in accordance with the Interim Construction Noise Guidelines (NSW DECCW, 2009).

4.1.1 ICNG - Construction noise

The guideline recognises that construction and excavation works will at times generate noise that is clearly audible at neighbouring sites. The primary focus is to provide a means of determining the severity of noise impacts at surrounding affected receiver locations and a framework for managing construction noise, generally through implementing best practice noise minimisation principles and facilitating communication between construction workers and the local community.

Small-scale construction projects/works generally do not require detailed calculations of noise emission.

For ongoing projects where surrounding receivers may be exposed to construction noise for periods exceeding three weeks, a more detailed assessment approach is adopted. In this case, a receiver is categorised by the likely community reaction to the level of noise, where some community reaction is expected at 10dB above the background level and strong community reaction is expected at levels exceeding 75 dB(A).

For this assessment, 10 dB above the existing EPA minimum measured daytime background level is 59 dB(A). This is defined as the Noise Affected Level under the ICNG. Above 75 dB(A) is defined as the Highly Noise Affected Level.

4.1.2 ICNG - Construction vibration

Section 4.4 of the ICNG states that "Human comfort vibration from construction works, including continuous, intermittent or impulsive vibration from construction, but excluding blasting, is to be assessed in accordance with Section 2.5 'Short-term works' in *Assessing Vibration – a technical guideline (DEC 2006)*".

The DEC vibration standard has been sourced from *British Standard 6472-1992 Evaluation of human exposure to vibration in buildings (1Hz to 80Hz).* The referenced table nominates preferred and maximum vibration dose values (VDV) that correlate with human annoyance at receiver sites of different classifications such as residential, education facilities etc.

Table 3. Acceptable vibration dose value for intermittent vibration ($m/s^{1.75}$), BS6472:1992				
Location	**Daytime**		**Night-time**	
	Preferred values	**Maximum values**	**Preferred values**	**Maximum values**
Critical areas	0.1	0.2	0.1	0.2
Residences	**0.2**	**0.4**	0.13	0.26
Offices, schools, educational institutions and places of worship	0.4	0.8	0.4	0.8
Workshops	0.8	1.6	0.8	1.6

A more critical assessment of vibration impacts may be related to structural damage to surrounding buildings. It is expected that the geotechnical engineer will specify a peak particle velocity limit not to be exceeded at the site boundary. Where this is not available, a guide to applicable structural damage criteria can be taken from *British Standard 7385-2:1993* and/or *German Standard DIN4150-3.*

BS7385-2:1993 recommends a maximum peak component particle velocity when measured at the base of the building of:

- 50mm/s for reinforced or framed structures – Industrial and heavy commercial buildings.
- 15mm/s for unreinforced or light framed structures – Residential or light commercial type buildings.

German standard DIN4150-3 recommends a maximum peak particle velocity of:

Table 4. DIN4150-3 Guideline values for assessing short-term vibration effects					
Line	**Type of structure**	**Vibration velocity, v_i, in mm/s**			
		Foundation			**Plane of floor of uppermost full storey**
		At a frequency of			**Frequency mixture**
		Less than 10Hz	**10 to 50Hz**	**50 to 100Hz**	
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that, because of their particular sensitivity to vibration, do not correspond to those listed in lines 1 and 2 and are of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

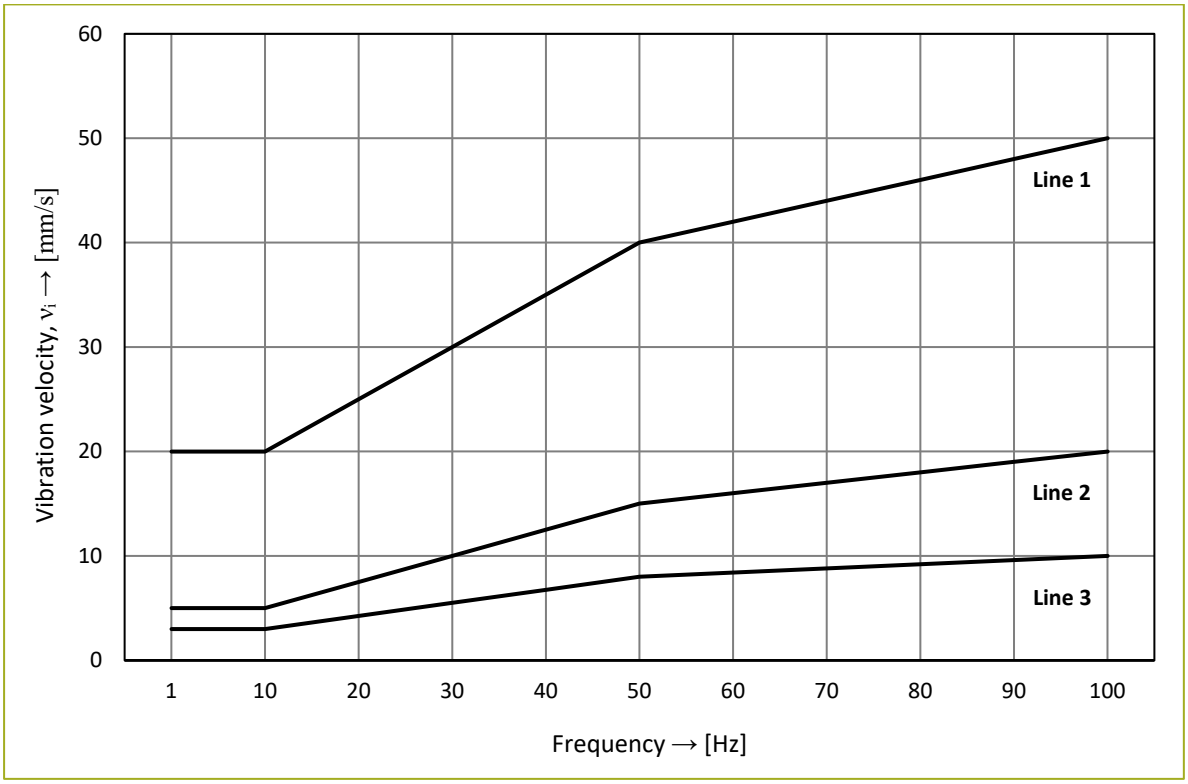


Figure 2. DIN4150-3 Curves representing guideline vibration velocity values at the building foundation

4.1.3 Sydney Metro – Technical Services

The requirements from Sydney Metro at Grade and Elevated Sections Corridor Protection Guidelines have been extracted below.

6.7 Noise and Vibration

The noise from construction and rail operation must be considered against statutory and project noise vibration limit requirements. SMA does not accept liability for the generation of noise and vibration from normal railway operations (including track maintenance), or for its transmission into developments above or adjacent to the at grade or elevated rail infrastructure.

When designing developments above or adjacent to at grade or elevated Metro rail infrastructure (existing or planned), consideration must be given to operational and construction vibration; as well as ground or structure borne noise emissions in accordance with Developments Near Rail Corridor and Busy Roads – Interim Guideline, Department of Planning, NSW Government 2008.

In planning the development, the following requirements apply.

Any development that occurs within a screening distance of 25 m horizontally from first reserve must consider the vibration on the Metro infrastructure with the following assessment criteria of maximum peak particle velocity (PPV):

- The peak particle velocities at any Metro at grade or elevated structures resulting from demolition works, driving or withdrawal of piles or any other construction activities which can induce vibration shall not exceed 15 mm/sec.

It is important to note that more stringent limits may apply if rail equipment, that is sensitive to vibration, has the potential to be affected by the development and its construction.

During development construction vibration monitoring may be required of the at grade and elevated Metro supports, such as viaduct girders and embankments. This monitoring must be conducted based on the selection of appropriate trigger levels.

If the vibration levels exceed tolerable limits, then the developer must modify the construction methodology in such a way that the vibration limits are satisfied.

The Developer shall submit a Noise and Vibration Assessment Report at DA stage, for both airborne and ground borne noise and vibration, to determine the effects on the proposed Development from the railway operations (and during construction of the proposed railway), to comply with Clause 87 of the State Environmental Planning Policy (Infrastructure) 2007 (the 'Infrastructure SEPP').

4.2 CONSTRUCTION NOISE

4.2.1 Construction noise sources and sound levels

In terms of noise emanating from typical construction activity, levels range depending on the process or sources involved. Typical construction noise levels are included in *Australian Standard 2436-2010 Guide to noise and vibration control on construction, demolition and maintenance sites* and the *Department for Environment, Food and Rural Affairs (DEFRA – UK) Update of Noise Database for Prediction of Noise on Construction and Open Sites, December 2004.*

Table 5. Construction activity typical sound levels, [dB]

Equipment	Typical sound power level – Lw	Reference noise level – L_{Aeq} at 10m
Circular saw	112	84
Angle grinder	108	80
Hand tools (pneumatic)	116	88
Trucks (dump)	117	89
22-tonne excavator	99	71
Excavator loading truck	107	79
Concrete pump	103	75
Concrete truck and pump	95	67

4.2.2 Calculated construction noise levels

The level of noise predicted at a specific receiver location is governed by the source noise level, the distance between the source and receiver, and the presence of any screening objects along the propagation path. The location of plant and equipment on construction sites are not always at a fixed point and, therefore, the distance between a noise source and receiver location can vary.

Koikas Acoustics has assessed each of the identified construction noise sources at a central location on the development site. This results in the following distances to nearby residential properties:

- 20 metres to Hills Showground Station;
- 30 metres to the nearest boundary of Hills Showground Precinct East
- 30 metres to the nearest boundary of Hills Showground Precinct West
- 30 metres to the nearest boundary of Castle Hill Showground, and
- 75 metres to the residential premises along Carrington Road.

Construction noise levels were calculated at the residential boundary for each of the nearest residential receivers. Construction noise levels will vary at times from those predicted in this report on account of plant and equipment being located at varying locations within the development site.

Table 6. Estimated construction noise levels to surrounding receivers – $L_{Aeq\ 15\ min}$ [dB]			
Equipment	**Noise assessment receiver location**		
	Hills Showground Station	**Hills Showground Precinct East and West, and Castle Hill Showground**	**Residential premises along Carrington Road**
Circular saw	78	74	66
Angle grinder	74	70	62
Hand tools (pneumatic)	82	78	70
Trucks (dump)	83	79	71
22 tonne excavator	65	61	53
Excavator loading truck	73	69	61
Concrete pump	69	65	57
Concrete truck and pump	61	57	49
Notes 1.	Predicted construction noise levels are estimates only due to the large variance in noise level generated by comparable plant performing similar tasks on different construction sites. Should complaints arise it may be necessary to survey noise being generated on-site to determine the actual working noise levels.		

Estimated construction noise levels in Table 6 do not consider acoustic screening from any existing boundary fences. Receivers that are screened from construction equipment by a boundary fence of approximately 1.8 metres in height, noise levels may be up to 5 dB below those predicted.

Noise from construction is predicted to, at times, exceed the Noise Affected level of the ICNG at nearby premises. This is due to the proximity of the adjoining residences in relation to the assessment site and the typical nature of noise associated with construction equipment.

It should be noted that the predicted levels consider construction noise levels being constant over a 15 minutes assessment period with the equipment operating at maximum capacity. Therefore, calculated noise levels above should be considered as conservative. Given typical respite periods, we could reasonably expect construction noise levels to be up to 3 to 5dB lower than predicted.

4.3 VIBRATION ASSESSMENT

The highest anticipated vibration levels will result from rock breaking or other impulsive-type excavation works (depending on the local geology).

Rock sawing is an alternative to rock breaking that generates far less vibration and should be used for removal of the existing rock should hammering cause excessive vibrations.

A guide to safe work distances for typical vibration generating construction works is given in Table 2 of the *Construction Noise and Vibration Guideline (RMS, 2016)*.

Table 7. Reproduced in part from Table 2 of the RMS construction noise and vibration guide			
Plant item	**Rating / Description**	**Minimum working distance**	
		Cosmetic damage (BS7385)	**Human response (Assessing vibration: A technical guideline)**
Vibratory roller	< 50kN (Typically 1-2 tonnes)	5m	15m to 20m
	< 100kN (Typically 2-4 tonnes)	6m	20m
Small hydraulic hammer	300kg – 5 to 12t excavator	2m	7m
Medium Hydraulic Hammer	900kg – 12 to 18t excavator	7m	23m
Jackhammer	Handheld	1m (nominal)	2m

The vibration generated from an excavator removing site soil during earthworks for the basement is not expected to result in structural damage or human annoyance at nearby receivers.

4.4 NOISE & VIBRATION CONTROLS

The NSW Department of Environment, Climate Change and Water (DECCW) recognise that there is a need to balance the existing noise amenity of residents along with the necessity to continue growth within the region. The fundamental principle involved with the development and success of each noise policy is maintaining open and free channels of communications between developers and residents alike.

Construction noise policies are implemented to limit noise exposure for premises surrounding construction sites. Noise controls and mitigation strategies must be reasonable and feasible and applied on a case-by-case basis to ensure the best possible outcome for all parties involved.

Due to proximity, construction noise levels will generally exceed any adopted criterion. For this particular development, construction noise levels could potentially significantly exceed the Noise Affected Level of the ICNG at times.

Minimising the impact of noise from construction sites to surrounding land uses can be achieved through treatment of the noise sources themselves, treating noise along its propagation path. Consideration needs to be given to each source in identifying the most practical and efficient noise controls where treatment is necessary.

Table C3 in AS2436-2010 states the relevant effects of various types of noise control measures typically employed on construction sites.

Table 8. AS2436-2010 Table C3 – Relative effectiveness of various forms of noise control	
Control by	**Nominal noise reduction possible, in total A-weighted sound pressure level LpA [dB]**
Distance	Approximately 6 for each doubling of distance
Screening	Normally 5 to 10, maximum 15
Enclosure	Normally 15 to 25, maximum 50
Silencing	Normally 5 to 10, maximum 20

For this project, the following noise and vibration controls could be implemented to help maintain suitable noise and vibration amenity for surrounding land uses:

- The use of moveable screens for specific work practices could achieve noise reductions of Table 8. The screens would have to be moveable where noise sources are not stationary within the construction site.
- Providing an acoustic type hoarding along the site boundary will also lower noise levels to surrounding pedestrians and Sydney Metro Station.
- Exhaust silencers could be considered to motorised plant and equipment such as the excavators. Silenced plant and equipment could lower noise emission from the exhaust system by 5 to 10dB.
- Undertake construction works during standard hours as defined in the ICNG.
- Use appropriately sized plant and equipment.
- Identify when high noise-generating activities are likely to take place and conducting this work during times of least noise sensitivity. Having open lines of communication with residents and appropriate scheduling of works on construction sites are processes recommended in both the City's construction noise code and the NSW ICNG.
- To minimise vibration from rock breaking, it is recommended that a hydraulic hammer attachment with a pointed 'cone' type hammer is used in place of a flat 'block' type hammer.
- The minimum work distances as tabled within this report should be observed at all times, especially regarding structural damage guidelines.
- Continuous vibration monitoring surveys may be considered during excavation to ensure vibration levels do not reach a point where the structural integrity of Sydney Metro is compromised. Vibration monitors can be set to measure either the peak particle velocity or r.m.s. acceleration at the site boundary where a design vibration limit is specified by the Geotech engineer or as a Vibration Dose Value within Sydney Metro Station.
- Progress noise monitoring could also be conducted during construction works to provide feedback to site managers as to the level of noise being emitted from the site.
- Refer to Section 6 of the ICNG and Section 4 of AS2436-2010 for additional information regarding the design, selection, and implementation of suitable work practices for noise control on construction sites.

4.5 COMPLAINTS HANDLING

A site contact and phone number should be distributed to all surrounding premises and displayed on the site notice-board for any complaints arising due to noise and/or vibration generated during construction works. The site should have clear complaints handling procedure and staff who are well-versed in the complaints handling procedures.

A register of all complaints must be kept on-site and be readily available. Details within the complaints register should include, but not be limited to:

- Date and time of the complaint,
- The person receiving a complaint,
- Complainant phone number,
- Site contact who the complaint was referred to for action,
- Description of the complaint,
- Action to be taken,
- The time frame for action to be implemented.

All complaints should be given a fair hearing and adequately investigated. This may involve scheduling a relevant consultant to substantiate or refute any received complaint, and/or verifying any remedial action taken by the site manager by way of on-site testing.

5.0 CONCLUSION

Koikas Acoustics was requested to prepare an acoustical report for the proposed mixed-use development at 2 Mandala Parade, Castle Hill NSW 2154 seeking approval for the construction of four buildings up to twenty storeys with associated basement level parking.

The assessment considers potential noise impacts to future occupants of the development, and to surrounding residents such that acceptable acoustic amenity for the area is maintained.

Acoustic planning levels have been referenced from the Interim Construction Noise Guidelines (NSW DECCW, 2009), Sydney Metro – Technical Services and other relevant acoustic planning guidelines and requirements. The included recommendations are based on designs prepared by Turner Studio.

A quantitative construction noise impact assessment has been conducted and construction noise and vibration plan of management have been prepared to outline reasonable and feasible noise and vibration mitigation measures. Not all mitigation measures apply to this development.

