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ACOUSTICAL REPORT

PROPOSED WOOLWORTHS AT THE MIXED-USE DEVELOPMENT

2 MANDALA PARADE, CASTLE HILL NSW 2154

(DORAN DRIVE PRECINCT)

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ACOUSTICAL REPORT
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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 an acoustical report for the proposed Woolworths at the mixed-use development at 2 Mandala Parade, Castle Hill NSW 2154 also seeking approval for the construction of four buildings up to twenty storeys with associated basement level parking.

For the DA proposal, the acoustic adequacy of the proposed design must be assessed in terms of standard planning guidelines issued by Council in their Local Environment Plan (LEP) and Development Control Plan (DCP), and also in terms of other standard planning guidelines related to common sources of noise.

As per Council guidelines and other standard planning instruments, Koikas Acoustics has determined a noise impact assessment from the operation of the Woolworths to adjoining and surrounding premises.

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 acoustic planning levels.



2.0 THE PROPOSAL

The development known as Doran Drive Precinct is proposed to occupy the following site 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 m² 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. The proposed Woolworths design can be seen in architectural drawings as prepared by D+R Architects, detailed in Table 2. All calculations and noise modelled scenarios conducted for this assessment are based on the architectural drawings detailed in the drawing list. Where design changes are made without the prior knowledge of Koikas Acoustics, the assessment results and conclusions published within this report may be incorrect.

The development location is situated in a primarily urban 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 mixed-use 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,
- 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



Table 2. Design drawings used in the assessment

Drawing Title	Drawing No.	Revision	Scale	Date	Job No.
Ground Level Plan Proposed Supermarket	DA 1.02	C	-	29/06/2021	-
Level 1 Supermarket Loading Dock Plan	DA 1.03	B	-	29/06/2021	-

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

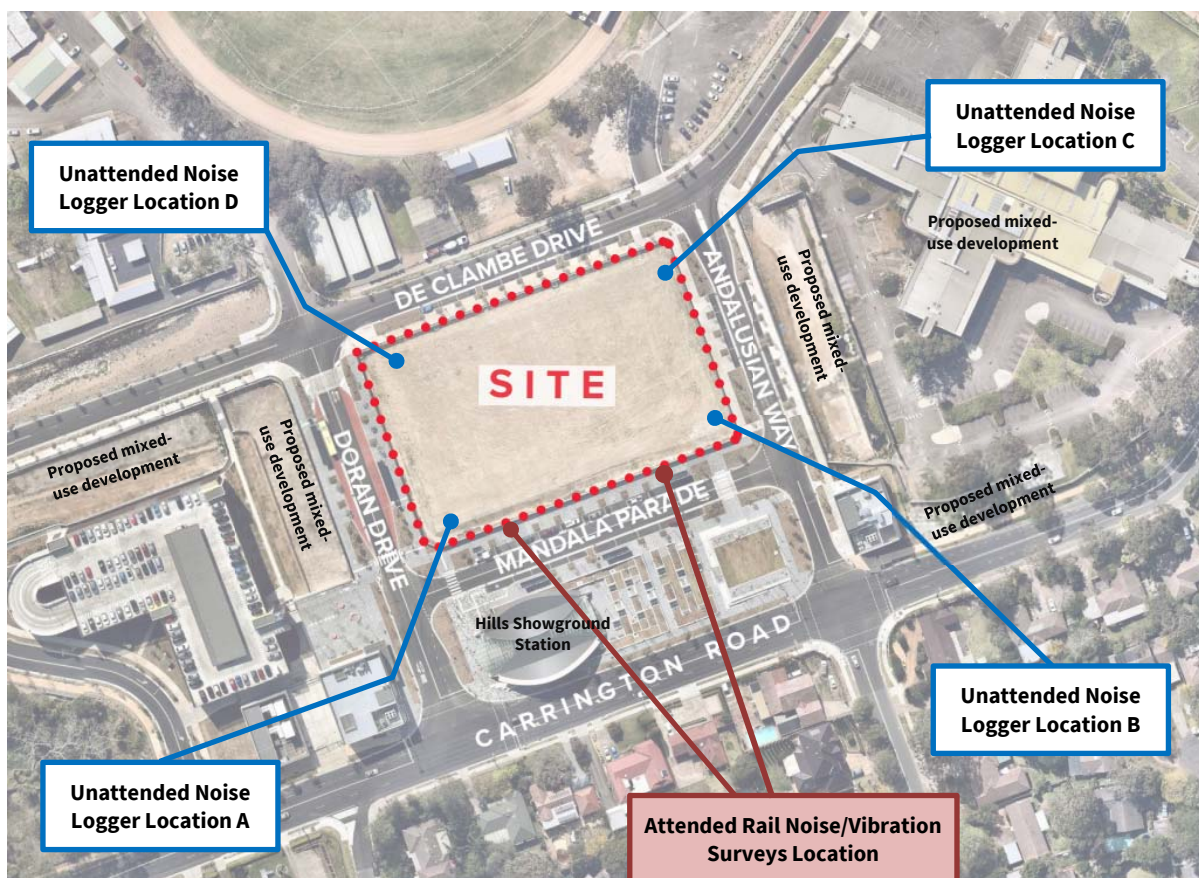


Figure 1. Aerial photo of the subject site, surrounding area and logger locations (image source – Turner Studio)

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.

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.

BOM weather records for the nearest available weather station indicate that inclement weather conditions did not adversely impact on the noise survey.

Noise logging surveys were conducted during 2020 covid lockdowns, as such, measured ambient noise levels may not be representative of typical traffic/ambient noise levels. Koikas Acoustics recommends that ambient noise logging surveys be reconducted at the CC stage to confirm ambient noise levels.



Table 3. 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.	The NSW EPA NPI refers to Night as 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays.		
	2.			
		Refer to Appendix A for unattended noise logger graphs.		



5.0 MECHANICAL PLANT AND BUILDING USE NOISE IMPACTS

Mechanical plant and equipment on this project could include air conditioning condensers units where they are installed in the development and other ventilation plant required for basement levels and garbage rooms etc.

5.1 ACOUSTICAL REQUIREMENTS

5.1.1 EPA Noise Policy for Industry

Noise emission design targets have been referenced from the NSW Environmental Protection Authority Noise Policy (EPA) for Industry (NPfI). The NPfI replaces the former Industrial Noise Policy, also prepared by the EPA.

The NPfI is designed to assess environmental noise impacts associated with scheduled activities prescribed within the Protection of the Environment Operations Act 1997, Schedule 1. It is also commonly used as a reference tool for establishing suitable planning levels for noise generated by mechanical plant and equipment and noise emission from commercial operations.

The guideline applies limits on the short-term intrusive nature of a noise or noise-generating development (project intrusive noise level), as well as applying an upper limit on cumulative industrial noise emissions from all surrounding development/industry (project amenity noise level).

The most stringent of the project intrusive noise level and project amenity noise level is applied as the **project noise trigger level**. The project noise trigger level is the point, above which noise emission from a source or development site would trigger a management response.

To be able to define the more stringent of the intrusive and amenity noise levels, the underlying noise metrics must be the same. As the intrusive noise level is defined in terms of an LAeq 15 minutes and the amenity noise level is defined in terms of an LAeq Period, a correction +3dB correction is applied to the project amenity noise level to equate the LAeq Period to LAeq 15 minutes.

5.1.2 Offensive Noise (POEO Act 1997 definition)

In the definitions of the Protection of the Environment Operations Act 1997, 'offensive noise' means noise:

- (a) *that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:*
 - (i) *is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or*
 - (ii) *interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or*



(b) *that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances, prescribed by the regulations.*

5.1.3 Protection of the Environment Operations (Noise Control) Regulation 2017

Clause 45 of the regulation requires that air conditioning units installed on residential premises must not emit noise that is audible within a habitable room in any other residential premises between the hours of 10 pm and 7 am (Monday to Friday) or 10 pm and 8 am (Saturday, Sunday and public holidays).

5.1.4 Green Star – Acoustic Comfort

The compliance requirements for the internal noise levels from Green Star – Design & As Built v1.3 have been extracted below.

10.1 INTERNAL NOISE LEVELS

|| One (1) point is awarded where project teams demonstrate that internal ambient noise levels in the nominated area are no more than 5dB(A) above the lower figure in the range recommended in Table 1 of AS/NZS2107:2016. || R2.10.01

The noise measurement and documentation must be provided by a qualified acoustic consultant and in accordance with AS/NZS 2107:2016. Noise measurement must account for all internal and external noise including noise arising from building services equipment, noise emission from outdoor sources such as traffic, and (where known) noise from industrial process. Occupancy noise is excluded.

|| Compliance shall be demonstrated through measurement, and the measurements shall be conducted in at least 10% of the spaces in the nominated area. The selection of representative spaces must be justified within the Submission Template and must consider how the spaces are considered to be the most conservative with respect to both internal, and external noise sources.

The range of measurement locations shall be representative of all spaces available within the nominated area. All relevant building systems must be in operation at the time of measurement. Projects less than 500m² Gross Floor Area (GFA) must account for measurements conducted in at least 95% of spaces within the nominated area. **|| R1.10.01**



5.1.5 AS2107:2016

The design sound levels of AS2107:2016 have been extracted below.

13

AS/NZS 2107:2016

TABLE 1 (continued)

Item	Type of occupancy/activity	Design sound level ($L_{Aeq,t}$) range	Design reverberation time (T) range, s
7	RESIDENTIAL BUILDINGS (see Note 5 and Clause 5.2)		
	Houses and apartments in inner city areas or entertainment districts or near major roads—		
	Apartment common areas (e.g. foyer, lift lobby)	45 to 50	—
	Living areas	35 to 45	—
	Sleeping areas (night time)	35 to 40	—
	Work areas	35 to 45	—
	Houses and apartments in suburban areas or near minor roads—		
	Apartment common areas (e.g. foyer, lift lobby)	45 to 50	—
	Living areas	30 to 40	—
	Sleeping areas (night time)	30 to 35	—
	Work areas	35 to 40	—



6.0 WOOLWORTHS NOISE IMPACT ASSESSMENT

The proposed Woolworths is located on the corner of Mandala Parade and Andalusian Way. The main supermarket section is located on the lower and upper ground floor area and adjoining the carpark below and loading dock above. The loading dock/plant room is located directly above on Level 1 and shares adjoining walls and ceiling/roof with retail/commercial premises.

Operational noise from the main supermarket section is expected to be negligible as it is mostly underground and does not share adjoining walls other premises. As such, this assessment focusses on the noise impact from the mechanical plant and loading dock areas.

6.1 PROJECT NOISE CRITERIA

Mechanical plant noise is assessed in accordance with the planning levels contained within the NPfI. Acoustic planning levels are largely determined in relation to the existing environmental noise levels as calculated in Table 4 for the corner of Mandala Parade and Andalusian Way. The following NPfI planning levels apply for this project:

Table 4. NPfI planning levels [dB]								
Period, T (Note 1)	Intrusive		Amenity					Project noise trigger level
	RBL	RBL + 5	Area classification	Recommended amenity noise level	High traffic area	Project amenity noise level	+3dB correction	
Day	49	54	Urban	60	No	55	58	54
Evening	44	49	Urban	50	No	45	48	48
Night	34	39	Urban	45	No	40	43	39
Notes	<ol style="list-style-type: none">1. EPA defines the following time periods, Day – 7am to 6pm Mon to Sat and 8am to 6pm Sun and public holidays, Evening – 6pm to 10pm Mon to Sun, Night – 10pm to 7am Mon to Sat and 10pm to 8am Sun and public holidays.2. Project noise amenity level = recommended noise amenity level – 5dB, except where specific circumstances are met, such as high traffic.							

Mechanical plant noise levels assessed to nearby commercial properties are not to exceed a recommended project amenity noise level of L_{Aeq} Period 63 dB during business hours.



6.2 EQUIPMENT AND ASSOCIATED SOUND LEVELS

Koikas Acoustics has been provided with the mechanical plant details of a similar Woolworths at Canterbury and preliminary mark up of the proposed Woolworths at 2 Mandala Parade, Woolworths. The locations of plant and equipment are not known at this stage and have been assumed. It appears that mechanical plant are located in a plant room on Level 1 and on the rooftop of the south-eastern corner (i.e. height of Level 5).

A review and preliminary noise impact assessment has been conducted to determine reasonable if the proposed Woolworths can be sufficiently treated to prevent adverse noise impact to surrounding premises. A detailed assessment should be conducted at the CC stage once specifications are known.

The plant room located on Level 1 adjoins a community space and retail/commercial premises. The adjoining wall is expected to be masonry with a minimum thickness of 200mm. Airborne noise through the adjoining wall is expected to be negligible, however, will be reassessed at the CC stage. Structure-borne noise is anticipated to be more intrusive. Recommendations to mitigate structure-borne noise has been provided in Section 6.6.

Rooftop mechanical plant (at least three chillers) are expected to cause the most adverse noise impact to residents overlooking the rooftop plant and residents directly below the rooftop plant on Level 4. Modelling has been conducted to determine the noise impact and reasonable treatment from the rooftop mechanical plant. Koikas Acoustics has previously undertaken measurements of three chillers in an enclosed area and found the spatial average to be L_{Aeq} 77 dB.



6.3 CALCULATED RECEIVER LEVELS

Mechanical plant noise levels have been predicted to nearby residential and commercial receivers by way of preparing an acoustic model and conducting point-to-point calculations based on standard sound propagation algorithms. All calculations consider the equipment as selected in the mechanical services plans, the associated sound levels and corresponding attenuators.

Reference should also be made to additional noise control recommendations included within Section 5.4 of this report, which also govern the calculated receiver noise levels.

Due to the size of the development, a number of potentially affected receiver locations must be assessed in terms of their respective noise exposure from mechanical plant and equipment associated with the development. The most noise-sensitive receiver locations are summarised below and are shown in below in Figure 2.

R1	Retail/Commercial
R2	Residential apartments (Level 3)
R3	Residential apartments (Level 4)
R4	Residential apartments (Level 6)
R5	Residential apartments (Level 7)

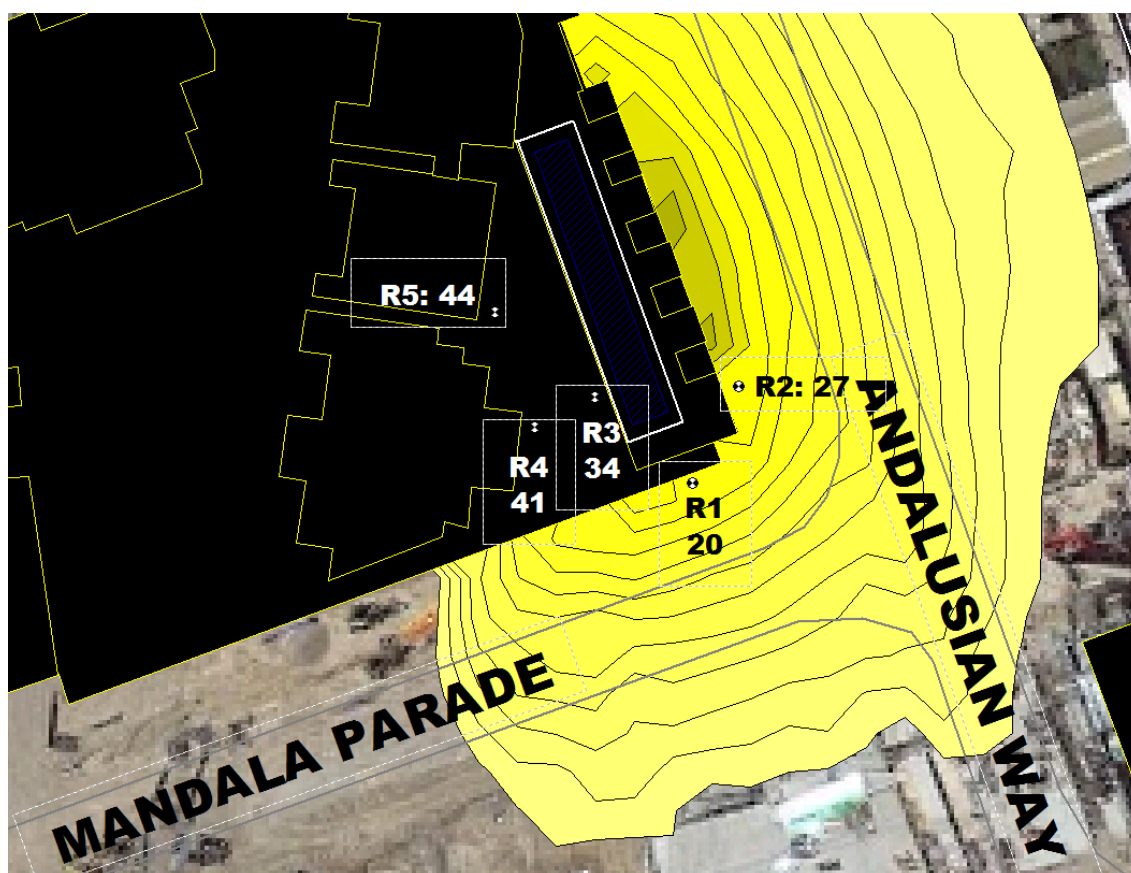


Figure 2: Receiver point for mechanical plant noise levels (image source – Cadna)

Predicted mechanical plant and equipment noise levels, inclusive of all identified fans and air conditioning condensers are as follows:

Table 5. Calculated receiver noise levels [dB]					
Receiver location	Project noise criteria $L_{Aeq\ 15\ mins}$				Predicted receiver noise level
	Residential Day	Residential Evening	Residential Night	Commercial	$L_{Aeq\ 15\ mins}$ Day / Evening / Night
R1 – Residential	N/A	N/A	N/A	63	20
R2 – Residential	54	48	39	n/a	27
R3 – Residential	54	48	39	n/a	34
R4 – Residential	54	48	39	n/a	41
R5 – Residential	54	48	39	n/a	44
Notes	1. Intrusive noise levels consider that all fans and all AC condensers may be operating simultaneously over a 15 minutes assessment period during the day, evening, or night period. It is highly unlikely that this scenario would ever occur, therefore actual noise levels may be lower than predicted.				

Mechanical plant noise levels have been assessed to comply with the limiting NPfI criteria, pending the inclusion of noise control measures as detailed in Section 6.4 Recommendations of this report.

6.4 RECOMMENDATIONS

- Should mechanical plant operate during the night-time, the following may be required mitigate noise to residents above Level 7 with direct line of sight:
 - Partial roof enclosure
 - Selecting quieter mechanical plant
 - Absorption to the internal façade of the plant room
 - Limiting the operating capacity of mechanical plant
 - Relocating mechanical plant
- A 2.7m noise barrier has been considered for this assessment and is required to be constructed of the following:
 - 75 mm thick stud frame with 75 mm insulation batts (20 kg/m^3) between the studs
 - one layer of 9 mm thick perforated fibre cement on the outside and perforated steel sheet
 - (minimum 50% open cells) to the inside of the frame
- All mechanical plant should be vibration isolated through spring/rubber mounts and hangers to minimise structure-borne noise.
- A more detailed assessment should be conducted at the CC stage once more details are known.

Furthermore, it is reasonable to expect that not all plant and equipment will be operating at full capacity at



the same time, as such, receiver noise levels are anticipated to be lower than predicted in this report.

6.5 INTERTENANCY NOISE IMPACT

Koikas Acoustics Pty Ltd was requested to provide comments regarding the noise intrusion from the Level 1 (street level) loading dock areas.

The noisiest activity identified is the garbage truck entering the loading dock, unloading the recycling bins (includes glass bottles and other recyclables) into the truck and exiting the loading dock. Noise intrusion calculations have been conducted to determine the noise impact from the loading dock. The noise source considered is that of a front lift truck idling, lifting a bin and unloading materials into the truck.

The proposed loading dock and Woolworths shares adjoining walls and ceiling/floor system with neighbouring retail/commercial tenancies and does not adjoin any residential premises.

Whilst there are no specified noise criteria for retail/commercial premises from loading dock activities, Koikas Acoustics has adopted noise criteria of $L_{Aeq,T}$ 50 dB, as outlined in AS2107:2016 (for quasi-static and steady-state noise sources) for small retail stores. The noise in question would be similar to that of traffic noise. The parameter (,T) for the noise metric $L_{Aeq,T}$ is the period of the activity that includes the truck driving in and out, the lifting, idling and reversing. This criterion is significantly more stringent compared to that of traffic noise intrusion whereby the period is over a longer period.

An analysis of the worst-case loading dock scenario has been conducted in Table 24. The most noise-sensitive premises is the adjoining retail/commercial premises with one common wall and located directly next to the loading dock entry/exit with a window on the southern façade (seen in Figure 3). This loading dock also shares a common ceiling/floor with retail/commercial premises above on Level 2.



