



**BRIGHTSIDE HOSPITAL '2'
149, 151 & 153 GILLIES AVENUE
EPSOM, AUCKLAND**

for
Southern Cross Hospitals Ltd

ACOUSTIC REPORT

**Prepared by
Earcon Acoustics Limited**

Proposed Plan Change

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QUALITY ASSURANCE

Document: Brightside Hospital 2
Acoustic Report

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1. INTRODUCTION

This report has been prepared to provide an acoustic assessment of the environmental noise effects from rezoning the site from Residential (Single House and Mixed Housing Suburban) to Special Purpose – Healthcare Facility and Hospital Zone, the noise likely to be generated by activities enabled under the Special Purpose – Healthcare Facility and Hospital Zone and the noise limits applicable at neighbouring receivers. The proposed plan change is applicable to 3 Brightside Rd and 149, 151 & 153 Gillies Ave.

We note that the proposed zoning does not ultimately change the noise limit applicable at the neighbouring receivers.

The expansion to the hospital will include private rooms, recovery areas, operating theatres, and 1 basement level of car parking spaces. The acoustic report also addresses the following:

- a. Noise emissions from the subject site and associated activities.
- b. Traffic noise.
- c. The required acoustic treatment to achieve compliance with the Auckland Unitary Plan Noise Limits.
- d. Recommended internal noise levels in accordance with AS/NZS 2107:2016.
- e. Construction Noise and Vibration.

2. SITE AND ENVIRONS

2.1 Location

The subject site is located at 3 Brightside Rd, 149, 151, 153 Gillies Ave in Epsom Auckland. The site and surrounding area are zoned Residential. As a part of a private plan change request the hospital is applying to change the site zoning to Special Purpose – Healthcare Facility and Hospital Zone (HFH Zone). This will ultimately have no change on the noise requirement regarding noise generated from the HFH Zone received at the neighbouring residential properties.

The site is exposed to high traffic noise levels from Gillies Ave.

2.2 Proposed Activity

The activities enabled under the HFH Zone includes recovery rooms, private rooms, operating theatres, consultant rooms and associated parking.

2.3 Operating hours

The hospital will operate 24 hours a day 7 days a week.

Figure 1: Aerial View of Site



2.4 Ambient Noise Levels

Ambient noise levels were undertaken in the area of the site to assess the existing ambient noise levels in the area. Measurements were undertaken on Wednesday the 28th of March 2018

The ambient noise level measurements were carried out in accordance with NZS6801:2008 (Acoustics-Measurement of Environmental Sound). The assessment is as per NZS 6802:2008 (Acoustics-Environmental Noise).

The measurements will be undertaken with a calibrated Rion NL-52 Type 1 precision integrating sound level meter with 1/3 octave band real-time analyser.

Table 1: Ambient Noise Levels

Location	Noise Levels dB				Notes
	LAeq	LA10	LA90	LAFmax	
1	55	60	45	69	
2	54	55	45	71	
3	65	68	54	73	

Ambient 24-Hour Noise Logging

Noise Logging was undertaken on Thursday the 7th of June 2018 at three separate locations around Brightside Hospital at Brightside Rd, Auckland.

- We logged noise levels for 3 periods of 5 days each to cover weekdays and weekends.
- Logging was undertaken in accordance with the requirements of “NZS6801:2008 Measurement of Sound”.
- Noise measurements were averaged over 15-minute periods, with frequency distributions in 1/3 Octaves.
- Noise measurements were carried out with a calibrated Rion NL52 Type 1 precision integrating sound level meter with logger and real-time analyser.
- The purpose of the monitoring was to assess the levels of noise in the vicinity of the hospital pertaining to noise and hospital operations

The measurements were undertaken in the locations as shown in the figure below:

Figure 2: Noise Measurement and Logging Locations

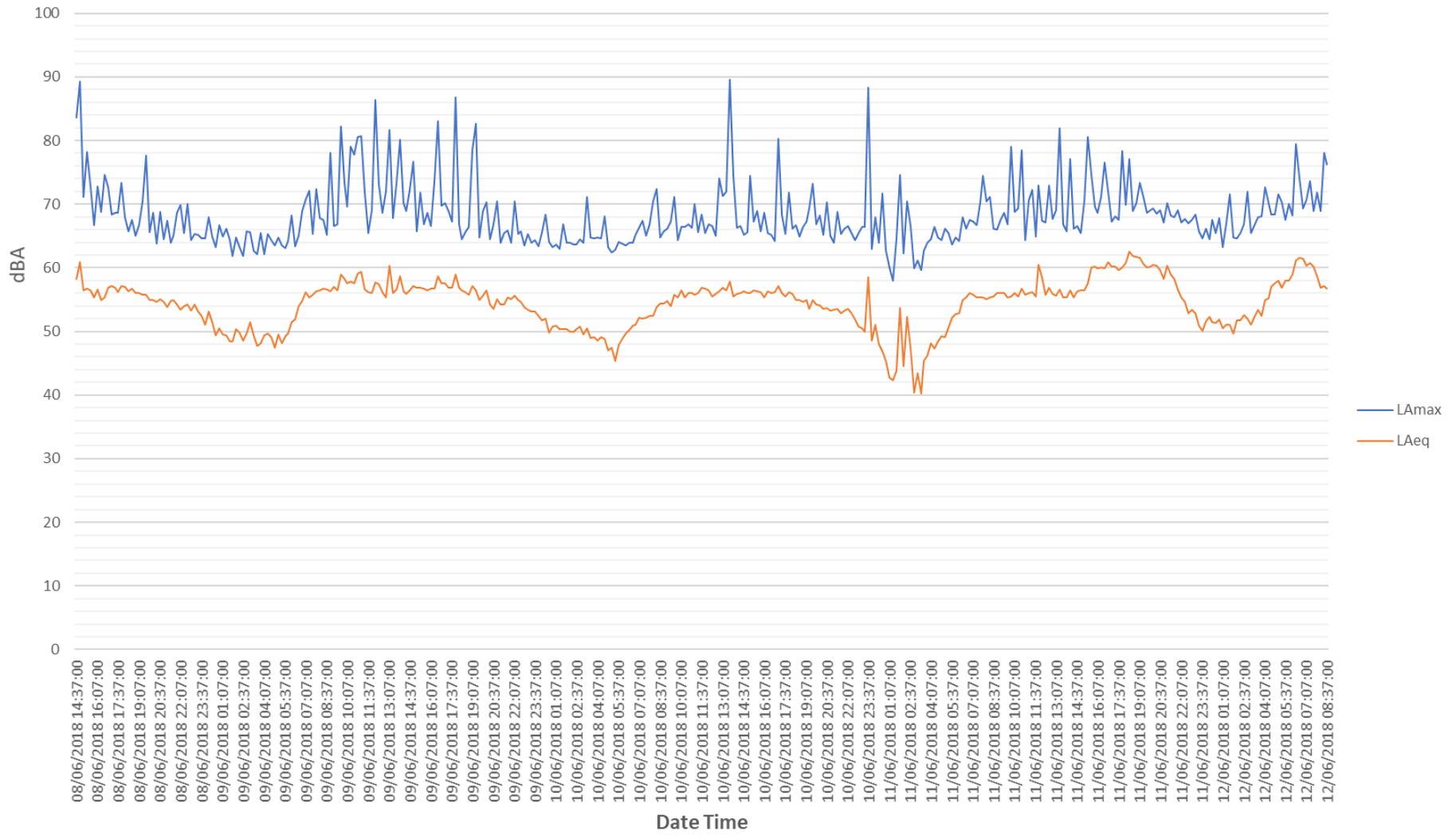


- **Location 1:** At the rear yard of 151 Gillies Ave, approximately 10m from the roadside edge of Gillies Ave.
- **Location 2:** At the rear of Brightside hospital
- **Location 3:** At the front yard of Brightside hospital to the right of the entrance, at approximately 10m from the roadside edge of Brightside Rd