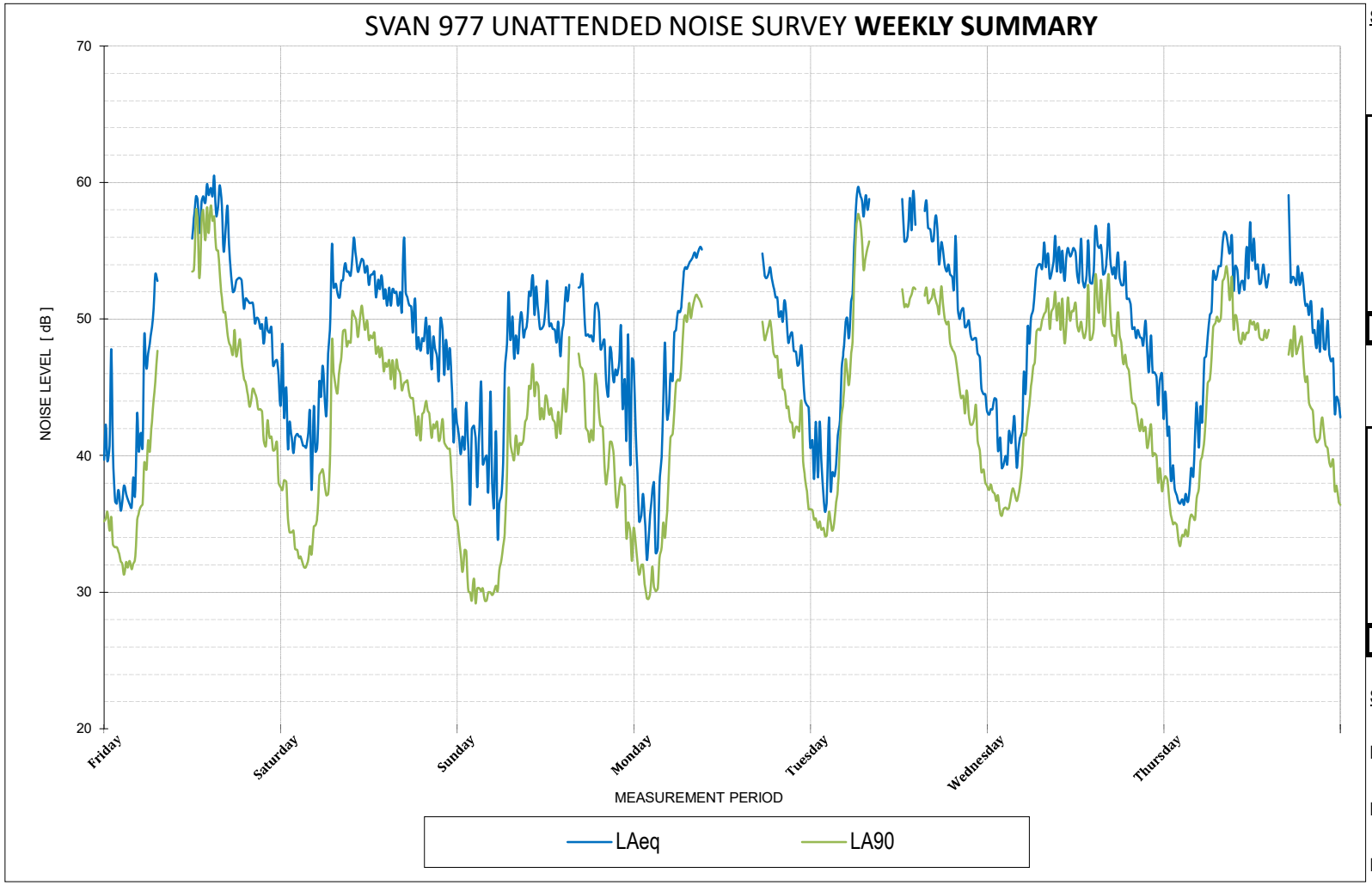
In our professional opinion, there is sufficient scope within the proposed building design to achieve the acoustical planning guidelines.

APPENDIX A

APPENDIX A

APPENDIX A

WEEKLY SUMMARY **LOGGER LOCATION:** Corner Mandala Parade & Dorian Drive **PERIOD:** 10th to the 16th July 2020



Sundays and Public Holidays the hours change to 0800

SUMMARY OF AMBIENT LEVELS

	LA90 Daytime	*LA90* Evening	*LA90* Night-time
Day 1	48	43	32
Day 2	45	41	32
Day 3	41	38	30
Day 4	50	42	30
Day 5	51	43	35
Day 6	49	42	36
Day 7	49	41	34
RBL	**49**	**42**	**32**

	LAeq Daytime	*LAeq* Evening	*LAeq* Night-time
Day 1	58	51	45
Day 2	53	49	45
Day 3	51	48	45
Day 4	54	51	46
Day 5	57	53	51
Day 6	54	51	46
Day 7	54	51	45
Average	**55**	**51**	**47**

SUMMARY OF TRAFFIC LEVELS

LAeq 15 hrs	0700-2200	54	dB
LAeq 9 hrs	2200-0700	47	dB
Max LAeq 1 hr	0700-2200	55	dB
Max LAeq 1 hr	2200-0700	48	dB

Maximum noise events as defined in the Environmental Noise Management Manual 7 day average - [LAmax - LAeq ≥ 15]	19

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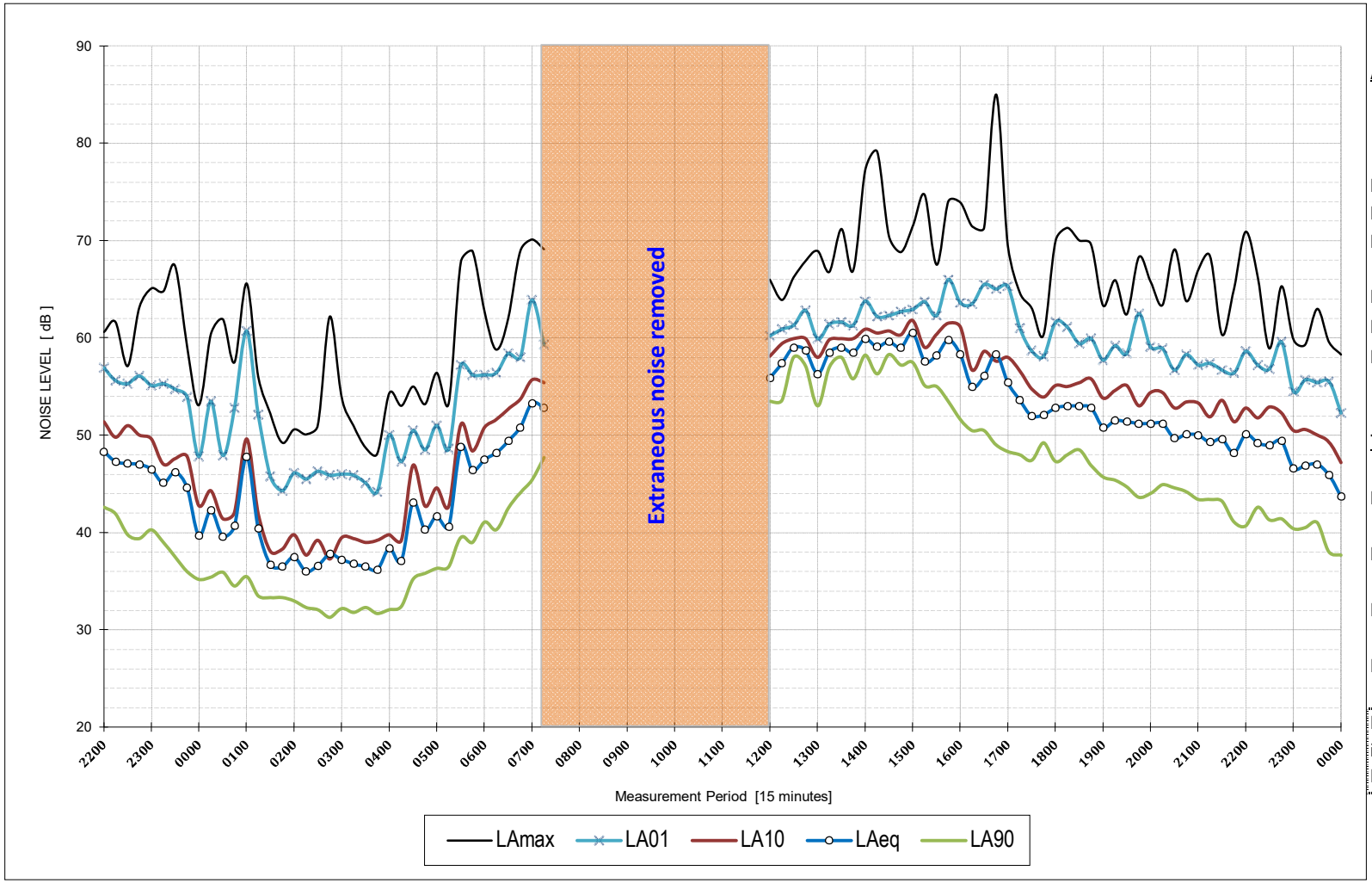
DAY 1 **LOGGER LOCATION:** Corner Mandala Parade & Dorian Drive **DATE:** Friday, 10 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	48	dB
LA90 Evening	1800-2200	43	dB
LA90 Night-time	2200-0700	32	dB
LAeq Daytime	0700-1800	58	dB
LAeq Evening	1800-2200	51	dB
LAeq Night-time	2200-0700	45	dB

TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	56	dB
LAeq 9 hours	2200-0700	45	dB
Max LAeq 1 hour	0700-2200	59	dB
Max LAeq 1 hour	2200-0700	47	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	18

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CONSULTANTS IN NOISE & VIBRATION

DAY 2 **LOGGER LOCATION:** Corner Mandala Parade & Dorian Drive **DATE:** Saturday, 11 July 2020

AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	45	dB
LA90 Evening	1800-2200	41	dB
LA90 Night-time	2200-0700	32	dB
LAeq Daytime	0700-1800	53	dB
LAeq Evening	1800-2200	49	dB
LAeq Night-time	2200-0700	45	dB

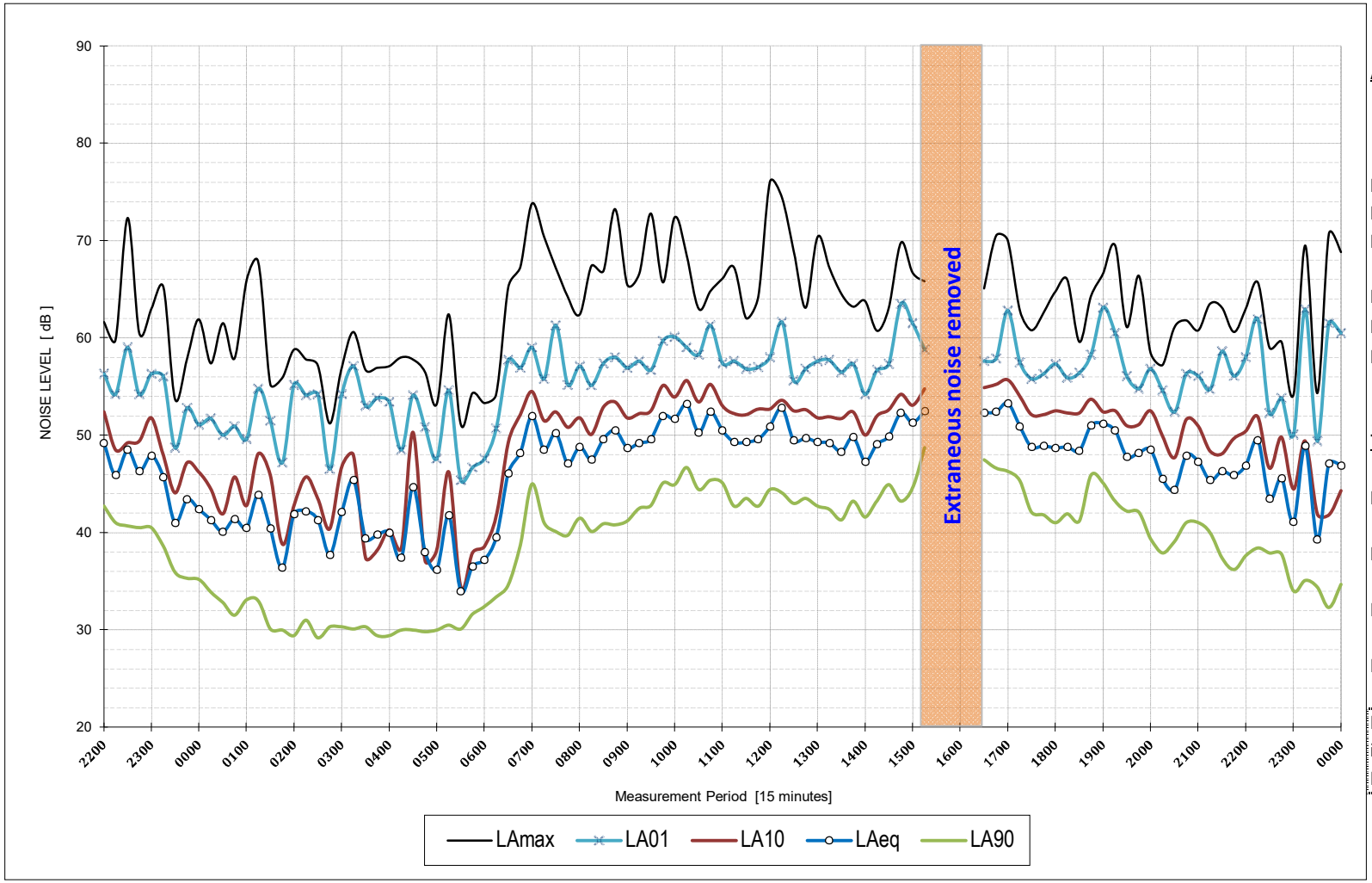
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	52	dB
LAeq 9 hours	2200-0700	45	dB
Max LAeq 1 hour	0700-2200	54	dB
Max LAeq 1 hour	2200-0700	48	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	24

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 3 **LOGGER LOCATION:** Corner Mandala Parade & Dorian Drive **DATE:** Sunday, 12 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0800-1800	41	dB
LA90 Evening	1800-2200	38	dB
LA90 Night-time	2200-0800	30	dB
LAeq Daytime	0800-1800	51	dB
LAeq Evening	1800-2200	48	dB
LAeq Night-time	2200-0800	45	dB

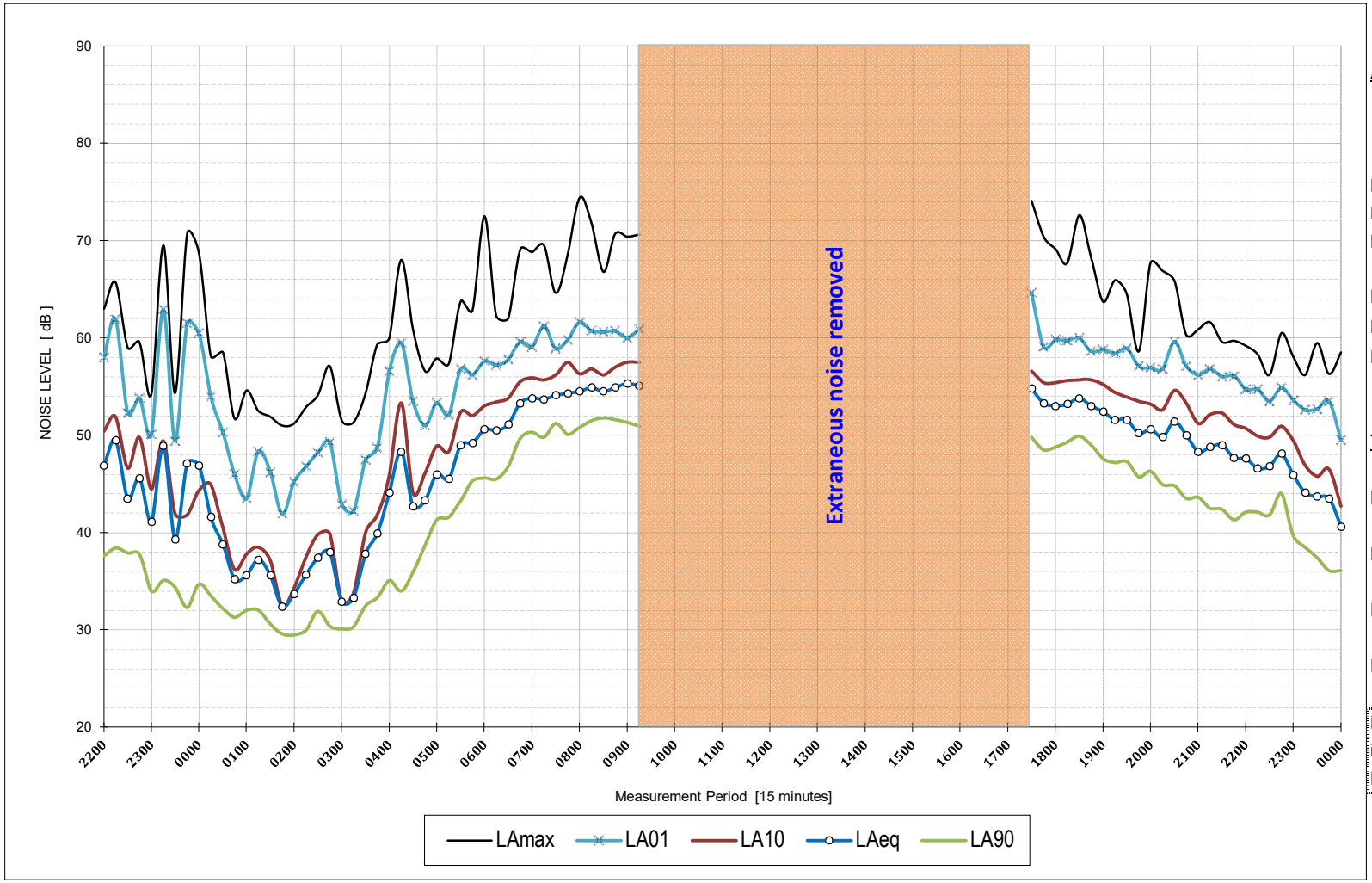
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	50	dB
LAeq 9 hours	2200-0700	43	dB
Max LAeq 1 hour	0700-2200	52	dB
Max LAeq 1 hour	2200-0700	46	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	26

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 4 **LOGGER LOCATION:** Corner Mandala Parade & Dorian Drive **DATE:** Monday, 13 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	50	dB
LA90 Evening	1800-2200	42	dB
LA90 Night-time	2200-0700	30	dB
LAeq Daytime	0700-1800	54	dB
LAeq Evening	1800-2200	51	dB
LAeq Night-time	2200-0700	46	dB

