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Acoustic Report

Traffic & Environmental Noise Assessment

For proposed development at

No. 400-404 Cabramatta Road West, 2-18 Orange Grove Road and 6 Links Avenue, Cabramatta

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1.0 SCOPE OF WORK

The aim of this report is to determine the building materials to be used and the construction methods to be adopted such that the proposed development at No. 400-404 Cabramatta Road West, 2-18 Orange Grove Road and 6 Links Avenue, Cabramatta (Figure 1 – Site Location) is built to achieve acceptable internal noise levels as per Fairfield Council requirements.

The architectural plans by Designiche P/L dated March 7th, 2024 (Stage1) & Aleksandar Projects (Stage 2)are for the proposed construction of fifty-three (53) townhouses including one level of underground parking (Stage 1) and eighty-five residential apartments with two (2) levels of associated basement parking (Stage 2) designed by Aleksandar Projects.

The subject site is located on the corner of Cabramatta Rd and Cumberland Highway in the suburbs of Cabramatta within a mixed residential and commercial environmental (Figure 2 – Surrounding Environment).

Noise intrusion levels (Noise Break-in) from the surrounding environment are to be within the limits adopted by AS 2107:2016 *'Acoustics – Recommended Design Sound Levels and Reverberation Times'* and Clause 102 of the State Environmental Planning Policy – (Infrastructure) 2007, such that all habitable rooms in the proposed development shall be designed to limit internal noise levels.

Noise Break-out from the use of the proposed development, including all proposed mechanical plant and equipment is to comply with the NSW Noise Policy for Industry (2017), NSW Road Noise Policy and Fairfield Council requirements.

2.0 NOISE SURVEY, INSTRUMENTATION & RESULTS

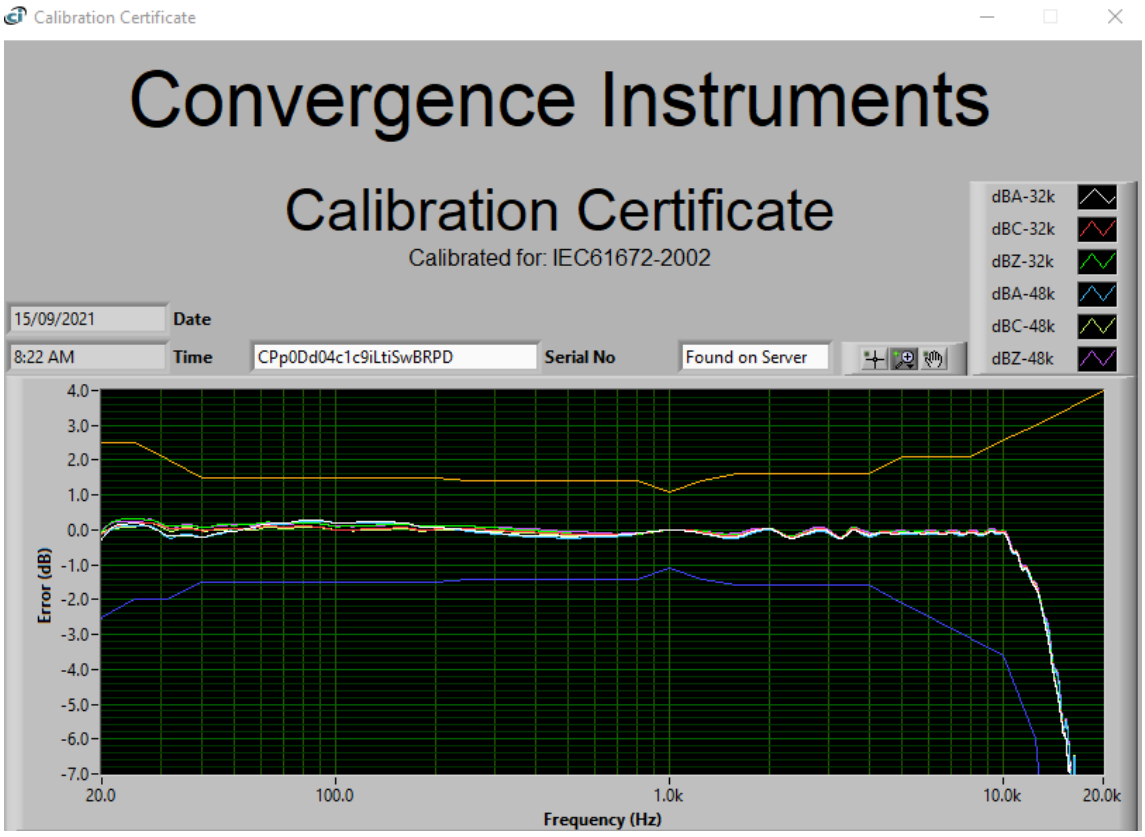
On September 27th, 2022 an engineer from this office went to the above address and carried out unattended noise measurements at the proposed development. Noise measurements were carried out near the proposed front building line facing Cumberland Highway in order to determine traffic noise levels. Nosie readings were also carried out near the eastern boundary of the site (away from the Cumberland Hwy) in order to determine existing background noise levels (Figure 3 – Noise Reading Locations – Point A and Point B).

The unattended environment noise monitoring was conducted for a period of seven (7) days between September 27th, 2022 and October 4th, 2022. The noise surveys were conducted to determine a conservative reading of the existing $L_{(A90,\ 15\ minutes)}$ and $L_{(Aeq,\ 15\ minutes)}$ during the Day & Evening [7:00 – 22:00] & Night/Early Morning [22:00 – 7:00].

All unattended sound level measurements and analysis performed throughout this project are carried out with a NSRTW_MK3 wireless sound level data loggers (Serial No. CPp0Dd04c1c9iLtiSwBRPD- Office tag -machine 1-) and (Serial No. AFHWJvUS8X0VCBNwx+- Office tag - machine 2 -). The sound loggers' specifications are as follows:

- Type 1 digital MEMS microphone
- Non-volatile 128 Mb recording memory
- Records L-max, L-min and Leq levels
- Log interval adjustable from 125 ms (8 points per second) up to hours
- A, C and Z weighting curves
- Oscilloscope and spectrum analyser features
- Observes and records 100% of the acoustic signal
- Software calculates global Leq according to ISO and OSHA methods
- WIFI connectivity to report measured levels remotely
- Weatherproof casing designed for indoor/outdoor applications
- Activity detection and logging.
- Long-term measurement and recording of acoustic levels for environmental impact studies.

The loggers are factory calibrated and front logger manufacturer's calibration certificate dated 15/09/2021 is presented below:



The microphones were positioned at 1.5m from ground level. The machines were calibrated prior and after reading using our Svantek SV 33A S/N: 90200 class 1 Calibrator with No significant drift recorded. Any readings affected by strong wind or rain have been disregarded. A Summary of those readings are presented in the tables below:

Table 2.1- Summary of Unattended Traffic Noise Readings at Point A from September 27th, 2022 –October 4th, 2022*

Measurement Location	*Time Period*	*LAeq 15min dB(A)**	*LA90 15min dB(A)*	*(RBL)** dB(A)*
Point A – Front Boundary facing Cumberland Highway	***Day (7am-6pm)***	71	62	61
	Evening 6pm-10pm	70	59	57
	Night/Early Morning (6am-7am)	67	50	48

***Site is mainly affected by traffic noise from Cabramatta Rd & Cumberland Hwy**
****RBL is calculated as per Fact Sheet B of the NPfI (2017)**

Table 2.2 - Summary of Background Noise Readings at Point B*

Measurement Location	*Time Period*	*LAeq 15min dB(A)*	*LA90 15min dB(A)*	*Rating Background Level (RBL)** dB(A)*
Point B	***Day (7am-6pm)***	51	45	43
	Evening (6pm-7pm)	48	43	41
	Night/Early Morning (6am-7am)	44	41	39

***Site is mainly affected by traffic noise from Cabramatta Rd & Cumberland Hwy**
****RBL is calculated as per Fact Sheet B of the NPfI (2017)**

The Full Average Statistical Noise Parameters L(Aeq, 15 minutes), L(A90, 15 minutes), L(A10, 15 minutes), L(A1, 15 minutes) at Point A are presented in Figure 4 – Noise Survey Point A.

3.0 TRAFFIC NOISE ASSESSMENT – *NOISE BREAK IN* –

Noise break-in into the proposed development will mainly be from traffic on Cabramatta Rd & Cumberland Hwy with internal noise levels inside the development to comply with AS 2107:2016, Department of Planning's document titled "*Development Near Rail Corridors and Busy Roads – Interim Guidelines"* [Referred to as the Interim Guidelines in this report] and Clause 102 of the SEPP.

3.1 AUSTRALIAN STANDARD 2107:2106 , THE INTERIM GUIDELINES & CLAUSE 102 OF THE STATE ENVIRONMENTAL PLANNING POLICY (SEPP)

It is usual practice, when we find it necessary to recommend internal sound levels in buildings to refer to Australian/New Zealand Standard AS/NZS 2107:2016 "Acoustics – Recommended Design Sound Levels and Reverberations times for Building Interiors".