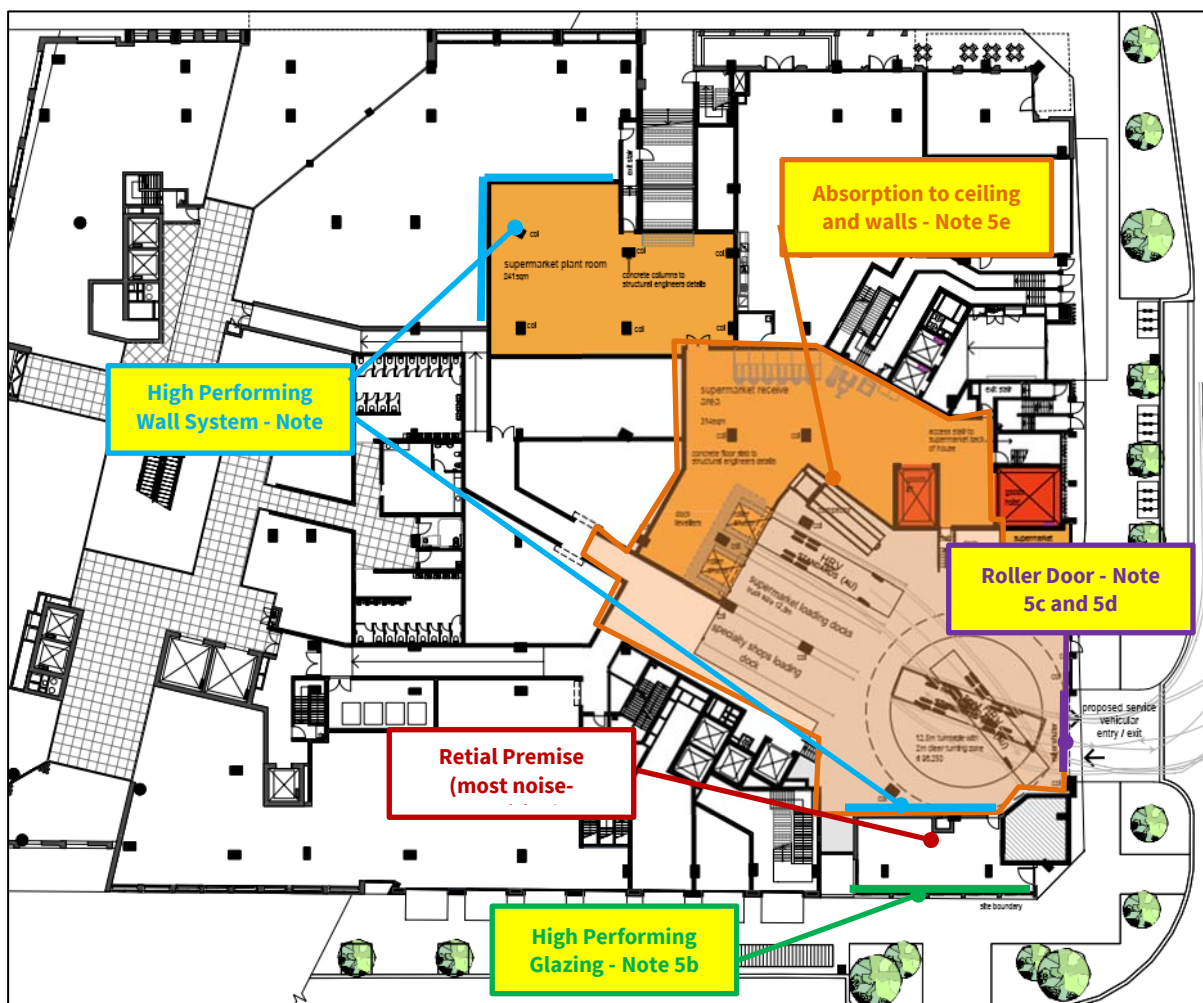


Figure 3: Loading dock on Level 1 (image source – architectural drawings)

Table 6 is a summary of the calculated noise contributions through each building element and noise intrusion to the most noise-sensitive space of adjoining retail/commercial premises.

Table 6. Noise impact within the adjoining retail/commercial premises to the loading dock [dB]										
Description	Octave Band Centre Frequency [Hz]									Total
	31.5	63	125	250	500	1k	2k	4k	8k	
Front lift truck idling/lifting (external) L_{Aeq}	71	86	93	94	91	95	95	90	82	101
Indoor correction	+6	+6	+6	+6	+6	+6	+6	+6	+6	
Front lift truck idling/lifting (internal) L_{Aeq}	77	92	99	100	97	101	101	96	88	107
Noise transmission through the adjoining wall										
Distance attenuation (15meters)	-28	-28	-28	-28	-28	-28	-28	-28	-28	
STL of AFS 162 + 20 air gap + 64 steel stud with insulations + 13mm plasterboard	-37	-49	-60	-58	-60	-62	-64	-66	-68	
Surface area radiation of the wall (24m ²)	+15	+15	+15	+15	+15	+15	+15	+15	+15	
Calculated noise level through adjoining wall L_{Aeq}	24	37	25	14	14	13	12	5	-6	37

Noise transmission through open roller door										
Distance attenuation (15meters)	-28	-28	-28	-28	-28	-28	-28	-28	-28	
Surface area radiation (16m ²)	+12	+12	+12	+12	+12	+12	+12	+12	+12	
Sound power level of open roller door L_{Aeq}	61	76	83	84	81	85	85	80	72	91
Noise transmission through the window on the southern facade (breakout noise from open roller door)										
Calculated Cadna receiver at window L_{Aeq}	27	41	44	41	36	38	36	29	19	48
STL of 10.38mm laminated glass	-18	-21	-25	-30	-33	-32	-34	-39	-45	
Surface area radiation of the window(5m ²)	+6	+6	+6	+6	+6	+6	+6	+6	+6	
Calculated indoor noise levels through window on eastern facade L_{Aeq}	15	26	24	17	9	12	8	-4	-20	29
Total calculated resultant indoor noise levels within the study room L_{Aeq}	27	31	28	29	24	26	24	17	7	36
Indoor noise criterion Level L_{Aeq}	-	-	-	-	-	-	-	-	-	50

A review of the loading dock of (seen in Figure 4), shows adjoining retail/commercial are significantly shielded and unlikely to be adversely affected by the noise within the loading dock.

Noise impact to residential premises is expected to be negligible on account of not sharing any adjoining walls or ceiling/floor systems with the proposed Woolworth and associated loading dock.

Notes:

1. A calibrated Cadna/A noise model was used to predict the external noise levels from the open roller door of the loading dock.
2. The sound transmission loss of building materials were based on Insul V9.0.22 and previous measurements/test reports.
3. Conservative assumptions have been made regarding the trucks noise sources, building materials and distances. No sound absorption was considered for the indoor spaces. A more detailed assessment will be conducted at the CC stage once more details are available.
4. Acceptable noise levels were achieved with readily available and reasonable building materials, i.e. double brick wall, AFS 162 with a stud wall and 10.38mm laminated glazing.
5. The following noise mitigation can be implemented to further reduce the noise:
 - a. Higher acoustically performing wall systems within a total of 300mm wall thickness;
 - b. installing higher acoustically performing glazing;
 - c. closing the roller door;
 - d. installing an acoustic roller door;
 - e. installing absorption in the loading dock, and
 - f. amend the architectural design/layout shielding glazing from the loading dock.



6. Garbage trucks should not be entering the loading dock during the night-time period (2200 to 0700 hours, or 2200-0800 hours on Sundays).
7. Koikas Acoustics has conducted noise measurements of various types of garbage trucks and found them to vary in noise level by up to 15 dB due to the type of vehicle and type of garbage. Koikas Acoustics has utilised one of the noisier garbage truck measurements within these calculations, however, the actual noise levels are likely significantly lower.

It is in Koikas Acoustics opinion that the loading dock areas on the street level can be acoustically treated and a management plan adopted to ensure adequate noise levels to the adjoining retail/commercial premises and surrounding residential premises at 2 Mandala Parade, Castle Hill NSW 2154. A more detailed assessment should be undertaken before construction to determine the required acoustic treatment.



6.6 LOADING DOCK/GOODS LIFT/IN-WARDS HANDLING AREA

The proposed Woolworths occupies the entire floor level between the loading dock level and the residential floor levels above.

Airborne noise from the loading dock is less of a concern. Structure borne noise however is of concern. Any mechanical plant or activities in the proposed Woolworths store or loading dock are therefore required to be vibration isolated from the concrete floors and walls.

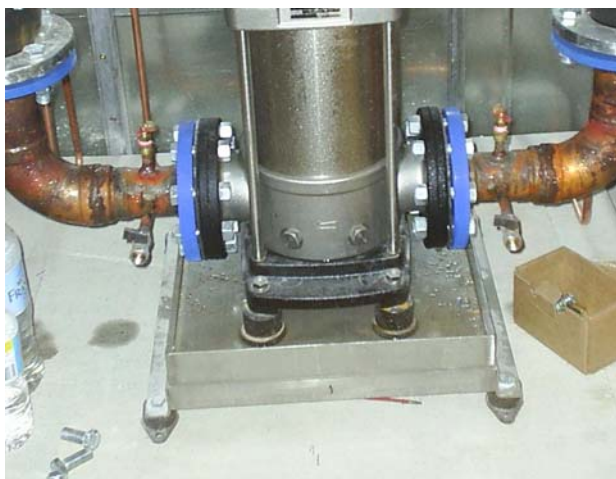
All equipment/small vehicles (pallet jacks, trolleys, etc.) servicing the loading dock and Woolworths store should use wheels that are air-filled and not be the more rigid rubber wheels. Air filled wheels can absorb considerable vibration energy, thus minimise impact noise propagating from the equipment/small vehicles to the concrete slab and floor level above.

6.6.1 Isolating Mechanical Plant

Refrigeration racks should be installed on 50 mm deflection springs mounts and pumps should be installed on 25 mm deflection springs mounts. An example of a unit with deflection springs installed is shown below.



Condenser units should be installed on double deflection rubber mounts as shown in the image below.



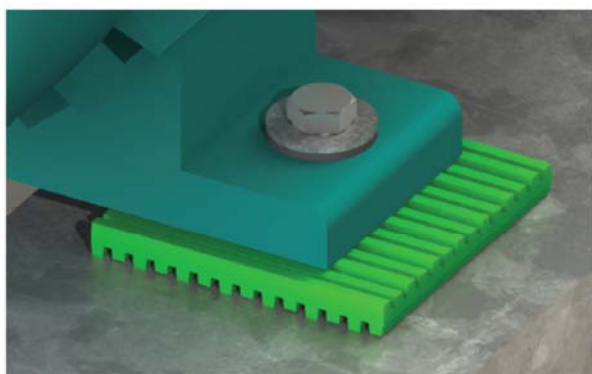
Springs Mounts



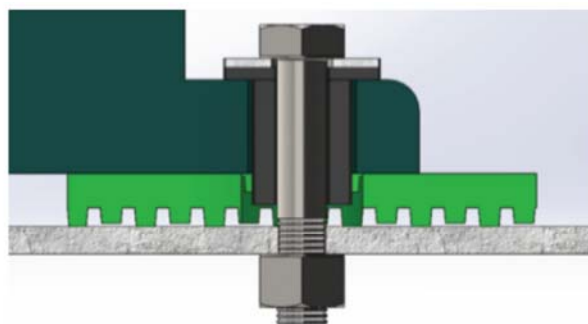
Rubber Mounts

6.6.2 Goods Lift & Truck Turntable

The rams of the goods lift between the loading dock and proposed Woolworths store should be isolated with supershearflex pads between the walls and floor as seen in the images below.

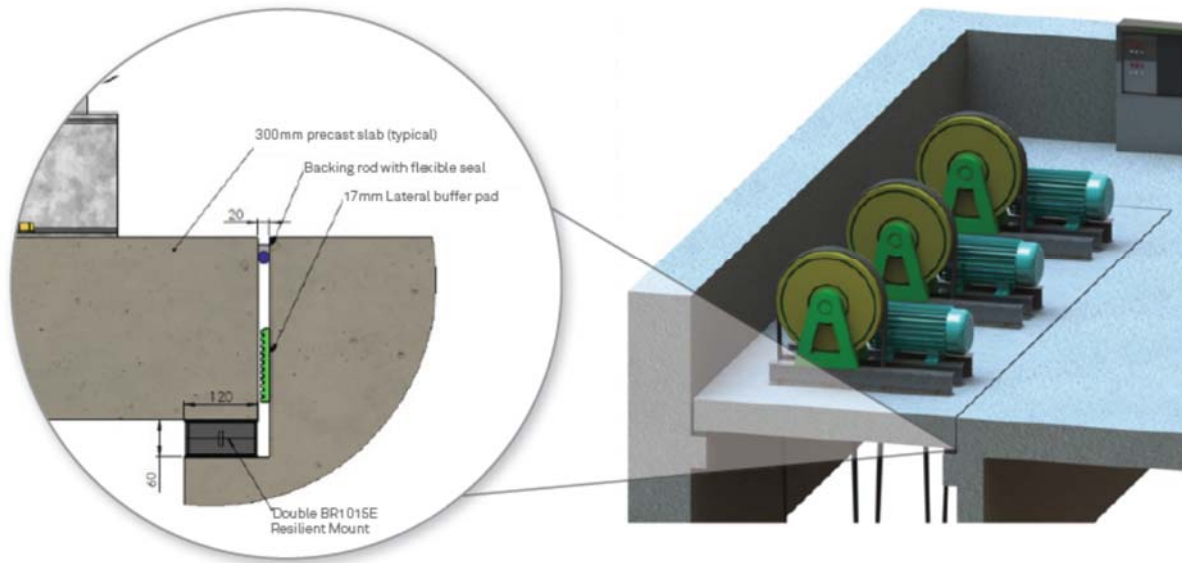


Above: Single pad mounting with isolated fixing for small lift motors.



Note: Rigid fixings through to the base structure will compromise the vibration transfer reduction, and require separation from the lift motor using isolation sleeves (refer Embelton Datasheet IS).

A 'floating' concrete slab for the lift motors would include supershearflex pads and resilient isolation mounts. See the schematic below.



Similarly, the truck turntable and any associated motors should be installed on one layer of the red shearflex pads between the concrete floor.

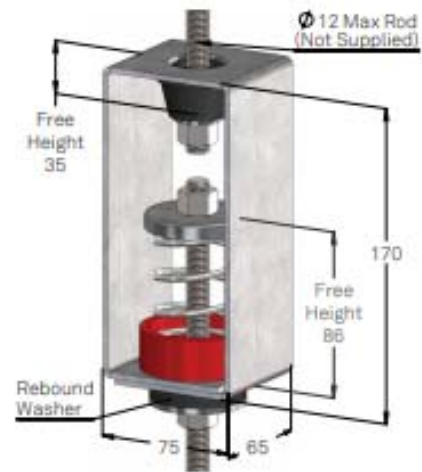
6.6.3 Isolating Pipe Work

The first 9 meters of the refrigeration pipe work should be contained with spring hangers, and subsequent pipe work can be held with rubber hangers in order to isolate any vibrations from propagating into the concrete flooring. An example of the spring hangers installed is presented below.





Rubber hangers



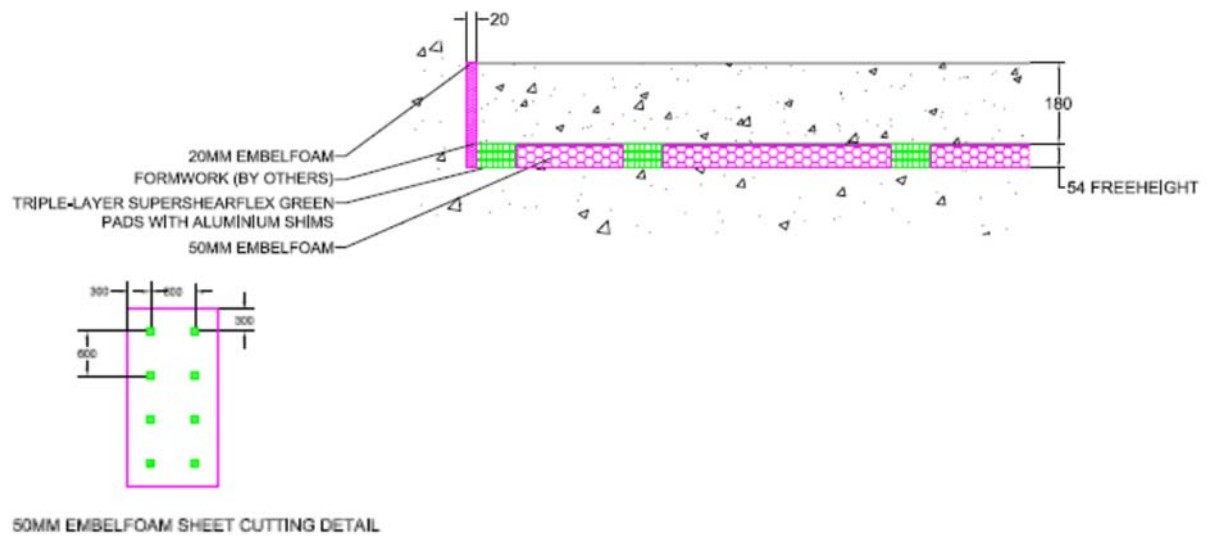
Spring hangers

6.6.4 Inward Goods Handling Area – Isolated Concrete Plinth

To isolate the inward goods handling area from the building, a concrete plinth could be constructed over green/red pads used in conjunction with deflection springs. A schematic and image of the pads and deflection springs setup of similar store ready for concrete pouring is presented below.

It is noted that Embelton should be contacted directly for the isolation on the concrete floor to determine the most appropriate pads and springs.





It is in Koikas Acoustics opinion that when the above recommendations are implemented to the proposed Woolworths loading dock and retail area, inaudibility of those activities to residents in the building above.

Embelton's opinion should be sought prior to purchasing the above recommended vibration isolation materials.

7.0 CONCLUSION

Koikas Acoustics was requested to prepare an acoustical report for the proposed Woolworths at the mixed-use development at 2 Mandala Parade, Castle Hill NSW 2154 also 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 current EPA, BCA and other relevant acoustic planning guidelines and requirements. The included recommendations are based on designs prepared by Turner Studio.

The conclusions reached in this report should assist the Council in making their determination of the proposal in terms of compliance with the necessary acoustic design requirements. A further detailed acoustic report may be required for the CC submission should the building design be amended, or as required by Council.

Operational and mechanical plant noise from the proposed Woolworths can be sufficiently treated to prevent adverse noise impact to adjoining and surrounding retail/commercial premises and residential premises. A more detailed noise impact assessment should be assessed at the CC stage once details are finalised.