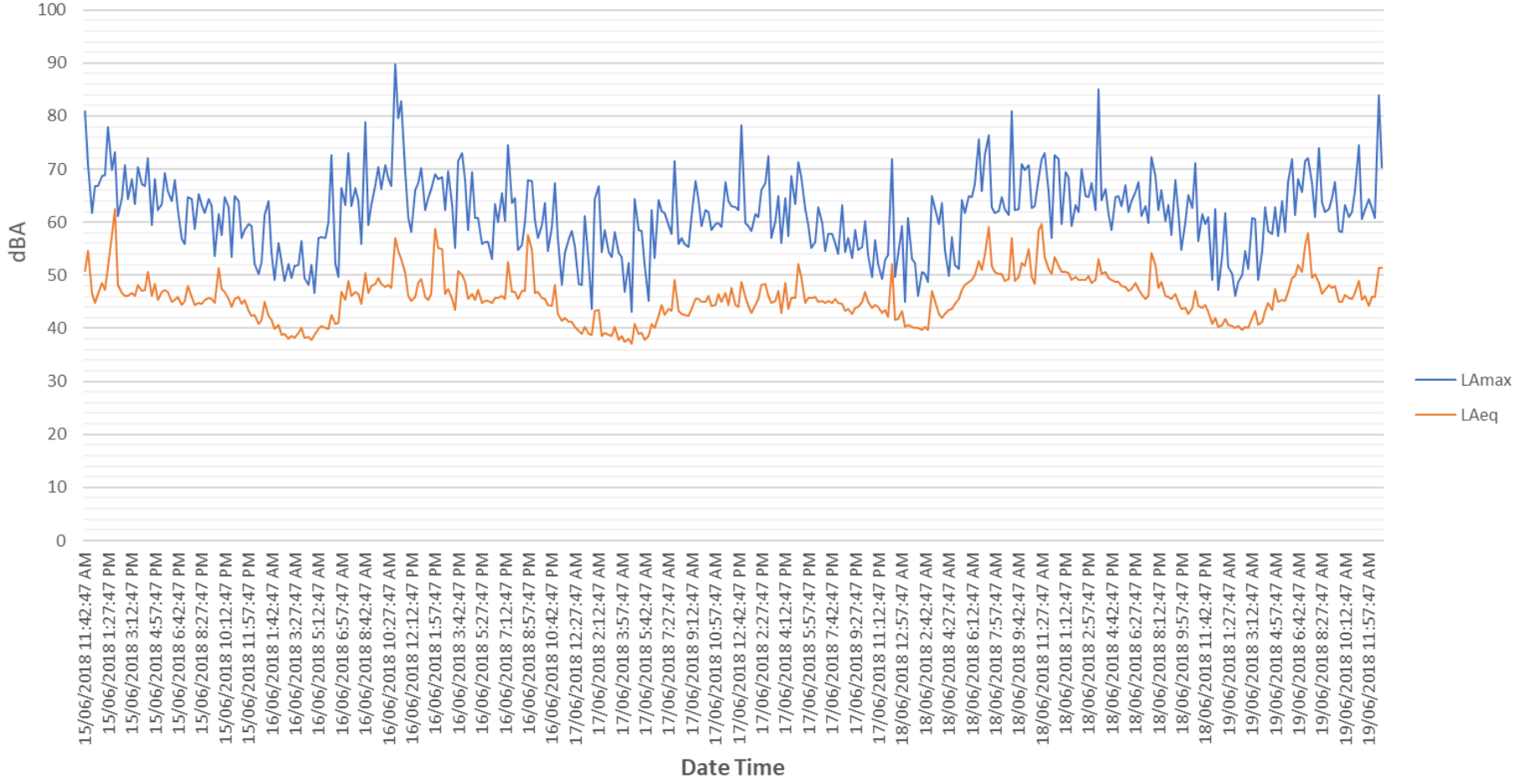
The Graphs in the following pages detail the logged noise Levels including the weighted averages over 15-minute periods. The definitions of the measurement metrics are as follows:

- **LA_{eq}:** Equivalent Sound Level, weighted over time and across frequencies (A-Weighting)
- **LA_{max}:** A-weighted, Maximum Sound Level during a period

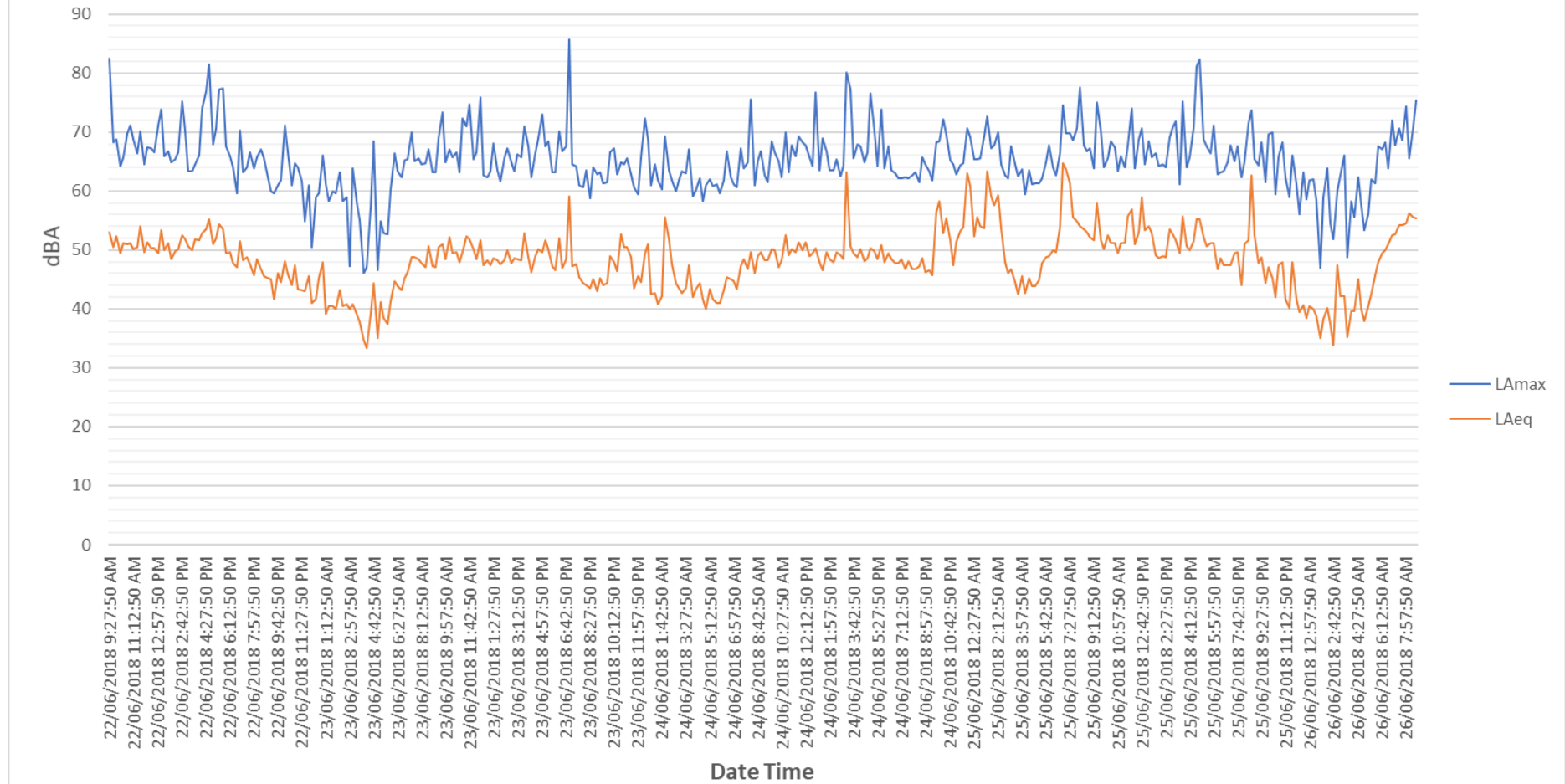
Gillies Ave - Location 1



Rear - Location 2



Brightside Road - Location 3



24 – Hour Logging Analysis

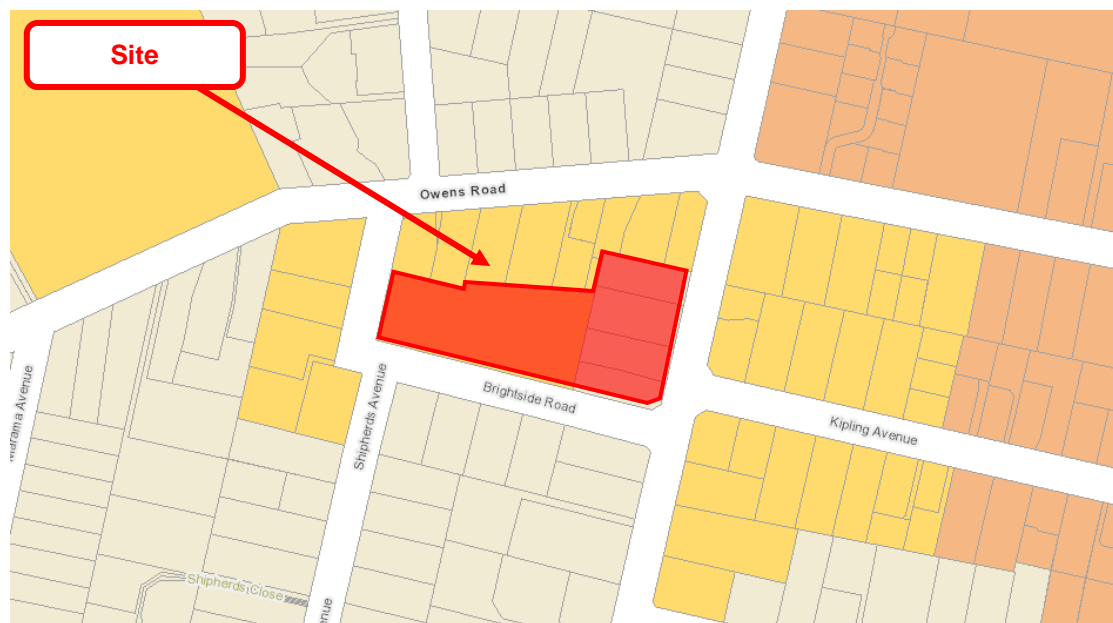
The ambient noise levels as indicated by the noise logging typically remains above 40dB LAeq with the quietest periods occurring between midnight and 7am. This level of noise matches the applicable night time noise limit at the neighbouring receivers.

Approaching the eastern boundary adjoining Gillies Ave remain on average above 50dB LAeq, throughout the night time. This level of noise is significantly above the relevant noise limit of 40dB LAeq, and would suggest any potential night time noise associated with traffic movements may produce up to 47dB LAeq without resulting in any audible increase in the overall noise levels.

3. AUCKLAND UNITARY PLAN REQUIREMENTS

The proposed development is to be located at 3 Brightside Road & 149, 151 – 153 Gillies Ave in Epsom, Auckland, in an area zoned Residential – Mixed Housing Suburban Zone and Residential – Single House Zone. It is proposed that the site be rezoned Special Purpose – Healthcare Facility and Hospital Zone. The following rules apply:

Figure 3: Zoning.