AS/NZS 2107:2016 sets out design internal noise levels and reverberation times for different buildings depending on the use of these structures. The noise levels recommended in AS/NZS 2107:2016 take into account the function of the area and apply that to the sound level measured within the space unoccupied although ready for occupancy.

In Table 1, Page 13of the standard recommends the following noise levels for residential buildings:

Type of occupancy/activity	Design sound level ($L_{Aeq,t}$) range	Design reverberation time (T) range, s
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	—

Cumberland Highway is classified as a busy road with more than 40,000 AADT. According to the Department of Planning's document titled "*Development Near Rail Corridors and Busy Roads – Interim Guidelines"* the development at the subject address is to be designed in accordance with Clause 102 of the SEPP.

Clause 102 of the SEPP states that where the development is for residential use and is located in or adjacent to a relevant road corridor, a consent authority must not grant consent unless it is satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:

- in any bedroom in the building – 35dB(A) at any time between 10.00p.m. and 7.00a.m.
- anywhere else in the building (other than a garage, kitchen, bathroom or hallway) – 40dB(A) at any time.
-

Section 3.6.1 of the Interim Guidelines states that when windows and doors are left open, indoor sound levels should not exceed the nominated noise criteria by more than 10 dB(A). If noise levels exceed the nominated rail noise criteria by more than 10 dB(A), then the provision of mechanical ventilation should be incorporated in the design of the building.

4.0 EXTERNAL BUILDING COMPONENT RECOMMENDATIONS

The façade specification can be conservatively estimated using the following formula:

$R_w = L_{(ext)} - L_{(int)} + 10 \log (S/A) + ADJ$ where

$R_{w=}$ Transmission loss of room façade.
$L_{(ext)=}$ External Noise level L eq $_{x\ hrs}$.= dB(A).
$L_{(int)=}$ Internal Noise level L eq $_{x\ hrs}$.= dB(A).
S = Total exterior surface area of the room.
A = Total sabins of absorption of the room.
ADJ = 3 + F+ G where F = 2 for Rail noise, F= 4 for Traffic noise with negligible trucks [percentage < 10%], and F= 6 for Traffic Noise with more than 10% trucks.

G allows for Primary angles of sound per the table below,

As the façade is made up of individual elements with different transmission coefficients. The total transmission loss of the façade is calculated using the following equation where n represents each material components of the façade:

$$R_{Total} = -10log_{10}\left(\frac{1}{\sum_{n=1}^{N} S_n}\sum_{n=1}^{N} S_n \tau_n\right)$$

.

External façade building recommendations calculated using the above formulas are provided in Section 5.0 below to ensure compliance with the noise criteria stated in Section 3.0 of this report.

5.0 FAÇADE & ROOF BUILDING COMPONENTS

The most practical building façade and roof components and material specifications to suit the required noise reduction indices for the above project are provided in Table 5.1 below:

Table 5.1 Windows/Sliders, Doors, Walls & Roof Specifications

Building Component	Rw Rating Achieved
Sliding Windows & Sliding Doors in Living/Dining/Kitchen & Bedroom Areas of all Units and townhouses *facing Cumberland Highway and Cabramatta Road* are to be 12.38mm laminated type with full perimeter Schlegel Q-Lon acoustic seals (Ph: 8707-2000). (1)(2)(3). **All Other Sliding Windows & Sliding Doors in Living/Dining/Kitchen & Bedroom Areas along the eastern and southern elevation are** to be 10.38mm laminated type with full perimeter Schlegel Q-Lon acoustic seals (Ph: 8707-2000). (1)(2)(3)	37 35
Windows in all Non habitable areas Bathrooms/Laundries/ Staircase etc) are to be 6mm in accordance with AS 2047 (Windows in Buildings). (1)(2)(3)	25
Entry Doors Separating Sole-Occupancy Units are to be Solid Core minimum 42mm thick with acoustic seals fitted around the door. A drop seal is required at the base of the external door.(2)(3)	>30
External Walls are to be 270/250 mm double brick, brick veneer with insulated cavity stud work , hebel, dincel construction or any other method of wall construction with Rw of 50. (1)(2)(3)	50
Roof is to be Minimum 150mm Concrete Roof with Rw + Ctr >=50 & Lntw >=62 for trafficable roof area OR Colorbond Steel Roofing with R2 insulation over battens, 13mm plasterboard ceiling with 75mm thick, 11kg/m3 insulation, in the ceiling cavity (3).	**50** **40-45**

NB: This report is to be read in conjunction with the BASIX certificate and any other related building specification. (1). No Through weep holes in windows/sliders. . (2). All gaps between window & door frames and the masonry walls are to be sealed using acoustic foam Hilti CP620 or similar. Glass wool batts can be applied prior to the application of the foam to seal larger gaps. (3). All gaps are to be acoustically sealed.

6.0 ACCEPTABLE NOISE LEVEL FROM PROPOSED DEVELOPMENT– NOISE BREAK OUT –

The nearest residential receivers that have the potential to be affected by the proposed development are detailed in Table 6.0.1 (Figure 5 – Nearest Residential Receivers).

Table 6.0.1 – Nearest Residential Receivers

Receiver	Location	Description
R1	22 Links Ave (south of site)	Elevated Single Storey Residential Dwelling
R2	4 Links Ave (south of site)	Two Storey Residential Dwelling
R3	8 Links Ave (south of site)	Two Storey Residential Dwelling
R4	10 Links Ave (south of site)	Two Storey Residential Dwelling
R5	19 Smiths Ave (east of site)	Single Storey Residential Dwelling
R6	17a Smiths Ave (east of site)	Single Storey Residential Dwelling at rear
R7	15 Smiths Ave (east of site)	Single Storey Residential Dwelling
R8	13 Smiths Ave (east of site)	Single Storey Residential Dwelling
R9	11 Smiths Ave (east of site)	Single Storey Residential Dwelling
R10	9 Smiths Ave (east of site)	Single Storey Residential Dwelling
R11	7 Smiths Ave (east of site)	Single Storey Residential Dwelling
R12	5 Smiths Ave (east of site)	Single Storey Residential Dwelling
R13	3 Smiths Ave (east of site)	Single Storey Residential Dwelling
R14	1-1a Smiths Ave (east of site)	Single Storey Residential Dwelling
R15	398 Cabramatta Rd W (north of site)	Single Storey Residential Dwelling

The following assessment will ensure the proposed townhouses at No. 400-404 Cabramatta Rd W, Cabramatta will comply with the requirements of Fairfield City Council including the NSW EPA Noise Guide for Local Government, the Protection of the Environment Operations Act 1997 (POEO) and the Noise Policy for Industry (2017).

Noise producing activities from the proposal at No. 400-404 Cabramatta Road W, Cabramatta are as follows:

Table 6.0.2 – Noise Producing Activities from Proposed Townhouses

Aspects	***Noise sources***
Entertainment	• Communal area/s
Car Park	• Noise from Vehicles entering carparks (major) • Noise from additional traffic generation (major) • Waste collection services entering the site (major)

Equipment and systems	• Mechanical Plant and Air conditioning Units (major) • Electrical substation (major)

6.1 NOISE GUIDE FOR LOCAL GOVERNMENT & POEO

The Department of Environment and Conservation (NSW) published the amended *Noise Guide for Local Government* in October 2010. The policy is specifically aimed at assessing noise from light industry, shops, entertainment, public buildings, air conditioners, pool pumps and other noise sources in residential areas.

Section 2.2.1 of the Noise Guide for Local Government states that a noise source is generally considered to be intrusive if the noise from the source when measured over a 15-minute period exceeds the background noise by more than 5 dB(A). Therefore, the noise criteria are as follows:

- **Day period:** **45 + 5 = 50 dB(A)**
- **Evening period:** **43 + 5 = 48 dB(A)**
- **Night period:** **41 + 5 = 46 dB(A)**

The appropriate regulatory authority (Local Council) may, by notice in writing given to such a person, prohibit the person from causing, permitting or allowing:

1. any specified activity to be carried on at the premises, or
2. any specified article to be used or operated at the premises.

or both, in such a manner as to cause the emission from the premises, at all times or on specified days, or between specified times on all days or on specified days, of noise that, when measured at any specified point (whether within or outside the premises,) is in excess of a specified level.

It is an offence to contravene a noise control notice. Prior to being issued with a noise control notice, no offence has been committed.

The Protection of the Environment Operations Act 1997 (POEO) defines "Offensive Noise" as noise:

1. (a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:
2. (i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or
3. (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 regulation.

6.1.1 SLEEP DISTURBANCE

In order to minimize the potential of sleep disturbance due to transient noises from the proposed development during the night hours (10:00pm – 7:00am), Section 2.2.4 of the Noise Guide For Local Government recommends that $L_{A1,1\text{-minute}}$ level of any noise outside a bedroom should not exceed the background noise level by more than 15dB.

$L_{A1,\ 1\ minute}$ =< 39 + 15= 54 dB(A) outside window of residential receiver

Similar text about sleep arousal is adopted in the Noise Policy for Industry 2017 as below:

Where the subject development/premises night-time noise levels at a residential location exceed:

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

a detailed maximum noise level event assessment should be undertaken.