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



APPENDIX A

APPENDIX A

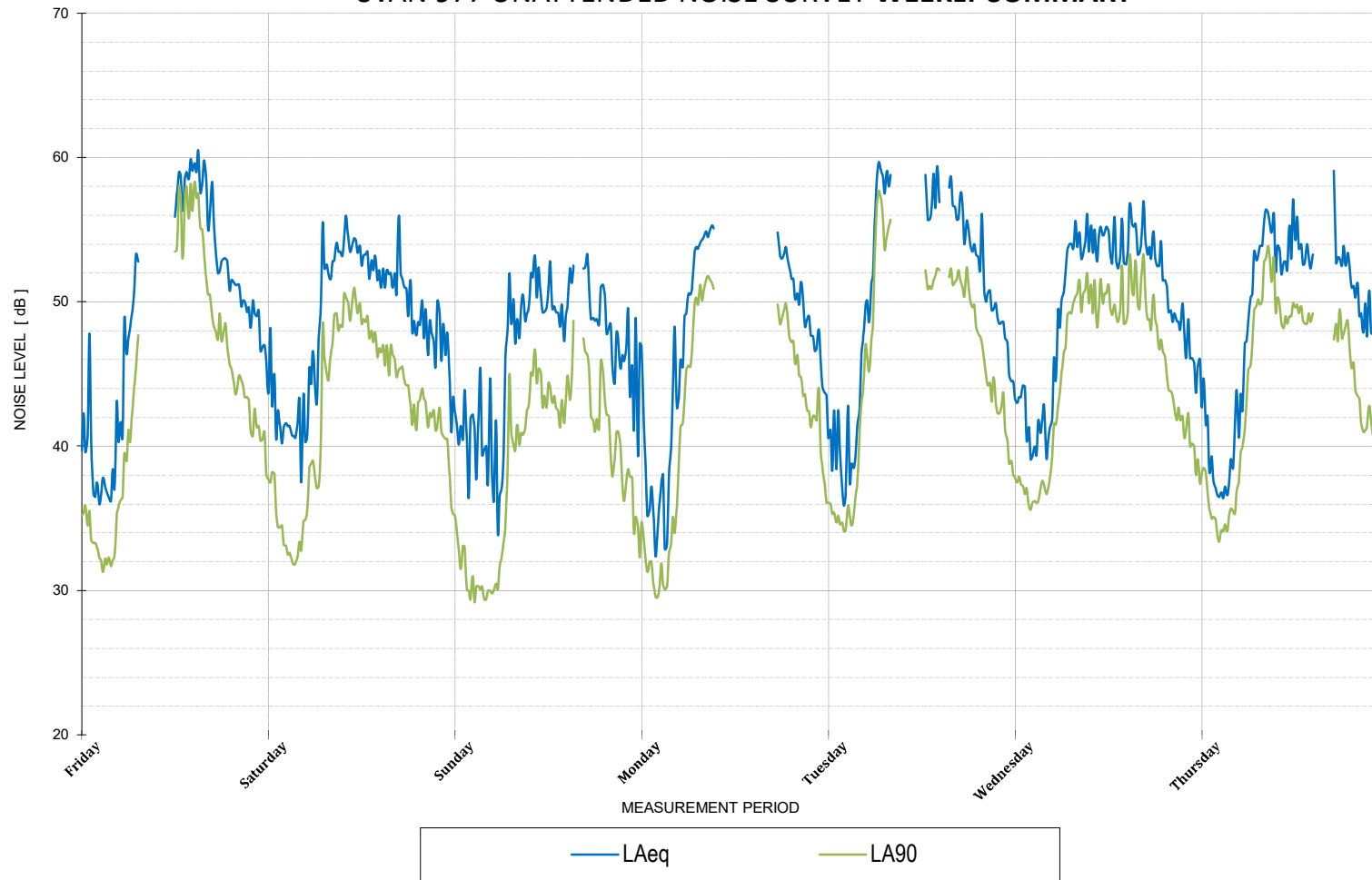
APPENDIX A

WEEKLY SUMMARY

LOGGER LOCATION: Corner Mandala Parade & Dorian Drive

PERIOD: 10th to the 16th July 2020

SVAN 977 UNATTENDED NOISE SURVEY WEEKLY SUMMARY



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

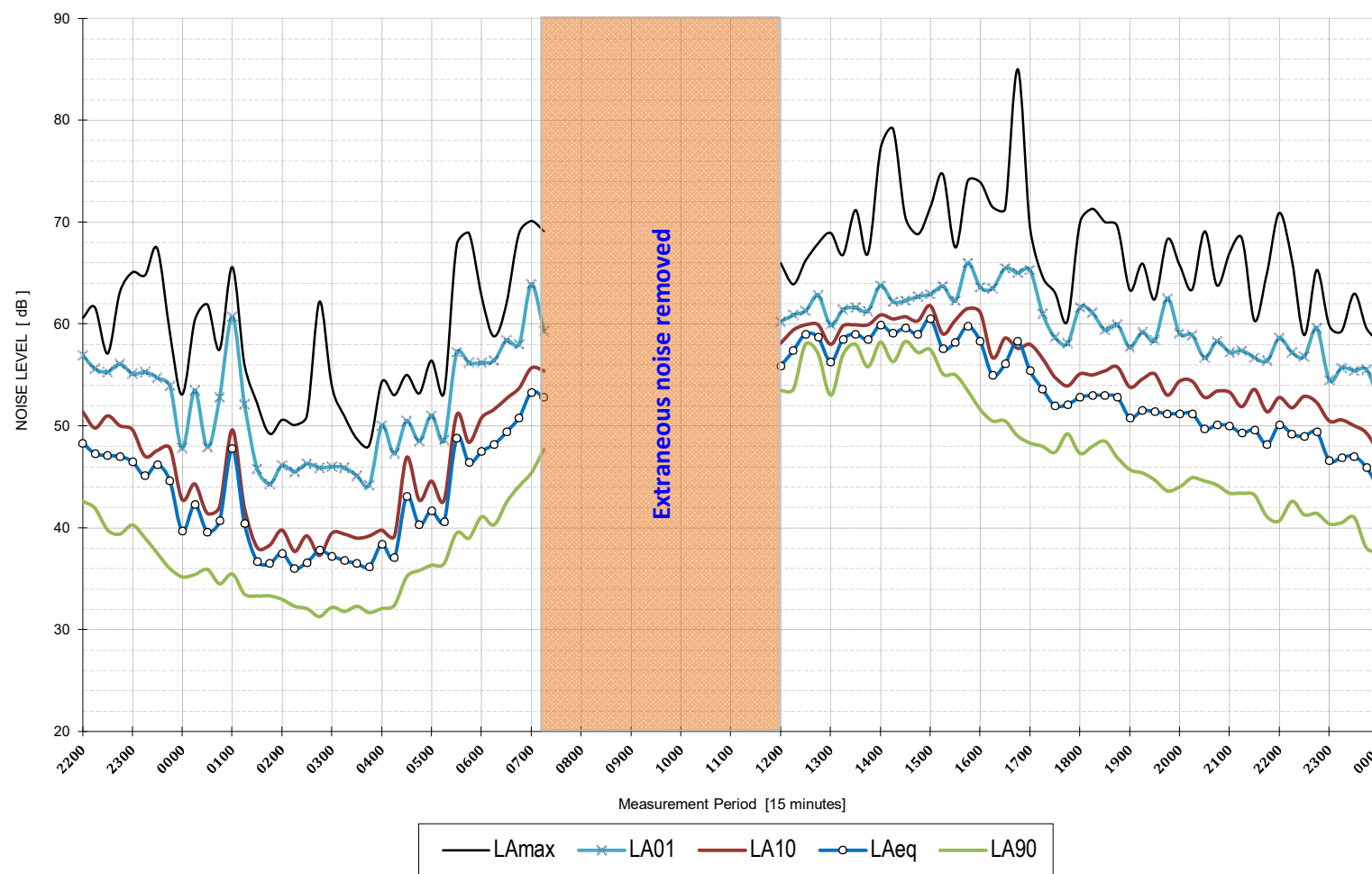
LAeq 15 hrs	0700-2200	54	dB
LAeq 9 hrs	2200-0700	47	dB
Max LAeq 1 hr	0700-2200	55	dB
Max LAeq 1 hr	2200-0700	48	dB

Maximum noise events as defined in the Environmental Noise Management Manual 7 day average - [L _{Amax} - LA _{eq} ≥ 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

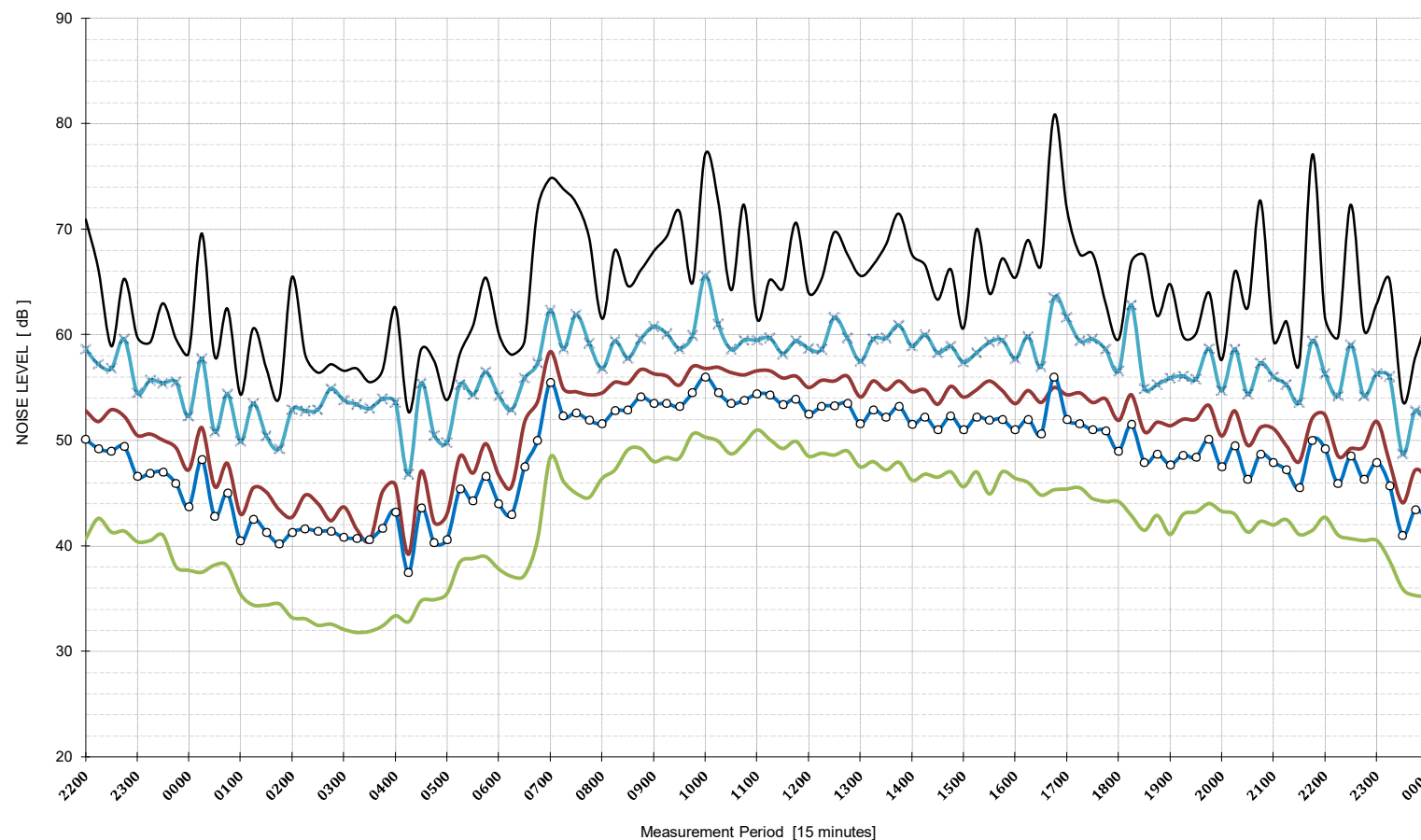
Maximum noise events as defined
in the Environmental Noise
Management Manual [$LA_{max} - LA_{eq} \geq 15$]

18

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

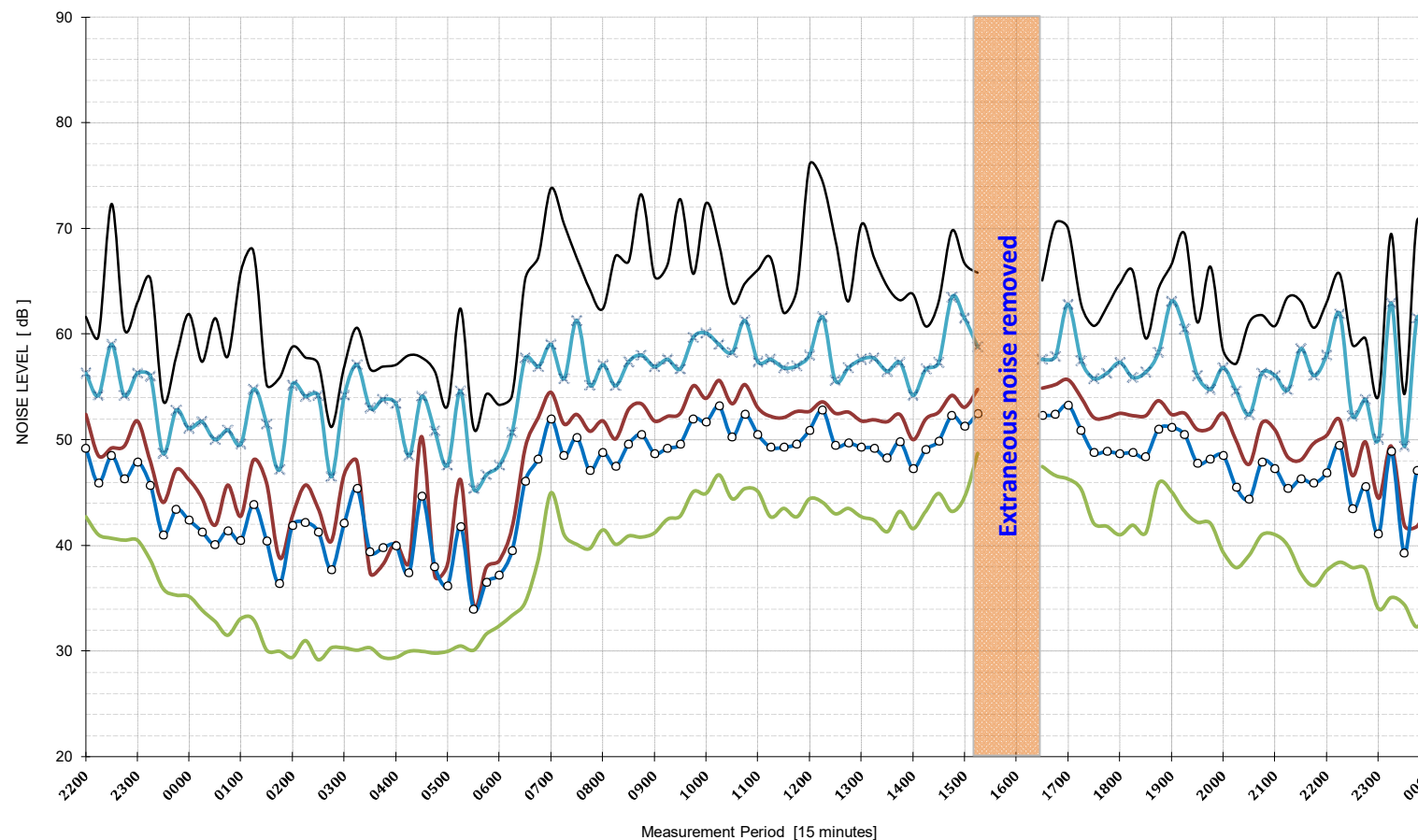
Maximum noise events as defined
in the Environmental Noise
Management Manual [$LA_{max} - LA_{eq} \geq 15$]

24

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

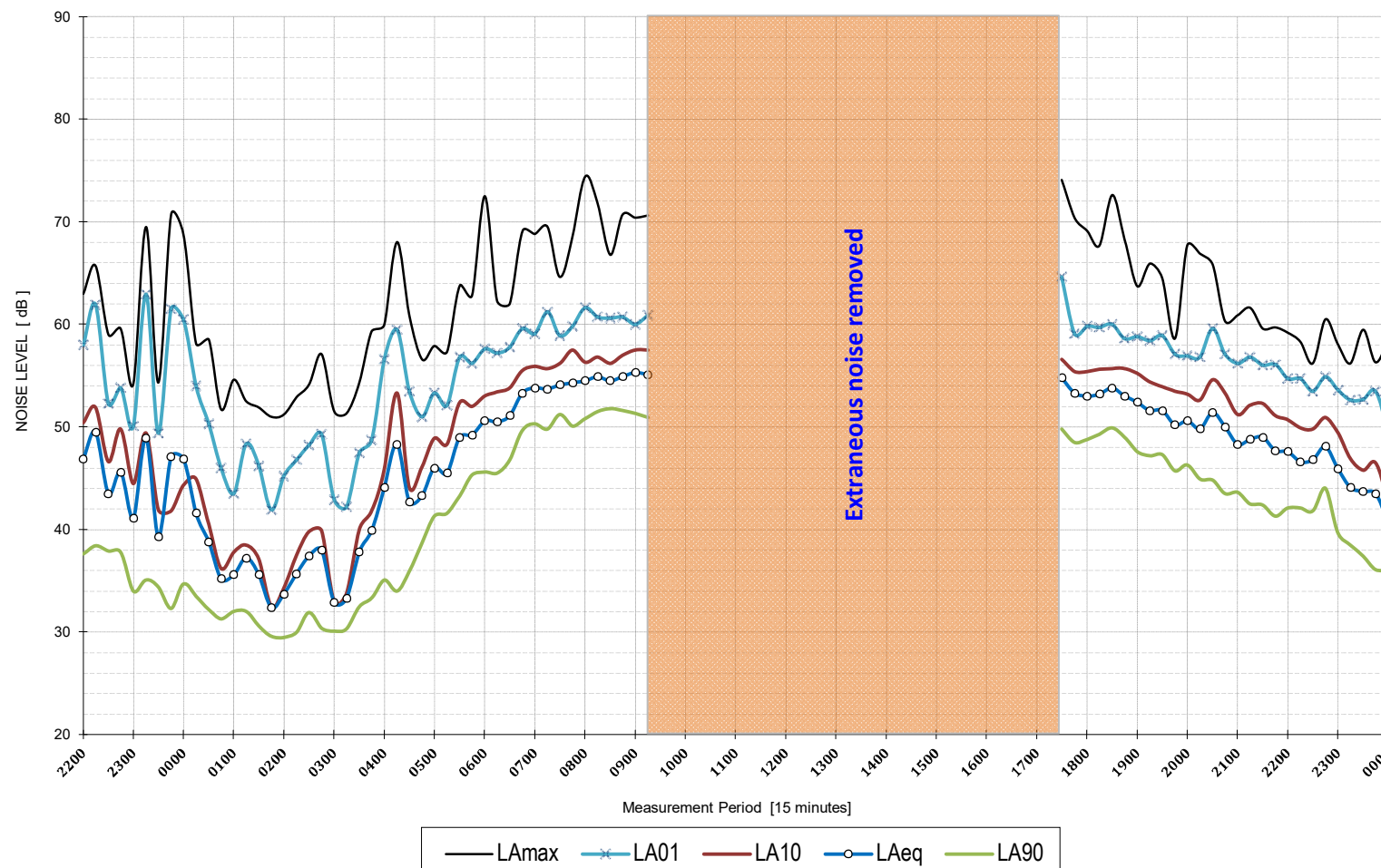
LAeq 15 hours	0700-2200	50	dB
LAeq 9 hours	2200-0700	43	dB
Max LAeq 1 hour	0700-2200	52	dB
Max LAeq 1 hour	2200-0700	46	dB

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

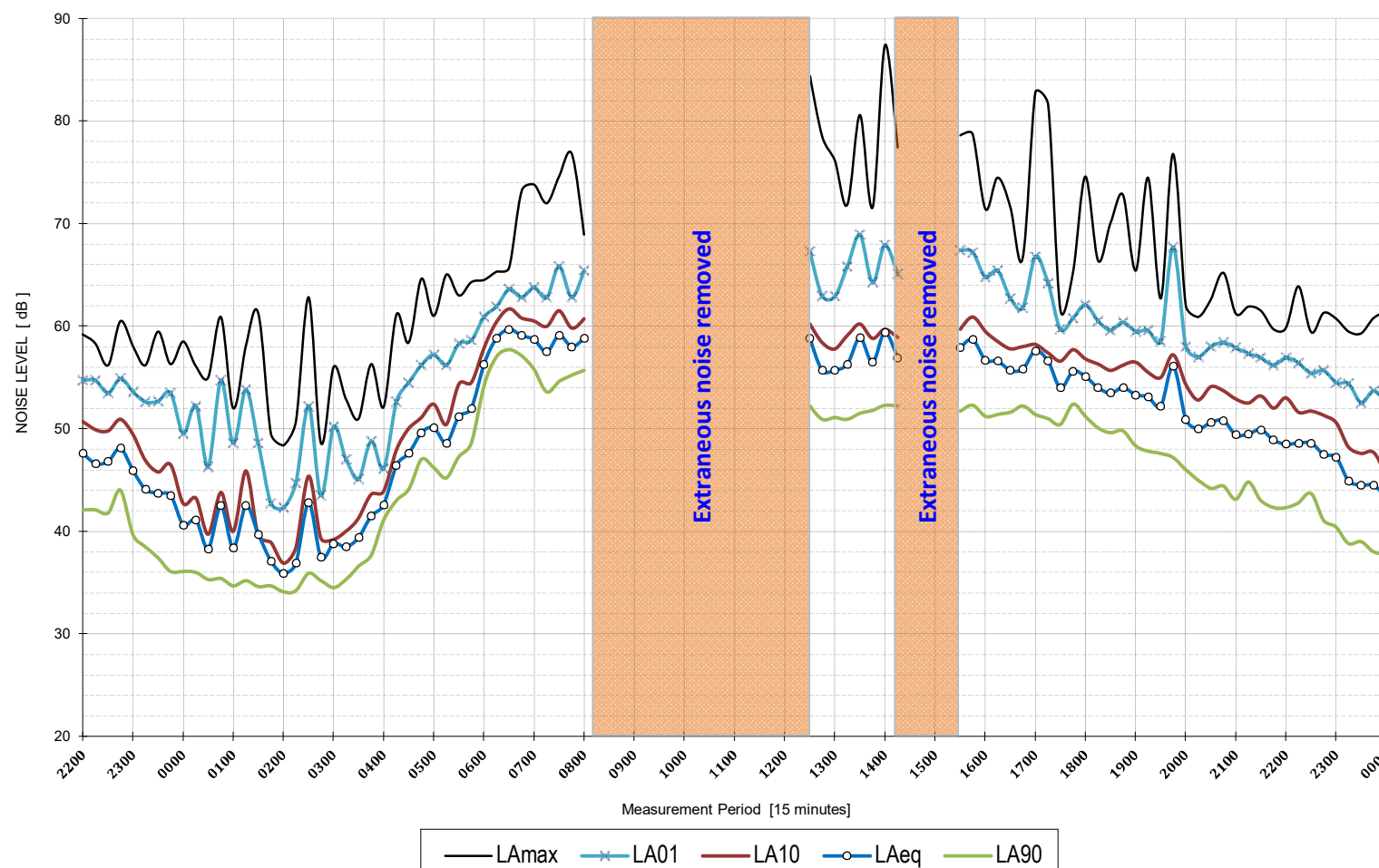
LAeq 15 hours	0700-2200	53	dB
LAeq 9 hours	2200-0700	46	dB
Max LAeq 1 hour	0700-2200	55	dB
Max LAeq 1 hour	2200-0700	49	dB