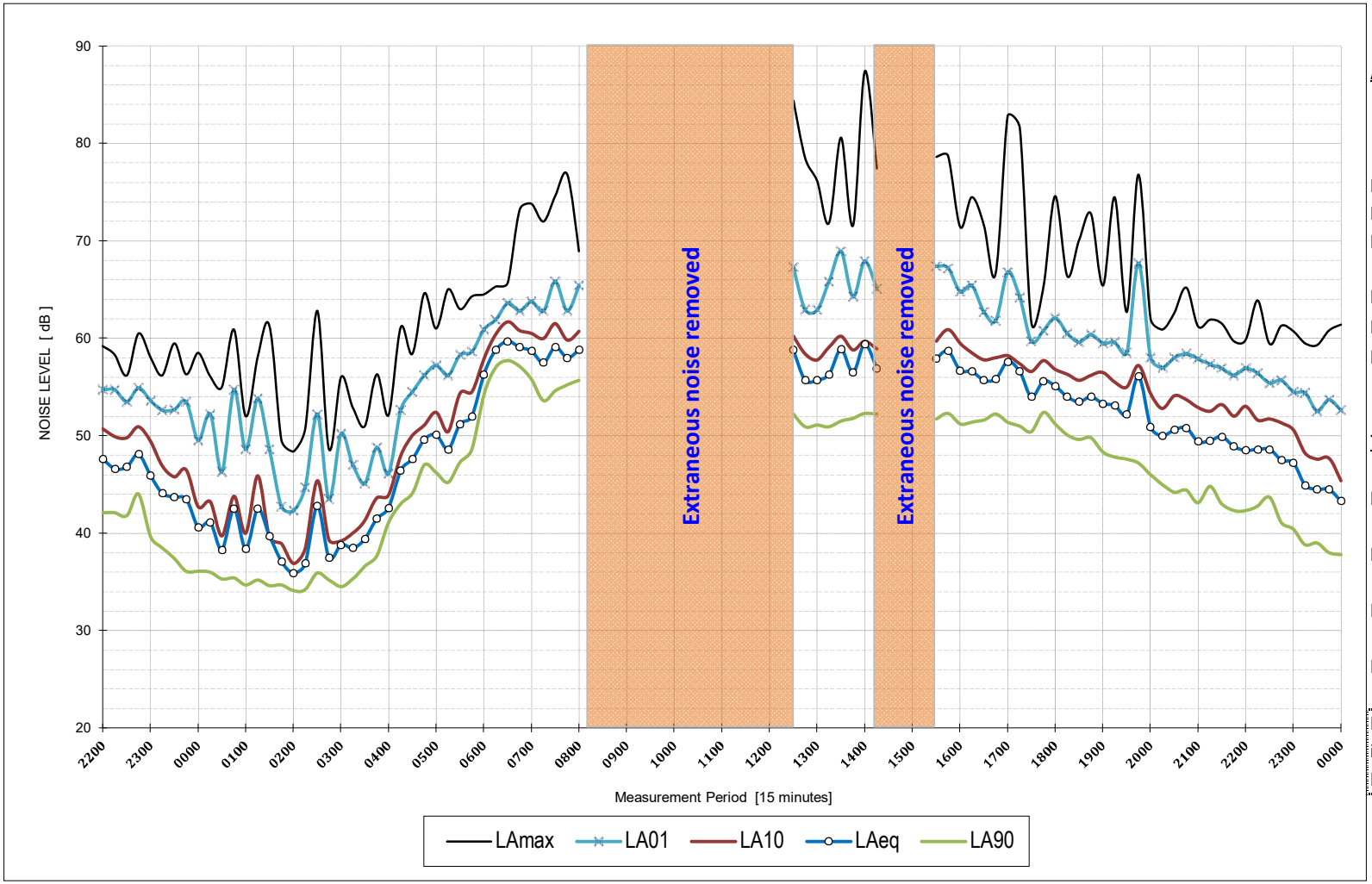
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	53	dB
LAeq 9 hours	2200-0700	46	dB
Max LAeq 1 hour	0700-2200	55	dB
Max LAeq 1 hour	2200-0700	49	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	27

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 5 **LOGGER LOCATION:** Corner Mandala Parade & Dorian Drive **DATE:** Tuesday, 14 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	51	dB
LA90 Evening	1800-2200	43	dB
LA90 Night-time	2200-0700	35	dB
LAeq Daytime	0700-1800	57	dB
LAeq Evening	1800-2200	53	dB
LAeq Night-time	2200-0700	51	dB

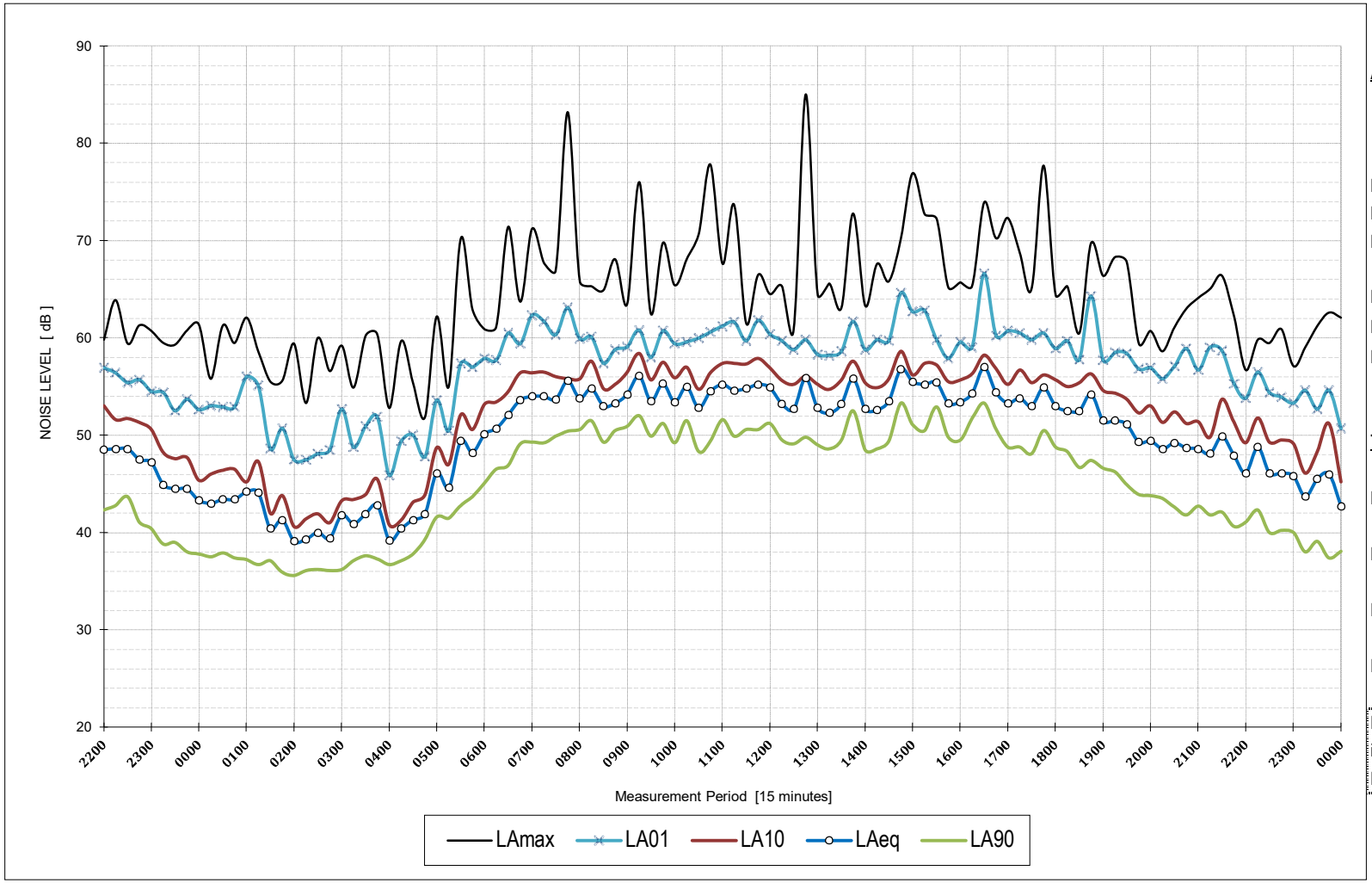
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	56	dB
LAeq 9 hours	2200-0700	51	dB
Max LAeq 1 hour	0700-2200	58	dB
Max LAeq 1 hour	2200-0700	52	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	11

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 6 **LOGGER LOCATION:** Corner Mandala Parade & Dorian Drive **DATE:** Wednesday, 15 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	49	dB
LA90 Evening	1800-2200	42	dB
LA90 Night-time	2200-0700	36	dB
LAeq Daytime	0700-1800	54	dB
LAeq Evening	1800-2200	51	dB
LAeq Night-time	2200-0700	46	dB

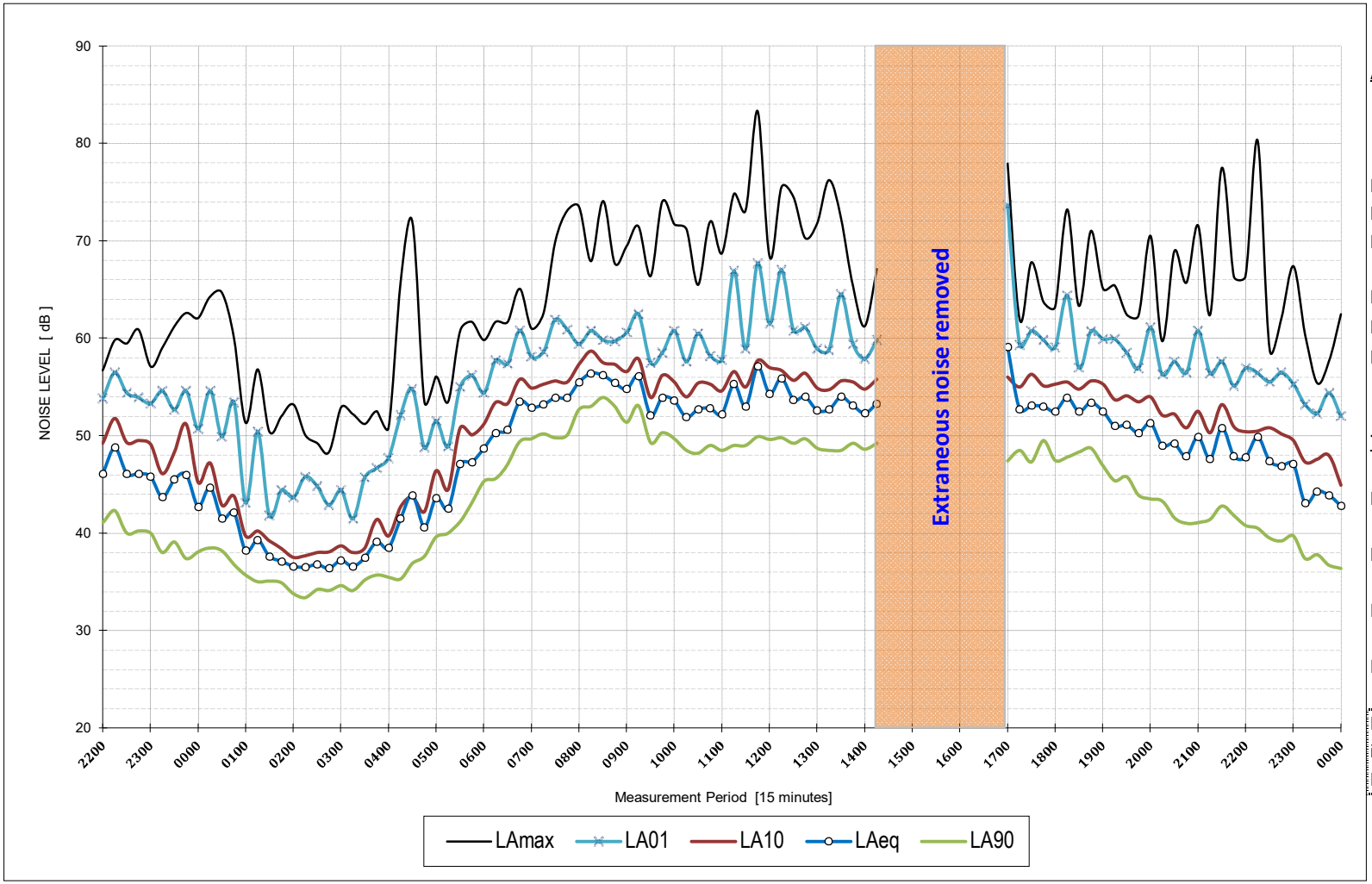
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	54	dB
LAeq 9 hours	2200-0700	46	dB
Max LAeq 1 hour	0700-2200	55	dB
Max LAeq 1 hour	2200-0700	48	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	17

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 7 **LOGGER LOCATION:** Corner Mandala Parade & Dorian Drive **DATE:** Thursday, 16 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	49	dB
LA90 Evening	1800-2200	41	dB
LA90 Night-time	2200-0700	34	dB
LAeq Daytime	0700-1800	54	dB
LAeq Evening	1800-2200	51	dB
LAeq Night-time	2200-0700	45	dB

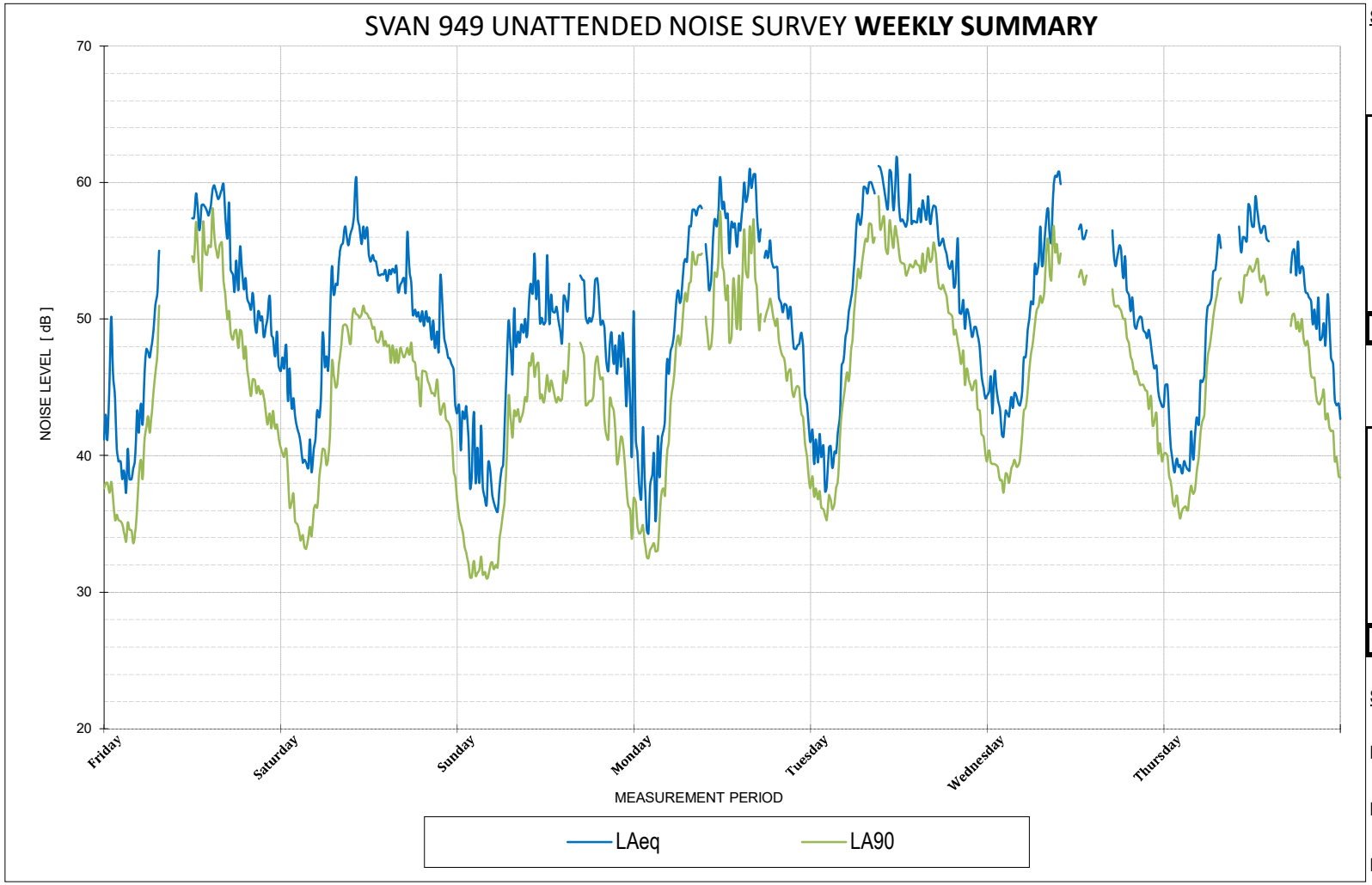
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	54	dB
LAeq 9 hours	2200-0700	45	dB
Max LAeq 1 hour	0700-2200	56	dB
Max LAeq 1 hour	2200-0700	47	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	13

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

WEEKLY SUMMARY **LOGGER LOCATION:** Corner Andalusian Way & Mandala Pde **PERIOD:** 10th to the 16th July 2020



Sundays and Public Holidays the hours change to 0800

SUMMARY OF AMBIENT LEVELS

	LA90 Daytime	*LA90* Evening	*LA90* Night-time
Day 1	49	44	34
Day 2	47	44	34
Day 3	43	41	31
Day 4	49	45	33
Day 5	53	45	36
Day 6	51	45	38
Day 7	51	44	36
RBL	**49**	**44**	**34**

	LAeq Daytime	*LAeq* Evening	*LAeq* Night-time
Day 1	58	52	45
Day 2	55	50	46
Day 3	51	50	45
Day 4	58	53	47
Day 5	59	53	50
Day 6	57	52	47
Day 7	56	52	46
Average	**57**	**52**	**47**