E25.6.13 Noise levels in the Special Purpose – Healthcare Facility and Hospital Zone

(1) The noise (rating) level from any activity measured within the boundary of any site in the Special Purpose – HealthCare Facility and Hospital Zone must not exceed the levels in Table E25.6.13.1 Noise levels in the Special Purpose – Healthcare Facility and Hospital Zone below:

Table 2: Referencing Table E25.6.13.1 of the AUP

Time	Noise Level
Monday to Saturday 7am – 10pm	55dB LAeq
Sunday 9am – 6pm	
All other times	45dB LAeq 75dB LAFmax

E25.6.22 All other zone interfaces

(1) Except as provided for in Standards E25.6.14 to E25.6.21 above, where noise generated by any activity on a site in one zone is received by any activity on a site in a different zone, the activity generating the noise must comply with the noise limits and standards of the zone at the receiving site.

E25.6.2 Maximum Noise Levels in Residential Zones

(1) The noise (rating) levels and maximum noise level arising from any activity in the Residential – Large Lot Zone, Residential – Rural and Coastal Settlement Zone, Residential – Single House Zone, Residential – Mixed Housing Suburban Zone, Residential – Mixed Housing Urban Zone and the Residential – Terrace Housing and Apartment Buildings Zone measured within the boundary of an adjacent site in these residential zones must not exceed the levels in Table E25.6.2.1 Noise levels in residential zones below:

Table 3: Referencing Table E25.6.2.1 of the AUP

Time	Noise Level
Monday to Saturday 7am – 10pm	50dB LAeq
Sunday 9am – 6pm	
All other times	40dB LAeq 75dB LAFmax

The noise shall be measured with a sound level meter complying at least with the International Standard IEC 651 (1979): Sound Level Meters, Type 1.

E25.6.1 General Standards

(4) The noise limits of the Plan do not apply to emergency service sirens and callout sirens during emergency situations.

In regards to the noise rules and requirements no changes will result from the proposed plan change and associated zoning change. The requirements of rule E25.6.2 will apply to all neighbouring receivers. Additionally in regards to construction noise and vibration the applicable rules remain unchanged.

E25.6.27 Construction noise levels in all zones except the Business – City Centre Zone and the Business – Metropolitan Centre Zone

(1) Noise from construction activities in all zones except the Business – City Centre Zone and the Business – Metropolitan Centre Zone must not exceed the levels in Table E25.6.27.1 Construction noise levels for activities sensitive to noise in all zones except the Business – City Centre Zone and the Business – Metropolitan Centre Zone when measured 1m from the façade of any building that contains an activity sensitive to noise that is occupied during the works.

Table 4: Referencing Table E25.6.27.1 of the AUP

Time of week	Time Period	Maximum noise level (dBA)	
		Leq	Lmax
Weekends	6:30am – 7:30am	60	75
	7:30am – 6:00pm	75	90
	6:00pm – 8:00pm	70	85
	8:00pm – 6:30am	45	75
Saturdays	6:30am – 7:30am	45	75
	7:30am – 6:00pm	75	90
	6:00pm – 8:00pm	45	75
	8:00pm – 6:30am	45	75
Sundays and public holidays	6:30am – 7:30am	45	75
	7:30am – 6:00pm	55	85
	6:00pm – 8:00pm	45	75
	8:00pm – 6:30am	45	75

E25.6.30 Vibration

(1) Construction and demolition activities must be controlled to ensure any resulting vibration does not exceed:

- a) the limits set out in German Industrial Standard DIN 4150-3 (1999): Structural vibration – Part 3 Effects of vibration on structures when measured in accordance with that Standard on any structure not on the same site; and
- b) the limits Table E25.6.30.1 Vibration limits in buildings in any axis when measured in the corner of the floor of the storey of interest for multi-storey buildings, or within 500mm of ground level at the foundation of a single storey building.