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

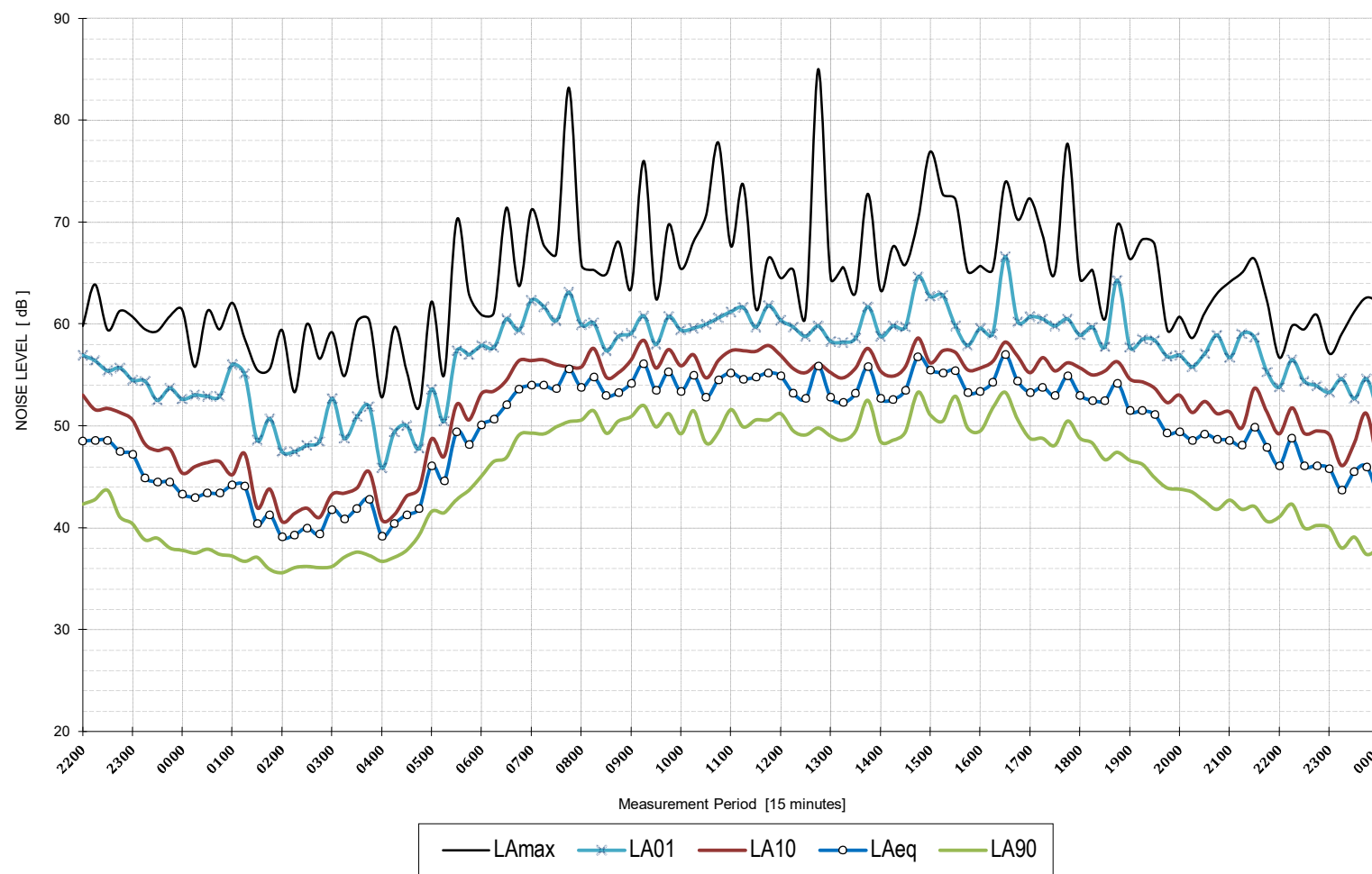
LAeq 15 hours	0700-2200	56	dB
LAeq 9 hours	2200-0700	51	dB
Max LAeq 1 hour	0700-2200	58	dB
Max LAeq 1 hour	2200-0700	52	dB

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

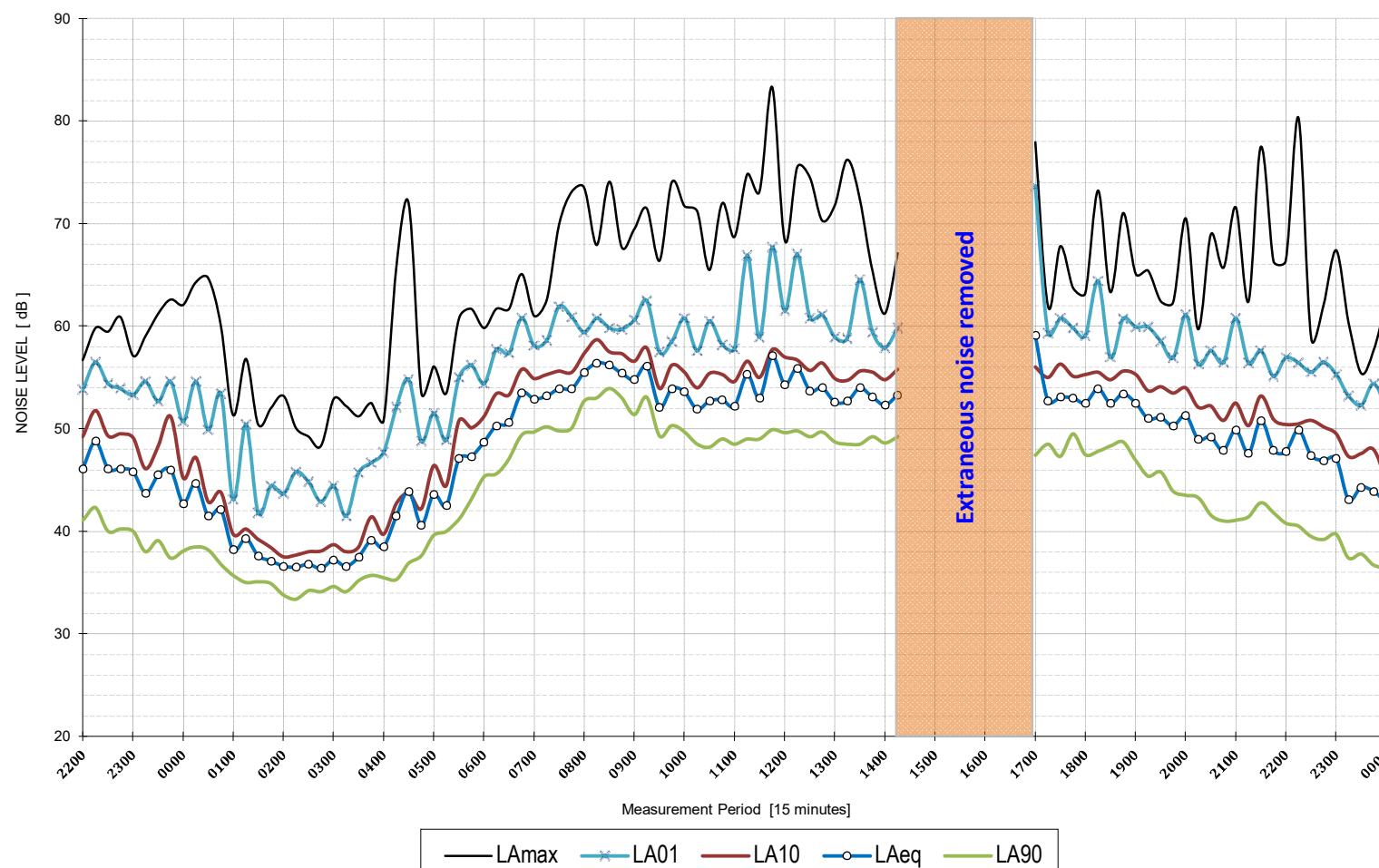
Maximum noise events as defined
in the Environmental Noise
Management Manual [LAmax - LAeq ≥ 15]

17

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

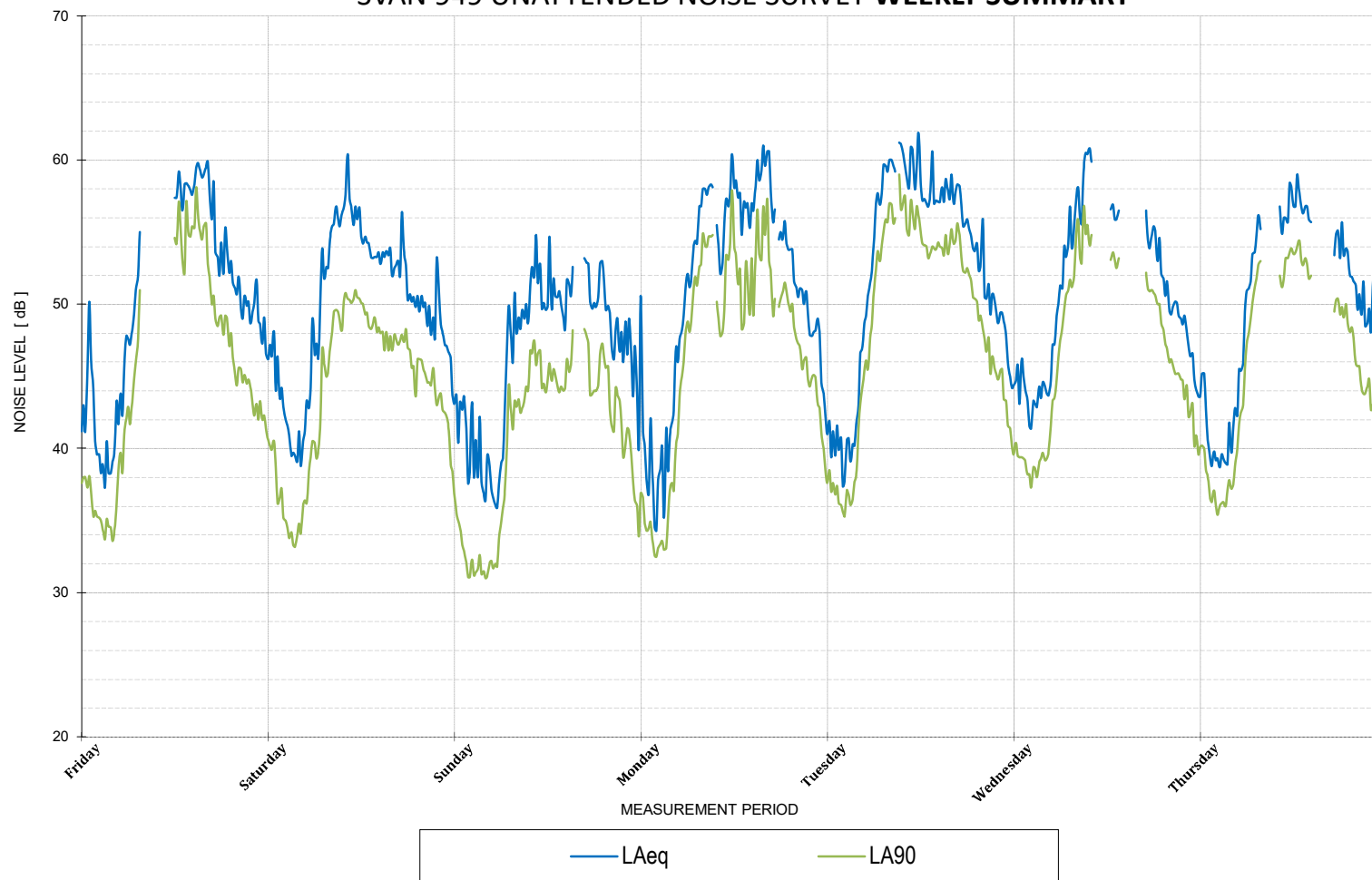
Maximum noise events as defined in the Environmental Noise Management Manual [LMax - LAeq ≥ 15]	13
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WEEKLY SUMMARY

LOGGER LOCATION: Corner Andalusian Way & Mandala Pde

PERIOD: 10th to the 16th July 2020

SVAN 949 UNATTENDED NOISE SURVEY WEEKLY SUMMARY



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

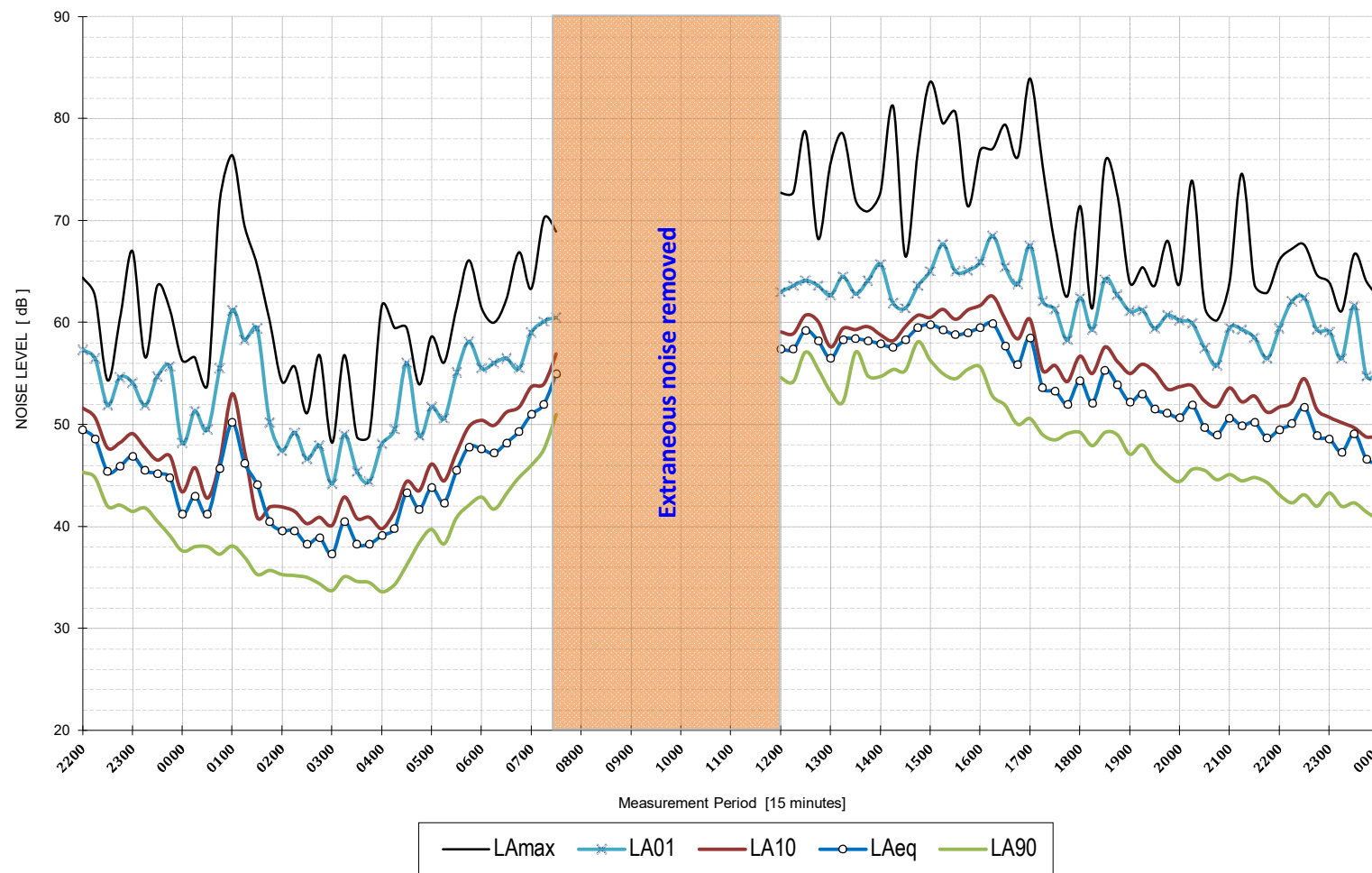
LAeq 15 hrs	0700-2200	56	dB
LAeq 9 hrs	2200-0700	47	dB
Max LAeq 1 hr	0700-2200	58	dB
Max LAeq 1 hr	2200-0700	48	dB

Maximum noise events as defined in the Environmental Noise Management Manual 7 day average - [L _{Amax} - LAeq ≥ 15]	19
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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

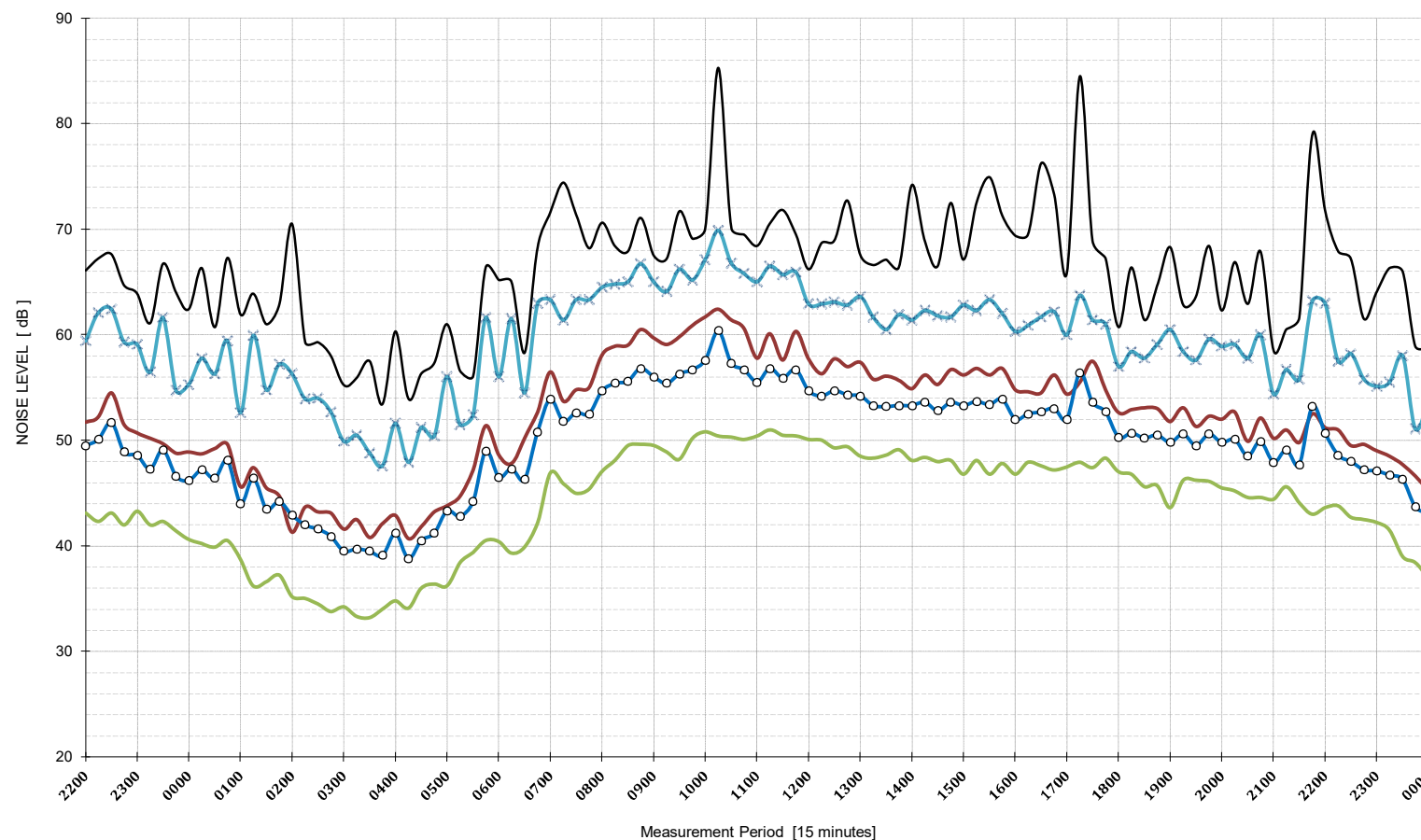
LAeq 15 hours	0700-2200	56	dB
LAeq 9 hours	2200-0700	45	dB
Max LAeq 1 hour	0700-2200	59	dB
Max LAeq 1 hour	2200-0700	47	dB