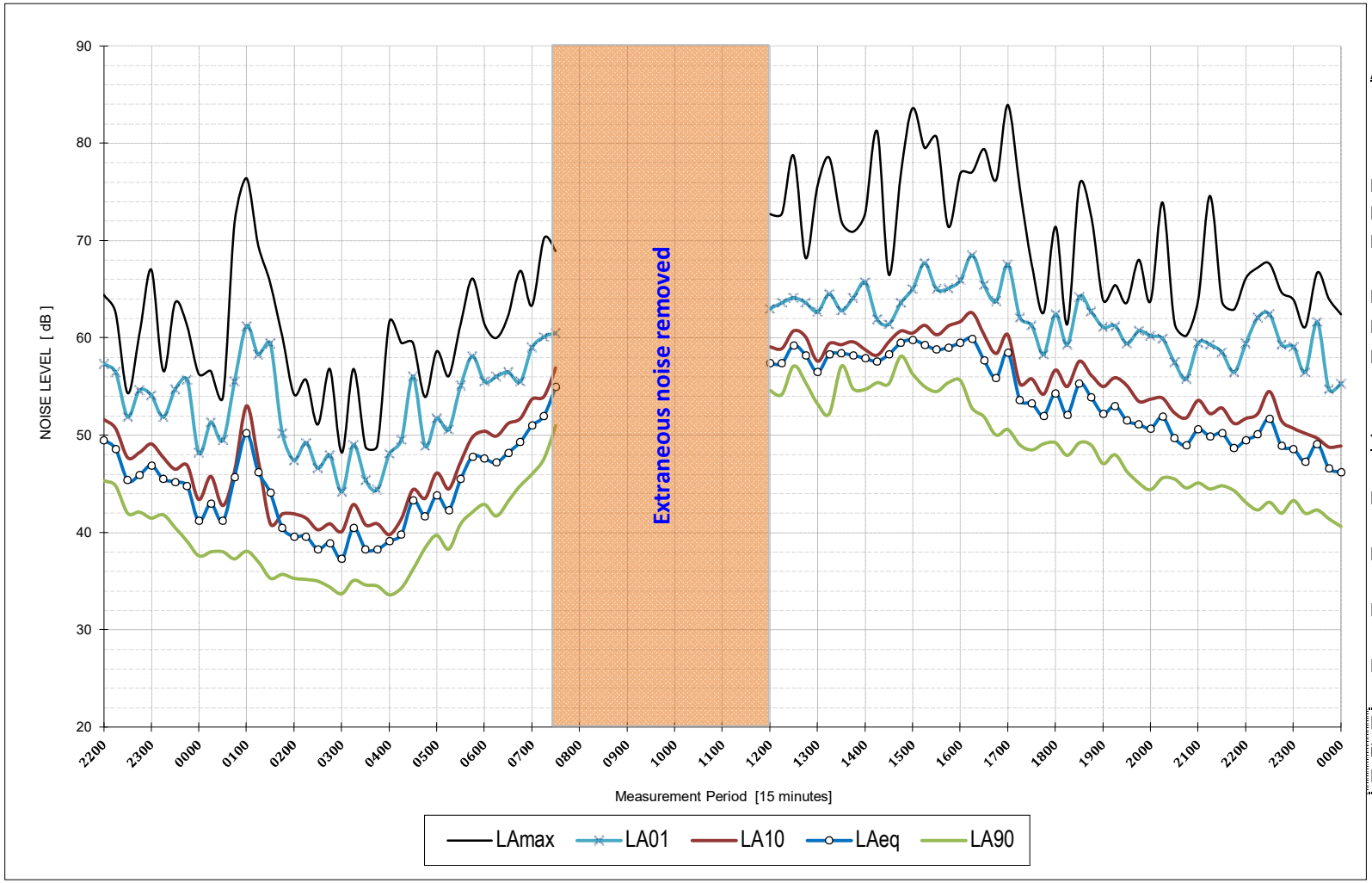
SUMMARY OF TRAFFIC LEVELS

LAeq 15 hrs	0700-2200	56	dB
LAeq 9 hrs	2200-0700	47	dB
Max LAeq 1 hr	0700-2200	58	dB
Max LAeq 1 hr	2200-0700	48	dB

Maximum noise events as defined in the Environmental Noise Management Manual 7 day average - [LAmax - LAeq ≥ 15]	19

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 1 **LOGGER LOCATION:** Corner Andalusian Way & Mandala Pde **DATE:** Friday, 10 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	49	dB
LA90 Evening	1800-2200	44	dB
LA90 Night-time	2200-0700	34	dB
LAeq Daytime	0700-1800	58	dB
LAeq Evening	1800-2200	52	dB
LAeq Night-time	2200-0700	45	dB

TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	56	dB
LAeq 9 hours	2200-0700	45	dB
Max LAeq 1 hour	0700-2200	59	dB
Max LAeq 1 hour	2200-0700	47	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	18

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 2 **LOGGER LOCATION:** Corner Andalusian Way & Mandala Pde **DATE:** Saturday, 11 July 2020

AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	47	dB
LA90 Evening	1800-2200	44	dB
LA90 Night-time	2200-0700	34	dB
LAeq Daytime	0700-1800	55	dB
LAeq Evening	1800-2200	50	dB
LAeq Night-time	2200-0700	46	dB

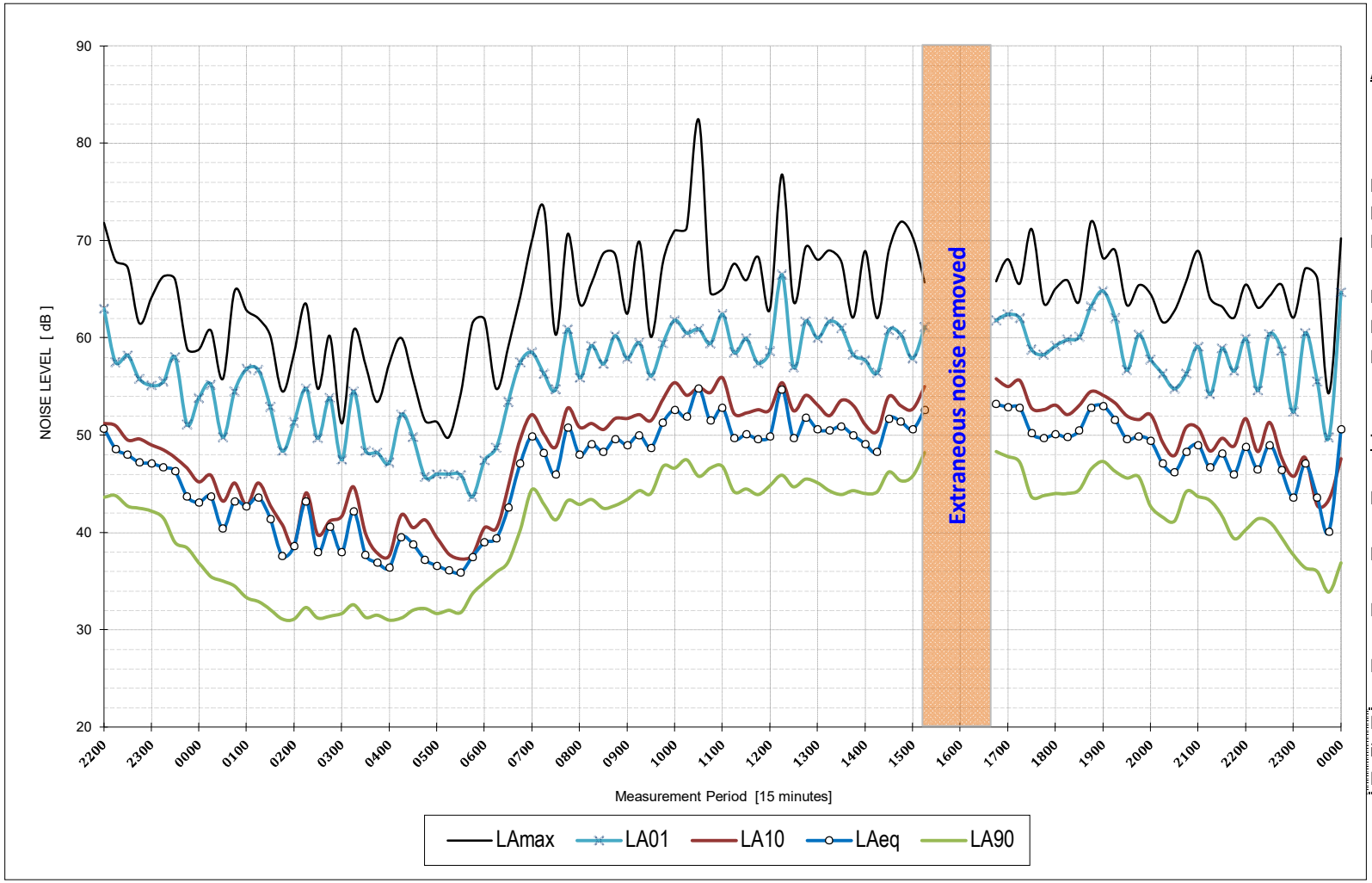
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	54	dB
LAeq 9 hours	2200-0700	46	dB
Max LAeq 1 hour	0700-2200	56	dB
Max LAeq 1 hour	2200-0700	48	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	30

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 3 **LOGGER LOCATION:** Corner Andalusian Way & Mandala Pde **DATE:** Sunday, 12 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0800-1800	43	dB
LA90 Evening	1800-2200	41	dB
LA90 Night-time	2200-0800	31	dB
LAeq Daytime	0800-1800	51	dB
LAeq Evening	1800-2200	50	dB
LAeq Night-time	2200-0800	45	dB

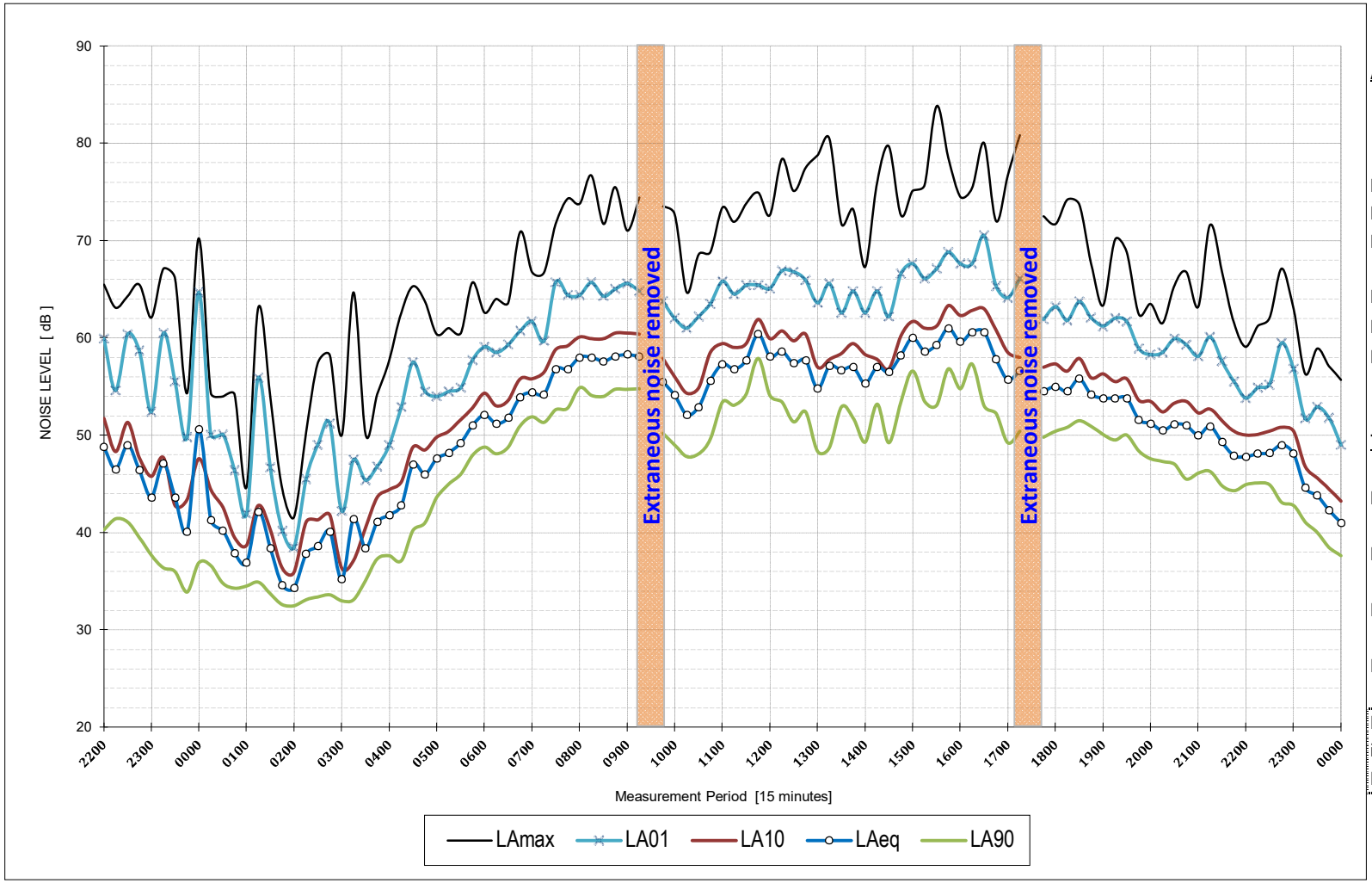
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	51	dB
LAeq 9 hours	2200-0700	44	dB
Max LAeq 1 hour	0700-2200	53	dB
Max LAeq 1 hour	2200-0700	47	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	31

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 4 **LOGGER LOCATION:** Corner Andalusian Way & Mandala Pde **DATE:** Monday, 13 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	49	dB
LA90 Evening	1800-2200	45	dB
LA90 Night-time	2200-0700	33	dB
LAeq Daytime	0700-1800	58	dB
LAeq Evening	1800-2200	53	dB
LAeq Night-time	2200-0700	47	dB

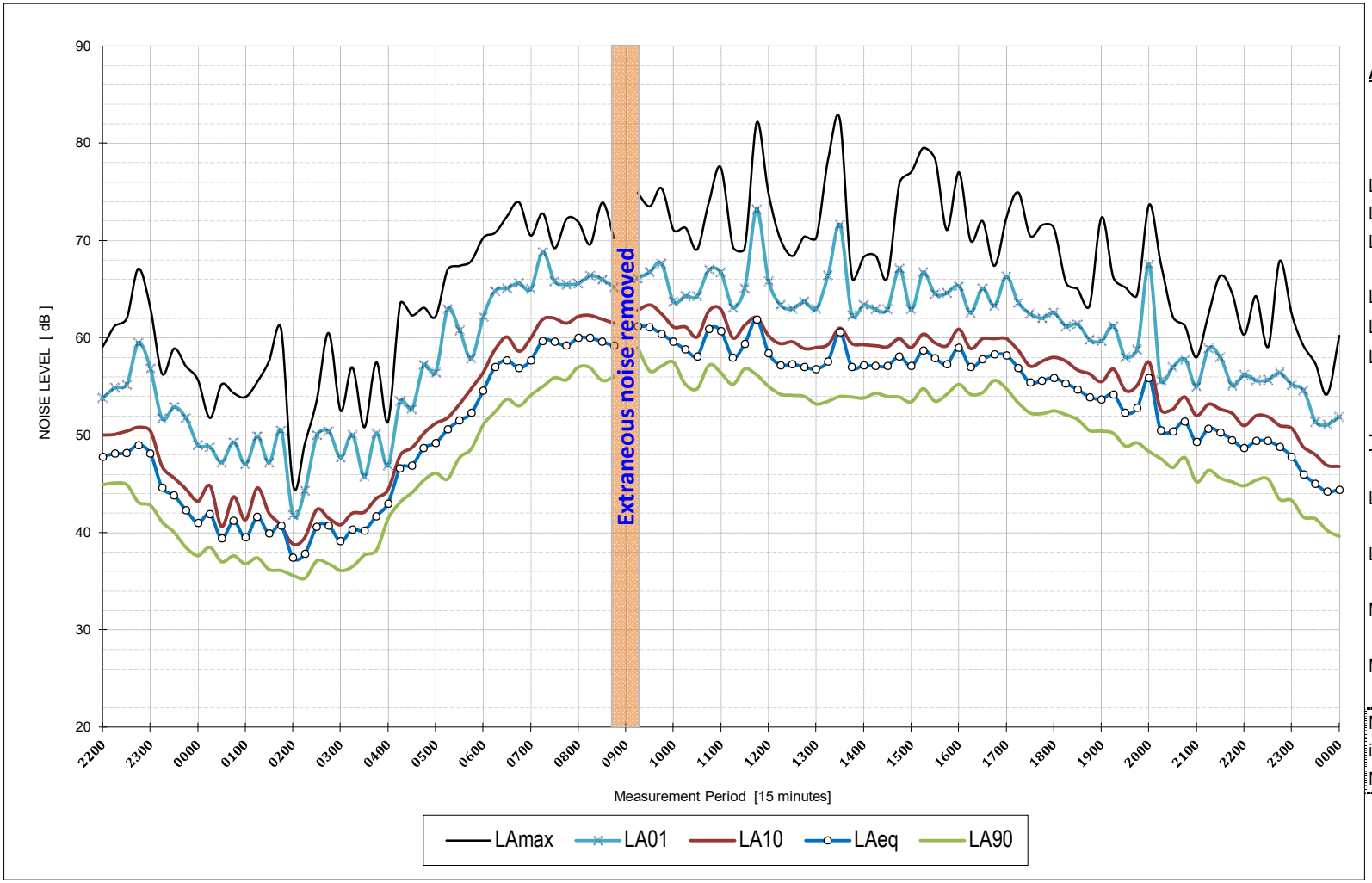
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	57	dB
LAeq 9 hours	2200-0700	47	dB
Max LAeq 1 hour	0700-2200	59	dB
Max LAeq 1 hour	2200-0700	50	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	19

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 5 **LOGGER LOCATION:** Corner Andalusian Way & Mandala Pde **DATE:** Tuesday, 14 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	53	dB
LA90 Evening	1800-2200	45	dB
LA90 Night-time	2200-0700	36	dB
LAeq Daytime	0700-1800	59	dB
LAeq Evening	1800-2200	53	dB
LAeq Night-time	2200-0700	50	dB