Additionally, Section 5.4 of the NSW Road Noise Policy states the following:

Further studies by the enHealth Council (2004) and the guidelines published by the World Health Organisation (1999) were reviewed and analysed in terms of the guidance on noise exposure and sleep disturbance. The enHealth report states that:

'as a rule for planning for short-term or transient noise events, for good sleep over 8 hours the indoor sound pressure level measured as a maximum instantaneous value should not exceed approximately 45 dB(A) $L_{A,\ (Max)}$ more than 10 or 15 times per night'.

6.2 NSW NOISE POLICY FOR INDUSTRY (2017)

The above policy seeks to promote environmental well-being through preventing and minimizing noise by providing a framework and process for deriving noise limits conditions for consent and licenses.

The Noise Policy for Industry 2017 recommends two separate noise criteria to be considered, the Intrusive Noise Criteria and the Amenity Noise Criteria. A project noise trigger level being the lowest of the amenity and the intrusiveness noise level is then determined.

If the predicted noise level L_{Aeq} from the proposed project exceeds the noise trigger level, then noise mitigation is required. The extent of any 'reasonable and feasible' noise mitigation required whether at the source or along the noise path is to ensure that the predicted noise level L_{Aeq} from the project at the boundary of most affected residential receiver is not greater than the noise trigger level.

6.2.1 AMENITY NOISE CRITERIA

The amenity noise levels presented for different residential categories are presented in Table 2.2 of the Noise Policy for Industry 2017. These levels are introduced as guidance for appropriate noise levels in residential areas surrounding industrial areas.

The recommended amenity noise levels for the proposed development 400-404 Cabramatta Road West, 2-18 Orange Grove Road and 6 Links Avenue, Cabramatta are presented in Table 6.2.1.1 below.

Table 6.2.1.1- Recommended Amenity Noise levels

Type of Receiver	***Area***	***Time Period***	***Recommended Leq Noise Level, dB(A)***
Residence	Urban	Day	60
		Evening	50
		Night	45

Where a noise source contains certain characteristics such as tonality, impulsiveness, intermittency, irregularity or dominant low-frequency content, a correction is to be applied which is to be added to the measured or predicted noise levels at the receiver before comparison with the criteria. Shown below are the correction factors that are to be applied:

Table 6.2.1.2 – Modifying Factor Corrections as per Fact Sheet C (Noise Policy for Industry 2017)

Factor	***Correction***
Tonal Noise	+ 5 dB [1,2]
Low-Frequency Noise	+ 2 or 5 dB [1]
Intermittent Noise	+ 5 dB
Duration	+ 0 to 2 dB(A)
Maximum Adjustment	Maximum correction of 10 dB(A)[1](excluding duration correction)

1. Where a source emits tonal and low-frequency noise, only one 5-dB correction should be applied if the tone is in the low-frequency range, that is, at or below 160 Hz.

2. Where narrow-band analysis using the reference method is required, as outlined in column 5, the correction will be determined by the ISO1996-2:2007 standard.

Correction for duration is to be applied where a single-event noise is continuous for a period of less than two and a half hours in any assessment period. The allowable exceedance of the $L_{Aequ,15min}$ equivalent noise criterion is depicted in Table 6.2.1.3 for the duration of the event. This adjustment accounts for unusual and one-off events and does not apply to regular and/or routine high-noise level events.

Table 6.2.1.3 – Adjustment for Duration as per Fact Sheet C (Noise Policy for Industry 2017)

Allowable duration of noise (one event in any 24-hour period)	***Allowable exceedance of LAeq,15min equivalent project noise trigger level at receptor for the period of the noise event, dB(A)***	
	Daytime & evening (7 am–10 pm)	***Night-time (10 pm–7 am)***
1 to 2.5 hours	2	Nil
15 minutes to 1 hour	5	Nil
6 minutes to 15 minutes	7	2
1.5 minutes to 6 minutes	15	5
less than 1.5 minutes	20	10

According to Section 2.4 of the above policy, the project amenity noise level is determined as follows:

Project amenity noise level for industrial developments = recommended amenity noise level (Table 2.2) minus 5 dB(A)

To convert from a period level to a 15-minute level, a plus 3 is added as per section 2.2 of the policy.

Therefore, the project amenity noise level for the proposed development 400-404 Cabramatta Road West, 2-18 Orange Grove Road and 6 Links Avenue, Cabramatta is as follows:

- **Day period:** **60 – 5 + 3 = 58 dB(A)**
- **Evening period:** **50 – 5 + 3 = 48 dB(A)**
- **Night period:** **45 – 5 + 3 = 43 dB(A)**
-

6.2.2 INTRUSIVENESS NOISE CRITERIA

Section 2.3 of the NSW Noise Policy for Industry summarizes the intrusive criteria as below:

$$L_{Aeq,\,15\,minute} \leq \text{rating background level plus } 5$$

While the background noise level known as $LA_{90,15\ minutes}$ is the Noise exceeded 90% percent of a time period over which annoyance reactions may occur (taken to be 15 minutes). The RBL is defined as the overall single-figure $L_{A90,15\ minutes}$ background level representing each assessment period (day/evening/night) over the whole monitoring period.

For the short-term method, the rating background noise level is simply the lowest measured LAF90,15min level.

For the long-term method, the rating background noise level is defined as the median value of the daily/evening/night lowest tenth percentile of L_{90} background noise levels and calculated in accordance with Fact Sheet B of the NPfI 2017.

Therefore, the acceptable L_{eq} noise intrusiveness criterion for broadband noise during the day, evening and night are as follows:

- **Day period:** **43 + 5 = 48 dB(A)**
- **Evening period:** **41 + 5 = 46 dB(A)**
- **Night period:** **39 + 5 = 44 dB(A)**

6.3 PROJECT NOISE TRIGGER LEVEL

A summary of intrusiveness and amenity noise levels as determined in Sections 6.2.1 & 6.2.2 are shown in Table 6.3.1 below:

Table 6.3.1 - Summary of Intrusiveness and project amenity noise levels

Period	***Intrusiveness Noise Level dB(A)***	***Project Amenity Noise level dB(A)***
Day Time (7:00am-6:00pm)	48	58
Evening Time (6:00pm-10:00pm)	46	48
Night & Early Morning (10:00pm – 7:00am)	44	43

The project noise trigger level is the lower (that is, the most stringent) value of the amenity and intrusiveness noise levels for the day, evening and night-time. Therefore, the project noise trigger levels for the proposed development are as shown below:

- Day period $L_{Aeq,15\ min}$: **48** dB(A)
- Evening period $L_{Aeq,15\ min}$: **46** dB(A)
- Night period $L_{Aeq,15\ min}$: **43** dB(A)

The proposed developments and its activities including all mechanical plant and carpark activities will not exceed the project noise trigger level at the most sensitive location, provided all noise control recommendations in Section 7.0 are adhered to.

6.4 NSW ROAD NOISE POLICY-TRAFFIC NOISE GENERATION CRITERIA

Table 3 on Page 11 of the Road Noise Policy states that the Leq,(1 hour) level of noise intrusion from land use developments with the potential to create additional traffic on local roads should not exceed 55 dB(A) during the daytime (7am to 10pm) and 50 dB(A) during nighttime (10pm to 7am).

7.0 PREDICTED NOISE FROM THE DEVELOPMENT

As stated in Section 6.0 of this report, noise levels from the proposed townhouses are classified into major and minor offensive noise sources. The main major noise sources are:

- Noise From additional vehicles on the Road, and in the driveway due to cars arriving and departing the site,
- Noise from residents gathering in the outdoor communal areas.
- Noise from air-conditioning units, pumps and compressors, electric substation and other mechanical plant.

7.1 NOISE FROM VEHICLES ON THE ROAD AND IN THE CARPARK

The proposal includes one (1) level of basement parking with a total of thirty-two (32) residence parking and fifteen (15) visitors parking (Figure 6 – Proposed Basement Car Park). There will also be three (3) ground level car parks with a total of twenty-seven (27) residence parking and sixteen (16) visitors parking. (Figure 7 – Proposed Ground Level Car Parks). Access to the carparks will be from Links Avenue.

7.1.1 NOISE ON SURROUNDING STREETS FROM ADDITIONAL TRAFFIC GENERATION

As per Hemanote Traffic study, the additional traffic generation predicted is 49 net vehicle movements in the AM peak hour and 60 net vehicle movements in the PM peak hour that are associated with the use of the proposed development (Stage 1 & Stage 2).

Predicted noise levels at 1.0 m from the building line of properties along Links Ave, due to the additional traffic generation are presented in Table 7.1.1.1 below:

Table 7.1.1.1 – Predicted Noise from additional Traffic Generation on Links Ave at 1.0m from Building Facade.

Activity	Period	Expected Noise levels $L_{eq\ 1hr}$ dB(A) from Additional Traffic Generation at 1.0m from building line along Links Ave	Complies with Traffic Noise Criteria- as per Section 5.3
Noise from Additional Traffic Generation	AM/PM Peak Hour	**53 / 48 dB(A)**	Yes <55/50 dB(A)

7.1.2 NOISE FROM CARS USING THE INTERNAL DRIVEWAY & CARPARK

Car park noises typically may comprise of people talking, car radios, cars starting and car doors closing. We depended on various acoustic literature, in addition to measurements and observations conducted at various carparks to produce the following carpark noise data:

Table 7.1.2.1– SWL Levels for Different Car Activities Expected to Occur in the Car Park

Car Park Noise Source	*Sound Power Level, dB(A)*
Car Door Closing - $L_{Max.}$	95
Car Starting - $L_{Max.}$	91
Car Accelerating	88
Car Moving at 10 km/hr	81

The above noise data is mostly applicable to the entry driveway and visitor's carpark. For the basement carpark, the only noise generated will be from cars moving in and out of the driveway ramp, as the rest of the noise producing activities will be attenuated by the basement enclosure.

All access to the site and its various carparks will be from Links Ave. The most critical noise receivers would be houses located at No, 4 & 8 Links Ave, adjacent to the driveway

entry. That is in addition to houses at No. 1 & No. 3 Smiths Ave adjacent to the visitor's car park near the eastern boundary.

Predicted noise levels at the boundaries of the nearest residential receivers due to cars entering and exiting the most critical carpark are presented in Table 7.1.2.2 below. Distance attenuation loss, including sound barrier attenuation and loss from the enclosure of the parking area have been taken into consideration when making our predictions.

The predicted noise levels will comply with the criteria of the Noise Policy for Industry 2017, provided the recommendations in Section 9 of this report are adhered to.

Table 7.1.2.2 – Predicted noise from vehicles entering and exiting the carpark at boundary of Nearest Residential receivers*, **

Activity	Period	Expected Leq at No. 4 Links Ave dB(A) *, **	Expected Leq at No. 8 Links Ave dB(A) *, **	Expected Leq at No. 1 & 3 Smiths Ave dB(A) *, **	*Compliance with Noise Trigger level (Noise Policy For Industry 2017).*
Noise impact from vehicles entering/exiting the carpark	7.00am - 6.00pm (Day)	38 dB(A)	38 dB(A)	34 dB(A)	Yes < 48 dB(A)
	6:00pm – 10:00pm (Evening)	38 dB(A)	38 dB(A)	34 dB(A)	Yes < 46 dB(A)
	10:00pm – 7:00am (Night)	35 dB(A)	35 dB(A)	31 dB(A)	Yes <43 dB(A)

***Based on Max. (1) Vehicles per 15 minutes (Day & Evening & Night)**
**** Assuming all recommendations in section 9 of this report are adhered to.**

Table 7.1.2.3 below presents $L_{A1,1\ minute}$ noise levels, at the external windows of the nearest residential receiver bedrooms of No. 2, 4 & 8 Links Ave from vehicles using the critical carpark between 10:00pm and 7:00am.

Table 7.1.2.3 – Predicted Noise from Vehicles using the carpark at nearest bedroom windows of residential receivers

Activity	Period	Expected $L_{A1,\ 1\ minute}$ dB(A) Outside Window of Residential Receiver No. 2 Links Ave	Expected $L_{A1,\ 1\ minute}$ dB(A) Outside Window of Residential Receiver No. 4 Links Ave	Expected $L_{A1,\ 1\ minute}$ dB(A) Outside Window of Residential Receiver No. 8 Links Ave	Complies with Sleep Arousal Criteria as per Section 5.1.1
Vehicles using the carpark between 10:00 pm and 7:00 am.	10:00 pm – 7:00 am	42	48	50	**Yes** $L_{A1,\ 1\ minute}$ <56 [L90+15]] dB(A), $L_{A1,\ 1\ minute}$ <54 [RBL+15] L_{AFmax} <52.

7.2 NOISE FROM COMMUNAL AREAS

The proposed stage 1 development will include fifty-three (53) townhouses. The outdoor common space area is located on the ground floor adjacent to the eastern boundary of the site (Figure 8 – Proposed Outdoor Common Space Area).
As per Harris /Pearson, Bennet, & Fidell (1977) report, the sound power level of (1) person talking is as per the table below.

Vocal Effort	No. of Talkers	Sound Power Levels [dB] at Octave Band Centre Frequencies [Hz]*,**,***							
		125	250	500	1000	2000	4000	8000	dB(A)
Females									
Casual	1	48.0	61.0	61.0	54.0	51.0	47.0	48.0	61.0
Normal	1	49.0	63.0	66.0	61.0	56.0	44.0	50.0	66.0
Raised	1	47.0	67.0	72.0	70.0	66.0	61.0	54.0	74.0
Loud	1	47.0	62.0	77.0	79.0	76.0	70.0	62.0	82.0
Shouted	1	48.0	68.0	82.0	89.0	88.0	81.0	71.0	93.0
Males									
Casual	1	58.0	62.0	63.0	55.0	53.0	51.0	48.0	63.0
Normal	1	60.0	66.0	69.0	62.0	58.0	54.0	48.0	69.0
Raised	1	65.0	71.0	76.0	70.0	66.0	61.0	55.0	76.0
Loud	1	69.0	78.0	85.0	84.0	79.0	73.0	63.0	87.0
Shouted	1	58.0	83.0	93.0	97.0	93.0	85.0	76.0	100.0

For a number of people (n) in any vocal category the increase in noise level at any octave band centre frequency is $\Delta L = 10\log_{10}(n)$.

The total noise level from all groups is determined using the equation.

$$L = 10\,Log_{10}\left(\sum_{i=1}^{n} 10^{(L_i/10)}\right)$$

Where L_i is the noise level from each group.

No residents/visitors are to be gathered in the outdoor common space area during night hours (i.e. between 10:00pm and 7:00am). No Music is to be played in the outdoor common space area.

The noise levels from people congregating in the outdoor common space area is calculated in accordance with ISO 9613.2 – *Acoustics – Attenuation of sound during propagation outdoors — Part 2: General method of calculation.* The predicted noise levels at the most affected receivers are presented in Table 7.2.1 below:

Table 7.2.1 – Predicted Noise from Outdoor common space area

Activity	Period	Expected. Leq dB(A) at No. 7 Smiths Ave	Expected. Leq dB(A) at No. 9 & 11 Smiths Ave	Expected. Leq dB(A) at No. 13 Smiths Ave	*Complies with Noise Guide for Local Government***
Residents/visitors congregating in the outdoor Common space area (Maximum Capacity)	7.00am - 6.00pm (Day) 6.00pm-10:00pm (Evening) ~~10:00pm – 7:00am (Night & Early Morning)~~ *	38 dB(A)	40 dB(A)	38 dB(A)	**Yes ✓** < 48 – Day <46 – Evening ~~<43 – Night~~

***No congregation is permitted in the outdoor common space area between 10pm – 7am. No music is to be played in outdoor common space area.**
**** NSW Noise Policy for Industry does not apply to Resident/Patron noise (Section 1.5 exclusions). Background noise level + 5 applies.**

7.3 NOISE FROM PROPOSED WASTE COLLECTION

The proposed development will have waste collection trucks entering the site to collect garbage in the designated waste collection areas. The truck is expected to enter through the driveway accessible from Links Ave before passing through the entire site and exiting through the same driveway. Typical sound power levels for truck operations are presented below.

Table 7.3.1 – Garbage Truck Noise Levels

Source	***Loading dock and vehicle movement sound power levels, dB Leq Octave band centre frequency (Hz)***						
	63	**125**	**250**	**500**	**1K**	**2K**	**4K**
Garbage truck/semi-trailer movement	114	116	111	106	104	103	102
Unloading of vehicles and bin/skip emptying	109	109	109	108	108	110	110

SoundPLAN 8.2 and its geo-database module were utilised to calculate the noise levels and noise contours along the nearest residential receivers. **SoundPLAN 8.2** allows for predicted noise levels and contours to be generated whilst accounting for ground elevation, distance and barrier attenuations, reflections, and reverberation (Figure 9 – SoundPLAN Noise Contours – Garbage Truck passing through site).

Assuming all control measurements recommended in Section 7 of this report have been fully implemented, the predicted noise levels LAeq $_{15min}$ at the nearest residential receivers have been calculated and tabulated in table 7.3.2 below.

Table 7.3.2 – Predicted Noise levels from Garbage Truck at Nearest Residential Receivers

Activity	**Period**	**Expected. Leq dB(A) at No. 2 Links Ave**	**Expected. Leq dB(A) at No. 4 Links Ave**	**Expected. Leq dB(A) at No. 8 Links Ave**	**Expected. Leq dB(A) at No. 10 Links Ave**	**Expected. Leq dB(A) at No. 9 Smiths Ave**	***Compliance with Noise Trigger level (Point A)- as per Section 5.2.3.***
Noise impact from truck driving through site and emptying bins	7.00am - 6.00pm (Day)	27 dB(A)	43 dB(A)	45 dB(A)	27 dB(A)	28 dB(A)	Yes < 48 dB(A)
	6:00pm – 10:00pm (Evening)	27 dB(A)	43 dB(A)	45 dB(A)	27 dB(A)	28 dB(A)	Yes < 46 dB(A)
	~~10:00pm – 7:00am (Night)~~	-	-	-	-	-	~~Yes~~ ** ~~< 43 dB(A)~~

***Assuming a maximum of 1 Truck per Day**
****Waste Collection will not occur during the night hours**

7.4 NOISE FROM PROPOSED ELECTRICAL SUBSTATION

The proposed electrical substation will be located on the ground floor adjacent to townhouse in block D & F (Figure 10 – Substation Location). Table 7.4.1 below lists the approximate sound power level (SWL) of various substation sizes in accordance with the "Standard AS 60076.10 – Power Transformers – Determination of Sound Levels.

Table 7.4.1 – Transformer Capacity Vs Sound Power level

Transformer Size (kVA)	Sound Power Level (dBA)
500	61.5
750	64
1000	66
1500	68
2000	70

The electrical substation proposed for the development will be rated at no more than 500 kVA. The most affected residential receivers in the development will be Units 32, 33, 44, 48 & 49. Table 7.4.2 below, predicts the internal noise levels during the operation of the substation in the most critical habitable spaces.

Table 7.4.2 – Predicted Internal Noise Levels at Receivers*

Habitable Space	Expected Leq dB(A) inside Unit 32	Expected Leq dB(A) inside Unit 33	Expected Leq dB(A) inside Unit 44	Expected Leq dB(A) inside Unit 48	Expected Leq dB(A) inside Unit 49	*Compliance with AS2107 as per Section 3.1*
Ground Floor Living Rooms	Inaudible	Inaudible	Inaudible	Inaudible	Inaudible	Yes
First Floor Bedrooms	Inaudible	Inaudible	Inaudible	Inaudible	Inaudible	Yes

Note* The above calculations have taken into account noise mitigation from distance loss and enclose mitigation from the proposed external walls and backyard fences (assumed to be gap free).

The nearest neighboring residential receiver at No. 5 Smiths Ave, is shielded from the electric transformer by units U 47, U 48, & U 49. The noise level from the transformer at the boundary of No. 5 smiths Ave is 12 d B(A) < the Project Noise Trigger Level.

8.0 MECHANICAL VENTILATION FOR RESIDENTIAL UNITS FACING CABRAMATTA RD & CUMBERLAND HWY

To achieve the indoor design sound levels required to habitable areas, it is assumed that the windows and doors are closed to avoid noise intrusion. Habitable Areas should not exceed 40 dB(A) during day the while bedrooms should not exceed 35 dB(A) during the night.

Windows openable by 20% cause a 10 dB(A) reduction between the internal and external noise levels. The "Development near Rail Corridors and Busy Roads – Interim Guideline" page 19, Section 3.6.1 states that "If internal noise levels with windows or doors open exceed the criteria by more than **10 dB(A)**, the design of the ventilation for these rooms should be such that occupants can leave windows closed, and also to meet the ventilation requirements of the Building Code of Australia."

Applying the above for the proposed development, an open window during the daytime gives an internal level (LAeq, 1 hour) of 61 dBA (i.e. 71 dBA – 10dB). This exceeds the day criterion of 50 dBA (i.e. 40 dBA + 10dB) as stated above. The night-time criterion of 45 dBA (i.e. 35 dBA + 10 dB) will also be exceeded.

Therefore, we recommend that mechanical ventilation is required for all residential units ***facing the Cumberland Hwy*** for the proposed development at No. 400-404 Cabramatta Rd Cabramatta.

Specific ventilation requirements are outside of our scope of expertise; however, an acoustically insulated building must be kept virtually airtight to exclude external noise. Therefore, mechanical ventilation, noise absorbing ventilators or air-conditioning are needed to provide fresh air and to control odours.

Requirements for ventilation are given in the Building Code of Australia (BCA) under Section 3.8.5. Indoor air quality is given in Australian Standard AS 1668.2 - 2002, *"The use of ventilation and air-conditioning in buildings - Ventilation design for indoor air contaminant control".* The following are typical ways to achieve ventilation through the property with windows closed:

1. Ducted Air-Conditioning System where the Fan Coil Units provide outside air mixed with the return air is always considered as a first option. Ductwork and plenums must be acoustically treated.
2. A device similar/equivalent to the Aeropac Room Ventilator and Air-Filter is fitted to the required rooms.

3. Silenceair external wall vents, together with upgraded toilet and laundry fans to provide forced flow-through ventilation. The fans in this case must be operating whenever external doors/windows are closed (available from www.silenceair.com)
4. Fresh air fan system to draw air from the façade with no view of the main road into the residence could also be used.

8.1 NOISE IMPACT OF MECHANICAL PLANT & EQUIPMENT

A range of mechanical plant, equipment and ventilation will be included in the proposed development a No. 400-404 Cabramatta Rd Cabramatta. Noise emitted by the use of the proposed mechanical plant is assessed by the Noise Policy for Industry 2017 and Fairfield Council requirements.

The proposed levels of basement parking are located below ground level which makes natural ventilation not possible. Thus, a mechanical extract system should be used. The mechanical ventilation system needs to achieve all required air changes for exhaust fume and extract smoke clearance in accordance with Australian Standard AS 1668.2 *"The use of ventilation and air-conditioning in buildings Mechanical ventilation in buildings"*.

A garage roller door may also be located at the entry of the car park. Predicted noise levels from the operation of garage roller doors have been estimated according to typical rollers doors installed at other developments. The average time duration for a garage roller door to fully open or close is approximately 30 seconds. Air-conditioning might also be installed in the proposed development. Typical noise levels for car park exhaust fans, condensing units and car-park roller doors are presented in Table 8.1.1

Table 8.1.1 – Typical Mechanical Plant Leq Sound Power Levels (dB(A))

Frequency [Hz]	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Typical Car Park Exhaust Fan	89	84	91	88	87	84	81	75	**91**
Typical Condensing Unit	71	69	67	61	58	54	47	44	**64**
Car-Park Security Roller Door	73	75	77	79	82	77	76	74	**85**

The operation of the proposed mechanical plant & equipment will comply with the criteria of the NSW Noise Policy for Industry 2017, provided the recommendations in Section 9.0 of this report are adhered to.

9.0 RECOMMENDATIONS

9.1 MECHANICAL PLANT

The recommendations listed in Table 9.1 below are essential for the noise break-out from the proposed development to comply with section 8.0 of this report.

Table 9.1– Typical Mechanical Plant Recommendations

Item	RECOMMENDATIONS
Basement Roller Door	• Ensure maintenance and lubrication of motor bearings, door tracks and joints. • The proposed security door fitted to the car parking area entrance must be independently mounted on rubber pads to prevent vibration noise transmission through the concrete walls and/or columns.
AC Condenser Units	• We recommend that all outdoor air-conditioning units to be acoustically enclosed or set away by more than 3.0m from any boundary with a sound power level of each unit no more than 65 dB(A).
General Mechanical Plant	• **We recommend acoustic assessment at CC stage of all proposed mechanical plants and equipment once the development has been approved and full Mechanical Services Plans have been prepared. In the meantime, we recommend the following**: ○ Procurement of quiet plant (when required) and the maintenance of existing plant. ○ Strategic positioning of plant away from potential sensitive receivers. ○ Commercially available silencers or acoustic attenuators for air discharge and air intakes of plant. ○ Acoustically lined and lagged ductwork. ○ Acoustic screens and barriers between plant and sensitive neighbouring premises; and/or, ○ Partially enclosed or fully enclosed acoustic enclosures around plant.

As the proposed development is still in the initial application stage, we recommend that further acoustic assessment for the mechanical plant is carried out when the

development has been approved and Mechanical Services plans have been prepared for our review.

9.2 SOUND BARRIER FENCE

We recommend that a 2.1m/1.8 m high lapped & capped timber, colorbond, or brick fence to be constructed along the perimeter of the Ground Floor tapered down to 1.2m as per Figures 11 – Sound Barrier Location.

9.3 ACCESS TO OUTDOOR COMMUNAL AREA & MUSIC

No residents/visitors are to be gathered in the outdoor common space area during night hours (i.e. between 10:00pm and 7:00am). No Music is to be played in the outdoor communal area.

9.4 DELIVERIES & WASTE COLLECTION

All deliveries and waste collection take place between 7:00 a.m. to 10:00 p.m.

9.5 SIGNS

The following signs are to be placed in and around the Townhouses.

- Signs reminding residents to minimise noise at all times shall be installed at every ground level carpark and the outdoor common space area to ensure that all sounds are to be restricted within the property and not transmitted into adjoining residences.
- Signs are to be also installed in the outdoor common space area advising that no access is permitted during the night hours (10:00pm – 7:00am).

10.0 DISCUSSION AND CONCLUSION

The construction of the proposed development at 400-404 Cabramatta Road West, 2-18 Orange Grove Road and 6 Links Avenue, Cabramatta, if carried out as recommended in the plans and specifications and including the acoustic recommendations in this report, will meet the requirements of Clause 102 of the State Environmental Planning Policy – (Infrastructure) 2007, AS 2107:2016 *'Acoustics – Recommended Design Sound Levels and Reverberation Times'*, and Fairfield Council requirements.

Noise break-out from the proposed development, including operation of all proposed mechanical plant & equipment; will comply with the requirements of the NSW Noise Policy for Industry (2017) and Fairfield Council requirements, provided recommendations in Section 7 of this report are adhered to.

Should you require further explanations, please do not hesitate to contact us.

Yours Sincerely,

M. Zaioor
M.S. Eng'g Sci. (UNSW).
M.I.E.(Aust), CPEng
Australian Acoustical Society (Member)

11.0 APPENDIX

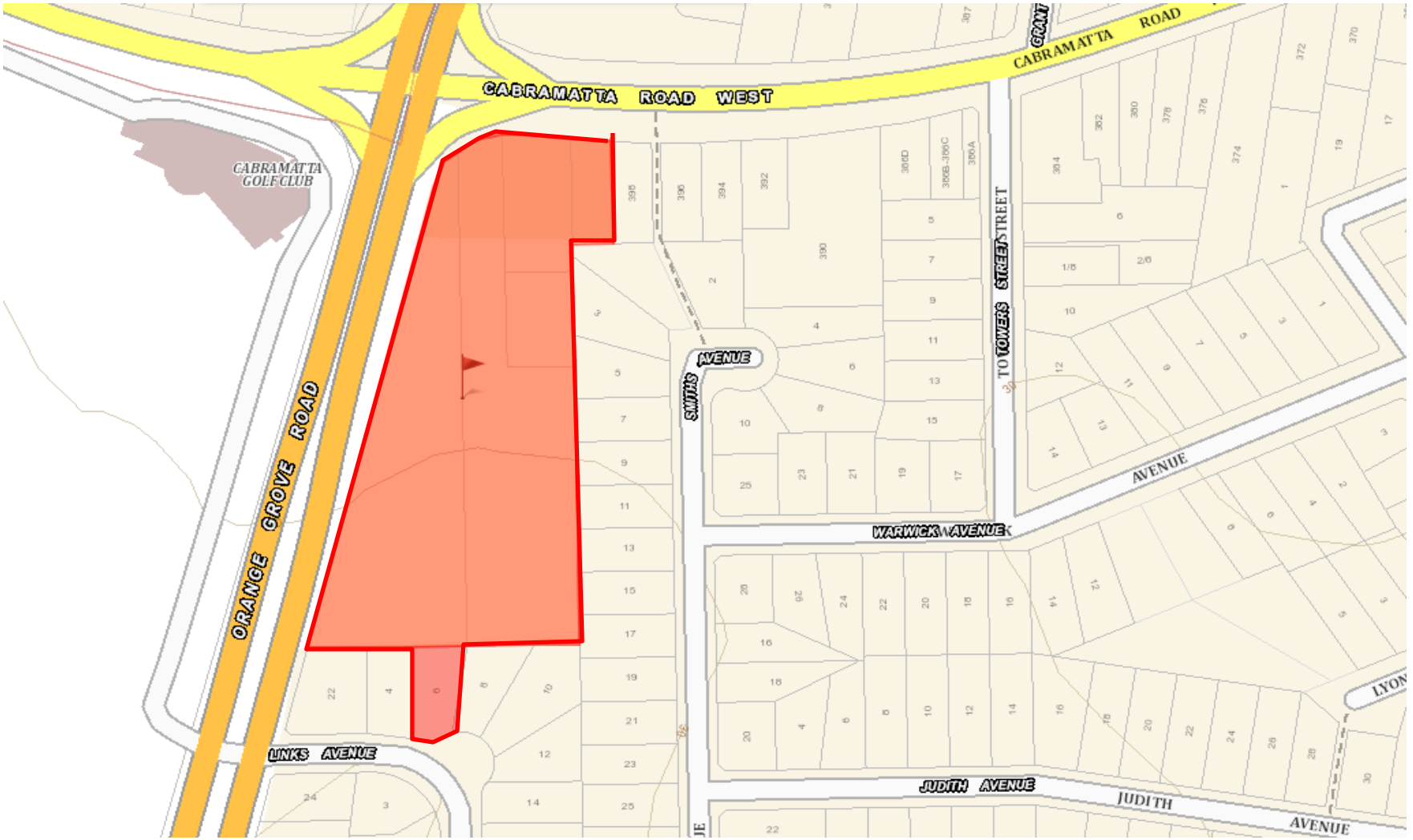


Figure 1 - Site Location

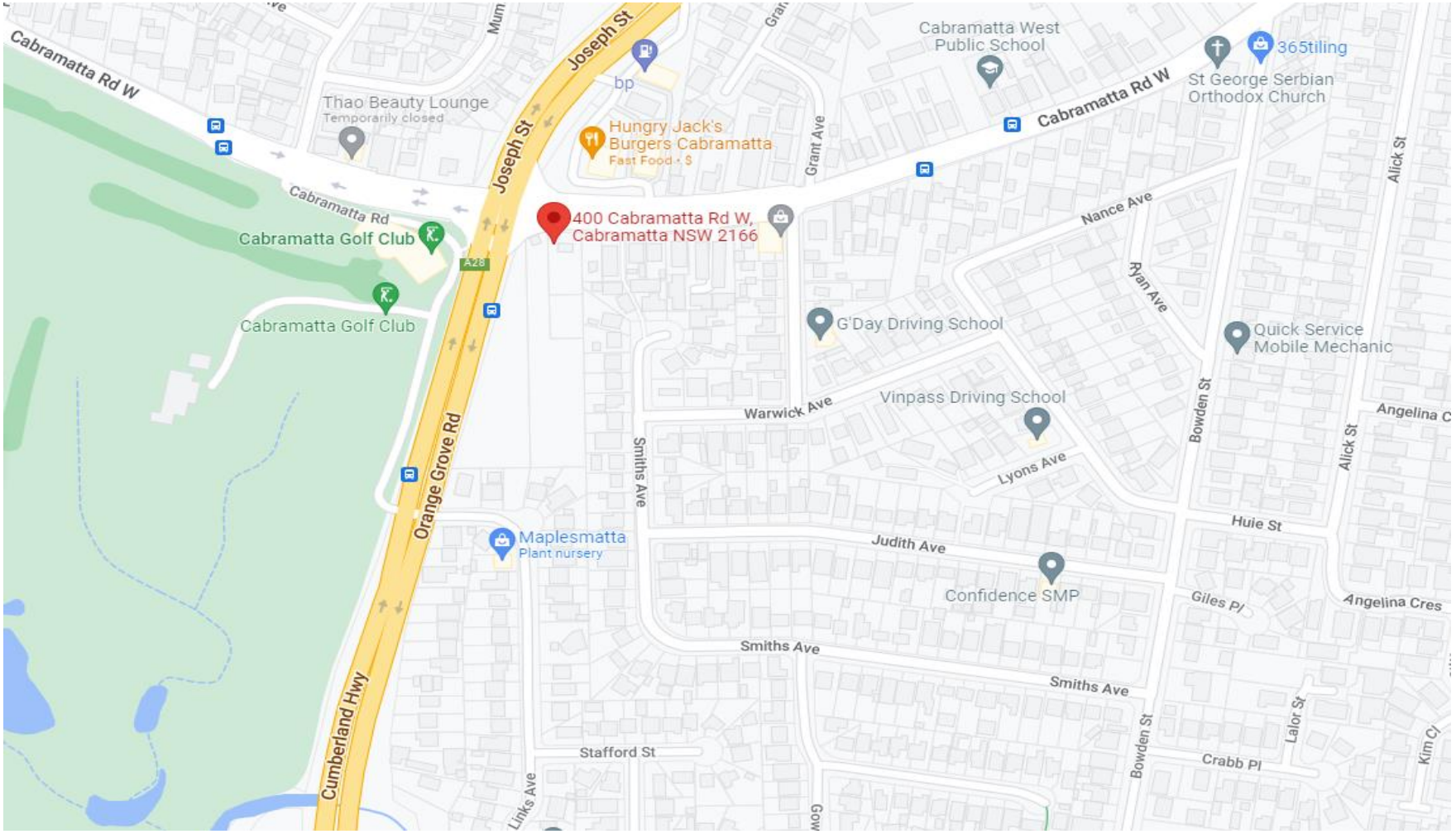


Figure 2 – Surrounding Environment

Figure 3 – Noise Reading Locations (Points A & B)

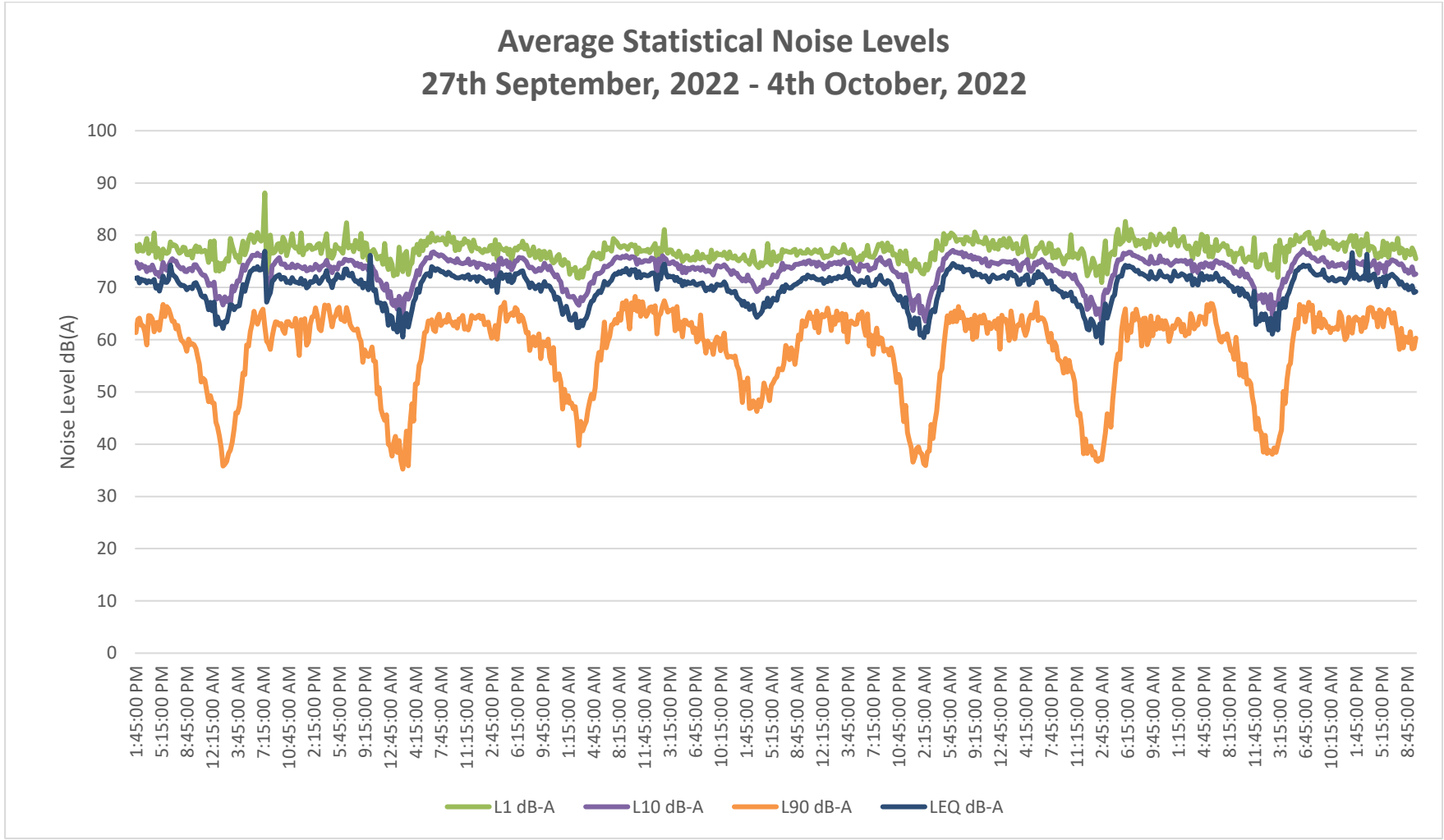


Figure 4 - Noise Survey Point A

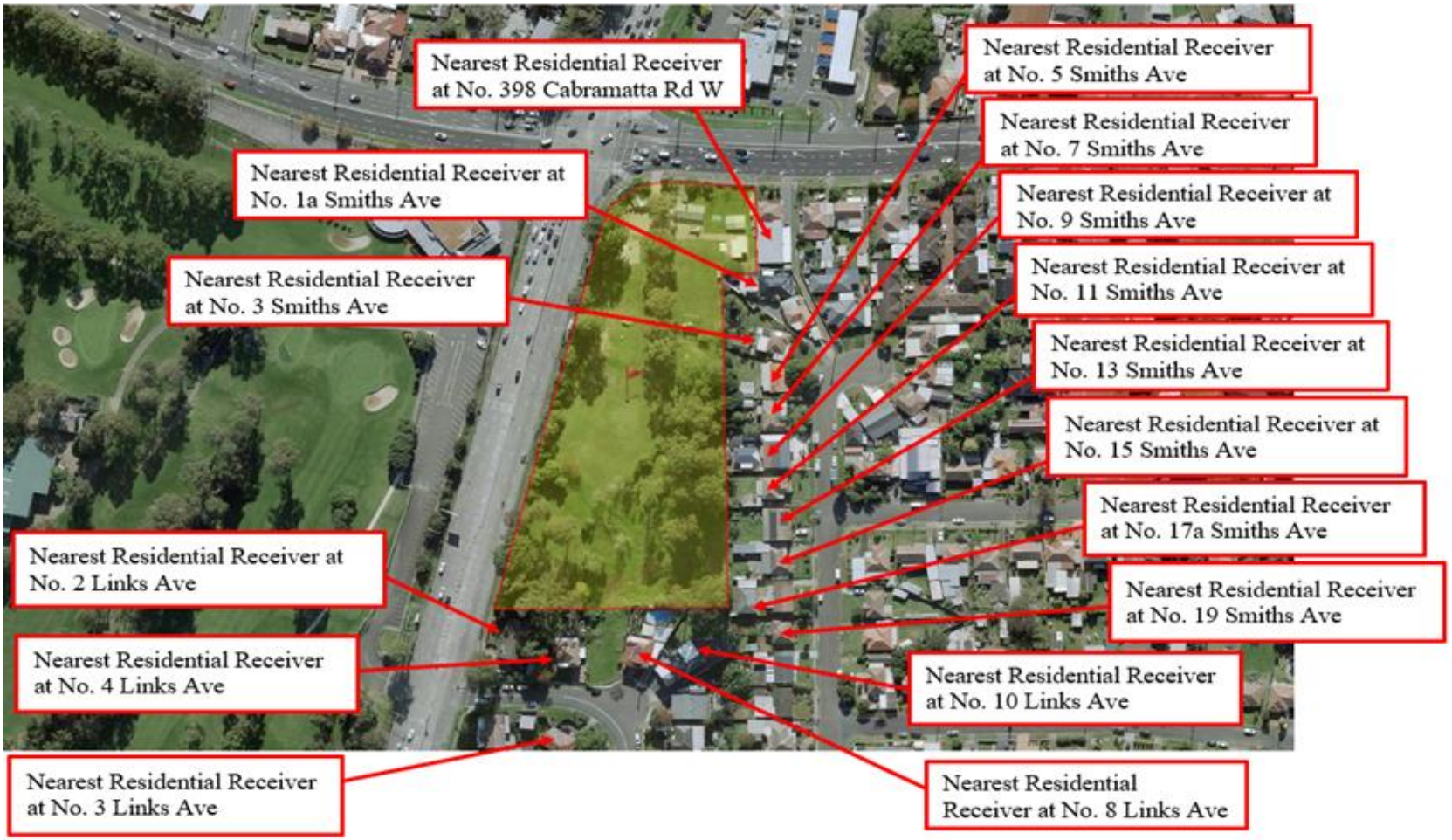


Figure 5 - Nearest Residential Receive

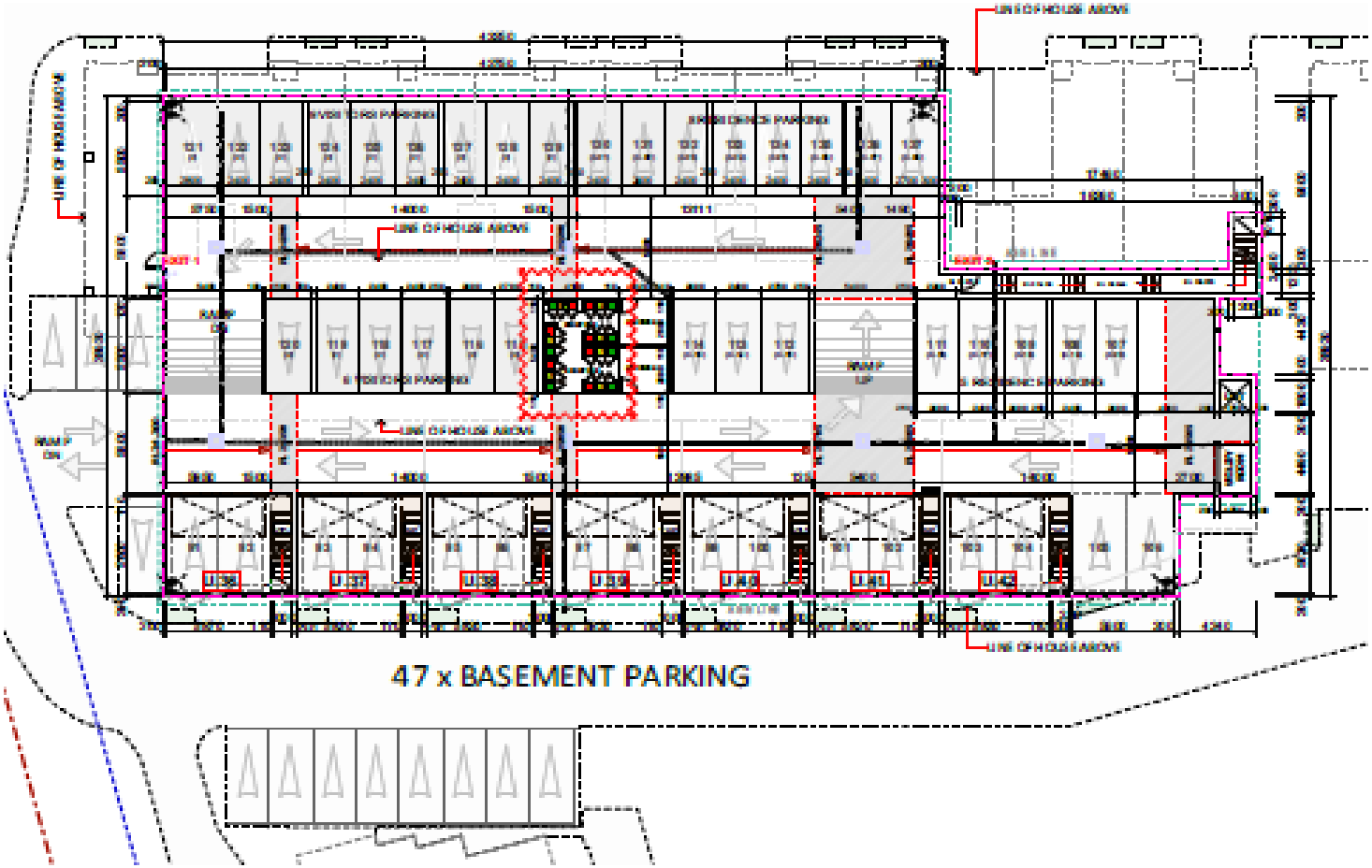


Figure 6 - Proposed Basement Carpark

Figure 7 - Proposed Ground Level Carparks

Ground Level Car Parking Spaces

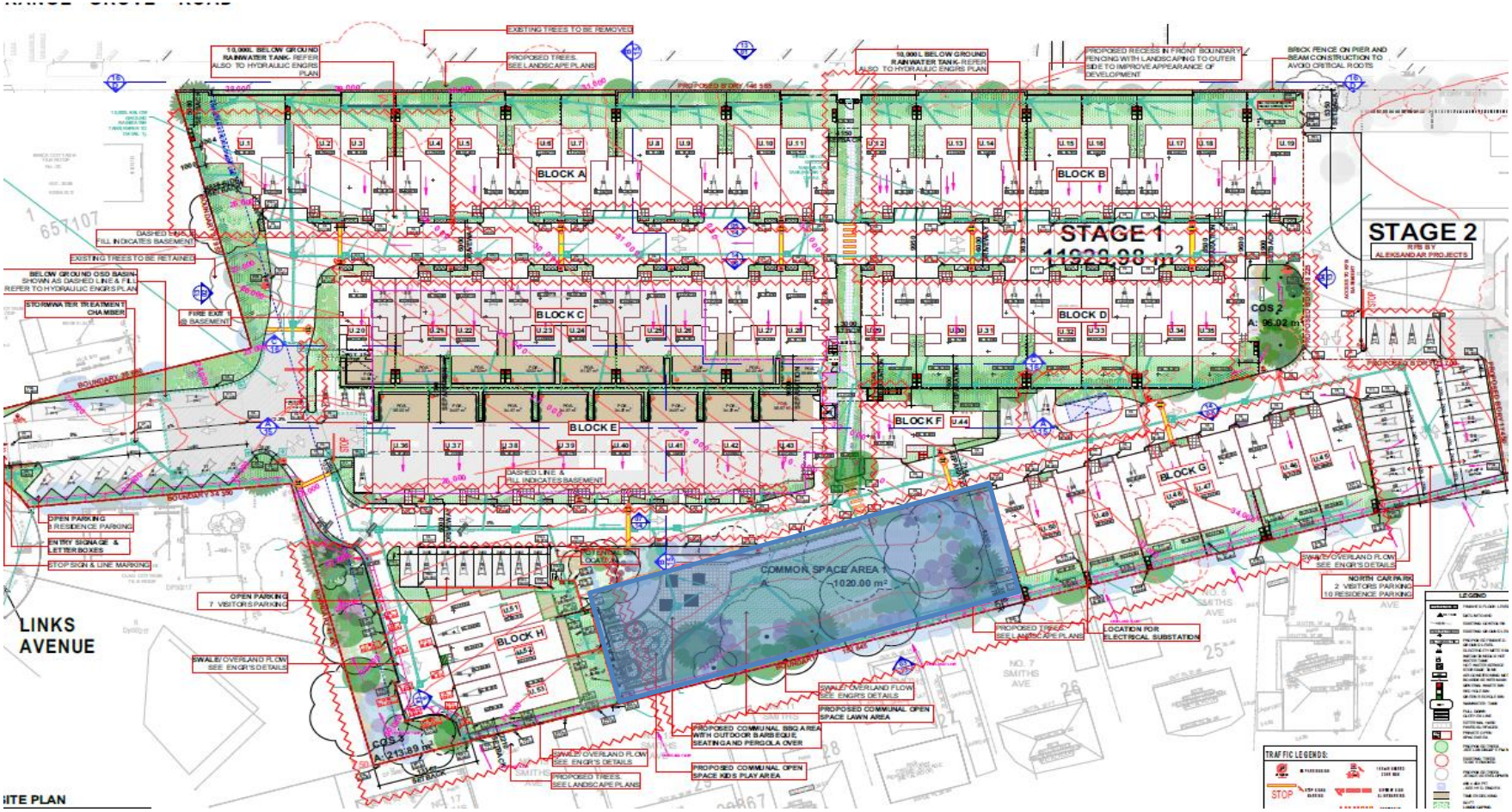


Figure 8 - Proposed Outdoor Common Space Area

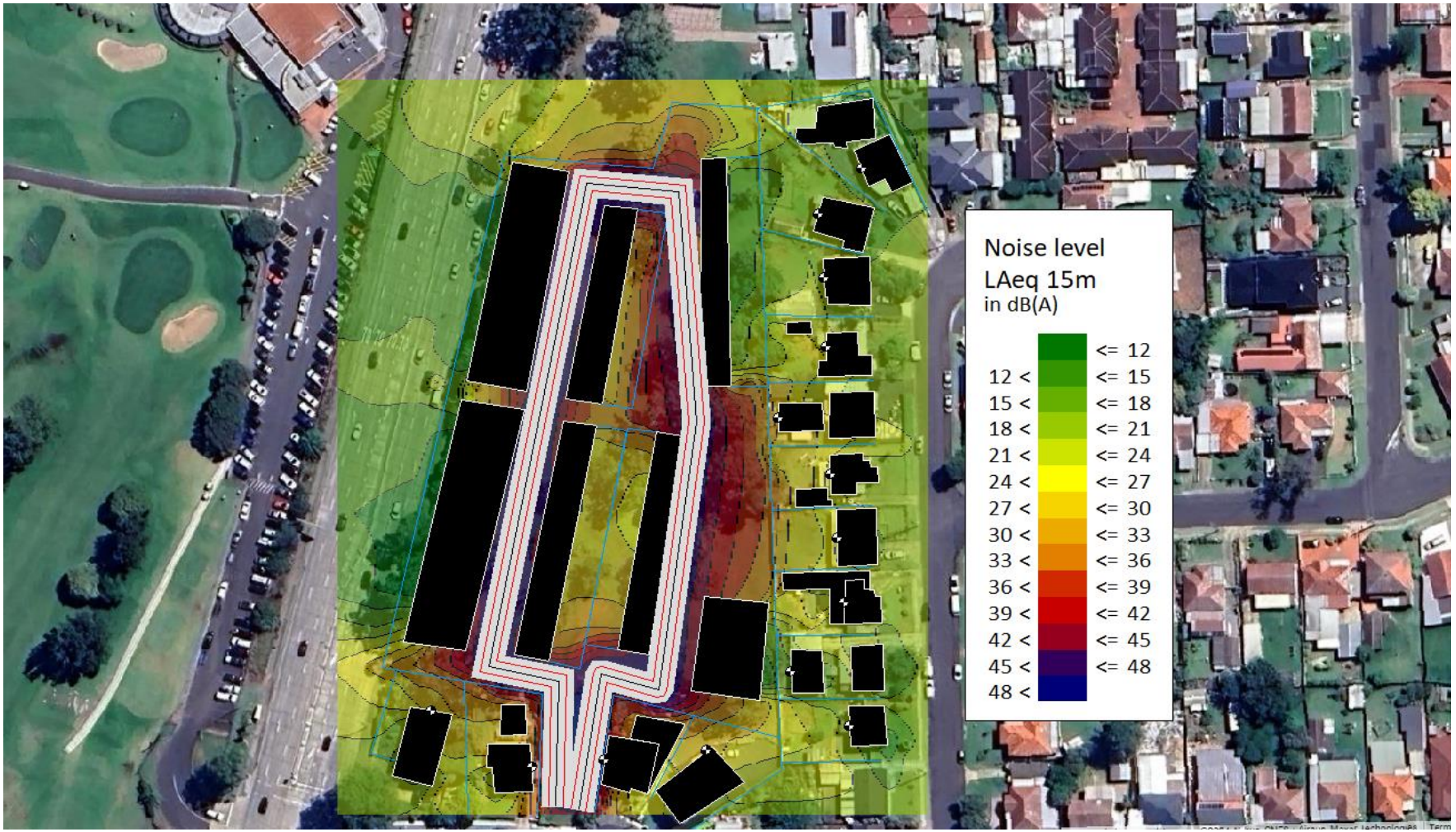


Figure 9 - SoundPLAN Noise Contours – Garbage Truck passing through site.

Figure 10 - Substation Location

Figure 11 - Proposed Sound Barrier Locations (Ground Floor)