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

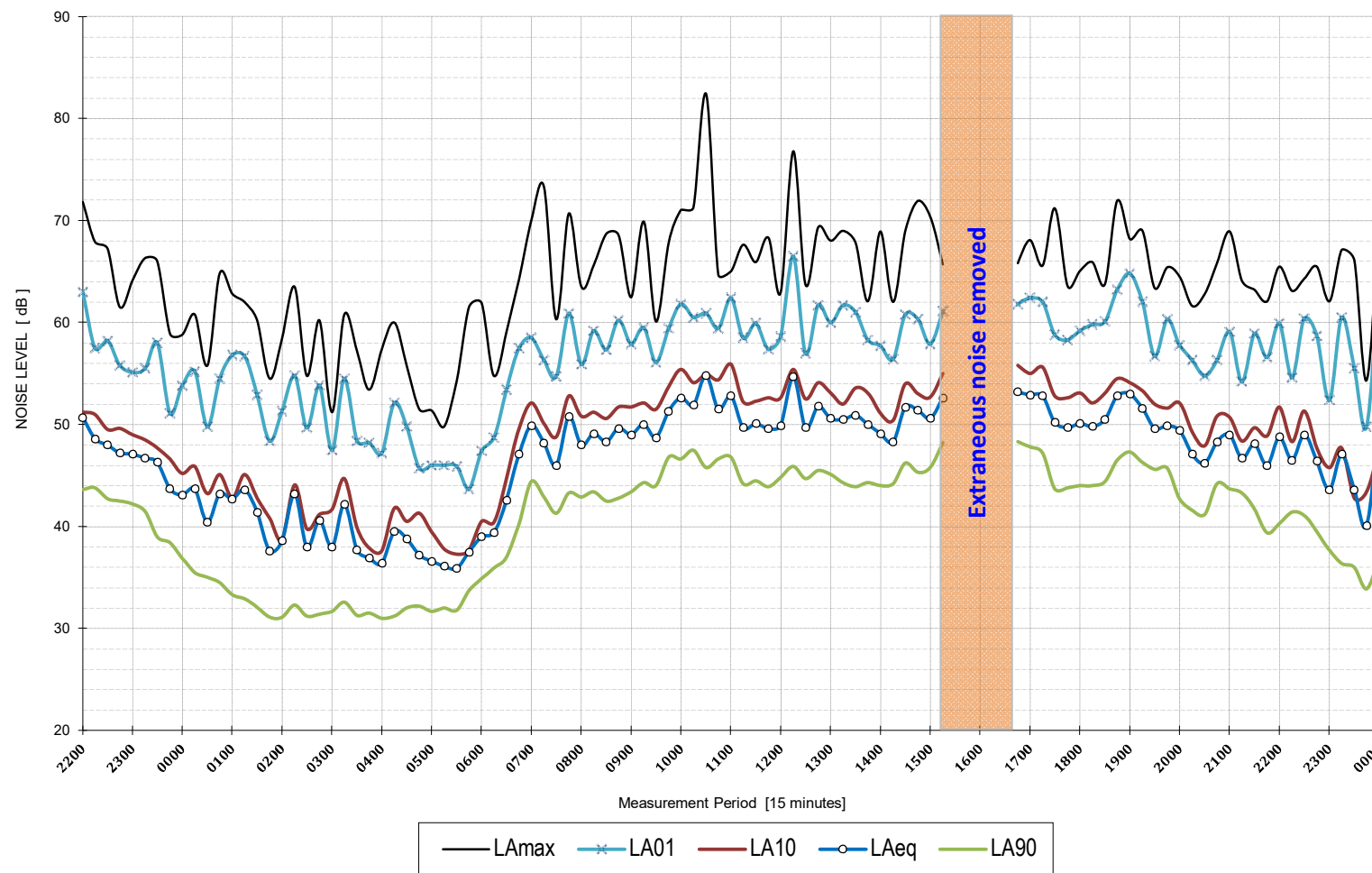
Maximum noise events as defined
in the Environmental Noise
Management Manual [$L_{Amax} - L_{Aeq} \geq 15$]

30

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

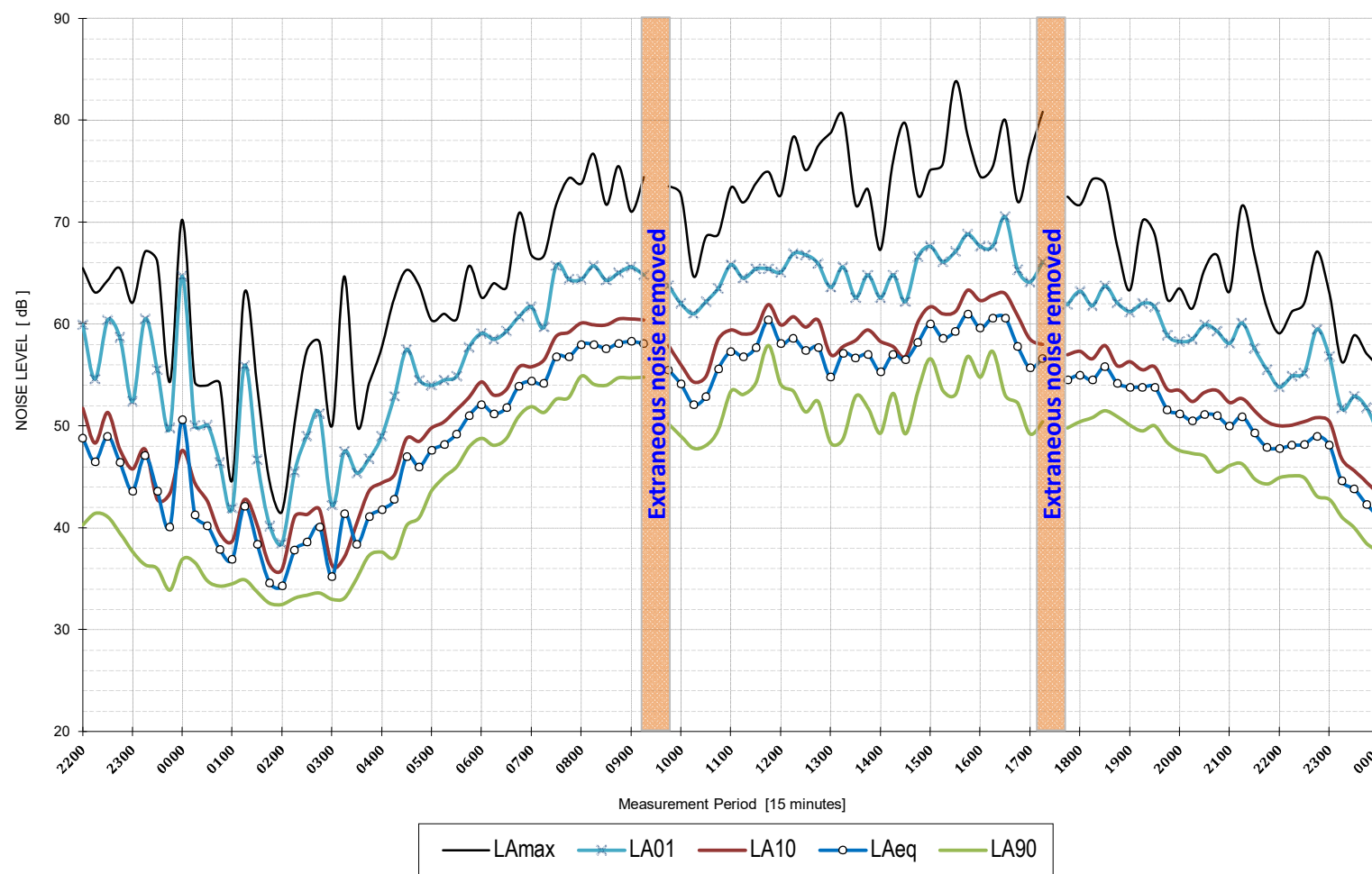
LAeq 15 hours	0700-2200	51	dB
LAeq 9 hours	2200-0700	44	dB
Max LAeq 1 hour	0700-2200	53	dB
Max LAeq 1 hour	2200-0700	47	dB

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

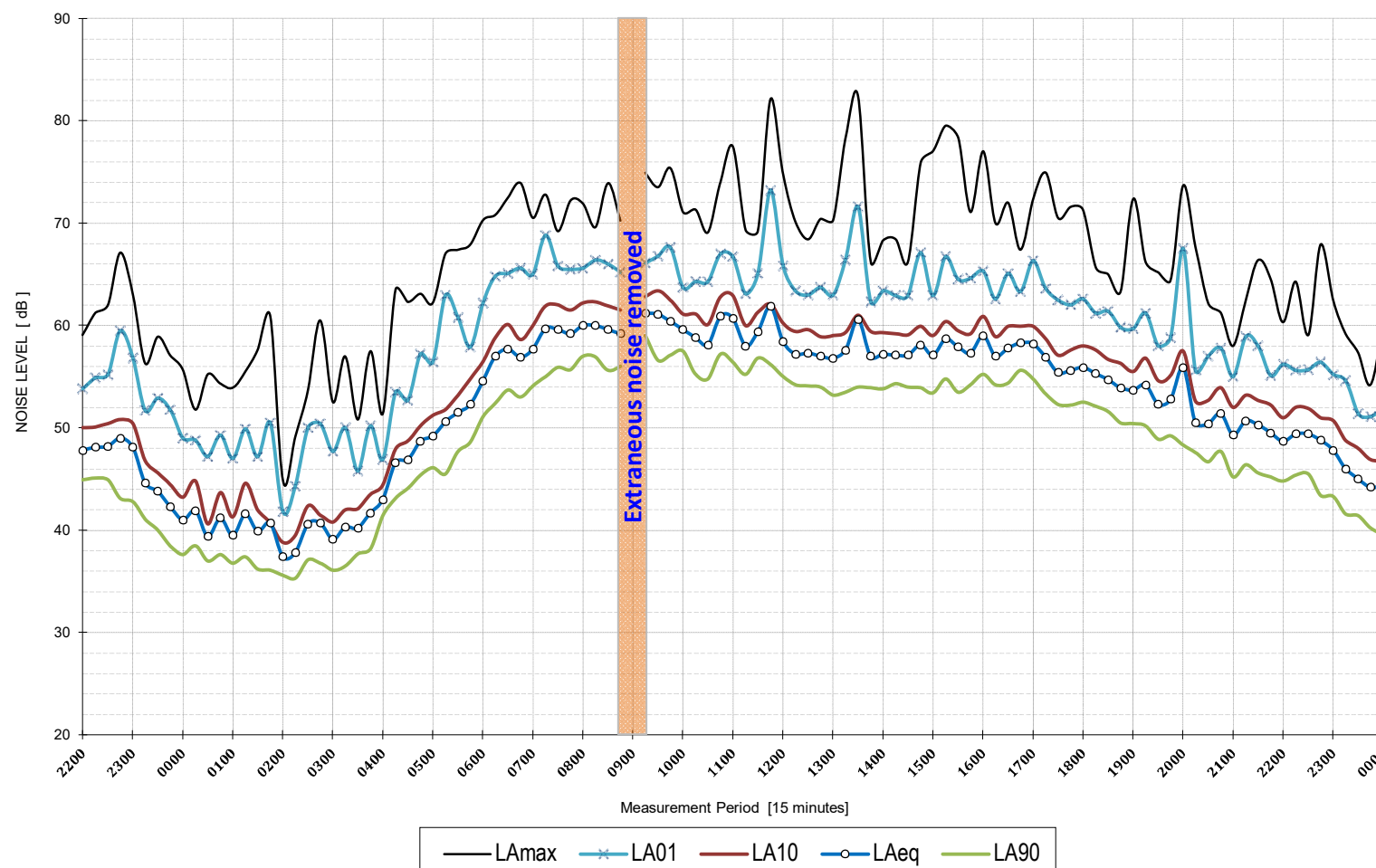
LAeq 15 hours	0700-2200	57	dB
LAeq 9 hours	2200-0700	47	dB
Max LAeq 1 hour	0700-2200	59	dB
Max LAeq 1 hour	2200-0700	50	dB

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

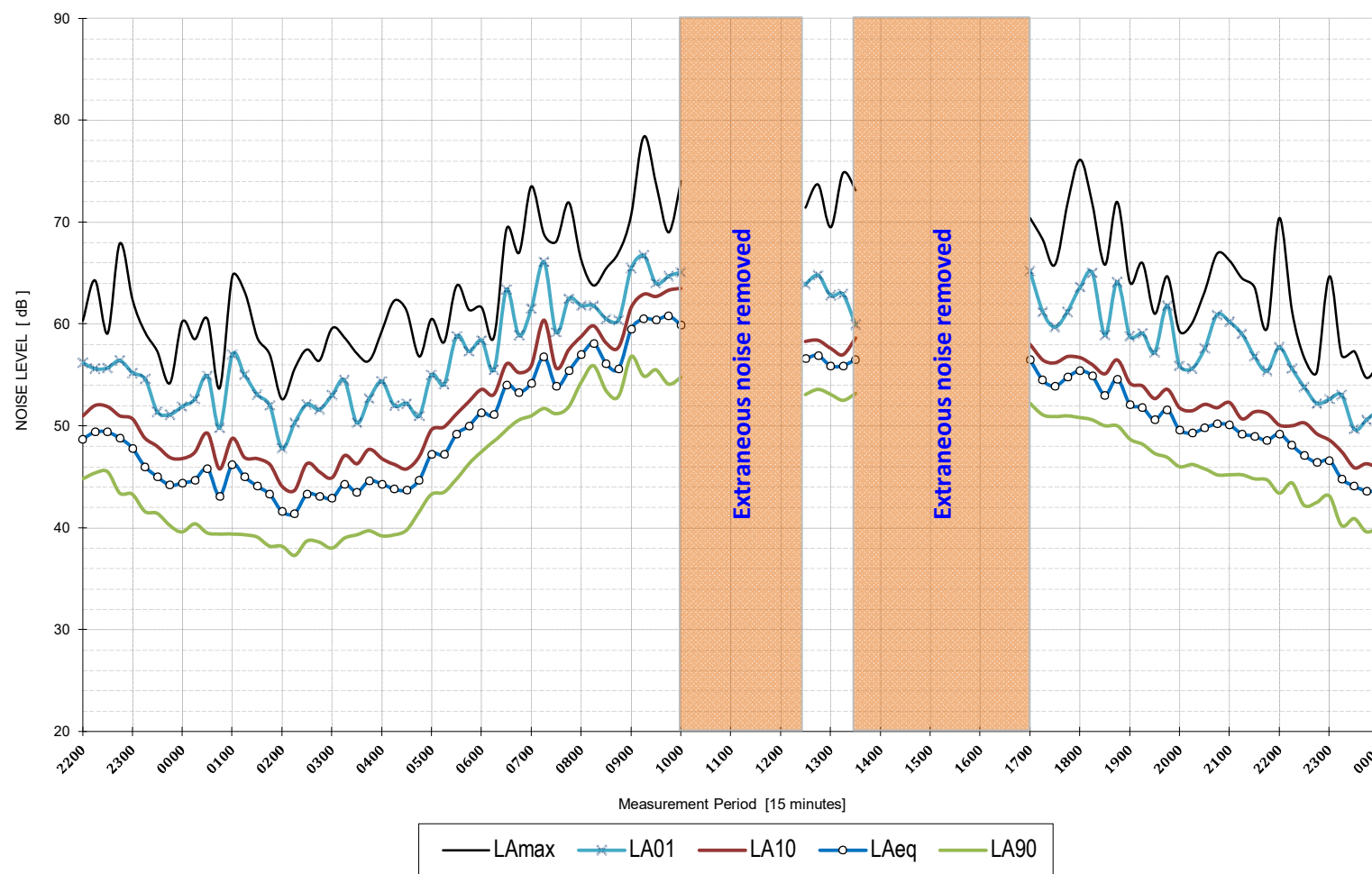
LAeq 15 hours	0700-2200	58	dB
LAeq 9 hours	2200-0700	50	dB
Max LAeq 1 hour	0700-2200	60	dB
Max LAeq 1 hour	2200-0700	52	dB

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

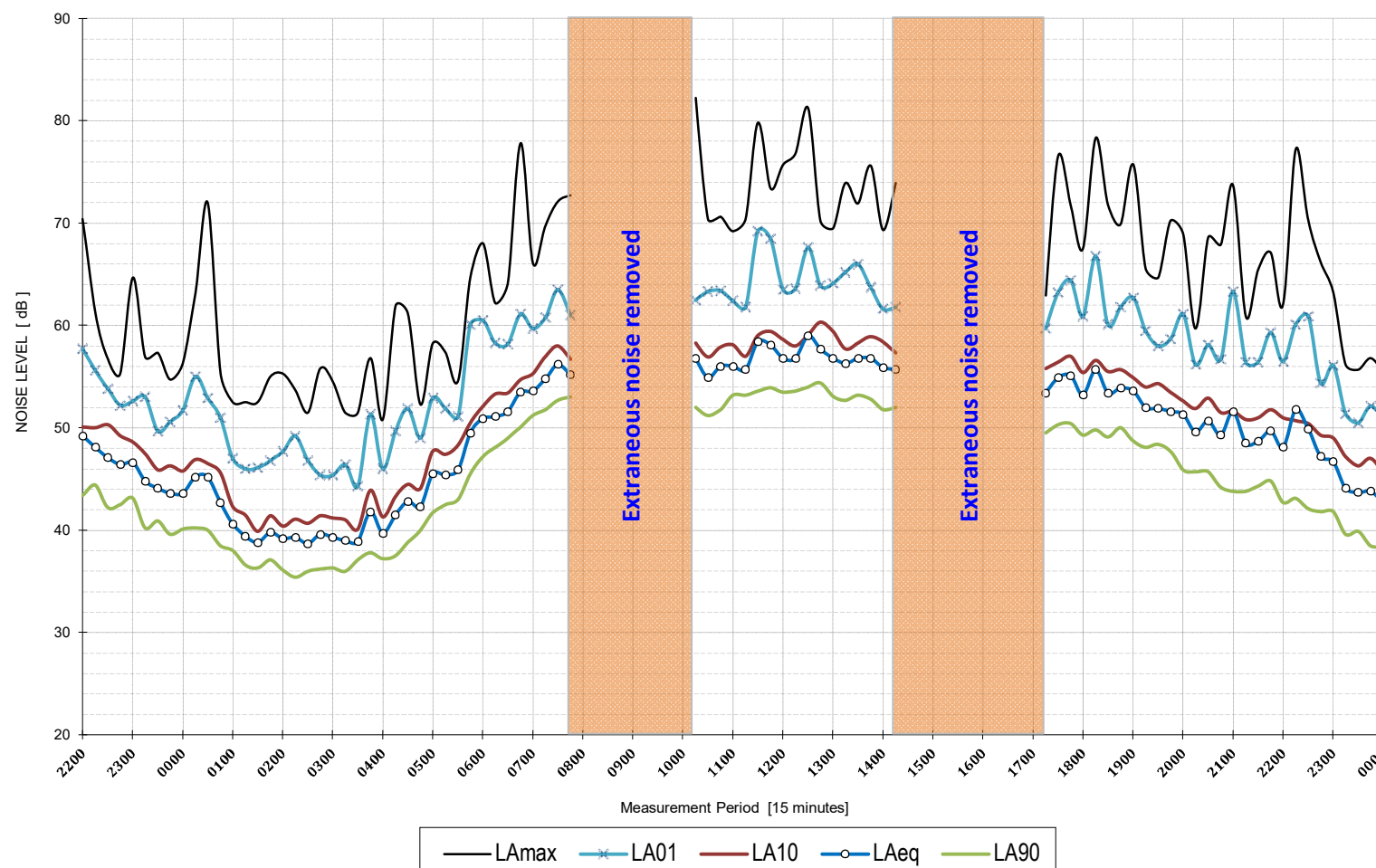
Maximum noise events as defined
in the Environmental Noise
Management Manual [LAmx - LAeq ≥ 15]

9

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 [$L_{Amax} - L_{Aeq} \geq 15$]