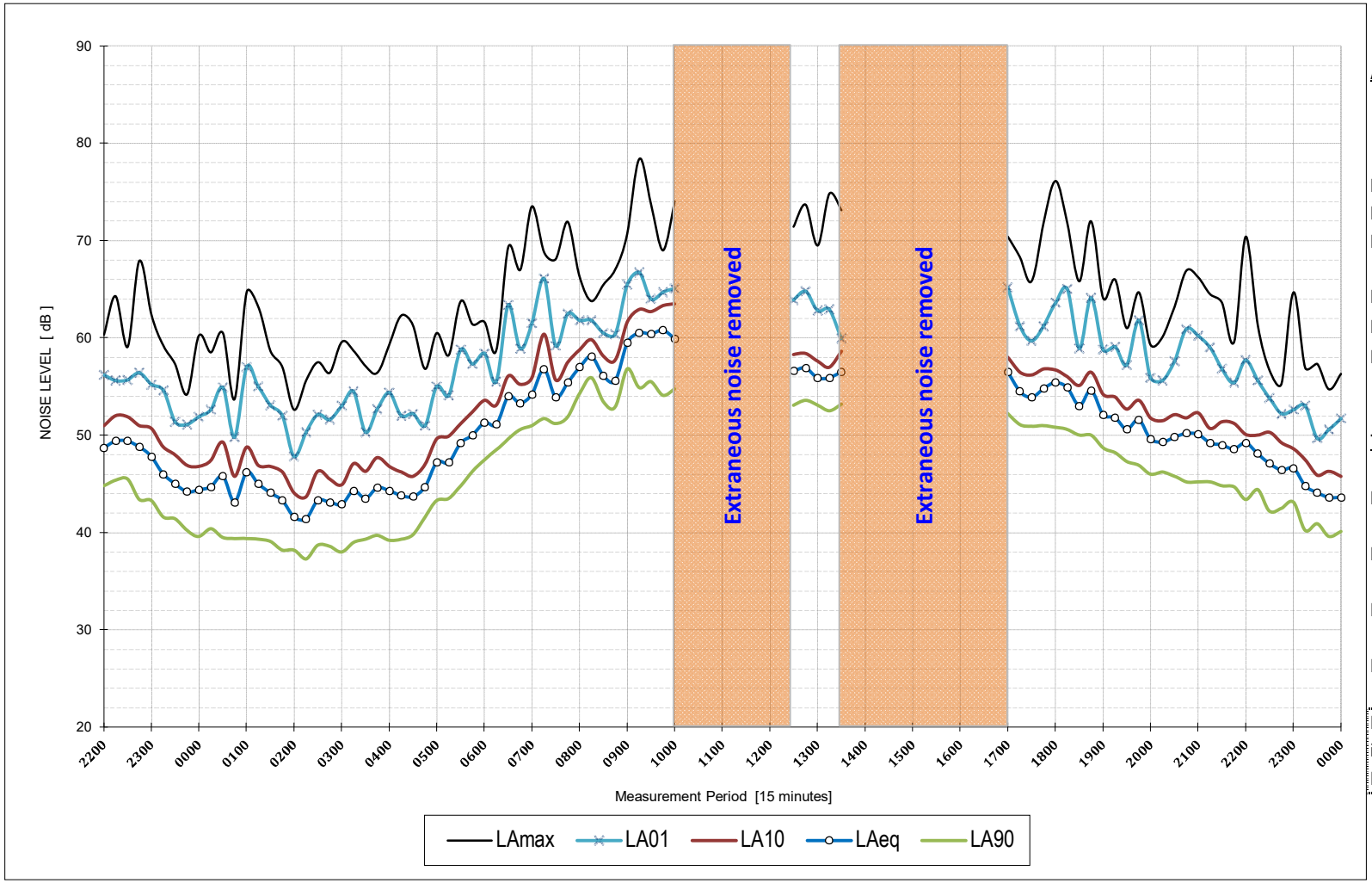
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	58	dB
LAeq 9 hours	2200-0700	50	dB
Max LAeq 1 hour	0700-2200	60	dB
Max LAeq 1 hour	2200-0700	52	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	15

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 6 **LOGGER LOCATION:** Corner Andalusian Way & Mandala Pde **DATE:** Wednesday, 15 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	51	dB
LA90 Evening	1800-2200	45	dB
LA90 Night-time	2200-0700	38	dB
LAeq Daytime	0700-1800	57	dB
LAeq Evening	1800-2200	52	dB
LAeq Night-time	2200-0700	47	dB

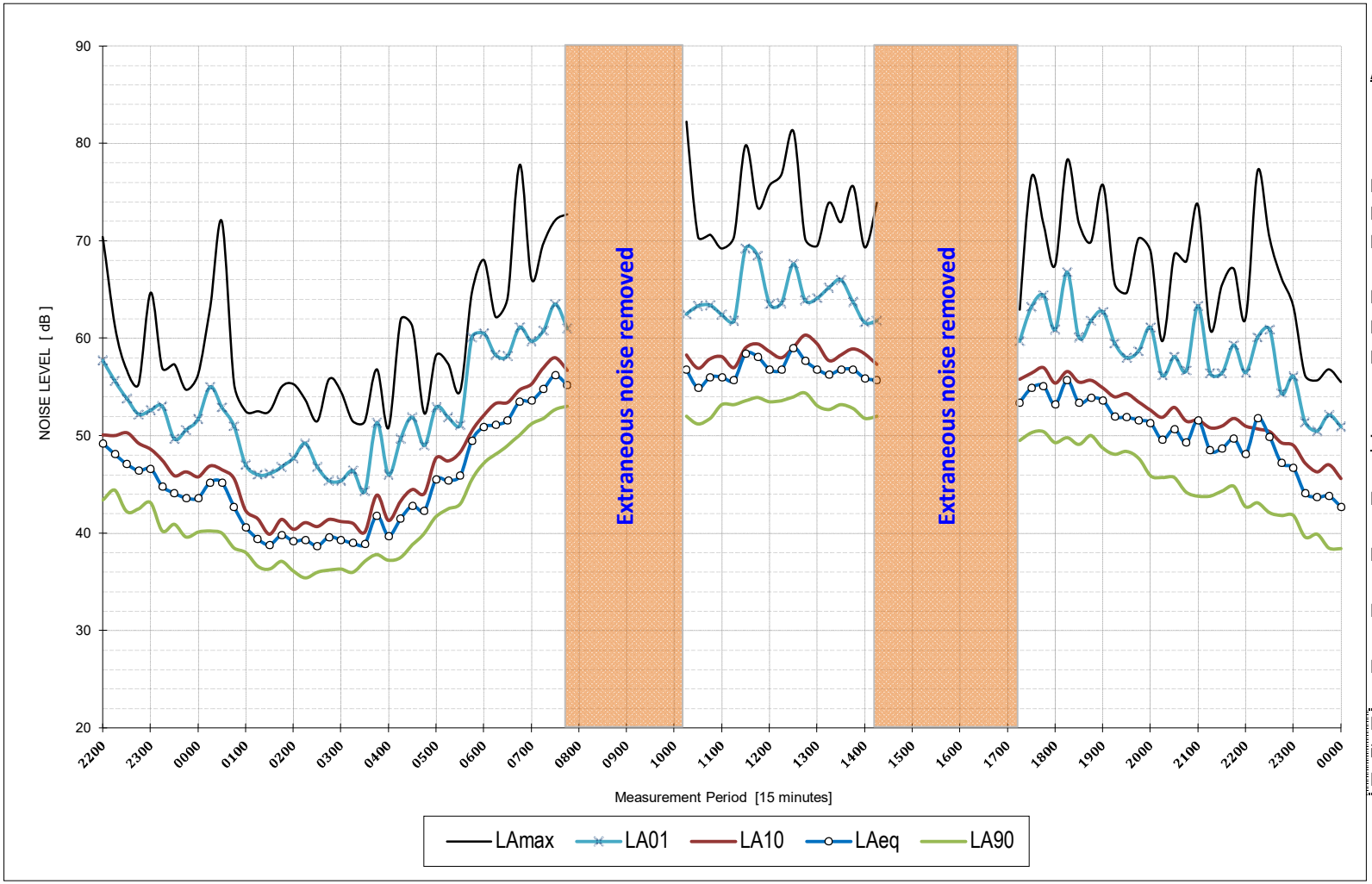
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	56	dB
LAeq 9 hours	2200-0700	47	dB
Max LAeq 1 hour	0700-2200	58	dB
Max LAeq 1 hour	2200-0700	50	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	9

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 7 **LOGGER LOCATION:** Corner Andalusian Way & Mandala Pde **DATE:** Thursday, 16 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	51	dB
LA90 Evening	1800-2200	44	dB
LA90 Night-time	2200-0700	36	dB
LAeq Daytime	0700-1800	56	dB
LAeq Evening	1800-2200	52	dB
LAeq Night-time	2200-0700	46	dB

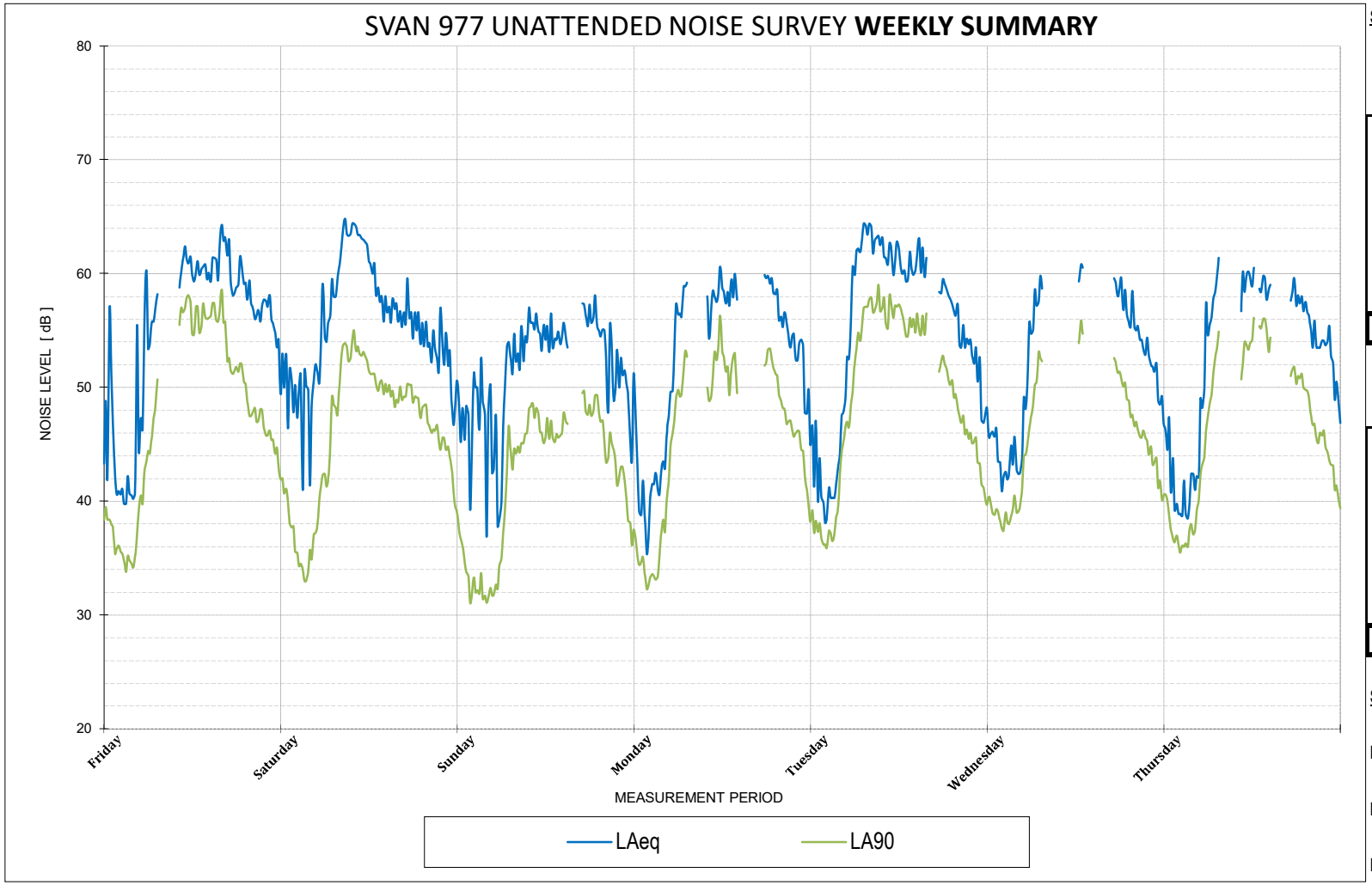
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	55	dB
LAeq 9 hours	2200-0700	46	dB
Max LAeq 1 hour	0700-2200	58	dB
Max LAeq 1 hour	2200-0700	48	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	14

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

WEEKLY SUMMARY **LOGGER LOCATION:** Corner De Clamb Drive & Andalusian Way **PERIOD:** 10th to the 16th July 2020



Sundays and Public Holidays the hours change to 0800

SUMMARY OF AMBIENT LEVELS

	LA90 Daytime	*LA90* Evening	*LA90* Night-time
Day 1	52	47	35
Day 2	49	46	34
Day 3	45	43	32
Day 4	49	47	33
Day 5	55	46	37
Day 6	52	46	38
Day 7	52	46	36
RBL	**52**	**46**	**35**

	LAeq Daytime	*LAeq* Evening	*LAeq* Night-time
Day 1	61	58	52
Day 2	61	55	53
Day 3	55	55	50
Day 4	58	57	51
Day 5	62	57	55
Day 6	59	56	51
Day 7	59	56	50
Average	**60**	**57**	**52**

SUMMARY OF TRAFFIC LEVELS

LAeq 15 hrs	0700-2200	59	dB
LAeq 9 hrs	2200-0700	52	dB
Max LAeq 1 hr	0700-2200	60	dB
Max LAeq 1 hr	2200-0700	55	dB

Maximum noise events as defined in the Environmental Noise Management Manual 7 day average - [LAmax - LAeq ≥ 15]	28

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 1 **LOGGER LOCATION:** Corner De Clamb Drive & Andalusian Way **DATE:** Friday, 10 July 2020

AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	52	dB
LA90 Evening	1800-2200	47	dB
LA90 Night-time	2200-0700	35	dB
LAeq Daytime	0700-1800	61	dB
LAeq Evening	1800-2200	58	dB
LAeq Night-time	2200-0700	52	dB

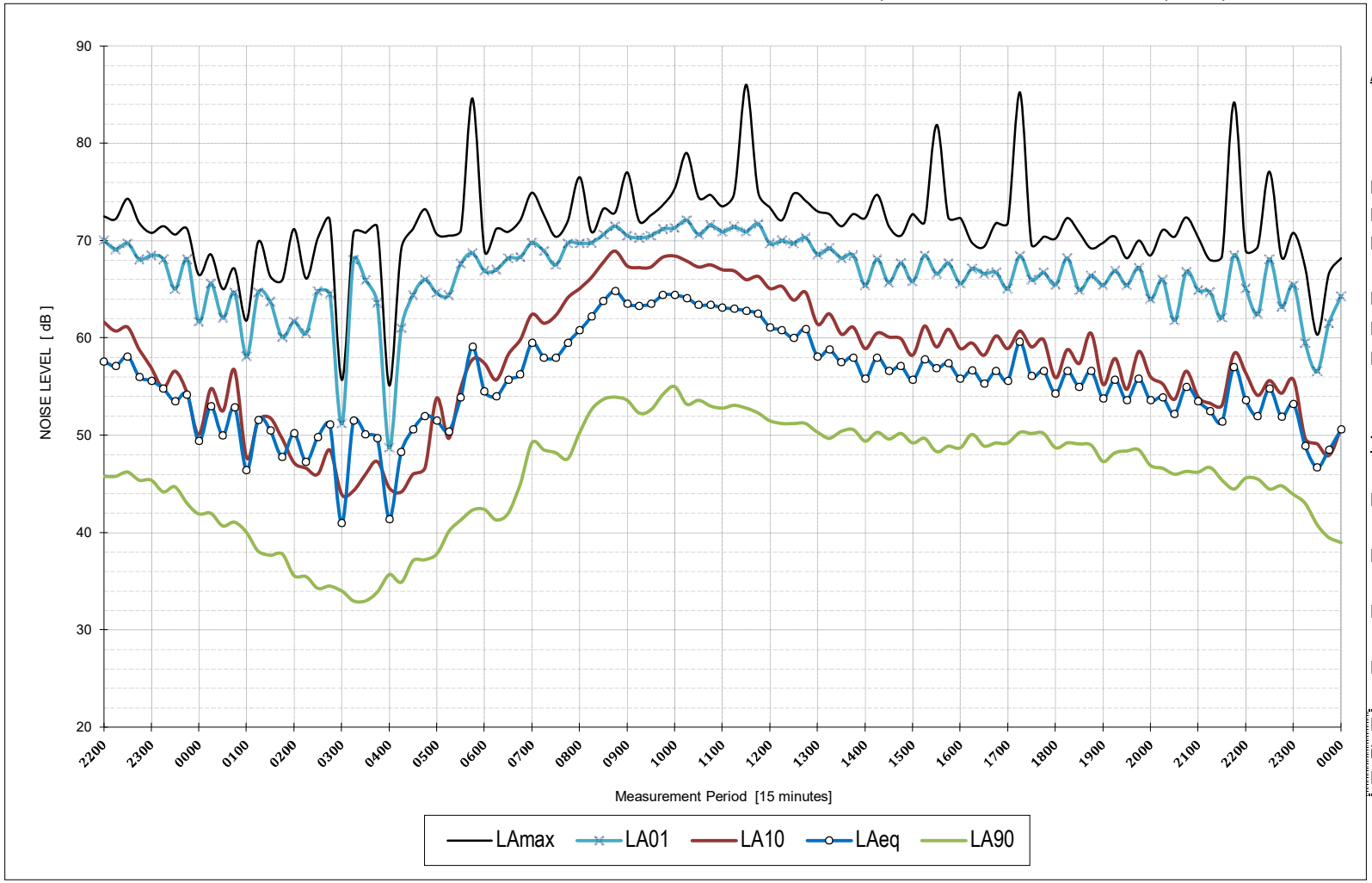
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	60	dB
LAeq 9 hours	2200-0700	52	dB
Max LAeq 1 hour	0700-2200	62	dB
Max LAeq 1 hour	2200-0700	56	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	29