Table 5: Referencing Table E25.6.30.1 of the AUP

Receiver	Period	Peak Particle Velocity Limit Millimetres/second
Occupied activity sensitive to noise	Night-time 10pm to 7am	0.3 mm/s
	Daytime 7am to 10pm	2 mm/s
Other occupied buildings	At all times	2 mm/s

Works generating vibration for three days or less between the hours of 7am to 6pm may exceed the limits in Table E25.6.30.1 Vibration limits in buildings above, but must comply with a limit of 5mm/s peak particle velocity in any axis when measured in the corner of the floor of the storey of interest for multi-storey buildings, or within 500mm of ground level at the foundation of a single storey building, where

- i. all occupied buildings within 50m of the extent of the works generating vibration are advised in writing no less than three days prior to the vibration-generating works commencing; and
- ii. the written advice must include details of the location of the works, the duration of the works, a phone number for complaints and the name of the site manager.

(2) Permanently installed stationary vibrating, reciprocating and rotating machinery and all piping, ducting and other equipment attached to such machinery must be installed and maintained so that any resulting vibration does not exceed the limits of Table E25.6.30.2 Vibration levels for stationary machinery when measured in any occupied room of any building on another site or in any occupied unit under different ownership from the source of the vibration. Vibration must be measured in accordance with ISO 2631-2:2003 Mechanical vibration and shock – Evaluation of human exposure to wholebody vibration – Part 2: Vibration in buildings (1Hz to 80Hz):

Table 6: Referencing Table E25.6.30.2 of the AUP

Affected occupied building or area	Time of day	Maximum vibration level in root mean square velocity (mm/s) between 8 and 80Hz
Noise sensitive spaces	7am – 10pm	0.20
Bedrooms and sleeping areas only within activities sensitive to noise	10pm – 7am	0.14

Under the Auckland Unitary Plan no internal noise rules apply to noise sensitive spaces from existing ambient noise generated by road traffic. The following recommendations for internal noise levels are based on the AS/NZS 2107:2016 standard.

4. PROPOSED PLAN CHANGES AND EFFECTS

The proposal includes changing the site zoning from Residential – Mixed Housing Suburban Zone and Residential – Single House Zone to Special Purpose – Healthcare Facility and Hospital Zone.

In regards to the noise rules and requirements, the proposed change results in the application of rule E25.6.13. However, this rule is only applicable between sites zoned Special Purpose – Healthcare Facility and Hospital Zone. As the only sites within the proposed Special Purpose – Healthcare Facility and Hospital Zone are under common ownership of the existing hospital, the noise rules whilst applicable may be disregarded due to common ownership, or disregarded with written consent.

The relevant noise rules applicable to the neighbouring residential receivers remains E25.6.2, via rule E25.6.22. Additionally the noise and vibration rules regarding construction will remain unchanged with the relevant rules remaining E25.6.27 and E25.6.30. Ultimately the proposed plan change to rezone to HFH Zone will not alter the noise amenity standards relevant at the neighbouring receivers.

5. POTENTIAL NOISE EMISSIONS

5.1 Noise Sources

5.1.1 Mechanical Plant

The air-handling units, chiller units will be installed externally. We will review the selection and location of the specific mechanical plant to ensure compliance and include the necessary acoustic treatment in the detailed design stages of the project. The chillers noise level is L_w 90dBA each, which is a typical noise level for similar chillers serving similar size buildings.

5.1.2 Traffic Noise

New car parking spaces surrounding a centrally located building and parking spaces within the basement, with access to the basement level parking requires vehicles to drive around the building along the boundaries of the site is anticipated as a worst case scenario. Under this scenario acoustic fencing, 2m high, is required along the northern and western boundaries shared with 30, 30A and 32A Owens Rd to mitigate the traffic noise levels during the day and night-time periods. The necessary acoustic mitigation may be provided dependant on operation and site layout and would be assessed for any development of the site.

An estimated trip generation of up to 49 vehicle trips over the busiest hour has been used in the predicted noise levels below. The night-time traffic flow rate is assumed be no more than 12 vehicles over any given hour, this is considered to be a conservative estimate, and is the maximum traffic flow rate, allowable to meet compliance at the neighbouring receivers, with the proposed acoustic fencing. As above, this would be assessed for any development on the site.

5.1.3 Rubbish Collection and Recycling

Loading will take place entirely on site within the eastern portion of the parking area fronting Gillies Ave. The bin store will be accessed through a loading bay door facing east. The following collections are anticipated:

- General rubbish
- Cardboard
- Polystyrene
- Mixed Recycling
- Office paper

The predicted noise levels assume that up to 2 collection types are occurring at the same time on the eastern side of the site. The trucks are assumed to manoeuvre onto site turn around and leave through the same entrance/exit, no trucks are therefore assumed to manoeuvre to the northern portion of the site near to the residential neighbouring boundaries. The trucks are assumed to keep engines running whilst the collection takes place, which is assumed to be complete within no more than 5 minutes.

5.1.4 People Noise

The occupants are a combination staff, patients and visitors. Noise will be primarily contained within the buildings. People noise within the car park will be negligible relative to the ambient traffic noise levels. The people noise will be less than minor.

5.1.5 Emergency Vehicle Noise

There are no emergency services proposed with the extension, all ambulance arrivals and departures will be planned transfers that will not involve the use of sirens or flashing lights. Nevertheless, sirens used for emergency situations are not subject to the applicable noise limits, being exempt in accordance with rule E25.6.1 (4).

5.2. Predicted Noise Emissions

5.2.1 Modelling & Methodology

- An environmental model has been constructed for the proposed site using CadnaA version 4.3 computer modelling program.
- The modelling method for noise propagation over distance is based on the international standard ISO 9613: "Acoustics – Attenuation of sound during propagation outdoors" methodology.
- The model allows importing digital ground elevation contours and data to define the topography and data for each of the noise sources.
- The input noise levels in the model are based on typical plant noise data.
- Using the 1/1 octave bands noise levels is more accurate and identifies tonality issues.
- The program then calculates the L_{Aeq} dB level which is the basis of the Auckland Unitary Plan noise limits.

5.2.2 Noise Emissions from the Subject Site

I summarise in the table below the noise emissions from the subject site and associated activities. The table includes the cumulative noise levels from all the sources. Typically noise averaging during the daytime can be applied, however, averaging has not been applied to the predicted noise levels below.

Table 7: Potential Noise Emissions from Traffic and Mechanical Plants

Boundary	Noise Limits L _{Aeq} dB	Predicted cumulative noise dB L _{Aeq}		Comment
		Day	Night	
30 Owens Rd	50 – Day 40 – Night	48	40	Complies at all times
30A Owens Rd		46	39	
32A Owens Rd		48	40	
34 Owens Rd		44	37	
36 Owens Rd		44	37	
2 Brightside Rd		<40	<35	
4 Brightside Rd		<40	<35	

The noise levels are based on 15 mins average with mechanical plant noise sources operating continuously within that period.

In accordance with E25.6.1 (4) the noise emissions generated by the emergency services sirens and callout sirens during emergencies are not subject to the noise limits of the Auckland Unitary Plan. The potential noise from use of sirens on or close to site has not been included in the predicted noise levels above.

6. CONSTRUCTION NOISE & VIBRATIONS

There will be no changes to the rules and requirements associated with construction noise and vibration due to the proposed zone change.

7. CONCLUSIONS

The proposed plan changes will not change the noise limit requirements applicable at the neighbouring receivers.

It is also considered that the traffic and mechanical plant noise that would be enabled under the HFH Zone would be able to comply with the Auckland Unitary Plan requirements taking into account the cumulative noise levels associated with hospital activities. Where necessary mitigation and management may be implemented to meet the applicable noise limits and would be able to be assessed for any development proposal.