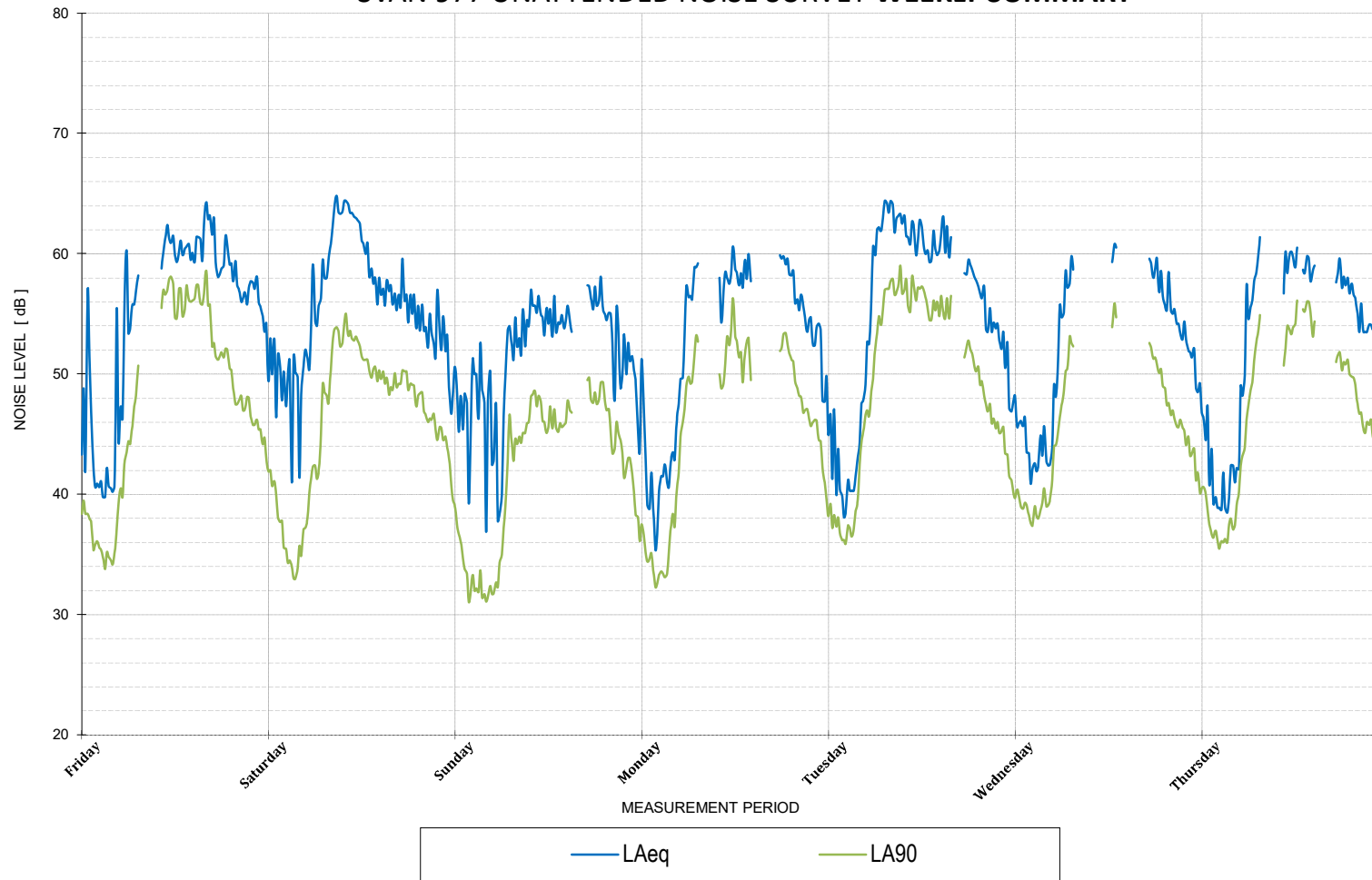
14

WEEKLY SUMMARY

LOGGER LOCATION: Corner De Clamb Drive & Andalusian Way

PERIOD: 10th to the 16th July 2020

SVAN 977 UNATTENDED NOISE SURVEY WEEKLY SUMMARY



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

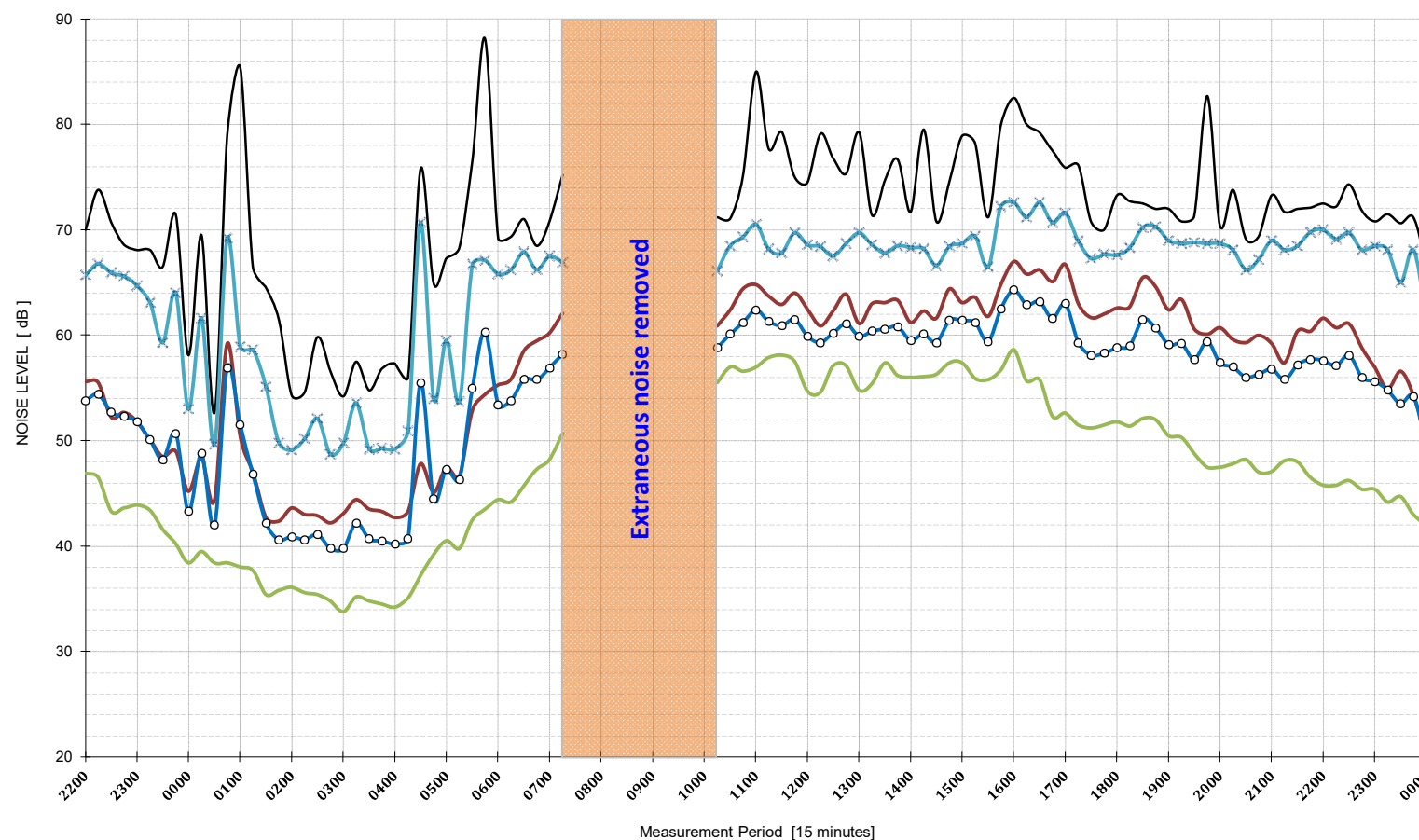
LAeq 15 hrs	0700-2200	59	dB
LAeq 9 hrs	2200-0700	52	dB
Max LAeq 1 hr	0700-2200	60	dB
Max LAeq 1 hr	2200-0700	55	dB

Maximum noise events as defined in the Environmental Noise Management Manual	28
7 day average - [L _{Amax} - LAeq ≥ 15]	

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

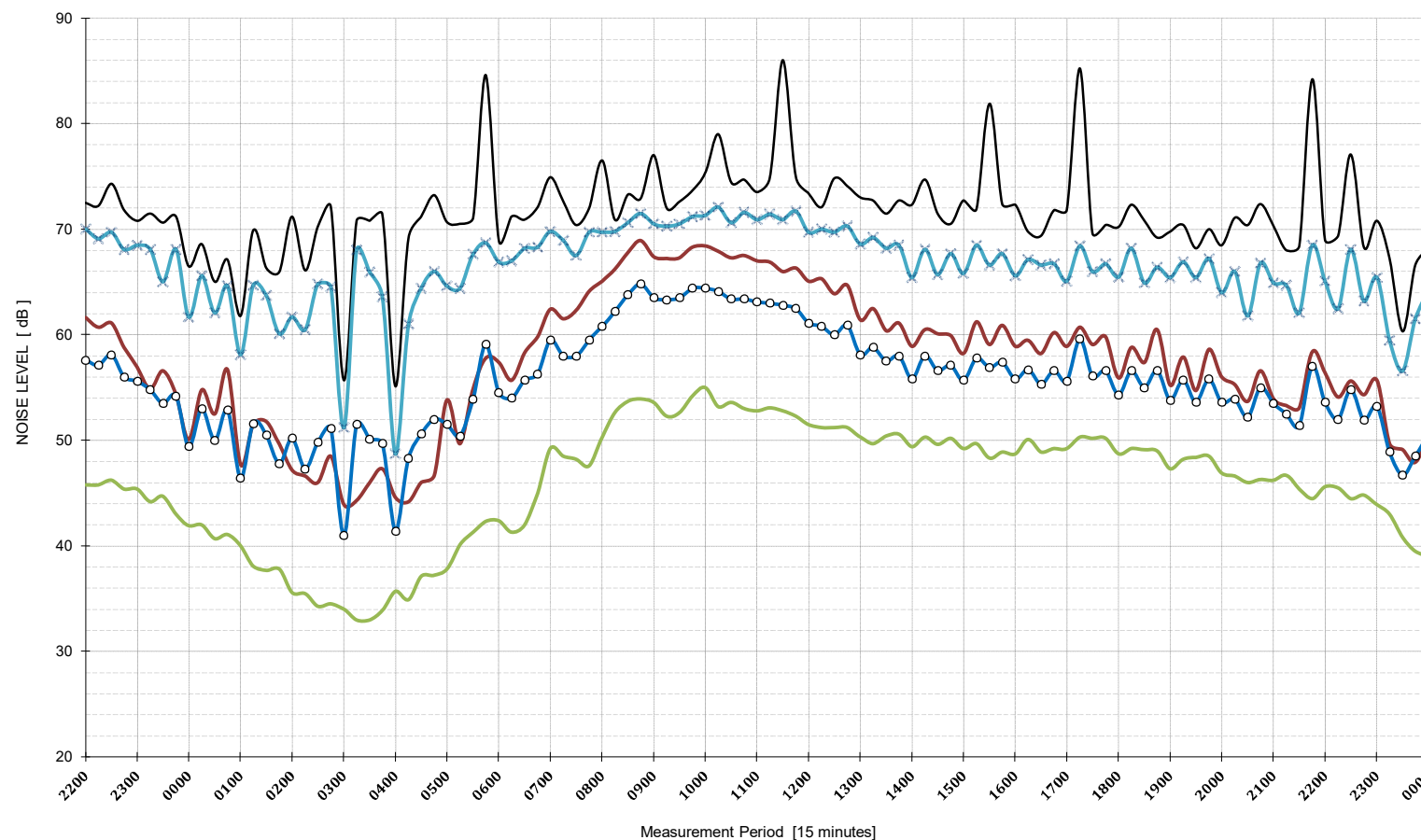
Maximum noise events as defined
in the Environmental Noise
Management Manual [$L_{Max} - L_{Aeq} \geq 15$]

29

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

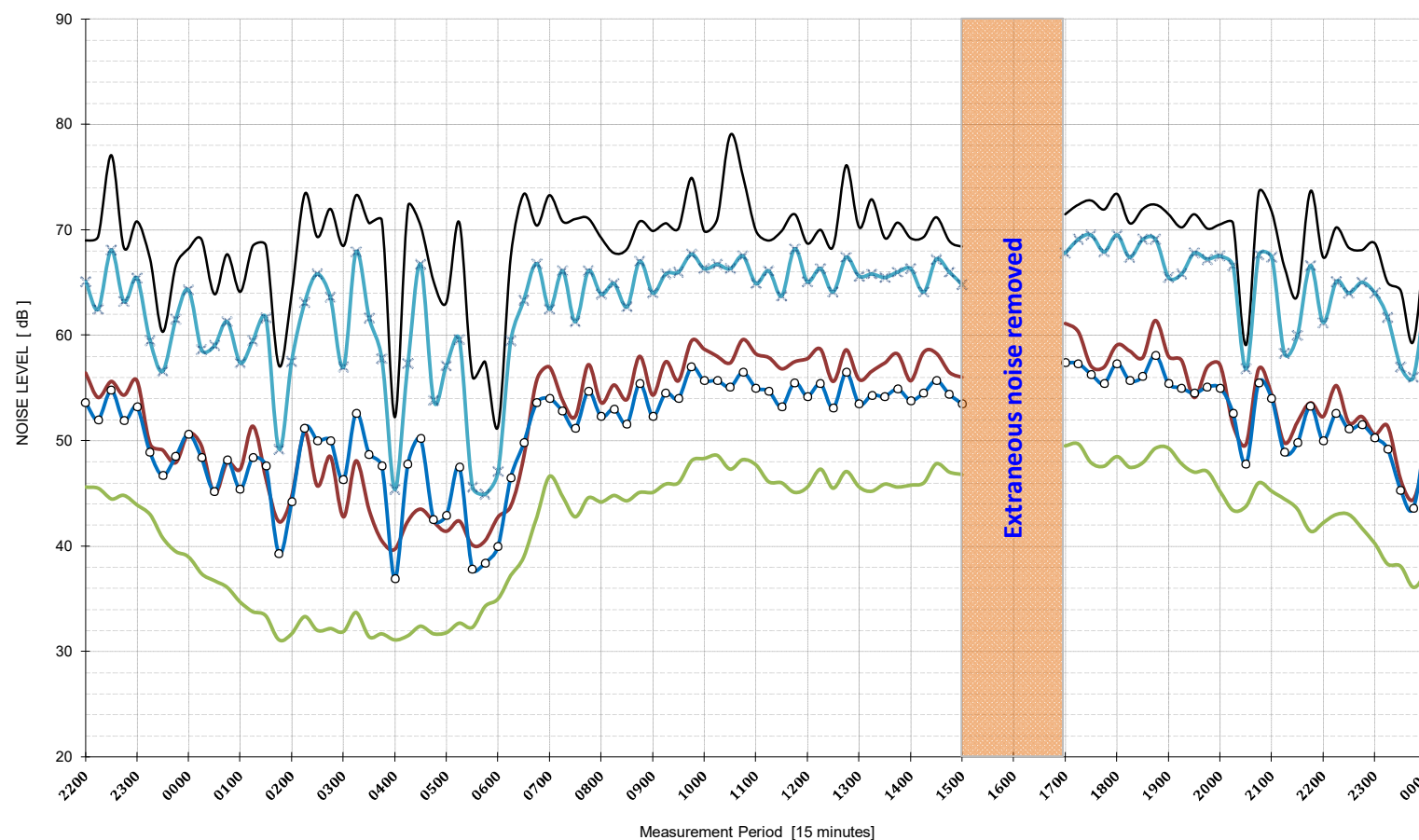
LAeq 15 hours	0700-2200	60	dB
LAeq 9 hours	2200-0700	53	dB
Max LAeq 1 hour	0700-2200	64	dB
Max LAeq 1 hour	2200-0700	56	dB

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

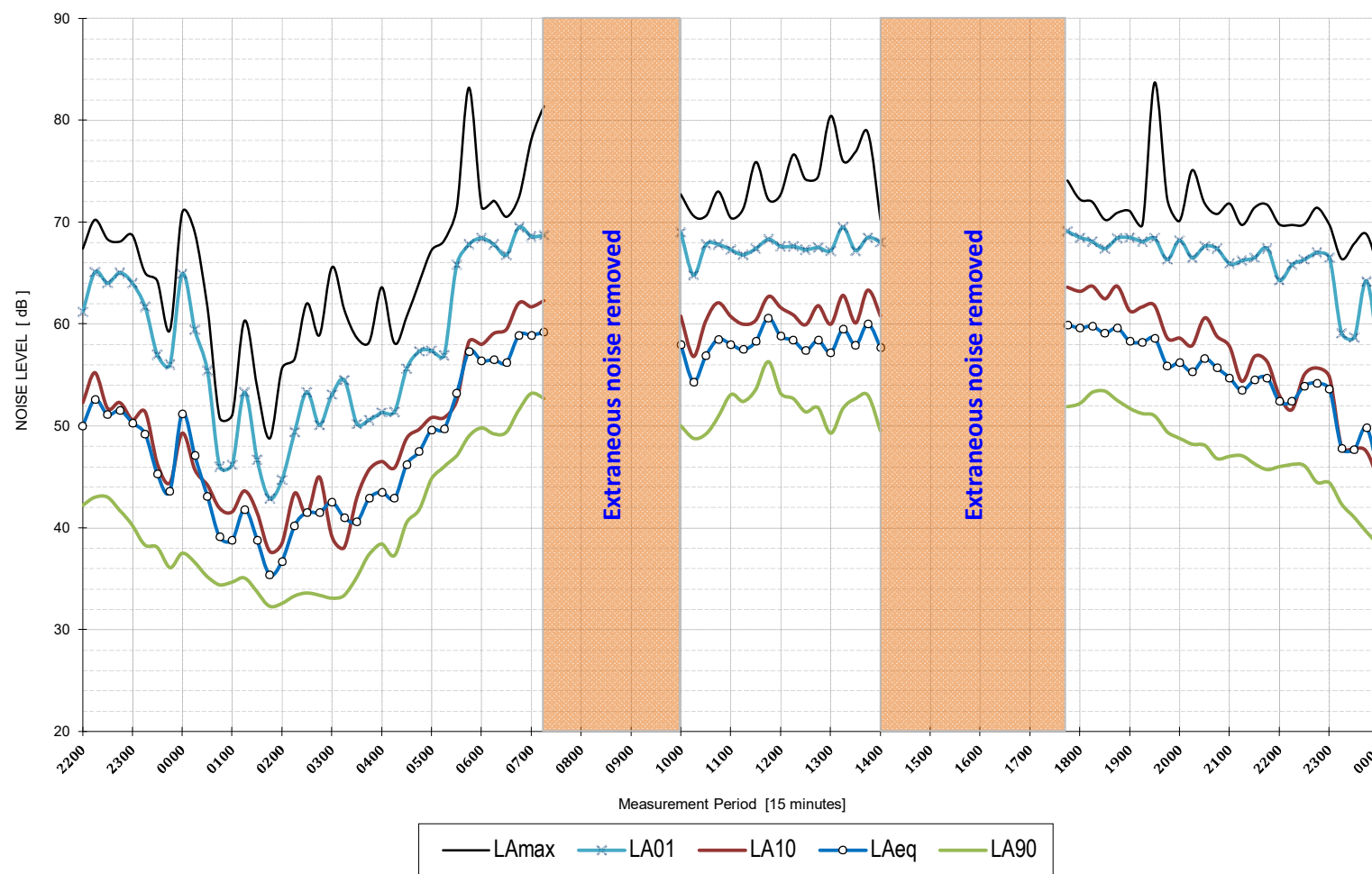
LAeq 15 hours	0700-2200	55	dB
LAeq 9 hours	2200-0700	49	dB
Max LAeq 1 hour	0700-2200	57	dB
Max LAeq 1 hour	2200-0700	51	dB

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

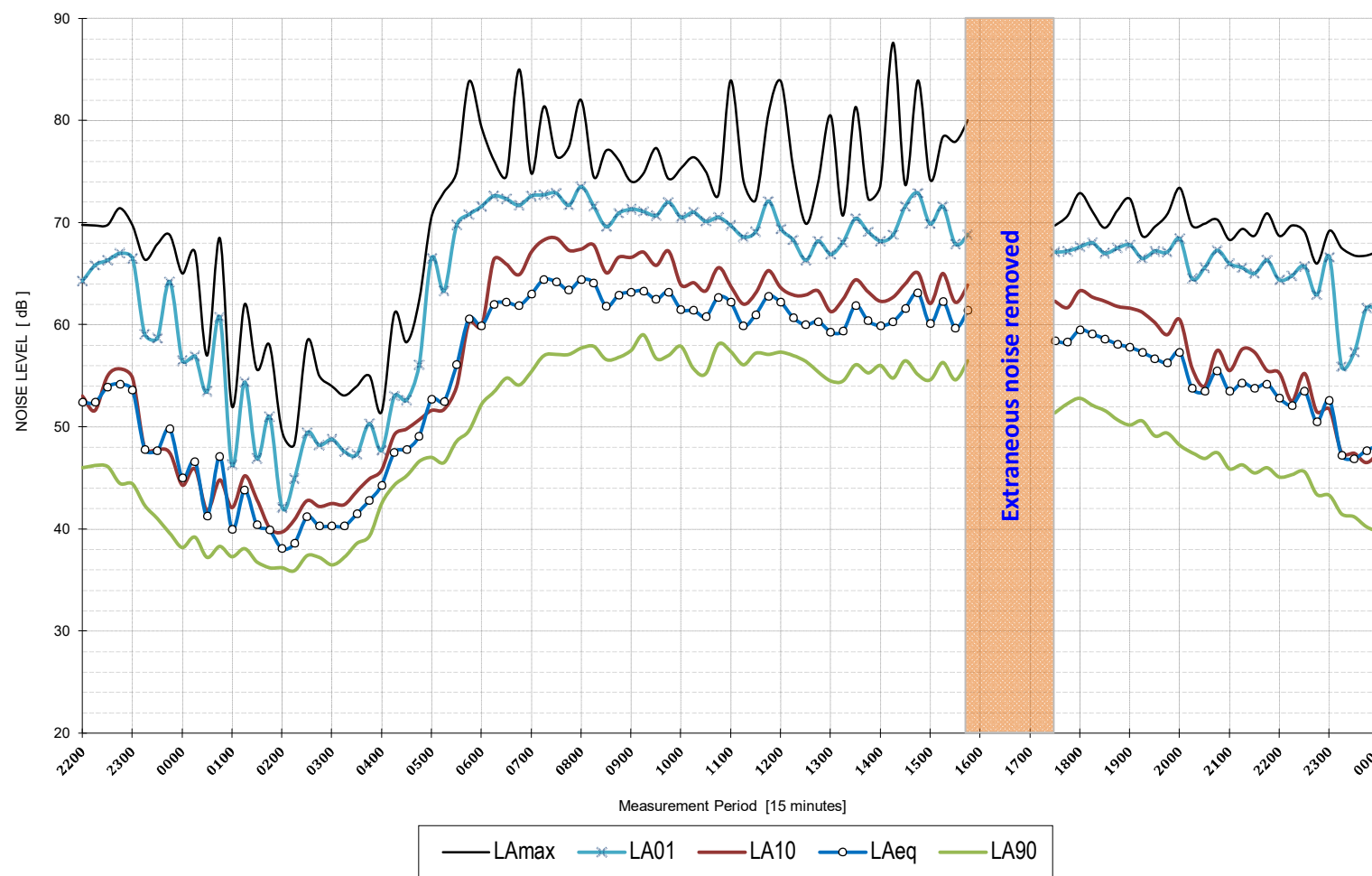
Maximum noise events as defined
in the Environmental Noise
Management Manual [$L_{Amx} - L_{Aeq} \geq 15$]

30

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

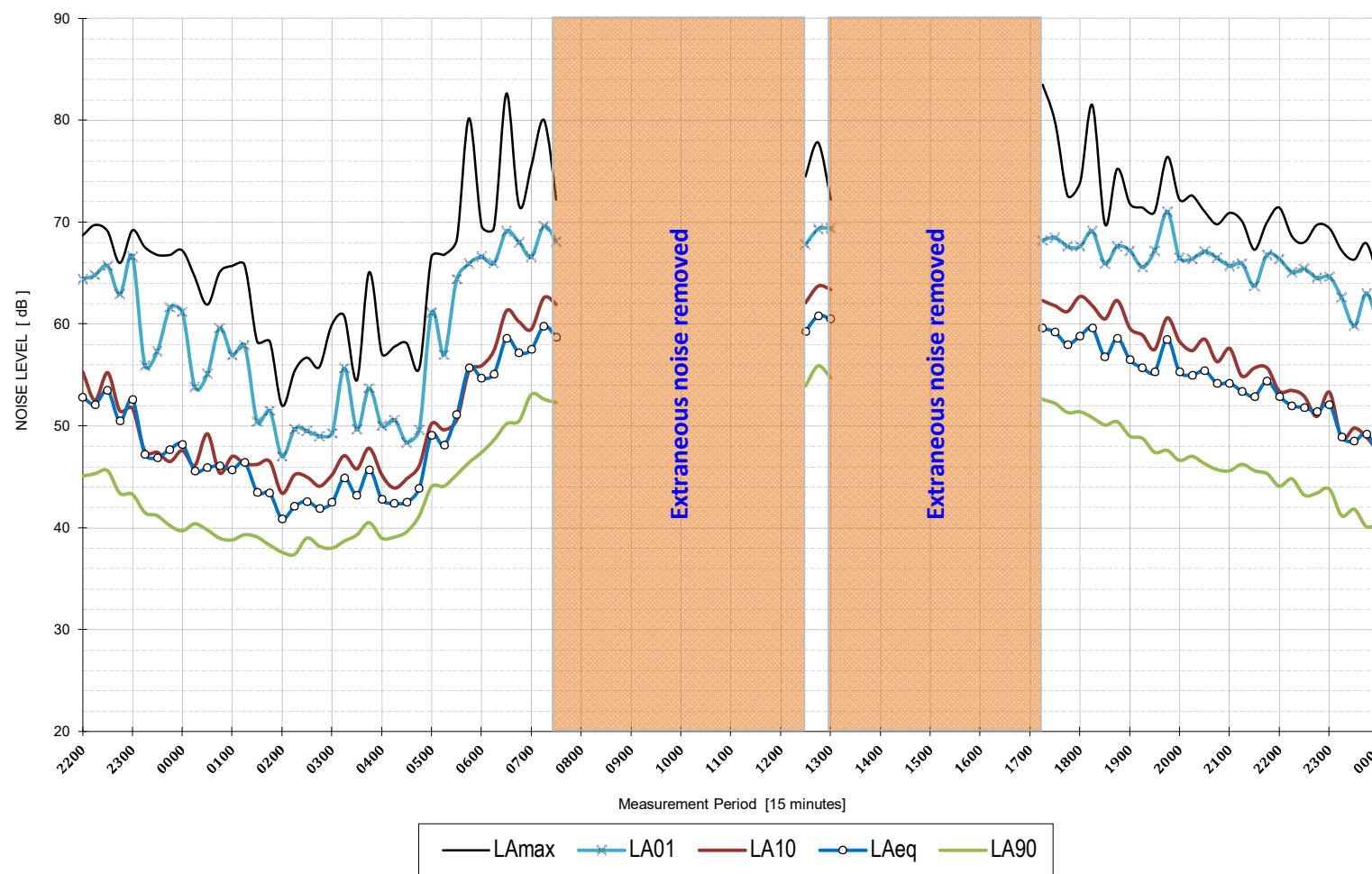
LAeq 15 hours	0700-2200	61	dB
LAeq 9 hours	2200-0700	55	dB
Max LAeq 1 hour	0700-2200	63	dB
Max LAeq 1 hour	2200-0700	58	dB

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

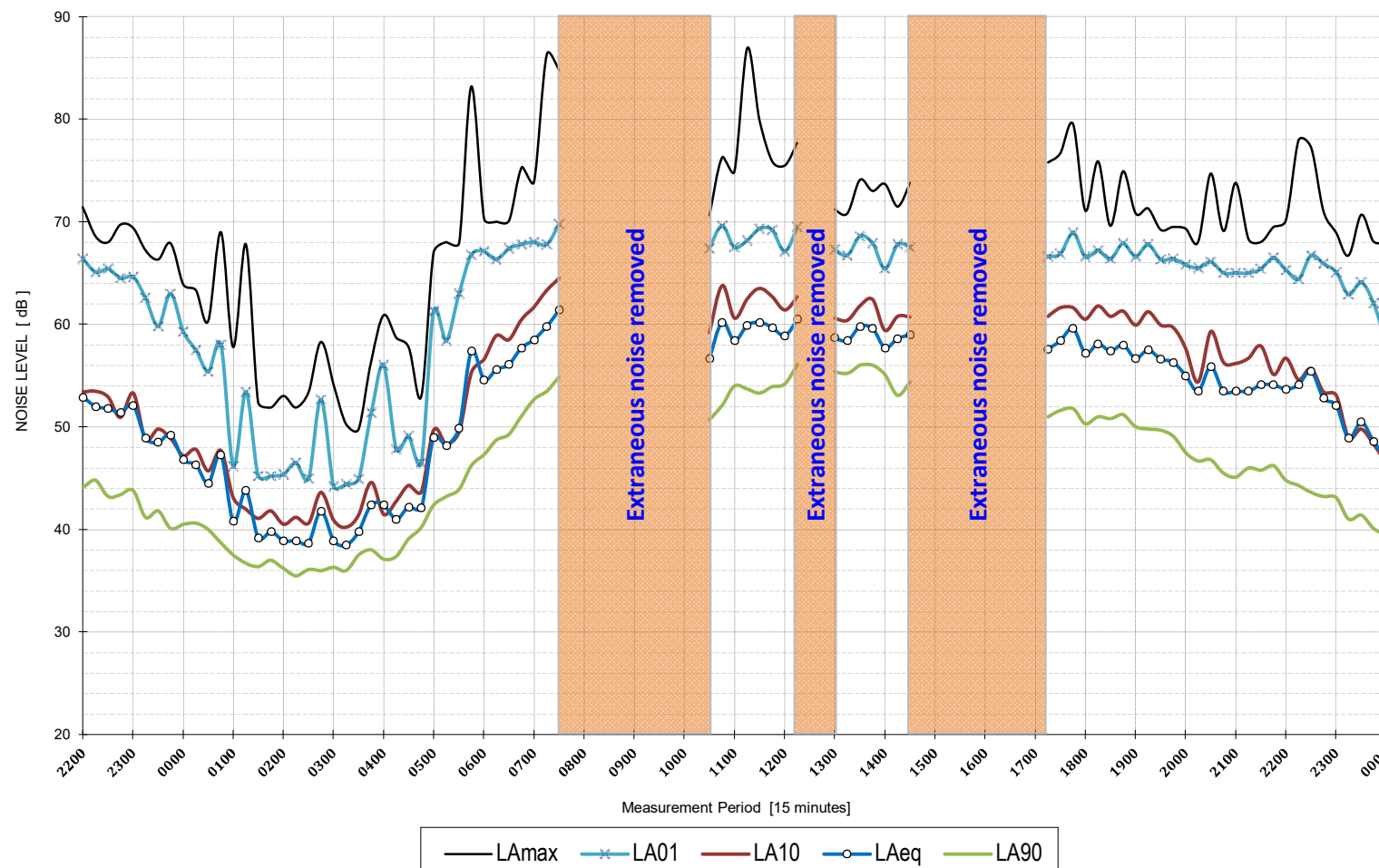
Maximum noise events as defined
in the Environmental Noise
Management Manual [$L_{Max} - L_{Aeq} \geq 15$]

24

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

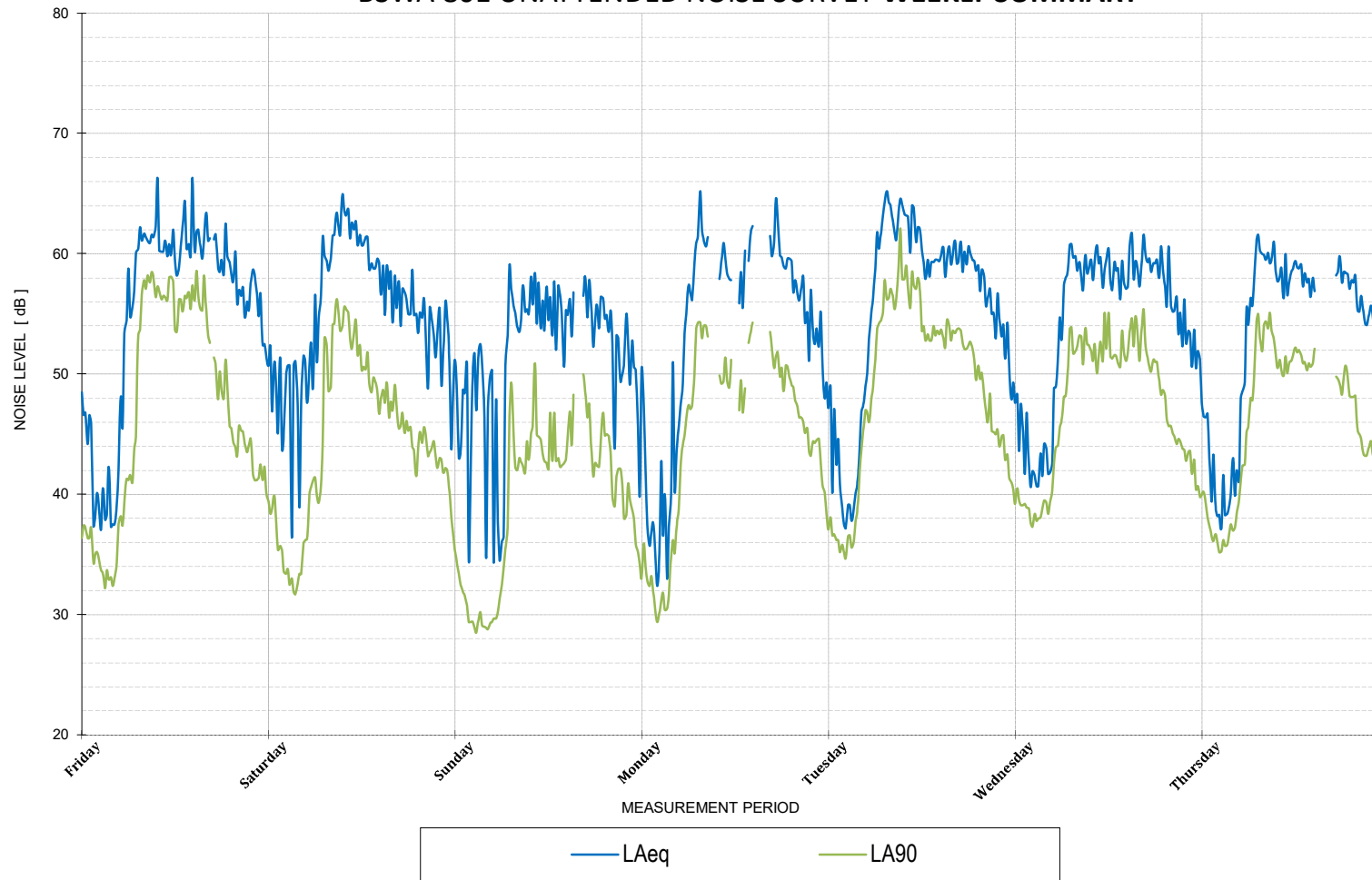
Maximum noise events as defined in the Environmental Noise Management Manual [LMax - LAeq ≥ 15]	25
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WEEKLY SUMMARY

LOGGER LOCATION: Corner Dorian Drive & De Clamb Drive

PERIOD: 10th to the 16th July 2020

BSWA 801 UNATTENDED NOISE SURVEY WEEKLY SUMMARY



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

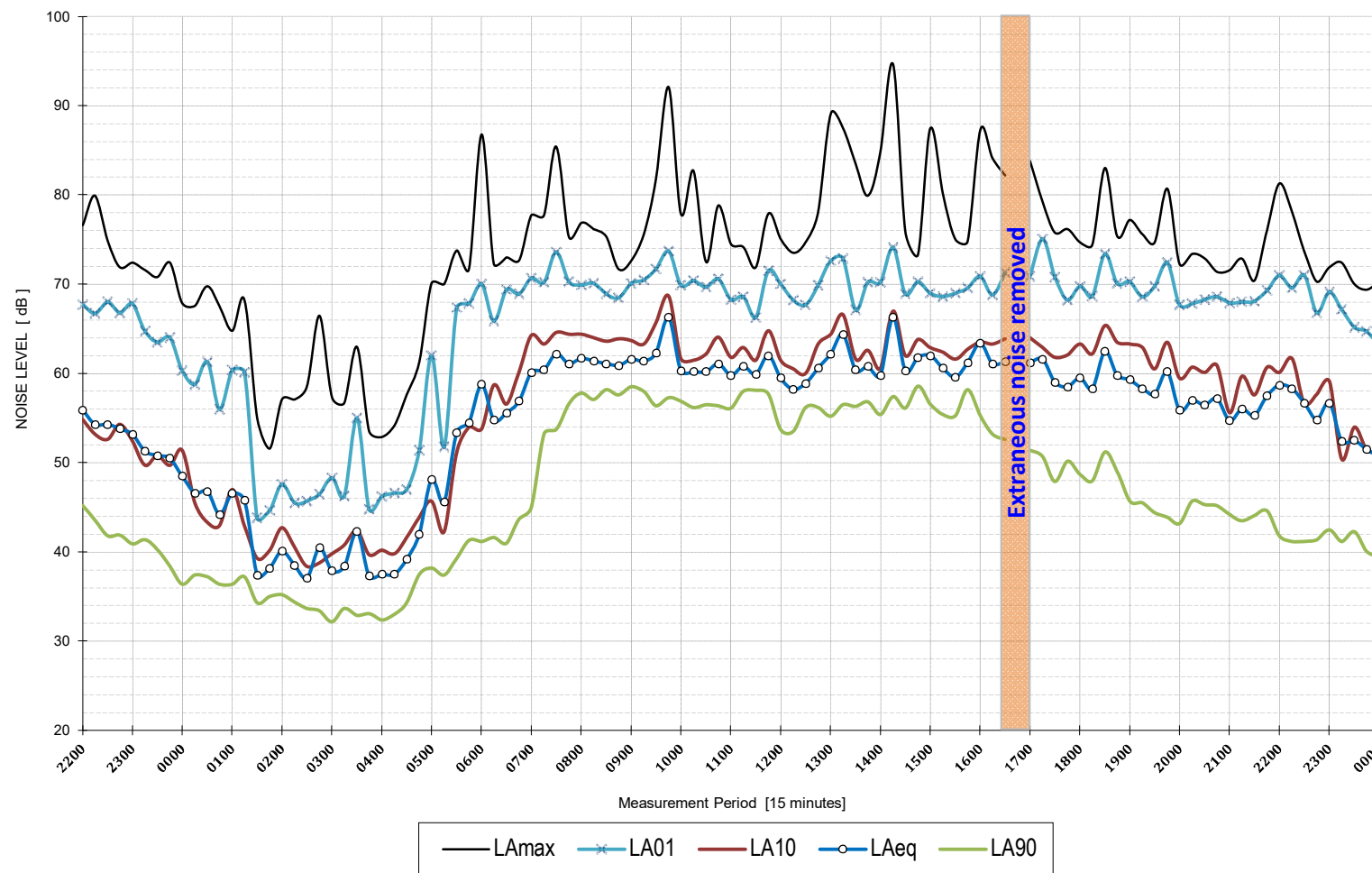
7 day average - [L_{Amax} - L_{Aeq} ≥ 15]

31

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

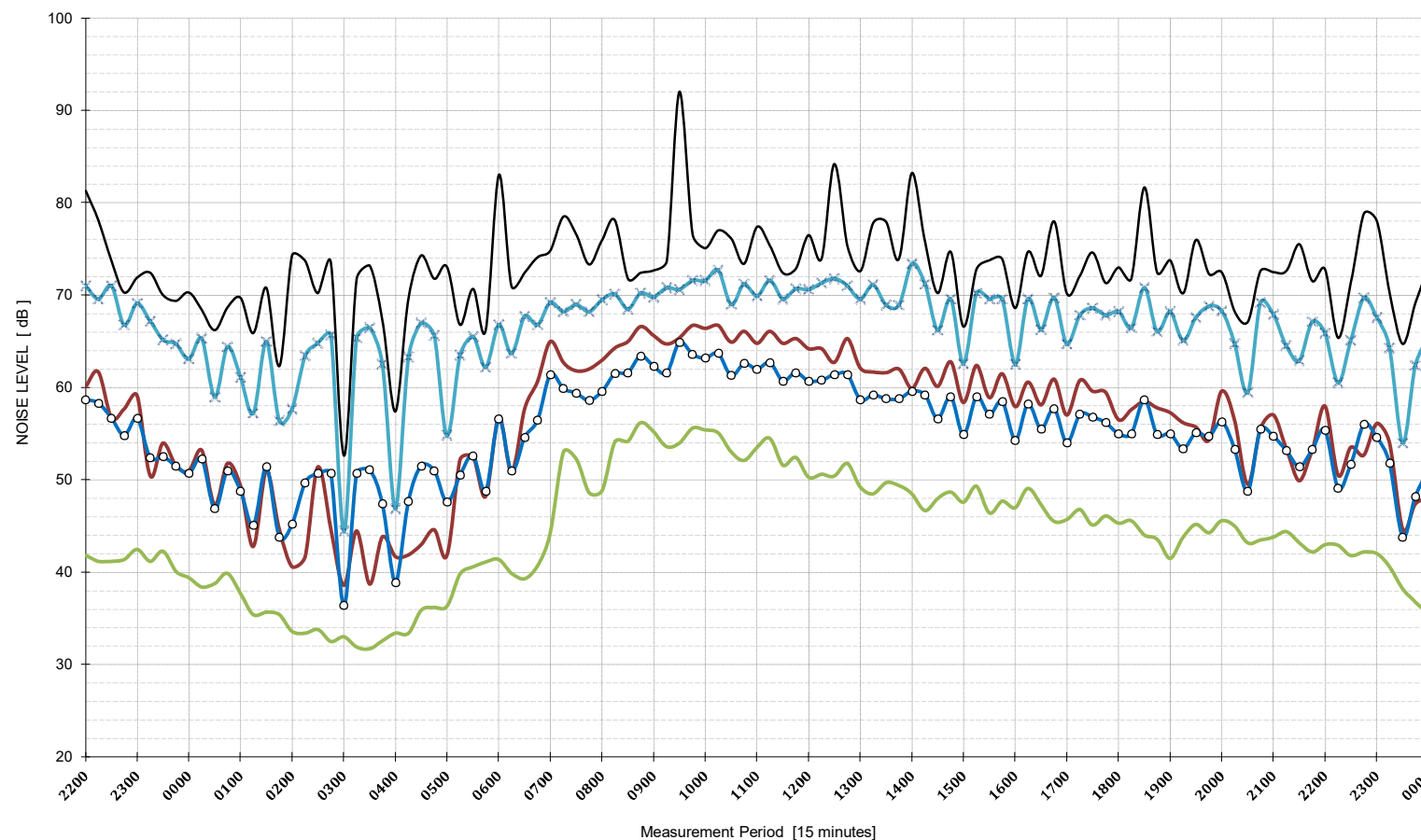
LAeq 15 hours	0700-2200	61	dB
LAeq 9 hours	2200-0700	51	dB
Max LAeq 1 hour	0700-2200	63	dB
Max LAeq 1 hour	2200-0700	55	dB

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

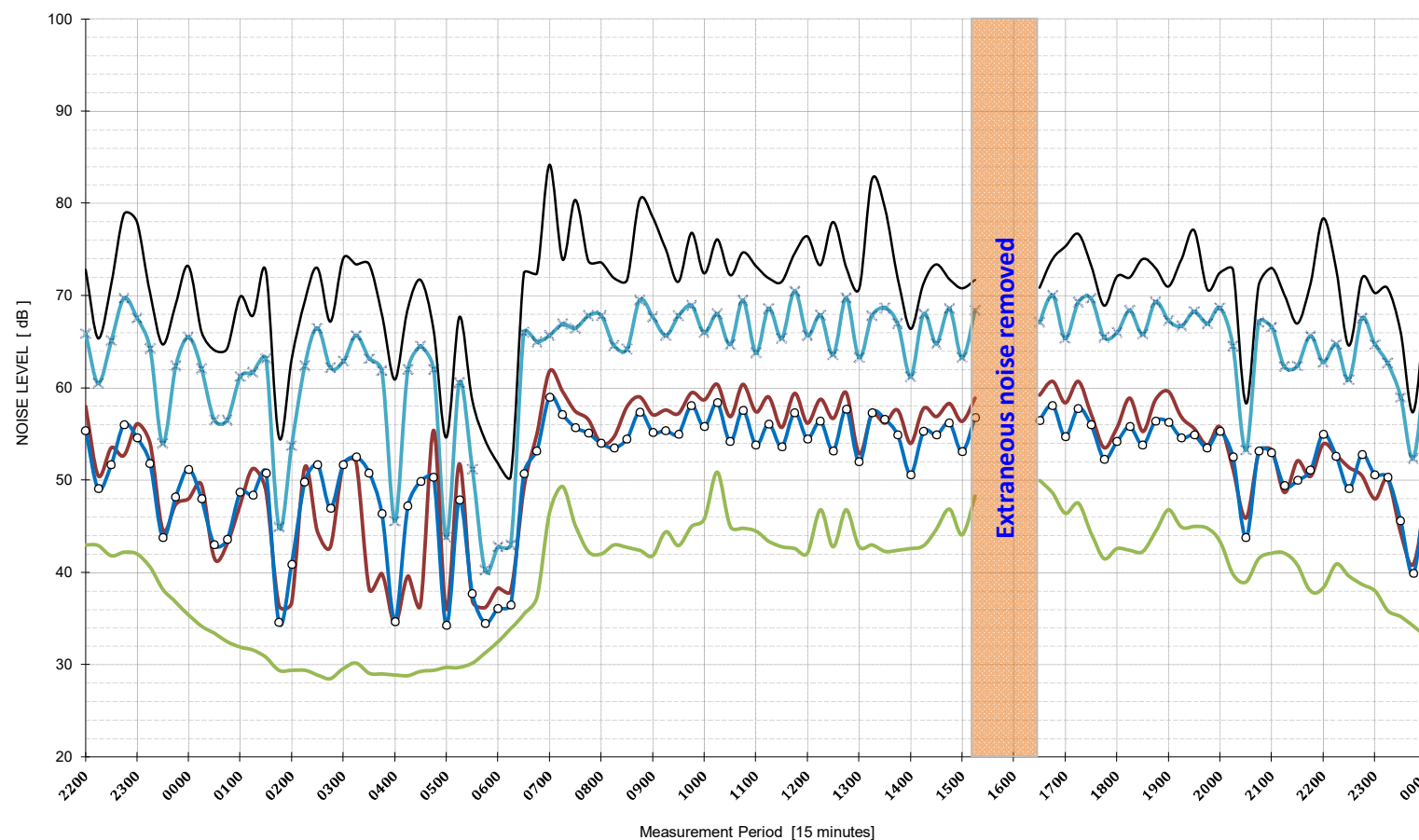
LAeq 15 hours	0700-2200	60	dB
LAeq 9 hours	2200-0700	53	dB
Max LAeq 1 hour	0700-2200	63	dB
Max LAeq 1 hour	2200-0700	55	dB

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

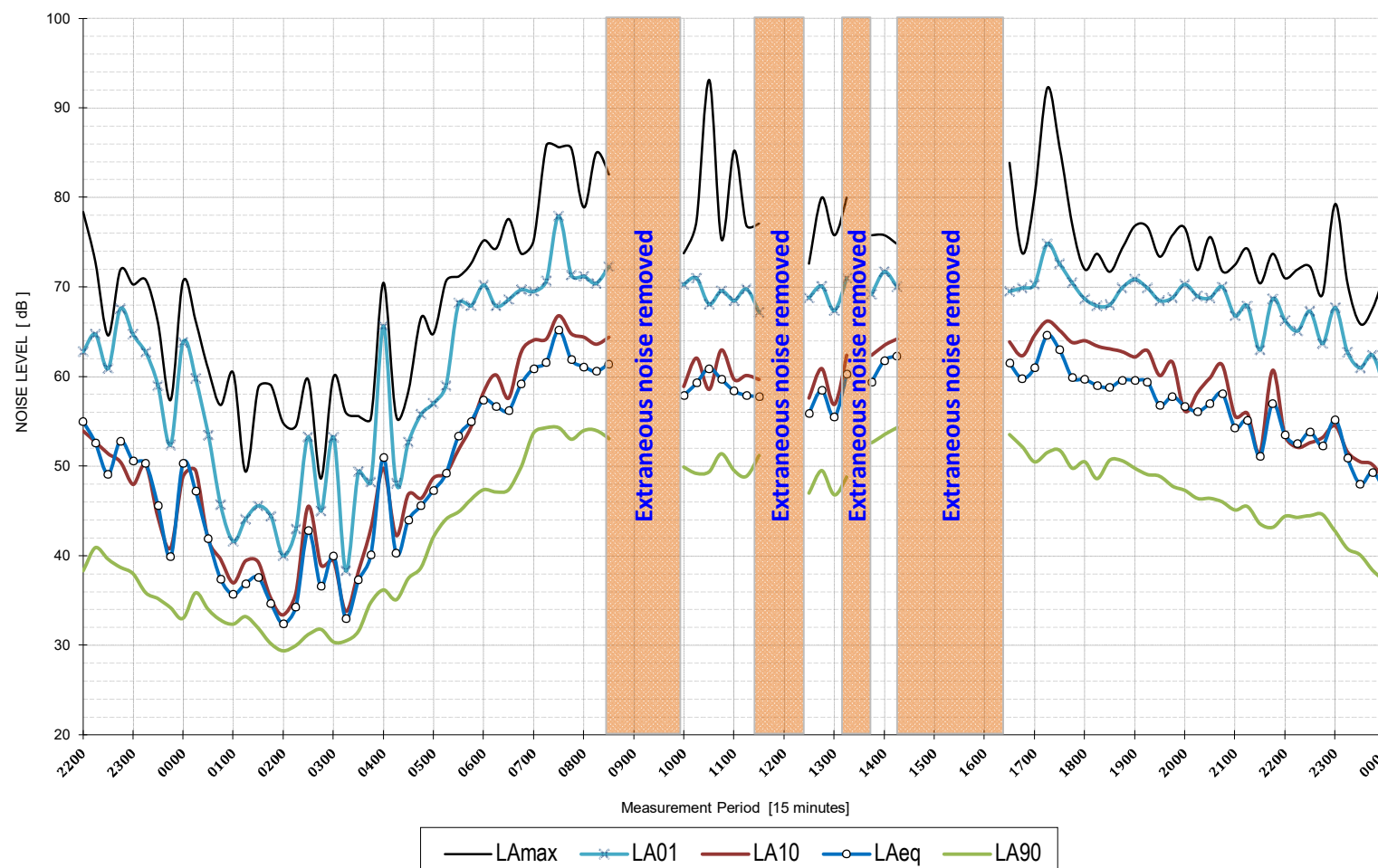
LAeq 15 hours	0700-2200	55	dB
LAeq 9 hours	2200-0700	50	dB
Max LAeq 1 hour	0700-2200	57	dB
Max LAeq 1 hour	2200-0700	53	dB

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

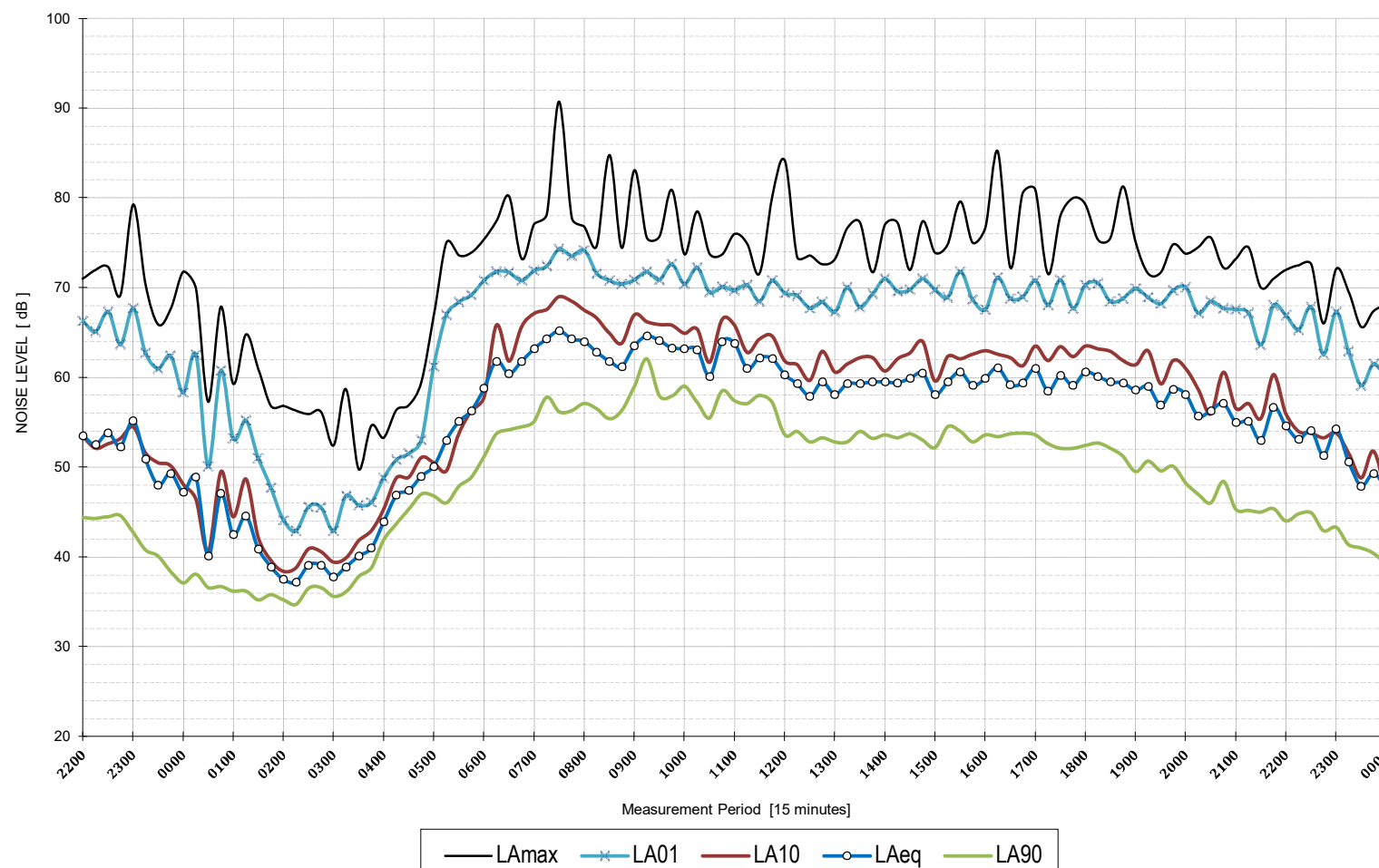
LAeq 15 hours	0700-2200	60	dB
LAeq 9 hours	2200-0700	51	dB
Max LAeq 1 hour	0700-2200	62	dB
Max LAeq 1 hour	2200-0700	54	dB

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

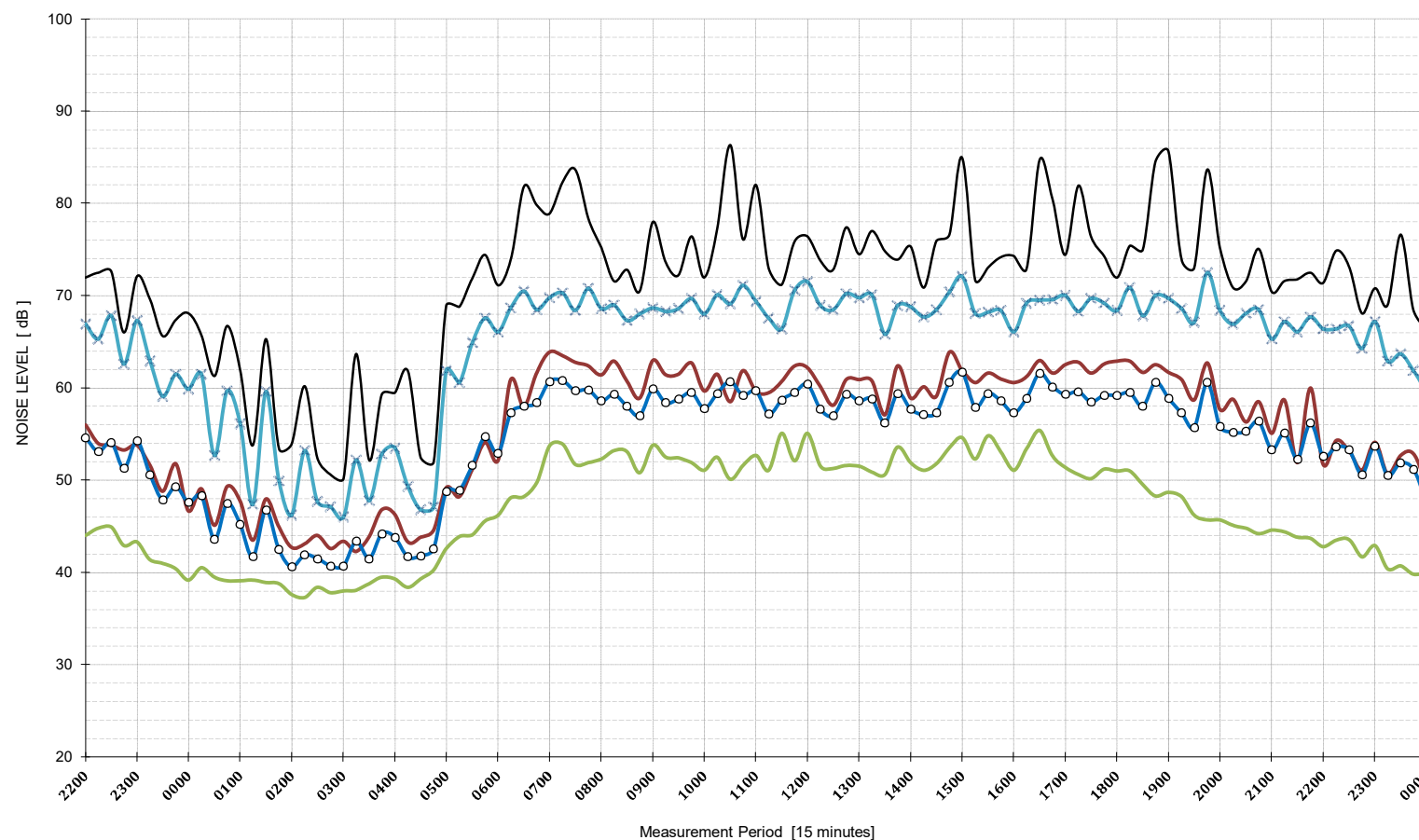
LAeq 15 hours	0700-2200	61	dB
LAeq 9 hours	2200-0700	54	dB
Max LAeq 1 hour	0700-2200	63	dB
Max LAeq 1 hour	2200-0700	56	dB

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

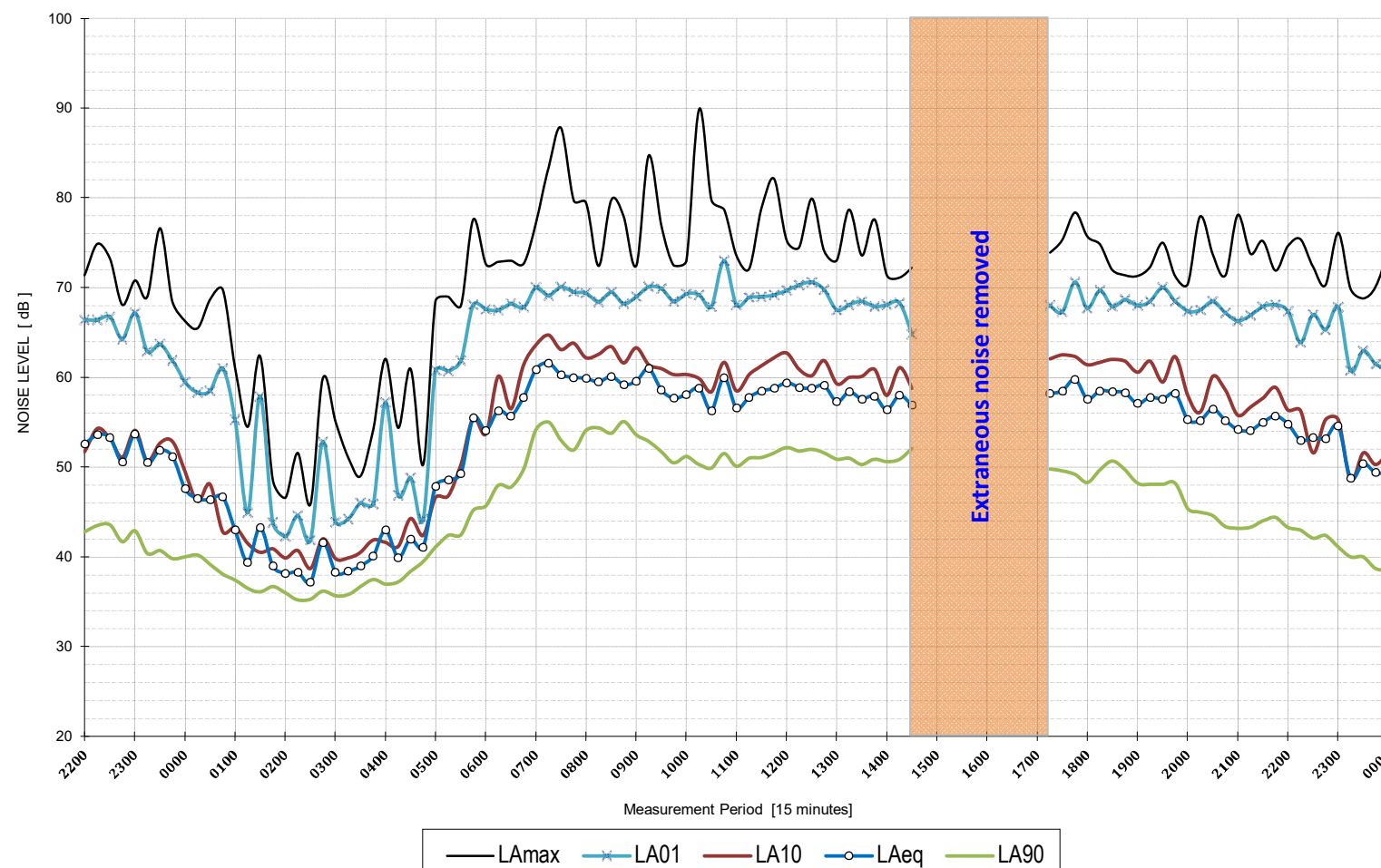
LAeq 15 hours	0700-2200	59	dB
LAeq 9 hours	2200-0700	51	dB
Max LAeq 1 hour	0700-2200	60	dB
Max LAeq 1 hour	2200-0700	53	dB

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