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 2 **LOGGER LOCATION:** Corner De Clamb Drive & Andalusian Way **DATE:** Saturday, 11 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	49	dB
LA90 Evening	1800-2200	46	dB
LA90 Night-time	2200-0700	34	dB
LAeq Daytime	0700-1800	61	dB
LAeq Evening	1800-2200	55	dB
LAeq Night-time	2200-0700	53	dB

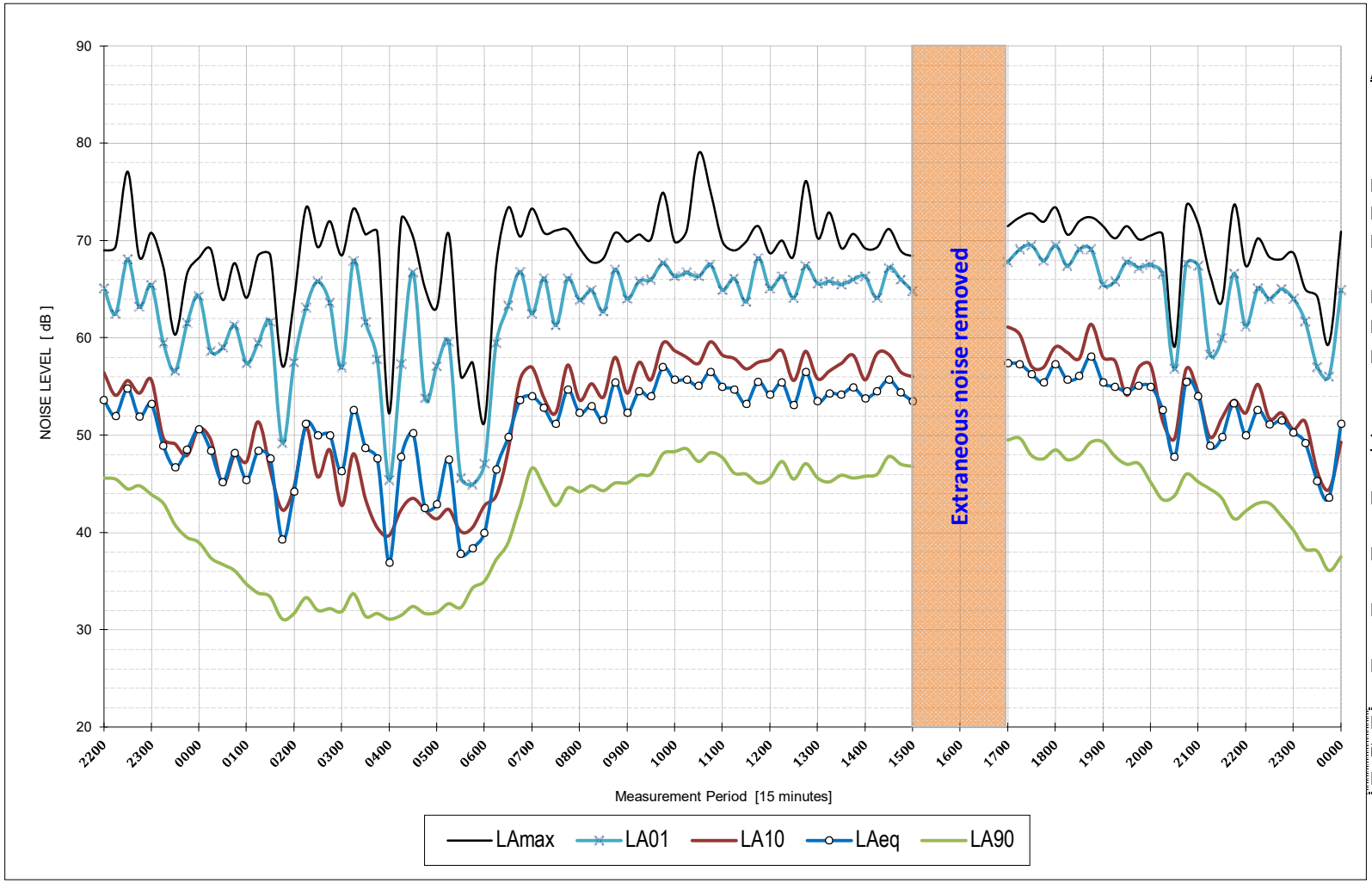
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	60	dB
LAeq 9 hours	2200-0700	53	dB
Max LAeq 1 hour	0700-2200	64	dB
Max LAeq 1 hour	2200-0700	56	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	31

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 3 **LOGGER LOCATION:** Corner De Clamb Drive & Andalusian Way **DATE:** Sunday, 12 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0800-1800	45	dB
LA90 Evening	1800-2200	43	dB
LA90 Night-time	2200-0800	32	dB
LAeq Daytime	0800-1800	55	dB
LAeq Evening	1800-2200	55	dB
LAeq Night-time	2200-0800	50	dB

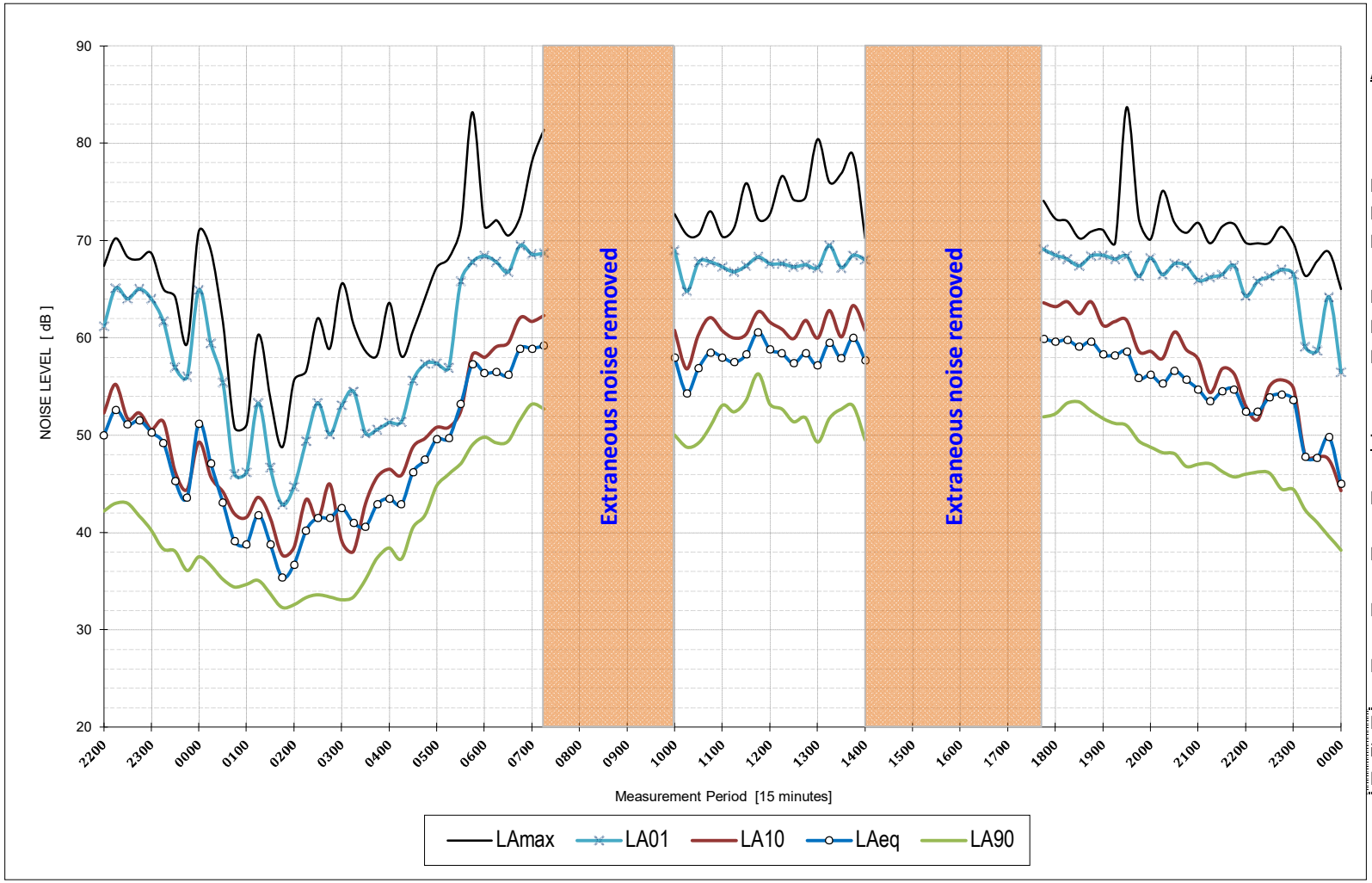
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	55	dB
LAeq 9 hours	2200-0700	49	dB
Max LAeq 1 hour	0700-2200	57	dB
Max LAeq 1 hour	2200-0700	51	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	34

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 4 **LOGGER LOCATION:** Corner De Clamb Drive & Andalusian Way **DATE:** Monday, 13 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	49	dB
LA90 Evening	1800-2200	47	dB
LA90 Night-time	2200-0700	33	dB
LAeq Daytime	0700-1800	58	dB
LAeq Evening	1800-2200	57	dB
LAeq Night-time	2200-0700	51	dB

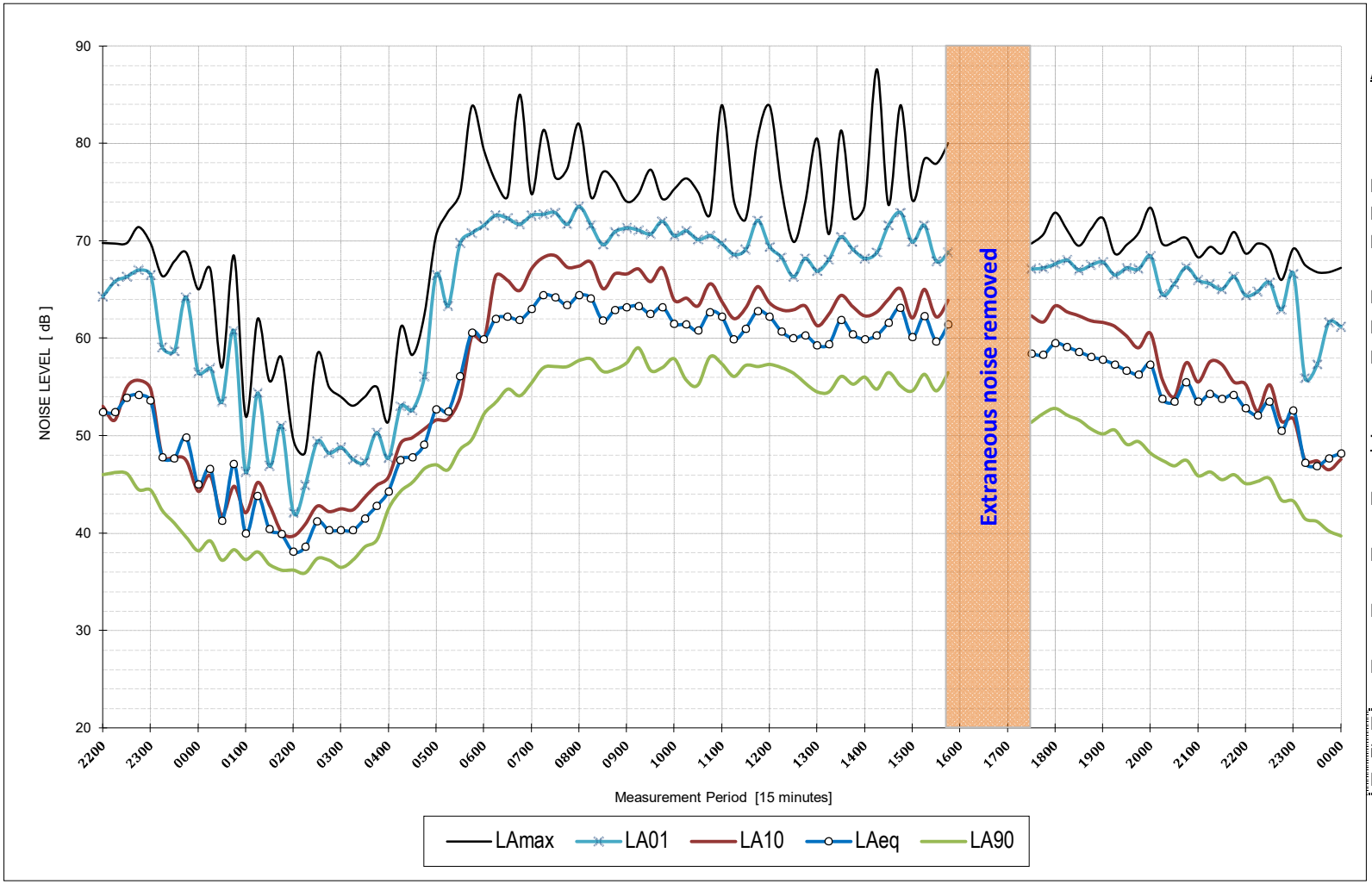
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	58	dB
LAeq 9 hours	2200-0700	51	dB
Max LAeq 1 hour	0700-2200	60	dB
Max LAeq 1 hour	2200-0700	55	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	30

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 5 **LOGGER LOCATION:** Corner De Clamb Drive & Andalusian Way **DATE:** Tuesday, 14 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	55	dB
LA90 Evening	1800-2200	46	dB
LA90 Night-time	2200-0700	37	dB
LAeq Daytime	0700-1800	62	dB
LAeq Evening	1800-2200	57	dB
LAeq Night-time	2200-0700	55	dB

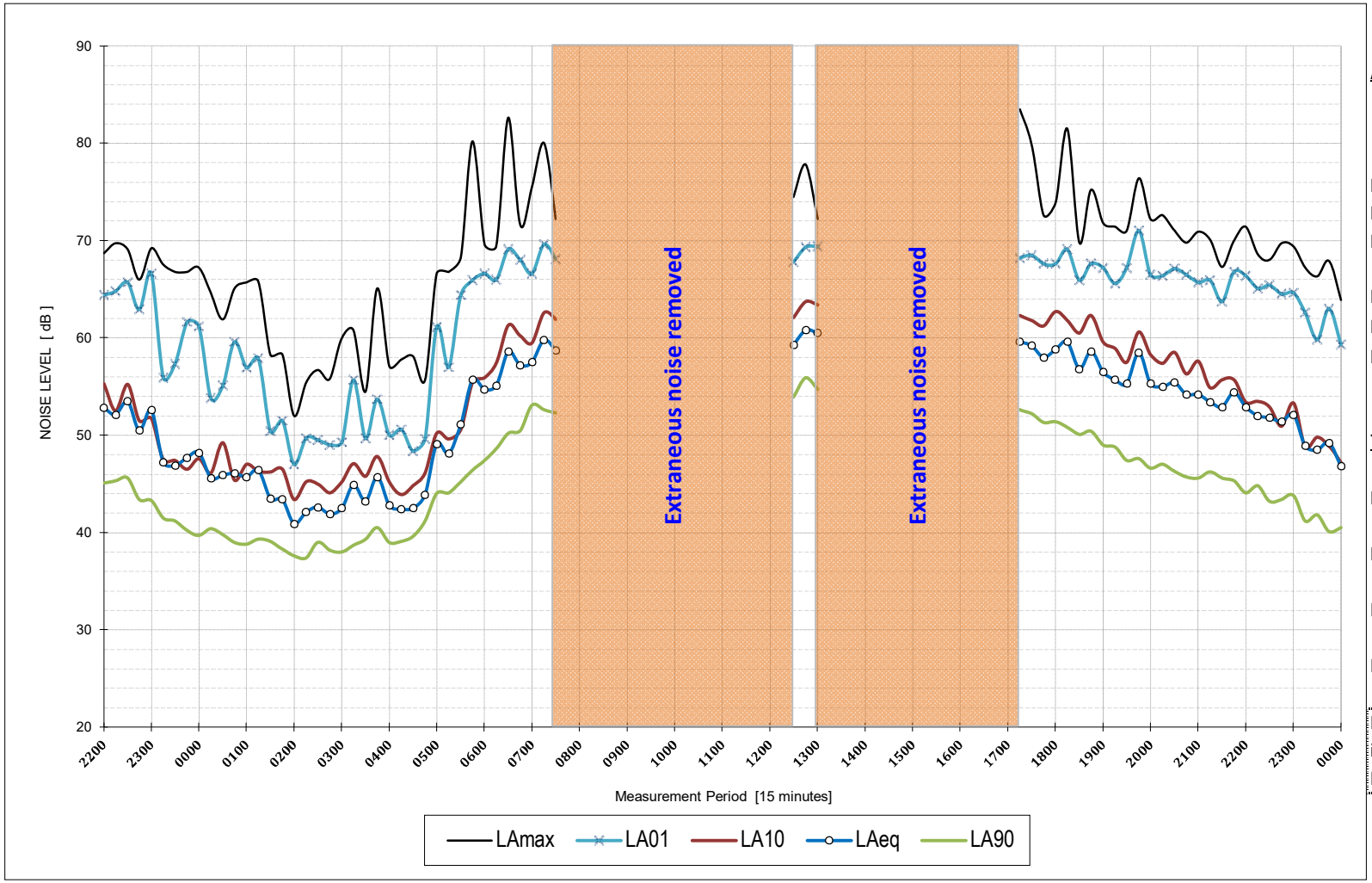
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	61	dB
LAeq 9 hours	2200-0700	55	dB
Max LAeq 1 hour	0700-2200	63	dB
Max LAeq 1 hour	2200-0700	58	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	22

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 6 **LOGGER LOCATION:** Corner De Clamb Drive & Andalusian Way **DATE:** Wednesday, 15 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	52	dB
LA90 Evening	1800-2200	46	dB
LA90 Night-time	2200-0700	38	dB
LAeq Daytime	0700-1800	59	dB
LAeq Evening	1800-2200	56	dB
LAeq Night-time	2200-0700	51	dB

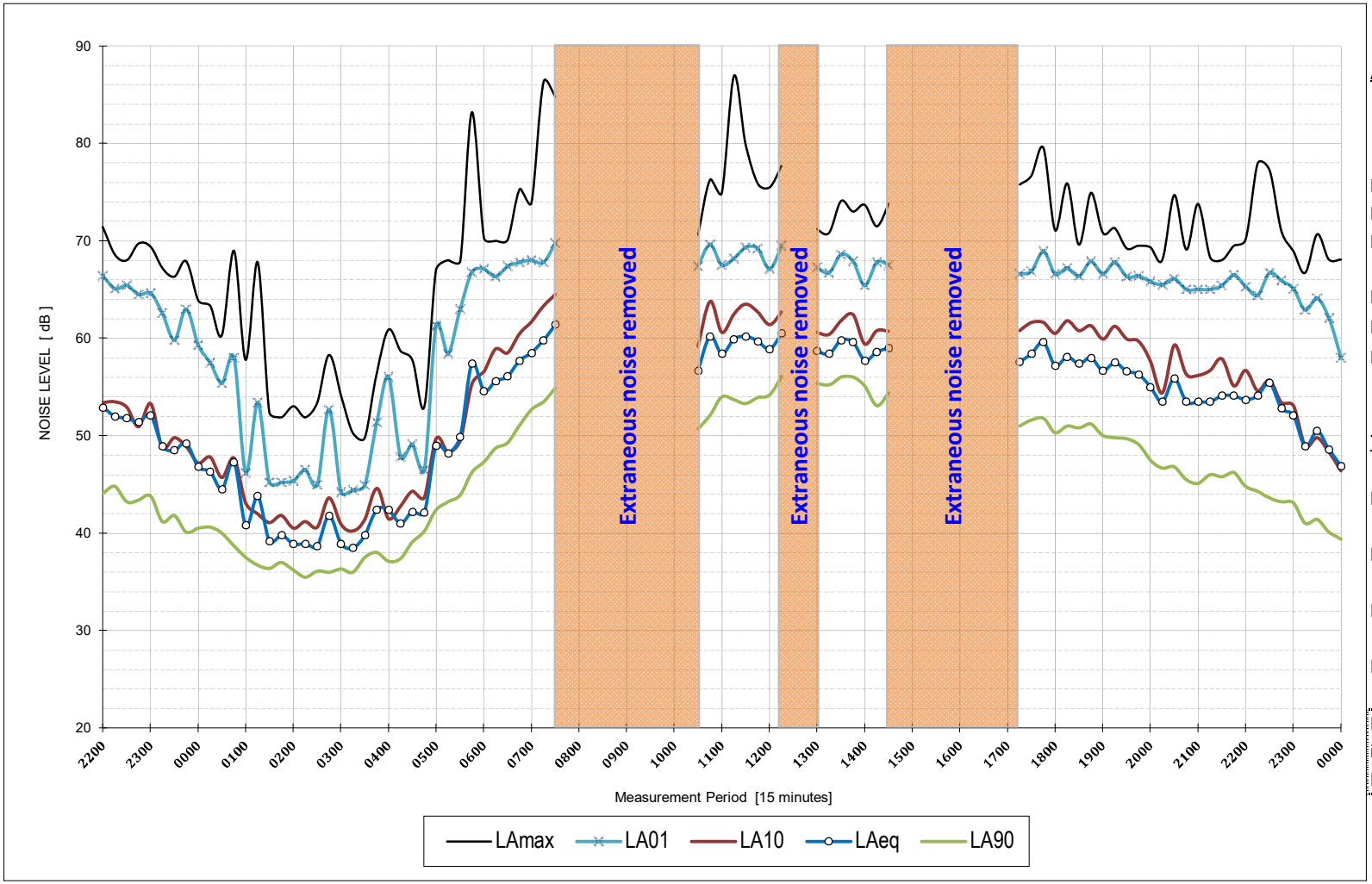
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	58	dB
LAeq 9 hours	2200-0700	51	dB
Max LAeq 1 hour	0700-2200	60	dB
Max LAeq 1 hour	2200-0700	53	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	24

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 7 **LOGGER LOCATION:** Corner De Clamb Drive & Andalusian Way **DATE:** Thursday, 16 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	52	dB
LA90 Evening	1800-2200	46	dB
LA90 Night-time	2200-0700	36	dB
LAeq Daytime	0700-1800	59	dB
LAeq Evening	1800-2200	56	dB
LAeq Night-time	2200-0700	50	dB

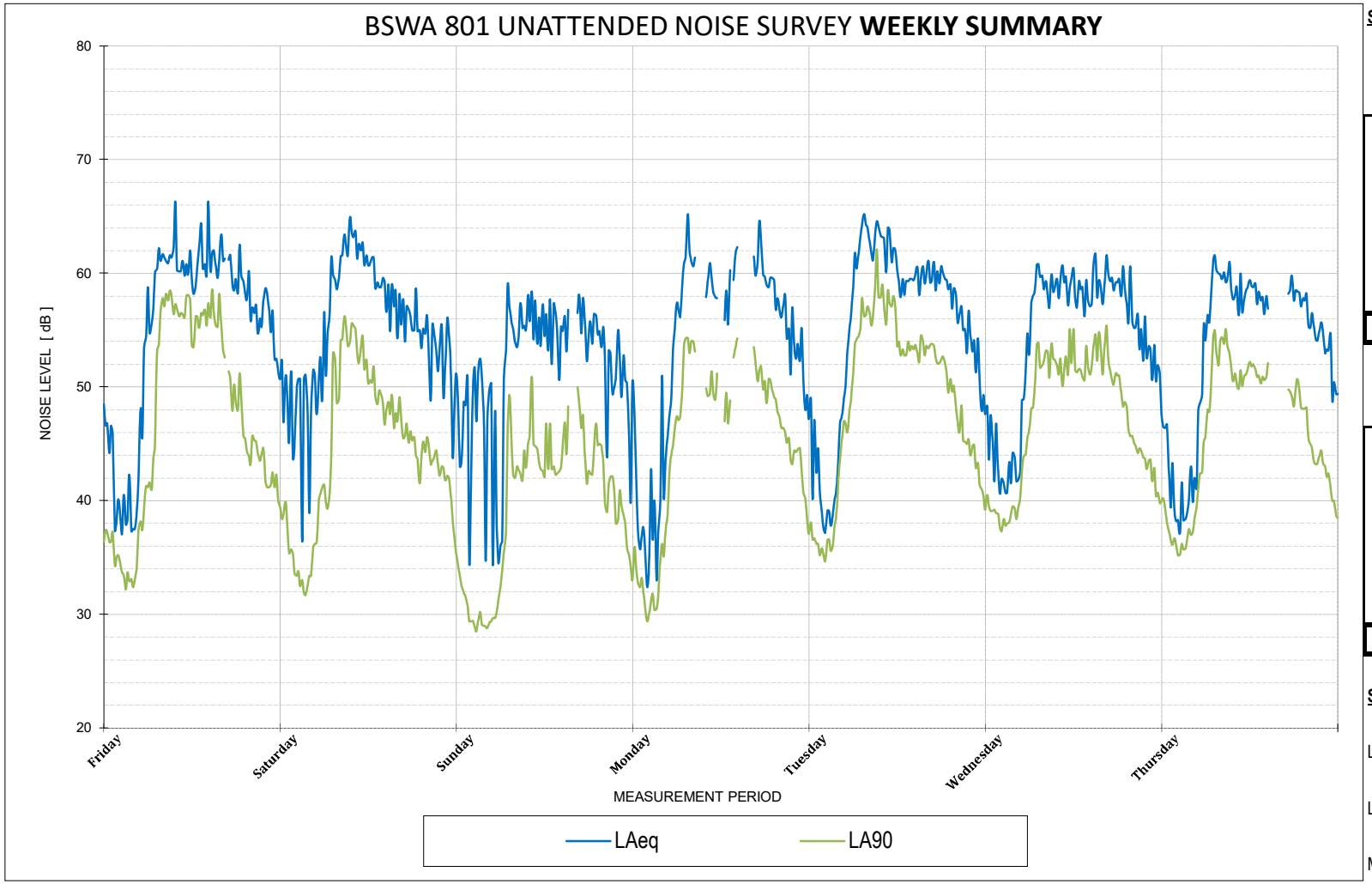
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	58	dB
LAeq 9 hours	2200-0700	50	dB
Max LAeq 1 hour	0700-2200	60	dB
Max LAeq 1 hour	2200-0700	54	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	25

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

WEEKLY SUMMARY **LOGGER LOCATION:** Corner Dorian Drive & De Clamb Drive **PERIOD:** 10th to the 16th July 2020



Sundays and Public Holidays the hours change to 0800

SUMMARY OF AMBIENT LEVELS

	LA90 Daytime	***LA90*** Evening	***LA90*** Night-time
Day 1	51	44	33
Day 2	46	43	33
Day 3	42	39	29
Day 4	48	44	30
Day 5	53	45	36
Day 6	51	44	38
Day 7	50	43	36
RBL	**50**	**44**	**33**

	LAeq Daytime	***LAeq*** Evening	***LAeq*** Night-time
Day 1	61	58	51
Day 2	60	55	53
Day 3	56	54	51
Day 4	61	58	51
Day 5	62	58	54
Day 6	59	57	51
Day 7	59	57	50
Average	**60**	**57**	**52**

SUMMARY OF TRAFFIC LEVELS

LAeq 15 hrs	0700-2200	59	dB
LAeq 9 hrs	2200-0700	52	dB
Max LAeq 1 hr	0700-2200	62	dB
Max LAeq 1 hr	2200-0700	54	dB

Maximum noise events as defined in the Environmental Noise Management Manual 7 day average - [LAmax - LAeq ≥ 15]	31

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 1 **LOGGER LOCATION:** Corner Dorian Drive & De Clamb Drive **DATE:** Friday, 10 July 2020

AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	51	dB
LA90 Evening	1800-2200	44	dB
LA90 Night-time	2200-0700	33	dB
LAeq Daytime	0700-1800	61	dB
LAeq Evening	1800-2200	58	dB
LAeq Night-time	2200-0700	51	dB

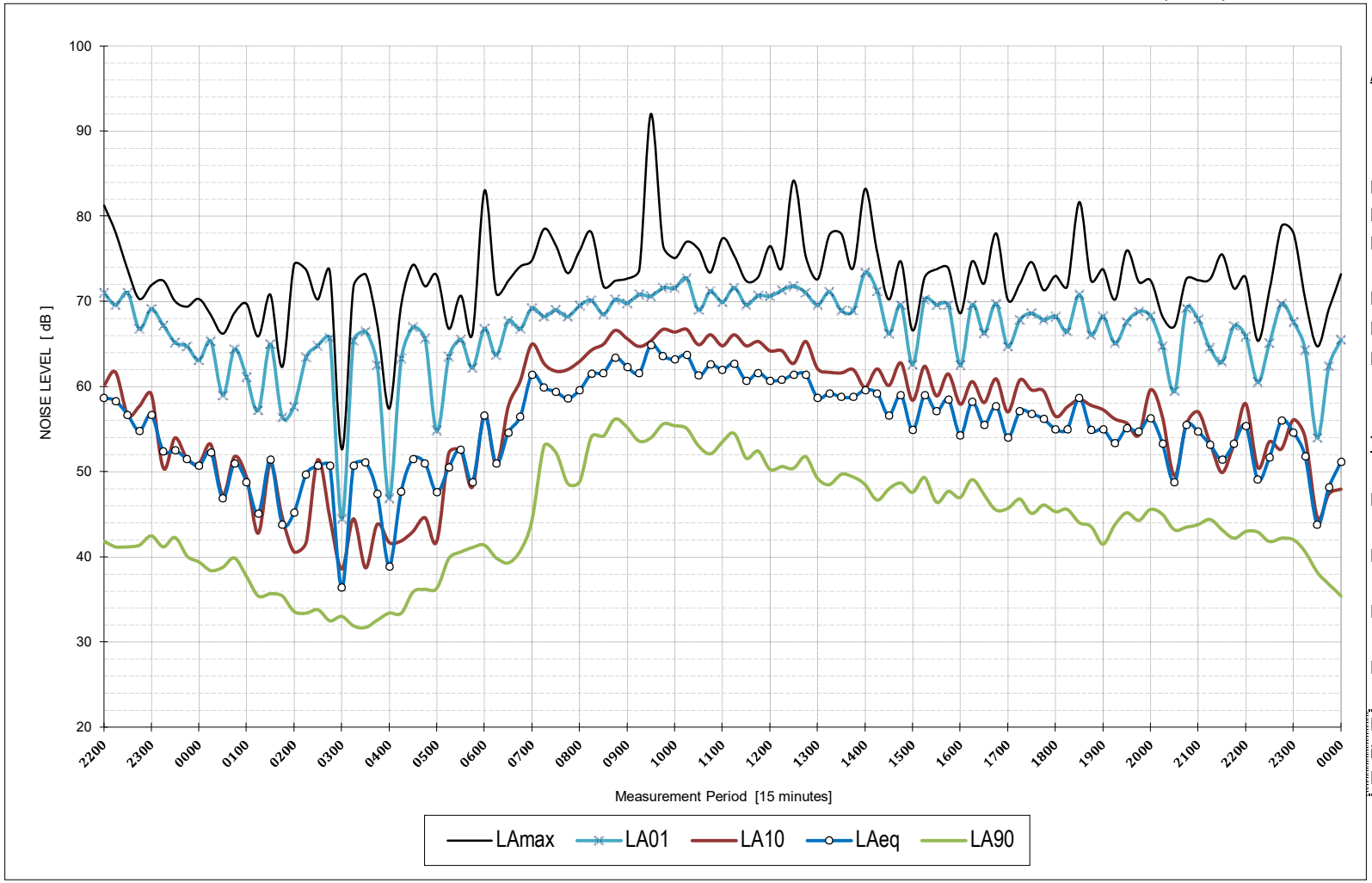
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	61	dB
LAeq 9 hours	2200-0700	51	dB
Max LAeq 1 hour	0700-2200	63	dB
Max LAeq 1 hour	2200-0700	55	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	35

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 2 **LOGGER LOCATION:** Corner Dorian Drive & De Clamb Drive **DATE:** Saturday, 11 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	46	dB
LA90 Evening	1800-2200	43	dB
LA90 Night-time	2200-0700	33	dB
LAeq Daytime	0700-1800	60	dB
LAeq Evening	1800-2200	55	dB
LAeq Night-time	2200-0700	53	dB

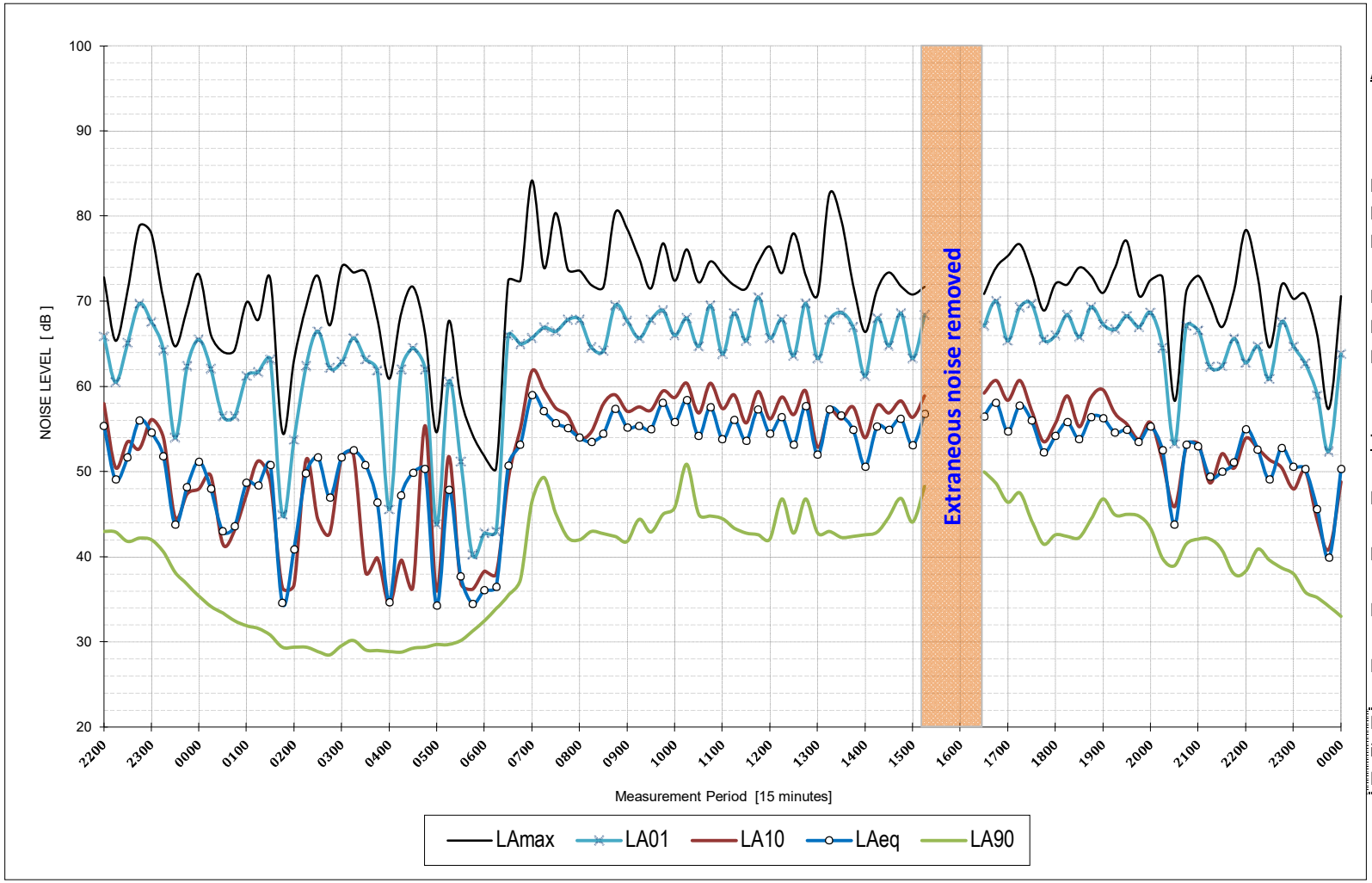
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	60	dB
LAeq 9 hours	2200-0700	53	dB
Max LAeq 1 hour	0700-2200	63	dB
Max LAeq 1 hour	2200-0700	55	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	36

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 3 **LOGGER LOCATION:** Corner Dorian Drive & De Clamb Drive **DATE:** Sunday, 12 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0800-1800	42	dB
LA90 Evening	1800-2200	39	dB
LA90 Night-time	2200-0800	29	dB
LAeq Daytime	0800-1800	56	dB
LAeq Evening	1800-2200	54	dB
LAeq Night-time	2200-0800	51	dB

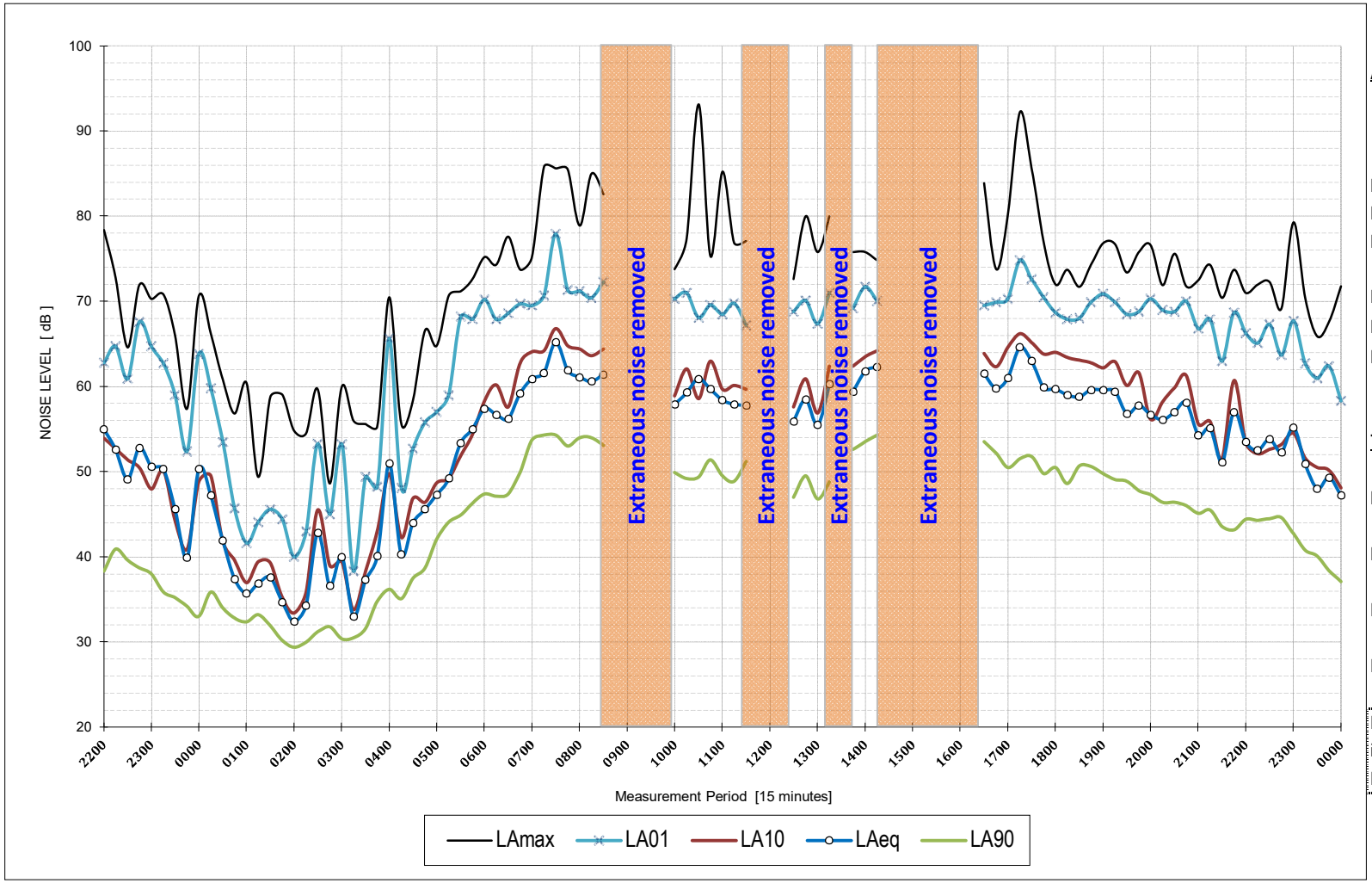
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	55	dB
LAeq 9 hours	2200-0700	50	dB
Max LAeq 1 hour	0700-2200	57	dB
Max LAeq 1 hour	2200-0700	53	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	35

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 4 **LOGGER LOCATION:** Corner Dorian Drive & De Clamb Drive **DATE:** Monday, 13 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	48	dB
LA90 Evening	1800-2200	44	dB
LA90 Night-time	2200-0700	30	dB
LAeq Daytime	0700-1800	61	dB
LAeq Evening	1800-2200	58	dB
LAeq Night-time	2200-0700	51	dB

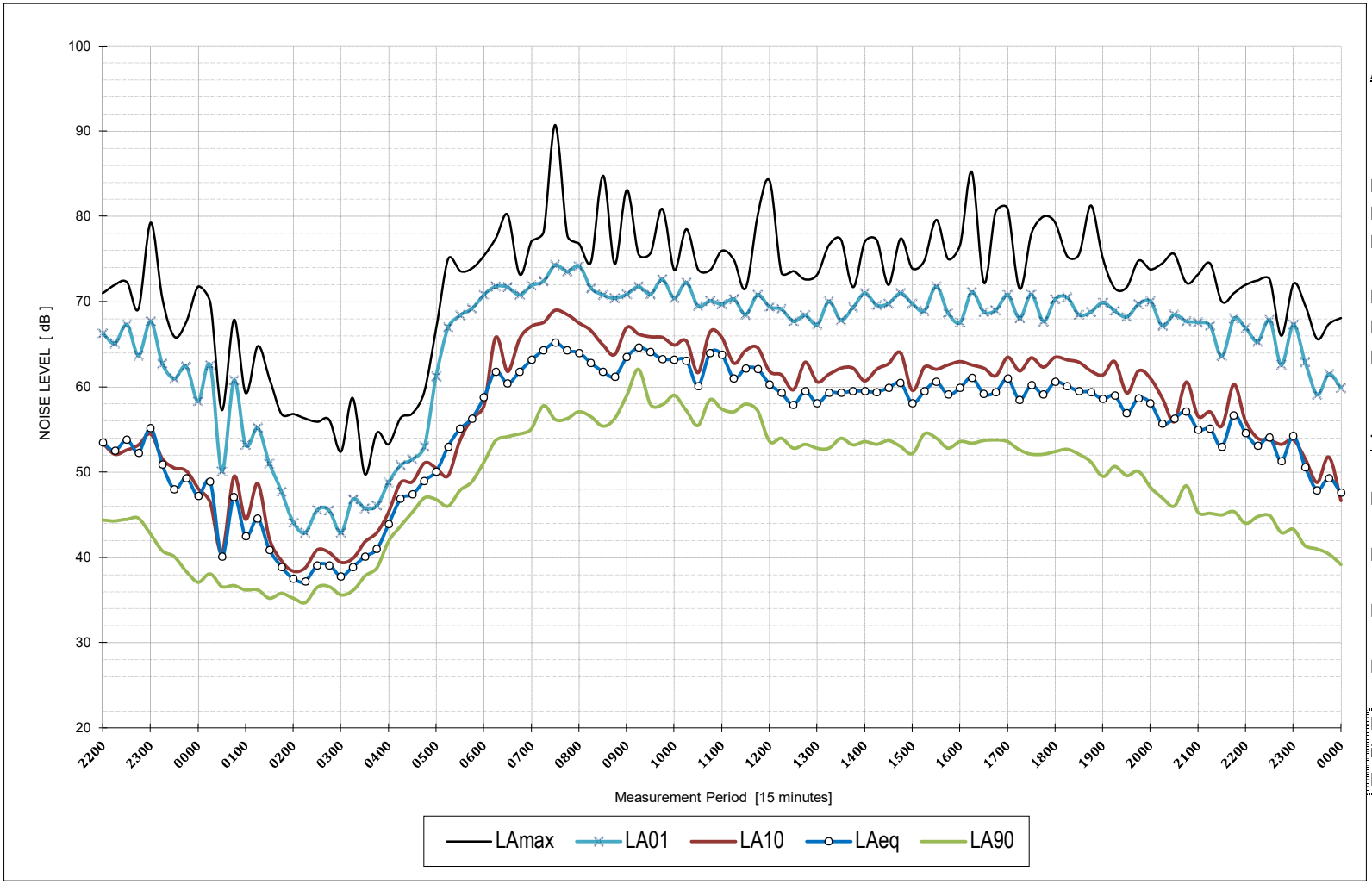
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	60	dB
LAeq 9 hours	2200-0700	51	dB
Max LAeq 1 hour	0700-2200	62	dB
Max LAeq 1 hour	2200-0700	54	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	32

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 5 **LOGGER LOCATION:** Corner Dorian Drive & De Clamb Drive **DATE:** Tuesday, 14 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	53	dB
LA90 Evening	1800-2200	45	dB
LA90 Night-time	2200-0700	36	dB
LAeq Daytime	0700-1800	62	dB
LAeq Evening	1800-2200	58	dB
LAeq Night-time	2200-0700	54	dB

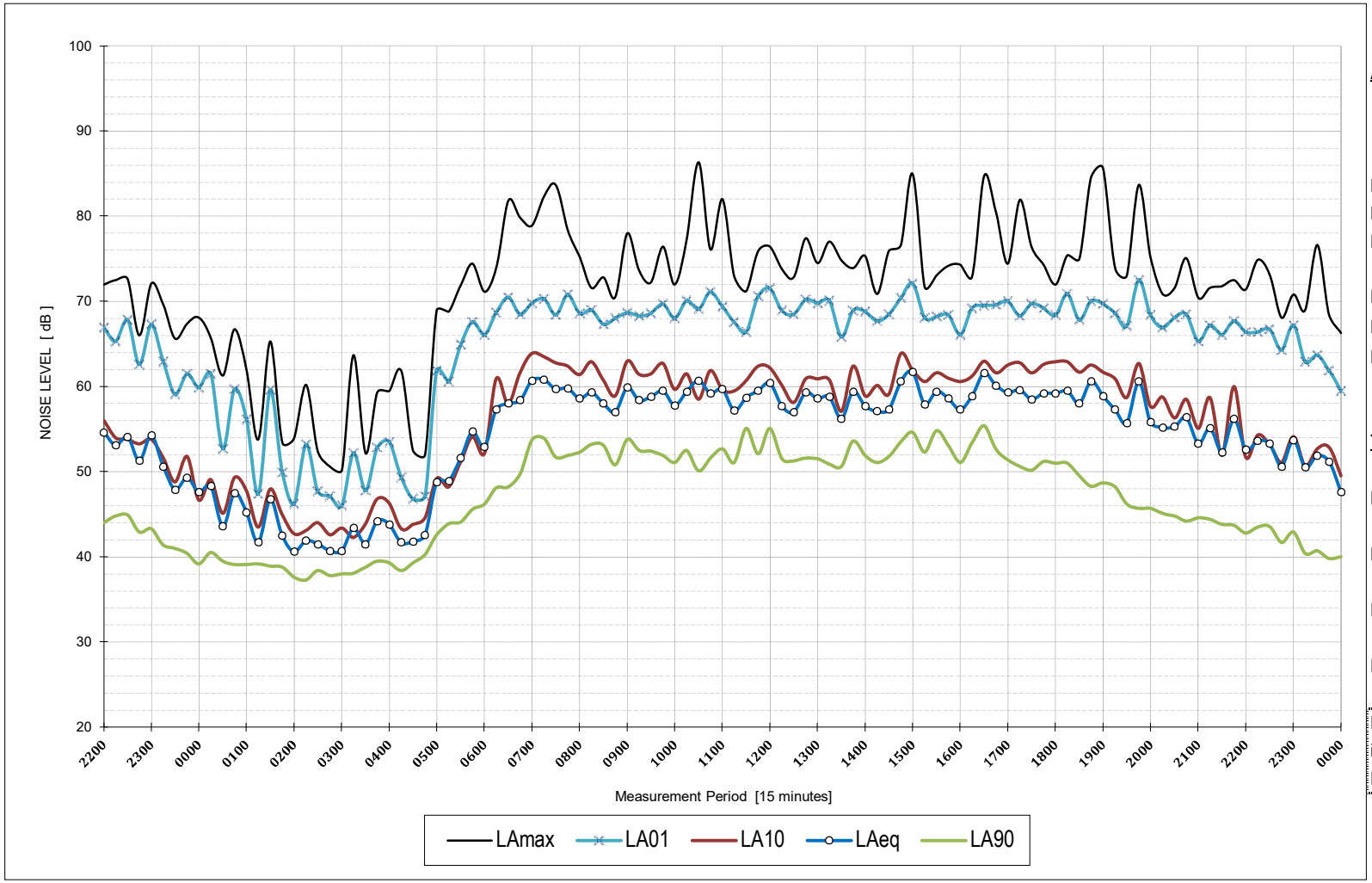
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	61	dB
LAeq 9 hours	2200-0700	54	dB
Max LAeq 1 hour	0700-2200	63	dB
Max LAeq 1 hour	2200-0700	56	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	28

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 6 **LOGGER LOCATION:** Corner Dorian Drive & De Clamb Drive **DATE:** Wednesday, 15 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	51	dB
LA90 Evening	1800-2200	44	dB
LA90 Night-time	2200-0700	38	dB
LAeq Daytime	0700-1800	59	dB
LAeq Evening	1800-2200	57	dB
LAeq Night-time	2200-0700	51	dB

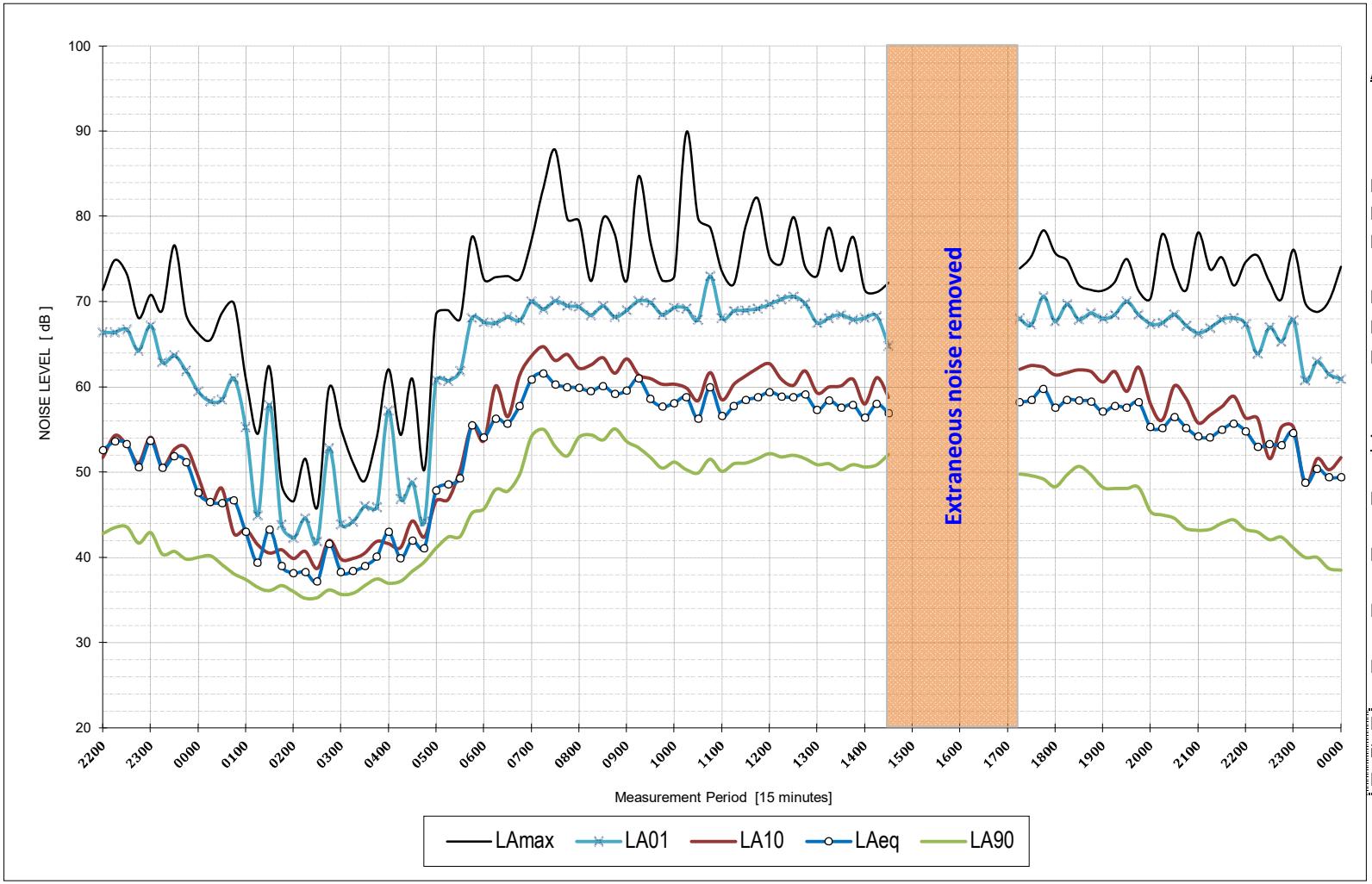
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	59	dB
LAeq 9 hours	2200-0700	51	dB
Max LAeq 1 hour	0700-2200	60	dB
Max LAeq 1 hour	2200-0700	53	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	26

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 7 **LOGGER LOCATION:** Corner Dorian Drive & De Clamb Drive **DATE:** Thursday, 16 July 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	50	dB
LA90 Evening	1800-2200	43	dB
LA90 Night-time	2200-0700	36	dB
LAeq Daytime	0700-1800	59	dB
LAeq Evening	1800-2200	57	dB
LAeq Night-time	2200-0700	50	dB

TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	58	dB
LAeq 9 hours	2200-0700	50	dB
Max LAeq 1 hour	0700-2200	60	dB
Max LAeq 1 hour	2200-0700	53	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	26

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION