MARSHALL DAY Acoustics

BATEMANS BAY COMMUNITY HEALTH NOISE AND VIBRATION REPORT

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Project: **BATEMANS BAY COMMUNITY HEALTH**

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1.0 INTRODUCTON

In January 2022, the NSW Government announced $20m to develop a HealthOne at Batemans Bay, now referred to as the Batemans Bay Community Health (BBCH) project.

The proposed BBCH will provide integrated and complementary healthcare services with the new Eurobodalla Regional Hospital (ERH), being developed in Moruya, NSW, 25km south of Batemans Bay.

The existing Batemans Bay Hospital and Health Service is aged infrastructure, and no longer considered fit for purpose. With the planned service changes at the existing Batemans Bay facility, the BBCH project provides the opportunity to purpose build infrastructure to provide a contemporary facility in Batemans Bay for community health services.

Batemans Bay Community Health (BBCH) will provide centre-based health and outreach community and outpatient services. BBCH will provide integrated and complementary community health care across the Eurobodalla and will improve local access to a range of services including:

- Allied Health
- Child, Youth and Family Services
- Women's Health
- Sexual Health
- Community nursing and wound management
- Palliative care
- Aboriginal Health
- Community Mental Health and Drug & Alcohol

An endorsed schematic design concept has been developed by NSW Health Infrastructure in order to proceed with consent authority approvals and design development. Marshall Day Acoustics has been engaged by NSW Health Infrastructure to prepare a Noise and Vibration Report to assess noise impact from the construction and operational phases of the project, based on the endorsed design.

2.0 THE PROJECT

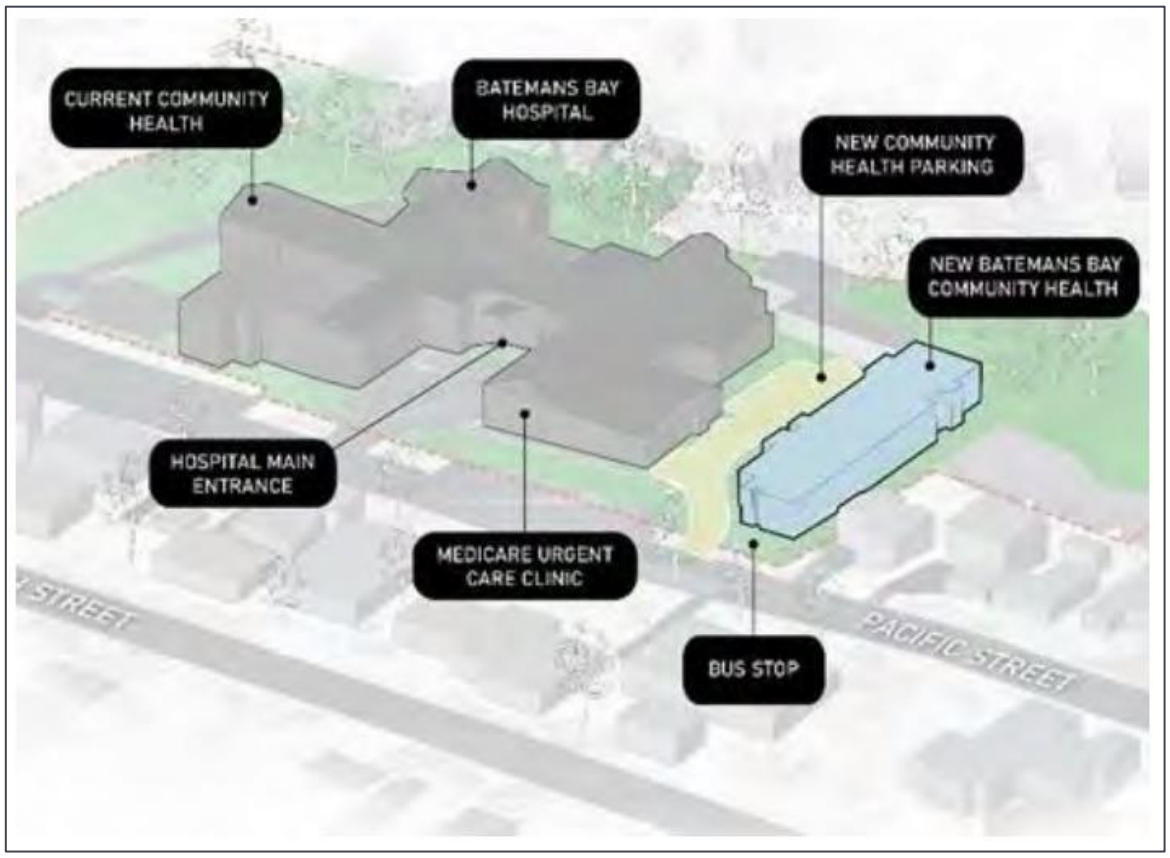
2.1 Site Location

The Batemans Bay Hospital site is identified as Lot 22, Plan DP1152713 via https://maps.six.nsw.gov.au and is located at 7 Pacific Street, southeast of the town centre. It is accessed from the Princess Highway to the west via South Street or Beach Road to the north.

The Eurobodalla Council Local Environmental Plan 2012 (LEP 2012) defines the zoning for the site as R3 – Medium Density Residential.

The LEP 2012 shows the majority of the precinct as the same R3 zoning category. There is RE2 Private Recreation space (golf course) to the east. RE1 Public Recreation space northeast along the coast and C2 Environmental Conservation Park area to the west towards the town centre. The following figure from the Schematic Design report prepared by NSW Health Infrastructure shows the location of the new Batemans Bay Community Health Centre (BBCH) in the context of the existing site and the locale.

Figure 1: Master Plan Development Built Form (Source: BBCH Schematic Design Report)



Surrounding properties to the south, east and west are residential. Private medical services are located opposite the site on the western side of Pacific Street comprising Batemans Bay Medical Centre, a commercial imaging and pathology collection service.

The site is currently accessed via three points, northern and southern end and the main entry to emergency. Carparking is currently located at the northern and southern ends of the site with on street parking located along the site frontage both sides of the main entry.

The proposed new BBCH building will be located on the site of the current southern carpark area.

The existing site, proposed BBCH building and surrounding properties are shown in Figure 2.

Figure 2: Project Site, Nearby Receivers and Noise Monitoring Locations (Source: Nearmaps)

2.2 Project Description

The project involves the development of a new Community Health Centre that will provide the Batemans Bay community with access to walk in health services. The adjacent new Urgent Care Centre (UCC) located on the existing hospital site is intended to take care of minor injury and illness. The UCC is operational and does not form part of the BBCH project.

The building footprint is elongated along the southern boundary. The built form is commensurate with its direct neighbours and is essentially single story partially suspended construction with an undercroft space at the eastern end of the southern facade to house engineering services including the air-conditioning plant and hot water systems.

The facade utilises a metal panel cladding system with a masonry brick base proposed to form a datum along the publicly accessible areas on the northern and western facades. Pitched roofs and eaves suit the residential context with clerestory windows oriented along the north-facing access facade. Sheet metal roof cladding is proposed.

The hours of operation have not been defined as following:

Community Health	Monday to Friday 8.00 am to 5.00 pm
Pathology (collection)	Monday to Friday 8.00 am to 4.30 pm

Vehicle access will be via the southernmost existing driveway crossover that currently serves the emergency department ambulance zone and back of house logistics.

The new on grade carpark aligns with the hospitals back of house hardstand. Approximately 17 spaces are provided including 2 accessible.

A new concrete driveway and maintenance access road will be constructed adjacent to the southern site boundary. This road is required to allow LHD access to the emergency generator and will also be used to maintain plant located in the undercroft of the new BBCH building.

The demolition of the existing ambulance bay ramp and awning will be required to facilitate the new accessway to the carpark.

The construction program requires the BBCH facility to be built while the existing hospital remains functional. Construction of the BBCH building will form Stage 1a with the carpark construction designated as Stage 1b. Stage 1b will be completed on the decommissioning of the emergency department and the back-of-house services at the hospital.

The proposed site layout is shown in Figure 3 and the general ground floor arrangement in Figure 4.

Figure 3: Proposed Site Plan (Source: Architectus)

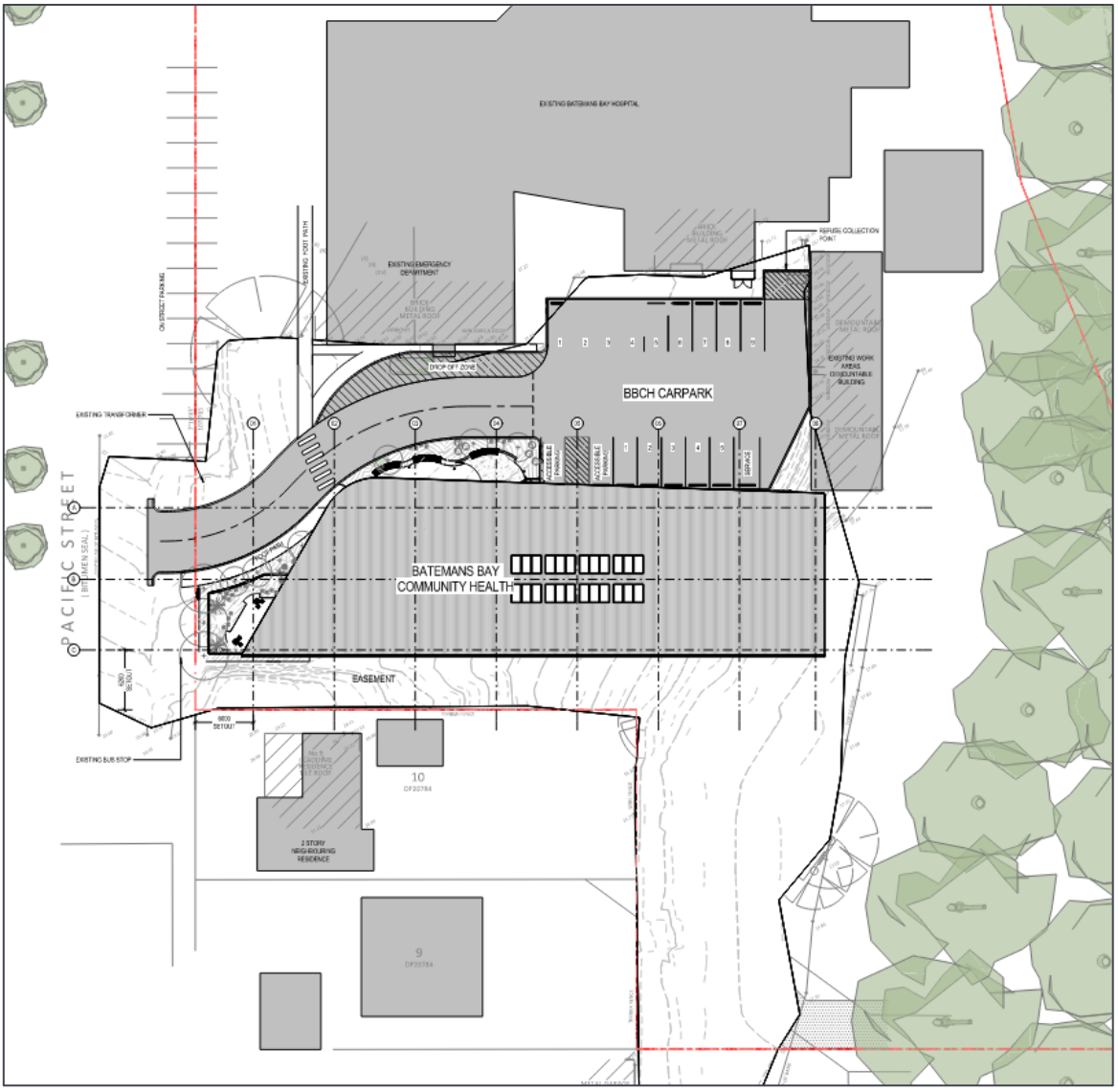


Figure 4: General Ground Floor Arrangement (Source: Architectus)

3.0 EXISTING NOISE ENVIRONMENT

3.1 Ambient Noise Monitoring

Unattended monitoring of ambient noise levels was undertaken at the site between 16 April 2024 and 28 April 2024. The logger was positioned on the southern side of the existing hospital loading and back of house area (Location NM1) as shown in Figure 2.

Instrumentation for the survey comprised a 01dB Fusion Sound Level Meter (S/N: 15360). Calibration of the meter was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dBA. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

The logger continuously sampled noise levels over the entire survey period and calculated relevant statistical indices for each 15-minute interval. All measurements were undertaken in general accordance with AS1055:2018 *Acoustics – Description and Measurement of Environmental Noise* and the NSW EPA's *Noise Policy for Industry* (NPfI). Data measured during periods of adverse weather, established through consultation with the weather station set up adjacent to the logger, has been excluded. The survey results are included in Appendix B.

3.2 Survey Results

3.2.1 Unattended Noise Monitoring

The measured data was processed according to the NPfI assessment time periods to establish project-specific noise trigger limits for operational noise. Table 1 details the RBL (background) noise levels recorded during the NPfI day, evening and night periods.

Table 1: Measured Ambient Noise Levels Corresponding to NPfI Assessment Time Periods

Location	Day		Evening		Night	
	7.00* am – 6.00 pm		6.00 pm – 10.00 pm		10.00 pm – 7.00* am	
	RBL	L_{Aeq}	RBL	L_{Aeq}	RBL	L_{Aeq}
NM1	41	60	39	50	39	48

*8:00am on Sundays and public holidays

3.2.2 Attended Noise Monitoring

Since unattended monitoring was conducted at the existing hospital site, attended measurements were carried out over 15-minute periods at locations representative of the residential receiver areas to the south, east and west (refer Figure 2). By establishing the relative difference between the levels measured at the logger location over the same time period, the corresponding background and ambient noise levels can be adjusted to account for any relative differences so that the assessment criteria derived is appropriate for the receiver areas considered.

Instrumentation for the measurements comprised a Brüel & Kjær Sound Level Meter Type 2250 (S/N: 3010265) fitted with microphone and windshield. Calibration of the meter was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dBA. All equipment carried appropriate and current calibration certificates.

The results of measurements are presented in Table 2.

Table 2: Attended Noise Monitoring Results

Location		Date	Time	Noise Level - dB		Notes	Level at Logging Location NM1 for same period	
				L_{A90}	L_{Aeq}		L_{A90}	L_{Aeq}
NM2	Adjacent Residential Property 9 Pacific Street	29.04.2024	15.40	40	44	Hospital mech just audible	-	-
NM3	Residential properties Western side of Pacific Street	29.04.2024	15.18	39	57	Normal background, traffic controls L_{Aeq}	-	-
NM4	Bavarde Avenue	29.04.2024	14.43	42	63	Traffic on Bavarde Ave dominant	-	-
NM2	Adjacent Residential Property 9 Pacific Street	30.04.2024	09.42	40	48	Hospital mech just audible	42	50

Noise levels at logger location NM1 were essentially controlled by hospital roof-mounted mechanical plant operation. The contribution from the existing plant, although lower in level, was faintly audible at the attended measurement location NM2 adjacent the neighbouring residential property (9 Pacific Ave).

The background noise level measured at NM3, on Pacific Street, was considered representative of the typical daytime background level at receivers in this area without mechanical services noise contribution.

At NM4 (receiver R3) on Bavarde Ave, the background noise level experienced was increased due to the influence of road traffic both on Bavarde Ave and golf course and waterfront precinct.

Based on the results of attended and unattended monitoring, together with the procedures documented in the NPfI, the RBLs shown in Table 3 have been determined to apply for the assessment of future construction and operational noise at the residential receivers considered.

Table 3: RBLs Adopted for Noise Assessment

Location	Day	Evening	Night
	7.00* am – 6.00 pm	6.00 pm – 10.00 pm	10.00 pm – 7.00* am
	RBL	RBL	RBL
NM1	41	39	39
NM2	40	37	37
NM3	39	37	32[1]
NM4	41	39	34[1]

Note 1: RBL during the night period based on evening RBL - 5dB. Levels are consistent with NPfI Table 2.3. Background noise levels at NM3 & NM4 not controlled by mechanical services operations.

4.0 ASSESSMENT CRITERIA

4.1 Construction Noise & Vibration

4.1.1 Construction Noise

The NSW EPA *Interim Construction Noise Guideline* (ICNG) provides guidance for assessing noise associated with construction activities and sets out management levels above which there may be community reaction to construction noise.

Management levels are described as:

- Noise Affected level - which is a level *"above which there may be some community reaction to noise"*
- Highly Noise Affected level - which is a level *"above which there may be a strong community reaction to noise"*

The ICNG also sets out recommended standard hours for construction work, these are:

- Monday to Friday 0700-1800 hrs
- Saturdays 0800-1300 hrs
- No work on Sundays or public holidays

Based on the above, the Noise Affected management level is derived by considering the background noise level (referred to in the ICNG as the rating background level, RBL) and hours at which construction works occur; adding 10 dB for work during the recommended hours or adding 5 dB for work outside these recommended hours.

The Highly Noise Affected level for residential receivers is set independent of the RBL, as 75 dB $L_{Aeq,\ 15\ mins}$.

Based on the measured daytime RBL, the construction noise management levels for the nearby residential receivers are summarised in Table 4 and apply throughout the recommended standard construction hours noted above. The noise management level applicable to the existing hospital building is also included.

Table 4: Construction Noise Management Levels for Residential and Noise Sensitive Receivers

Land Use	Management Level, dB $L_{Aeq\ 15\ min}$	
	Noise Affected	Highly Noise Affected
Residential	50[1,2]	75
Hospital wards & operating theatres	45[3]	-

Note 1: A daytime RBL of 40dBA adopted for consistency for assessment of construction noise at all surrounding residential properties.
Note 2: External noise level. Applies at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level.
Note 3: Internal noise level to be assessed at the centre of the occupied room.

4.1.2 Construction Vibration

Vibration Limits - Human Comfort

Criteria for assessment of the effects of vibration on human comfort are set out in British Standard BS 6472-1992. The methods and criteria documented are the basis for the "preferred" and "maximum" vibration levels adopted by the NSW EPA publication *Assessing Vibration: A Technical Guideline* (AVTG,2006).

Acceptable values of human exposure to continuous vibration, such as that associated with construction works are dependent on the time of day and the use or sensitivity of an occupied space. Guidance on preferred values for continuous vibration is set out in Table 5.

Table 5: Preferred and Maximum Vibration Levels for Human Comfort - Continuous Vibration

Place	Time	Peak Particle Velocity (mm/s)	
		Preferred	Maximum
Critical working areas (e.g. hospital operating theatres precision laboratories)	Day or night time	0.14	0.28
Residences	Daytime	0.28	0.56
	Night time	0.20	0.40
Offices	Day or night time	0.56	1.1
Workshops	Day or night time	1.1	2.2

Note 1: Daytime period is 7.00 am to 10.00 pm and night-time period is 10.00 pm to 7.00 am.

In the case of intermittent vibration, which is caused by construction plant such as rock breakers, the criteria are expressed as a Vibration Dose Value (VDV) and are presented in Table 6. Calculation of VDV is based on the level and the duration of the vibration events over the relevant period.

Table 6: Preferred and Maximum Vibration Levels for Human Comfort – Intermittent Vibration

Location	Day[1]		Night[1]	
	Preferred Value VDV	Maximum Value VDV	Preferred Value VDV	Maximum Value VDV
Critical working areas (e.g. hospital operating theatres precision laboratories)	0.1	0.2	0.1	0.2
Residences	0.2	0.4	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80

Location	Day[1]		Night[1]	
	Preferred Value VDV	Maximum Value VDV	Preferred Value VDV	Maximum Value VDV
Workshops	0.80	1.60	0.80	1.60

Note 1: Daytime period is 7.00 am to 10.00 pm and night-time period is 10.00 pm to 7.00 am.

Vibration Limits – Effects on Structures

Whilst the AVTG provides guidelines for the assessment of vibration impacts on people (human comfort), no direct instruction or guidance is provided for the assessment of impacts on structures. For assessment of vibration effects on structures, the German standard *DIN4150-3 Structural vibration – Effects of vibration on structures* – 1999 is generally adopted.

The guideline vibration limits, as reproduced from the standard, are detailed in Table 7.

Table 7: Structural Damage Criteria DIN 4150 (PPV mm/s)

Line	Type of structure	Vibration at the foundation of building, at a frequency of			Vibration in horizontal plane of highest floor, at all frequencies
		1Hz to 10Hz	10Hz to 50Hz	50Hz to 100Hz and above	
I	Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20[1]	20 to 40	40 to 50	40
II	Dwellings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15

For commercial and industrial buildings 20 mm/s PPV is applicable.

British Standard BS 7385 Part 2-1993 *"Evaluation and measurement for vibration in buildings Part 2"* also sets guide values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. These levels are judged to give a minimum risk of vibration-induced damage, where minimal risk for a named effect is usually taken as a 95% probability of no effect. The limits adopted in BS 7385 are similar to but slightly less stringent than those recommended by DIN 4150.

BS 7385 also makes the following refence to heritage building:

"a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive."

4.2 Operational Noise

4.2.1 Eurobodalla Council

The Batemans Bay Regional Centre Development Control Plan 2011 does not include any qualitative or quantitative requirements in regard to noise emissions.

4.2.2 NSW NPfI

The NSW *Noise Policy for Industry* (NPfI) provides a framework and process for deriving noise criteria for consents and licences that enable the Environment Protection Authority to regulate premises that are scheduled under the *Protection of the Environment Operations Act 1997*.

The NPfI is not intended to be applied in the assessment of smaller developments and noise sources regulated by local government. Councils may however, find the policy to be of assistance in noise assessment and land-use planning.

The NPfI documents a procedure for assessment and management of (industrial) noise which considers limiting intrusiveness (the level of the noise emission above the prevailing background sound level – only applicable to residential receivers) and also maintaining amenity by minimising the cumulative increase in the ambient noise level that may occur with successive developments.

Intrusiveness Noise Level

For assessing intrusiveness, the background noise level (L_{A90}) is measured and the Rating Background Level (RBL) determined. The intrusiveness of an industrial noise source may generally be considered acceptable if the equivalent continuous noise level (L_{Aeq}) of the source (measured over a 15-minute period) does not exceed the background noise level (RBL) by more than 5dB.

Amenity Noise Level

The amenity assessment is based on noise criteria specific to land use and associated activities. The criteria relate only to industrial-type noise and do not include community noise, amplified music/patron noise, transportation noise (when on public transport corridors), noise from motor sport, construction noise, blasting, shooting ranges, occupational workplace noise and wind farms.

The amenity noise level aims to limit continuing increases in noise levels which may occur if the intrusiveness level alone is applied to ongoing developments within an area.

The recommended amenity noise level represents the objective for total industrial noise at a receiver location. The project amenity noise level represents the objective for noise from a single industrial development at a receiver location.

To prevent increases in the ambient noise environment due to the cumulative effect of several developments, the project amenity noise level for each new source of industrial noise is set at 5dBA below the recommended amenity nose level.

The following exceptions are applicable to determining the project amenity noise level:

- For high traffic areas the amenity criterion for industrial noise becomes the $L_{Aeq,period(traffic)}$ minus 15dB.
- Where cumulative industrial noise is not a consideration because no other industries are present in, or likely to be introduced into the area, the relevant amenity noise level is assigned as the project amenity noise level for the development.

Neither of these exceptions are applicable in this instance.

Amenity noise levels are not used directly as regulatory limits. They are used in combination with the project intrusiveness noise level to assess the potential impact of noise, assess mitigation options and determine achievable noise requirements.

An extract from the NSW NPfI that relates to the amenity noise levels for surrounding receivers is given in Table 8.

Table 8: NPfI Amenity Noise Levels

Receiver	Noise Amenity Area	Time of Day[1]	Recommended Amenity Noise Level $L_{Aeq,Period}$ (dB)
Residence	Suburban	Day	55
		Evening	45
		Night	40
Hospital ward (external)	All	Noisiest 1 hour period when in use	50
Commercial	All	When in use	65

Note 1: EPA Governing Periods are Day: 7:00 am to 6:00 pm, Evening 6:00 pm to 10:00 pm and Night 10:00 pm to 7:00 am on Mondays to Saturdays & 8:00 am on Sundays and public holidays.

Maximum Noise Level Events – Sleep Disturbance

Noise sources of short duration and high level that may cause disturbance to sleep if occurring during the night-time require consideration.

The approach recommended by the NPfI is to apply the following initial screening noise levels:

- $L_{Aeq,15min}$ 40dBA or the prevailing RBL + 5dB, whichever is the greater; and/or
- L_{AFmax} 52dBA or the prevailing RBL + 15dB, whichever is the greater.

The sleep disturbance screening noise levels apply outside bedroom windows during the night-time period.

Where the screening noise levels cannot be met, a detailed maximum noise level event assessment should be undertaken. It may also be appropriate to consider other guidelines including the NSW RNP which contains additional guidance relating to potential sleep disturbance impacts.

A review of research on sleep disturbance in the RNP indicates that in some circumstances, higher noise levels may occur without significant sleep disturbance. Based on currently available research results, the RNP concludes that:

- *"Maximum internal noise levels below 50 dBA to 55 dBA are unlikely to cause awakening reactions."*
- *"One or two noise events per night, with maximum internal noise levels of 65 dBA to 70 dBA, are not likely to affect health and wellbeing significantly."*

Based on these findings, noise levels below 60-65dB L_{Amax} outside an open bedroom window would be unlikely to cause awakening reactions (assuming that the facade of the residential building provides 10dB attenuation, which would be typical of a facade with partially open windows). Furthermore, one or two events with a noise level of 75-80dB L_{Amax} outside an open bedroom window would be unlikely to affect health and well-being significantly.

NPfI Project Noise Trigger Levels

The NPfI stipulates that project noise trigger levels are determined for the daytime (7:00 am – 6:00 pm), evening (6:00 pm – 10:00pm) and night-time (10:00pm – 7:00am Monday to Saturday, 10:00 pm – 8:00 am Sunday and public holidays) periods, as relevant.

Applying the NPfI guidelines, the amenity and intrusiveness noise levels and resulting project trigger levels (shown in bold) applicable to sources of continuous operational noise, such as mechanical plant, vehicular movements and other on-site activities are shown in Table 9.

Table 9: Project Specific Noise Trigger Levels

Receiver	Area Classification	Period [1]	Project Noise Trigger Levels		
			RBL[2] $L_{A90(15min)}$	Intrusiveness $L_{Aeq(15min)}$	Amenity[3,4] $L_{Aeq(15min)}$
Residential R1	Suburban	Day	40	**45**	53
		Evening	37	**42**	43
		Night	37	42	**38**
Residential R2		Day	39	**44**	53
		Evening	37	**42**	43
		Night	32	**37**	38
Residential R3		Day	41	**46**	53
		Evening	39	44	**43**
		Night	34	39	**38**
Residential R4		Day	41	**46**	53
		Evening	39	44	**43**
		Night	34	39	**38**
Residential R5		Day	41	**46**	53
		Evening	39	44	**43**
		Night	34	39	**38**
Hospital ward	All	Noisiest $L_{Aeq,1hr}$			**50**
Commercial	All	When in use			**63**

Note 1: EPA Governing Periods are Day: 7:00 am to 6:00 pm, Evening 6:00 pm to 10:00 pm and Night 10:00 pm to 7:00 am. & 8:00 am on Sundays and public holidays.
Note 2: RBL Rating Background Level.
Note 3: Assuming existing noise levels unlikely to decrease in the future.

Note 4: Project amenity noise level (ANL) is urban ANL minus 5dBA plus 3dBA to convert from a period level to a 15-minute level.
Note 5: NPfI Minimum assumed RBLs adopted for evening and night time periods.

For maximum noise level events occurring during the night-time period that may cause disturbance to sleep, the following screening noise levels apply outside bedroom windows if required:

- $L_{Aeq,15min}$ 40dB; and/or
- L_{AFmax} 52dB.

4.2.3 Additional Traffic on the Local Roads

The NSW *Road Noise Policy* (2011) was released by the EPA to replace the *Environmental Criteria for Road Traffic Noise* (1999) from 1 July 2011. The key provisions of the policy are an emphasis on the use of land use planning, better road design and vehicle noise emission control to avoid or minimise road traffic noise impacts. The assessment criteria for residences potentially affected by additional traffic generated by land use developments on arterial, sub-arterial and local roads are summarised in Table 10.

Table 10: Road Traffic Noise Assessment Criteria for Residential Land Uses

Road Category	Type of Development	Assessment Criteria – dBA	
		Day (7 am-10 pm)	Night (10 pm-7 am)
Freeway/arterial/sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,15hr}$ 60 (external)	$L_{Aeq,9hr}$ 55 (external)
	Relative Increase Criteria	Existing traffic $L_{Aeq,15hr}$ + 12 dB (external)	Existing traffic $L_{Aeq,9hr}$ + 12 dB (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq,(1hour)}$ 55 (external)	$L_{Aeq,(1hour)}$ 50 (external)

Where predicted noise levels exceed the project-specific noise criteria, an assessment of all feasible and reasonable mitigation options should be considered. The RNP states that an increase of up to 2dB represents a minor impact that is considered barely perceptible to the average person.

5.0 ASSESSMENT

5.1 Construction Noise & Vibration

5.1.1 Construction Works

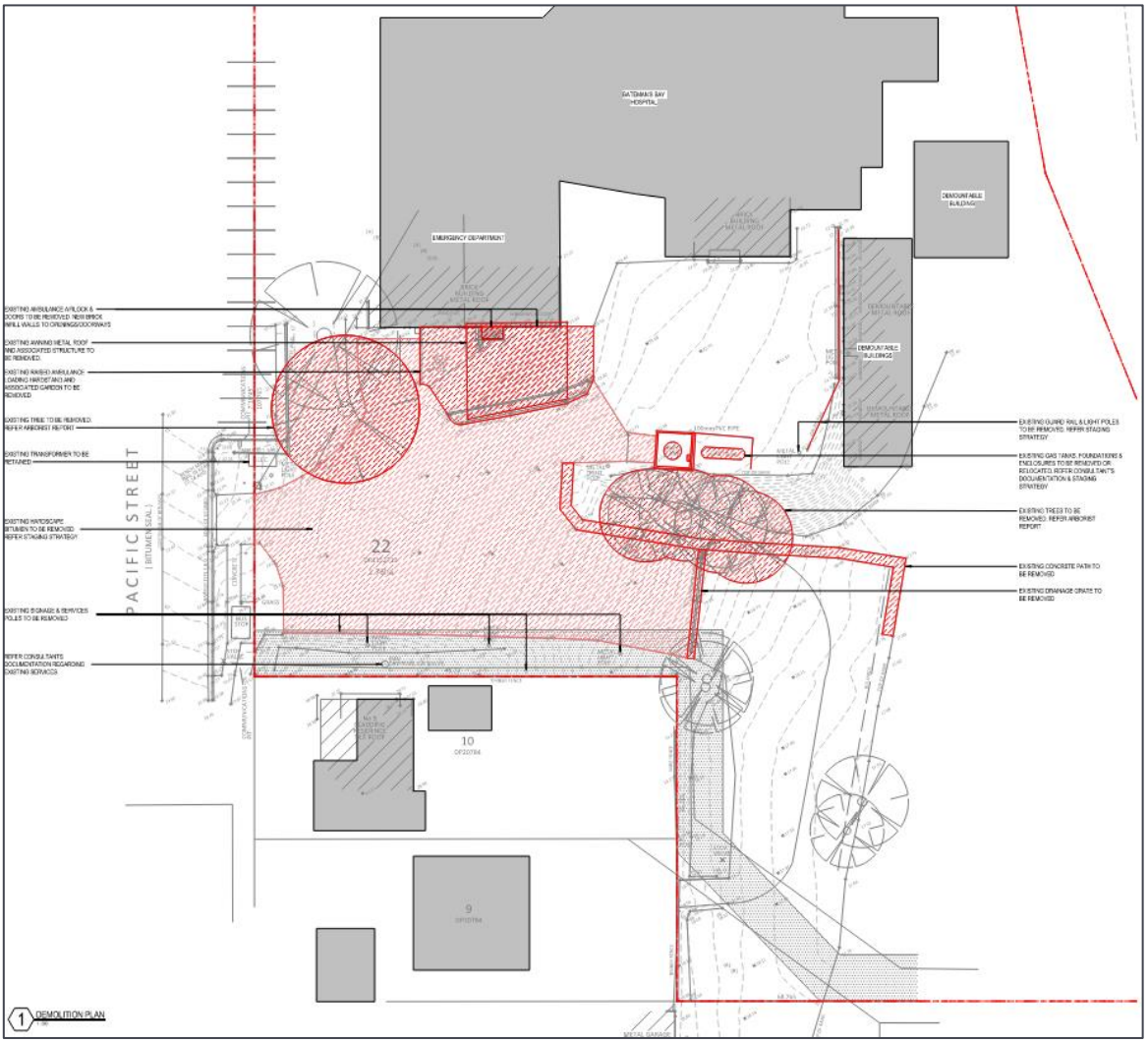
The preferred structural option for construction has yet to be selected. Based on the structural concept documented by GHD in the *Part 3 Schematic Design Report* (GHD S4 Rev 1 18.03.2024) the foundations will consist of pad and strip footings assumed to bear onto natural ground. The lower floor is proposed to be a reinforced slab on ground, bearing on natural ground. The majority of the ground floor structure is to comprise a nominal 180mm thick post tensioned slab spanning over the lower ground level space. The post tensioned slab is to transition into a suspended nominally reinforced concrete slab supported by bucket piers to bearing material within the footprint of the fill or higher elevation ground level. The supporting load bearing elements are reinforces concrete columns for predominantly vertical loads and reinforced concrete shear walls for lateral loading.

Demolition works will be minimal and principally involve the removal of the ramped hardstand and (free-standing) ambulance awning.

Excavation works are also expected to be relatively minor with minimal cut and fill involved.

The proposed demolition plan is shown in Figure 5.

Figure 5: Proposed Demolition Plan (Source: Architectus)



5.1.2 Noise

The noise levels presented in Table 11 have been calculated based on BS 5228-1:2009 noise levels for typical plant nominated operating 80% of the relevant time period (i.e. 15 minutes). A nominal 5 dB screening value has been included to represent the typical attenuation provided by a solid screen along the boundary fence that prevents line of sight between the source and receiver. Based on the noise levels presented in Table 11, the resultant noise levels potentially received at surrounding properties can be estimated based on distance, barrier and working conditions (i.e. period which the activity is continuously being conducted).

Table 11: Preliminary Construction Noise Evaluation

Plant	Noise Level vs Distance			
	10m	20m	50m	100m
	$L_{eq\ (15min)}$	$L_{eq\ (15min)}$	$L_{eq\ (15min)}$	$L_{eq\ (15min)}$
Demolition – Small breaker excavator mounted	73	67	58	50
20t Excavator	72	66	57	49
Bored Piling (Excavator)	71	65	56	48
Concrete mixer truck & concrete pump	72	66	57	49
Hand tools (pneumatic)	74	68	58	51

Noise emissions to the closest sensitive receivers to the site are not expected to exceed 75dBA. High noise levels can be expected when demolition and excavation works take place in close proximity to the boundary. As plant operates at greater distance away from the receiver, noise levels will reduce.

Noise generated during periods of intensive works has been predicted to potentially exceed the noise management levels at sensitive receivers surrounding the site located on Pacific Street during standard hours. These exceedances should be managed with available feasible and practicable management techniques. Noise from construction works should generally achieve management levels at residences to the east and south east (R2, R3, R4 & R5).

Upon appointment of a Contractor and when proposed construction methodologies and plant and equipment are finalised it will be necessary prepare a Construction Noise and Vibration Management Plan (CNVMP). The CNVMP is a documented plan that should assist the construction team in managing and mitigating noise impacts as well as communicating effectively with impacted stakeholders. Many complaints about construction noise are due to preventable activities during construction periods.

5.1.3 Vibration

It should generally be possible to allow sufficient distance between construction plant and other properties to allow vibration levels at surrounding structures to not exceed the limits applicable for structural damage. Further, more detailed investigations will however be required when a contractor has been appointed and a works schedule developed.

Indicative safe working distances from the vibration intensive plant items applicable for cosmetic damage, structural damage and human comfort are provided. Safe working distances have been developed to establish a trigger point at which further detailed evaluation e.g. vibration monitoring should be implemented. It should be noted that being located within the safe working distance does not necessarily mean that vibration criteria at a subject receiver is exceeded.

A detailed vibration impact assessment will be required to be prepared as part of the full CNVMP once detailed construction methodology is available.

Table 12: Minimum Working Distance – Human Comfort

Plant Items	Minimum Working Distance (m)[1]
Small hydraulic hammer (300kg on 5-12t excavator)	7
Piling rig - Bored	N/A
Excavator	N/A

1. Based on TfNSW Construction Noise and Vibration Strategy recommendations.

Indicative minimum set back distances relative to criteria in Table 7 for cosmetic structural damage from construction plant/works plant are provided in Table 13.

Table 13: Setback Distances – Effects of Vibration on Non-Sensitive Structures

Plant Items	Indicative minimum Setback distance (m)
Small hydraulic hammer (300kg on 5-12t excavator)[1]	2
Piling rig - Bored[2]	2
Excavator[2]	N/A

1. Based on TfNSW *Construction Noise and Vibration Strategy* and RMS *Environmental Noise Management Manual.*
2. Based on archival MDA measured data

5.2 Operational Noise

5.2.1 Prediction of Operational Noise

Operational noise emissions associated with the new development will comprise those from the following sources:

- additional mechanical plant and equipment.
- Noise from the use of some internal spaces such as the group meeting rooms may also require consideration.
- Vehicular movements entering and leaving the carpark currently generate noise at neighbouring residential properties. This will continue under the proposed development however the neighbouring residence to the south will benefit from shielding provided by the proposed new building.

Prediction of airborne noise emissions potentially generated from the proposed plant and on-site activities has been undertaken based on the ISO 9613-2:1996 *Acoustics – Attenuation of sound propagation outdoors – Part 2: General method of calculation* (ISO, 1996) algorithms as implemented in Minerva Software v7.0.5.0, an acoustic modelling program developed by MDA. The model

incorporates factors such as source sound level emissions and location, screening effects where relevant, receiver locations, distance attenuation and ground and atmospheric absorption effects.

This model provides a suitable methodology for the purposes of predicting environmental noise levels from industry and other sources and has been adopted for this assessment.

5.2.2 Mechanical Services Noise

The design for mechanical services in the new building is outlined in the *Part 3 Schematic Design Report* (GHD S4 Rev 1 18.03.2024).

Heating and cooling is to be provided by several reverse-cycle, heat-pump type variable refrigerant flow (VRF) systems. Horizontal discharge type outdoor units are proposed to be located in the undercroft of the new building. Indoor units will be either ducted fan coil units, ceiling cassette or wall-mounted units.

Two split systems, with the outdoor units located in the undercroft area, will be used to cool the comms room. The indoor units will be wall-mounted. The undercroft plant area will be located under the eastern end of the building. The units can be installed facing eastwards to minimise noise emissions to residential properties located to the south.

Outdoor air will be drawn via louvres on the southern perimeter wall of the new building. Relief and exhaust air will also utilise louvres on the southern elevation.

Exhaust ventilation will be provided by inline duct-mounted fans.

Noise emissions from external plant has been conducted based on the preliminary plant selection as supplied by the client.

The preliminary issue mechanical services design locates the outdoor units on plant platforms within the undercroft plant area. The preliminary outdoor plant selection is shown in Table 14. Mechanical services design and plant selection are yet to be finalised and equipment schedules will be subject to revision.

To reflect a worst-case scenario, all units have been assumed to face south.

Table 14: Outdoor Mechanical Plant

Plant Item	Location	L_{AWeq} (per unit)	Night Mode[1] operation mode reduction
Daikin RXYMQ9AY1 7 off	Undercroft Plant area	76	Yes

Note 1: Manufacturers data indicates that a reduction of up to 9 dB can be achieved when operating on night mode. Typically around 6 dB reduction in operational noise is experienced.

Based on the manufacturer's noise level data, the noise levels predicted at surrounding receivers are shown in Table 15.

Table 15: Predicted $L_{Aeq(15minute)}$ Operational Noise Emissions from Outdoor Units

Receiver	Receiver Address	Predicted Noise Level dB	Criteria Evening/Night 6.00pm – 7.00 am[1]	Compliance
R1	9 Pacific Street	34	38	Yes
R2	14 Bavarde Ave	37	37	Yes

Receiver	Receiver Address	Predicted Noise Level dB	Criteria Evening/Night 6.00pm – 7.00 am[1]	Compliance
R3	20 Bavarde Ave	34	38	Yes
R4	18 Heradale Pl	33	38	Yes
R5	14 Heradale Pl	34	38	Yes

Note 1: 8.00 am Sundays and public holidays

The preliminary review indicates that acceptable noise levels, not exceeding the criteria applicable for operational noise emissions during the evening and night periods), will be achieved with the preliminary mechanical design as documented. Operational noise levels are likely to be lower than that predicted during the night-time, with the units set to night mode. Detailed assessment should be conducted during the design development stage of the project to confirm compliance or the requirement for additional treatment of the undercroft area in the event of exceedance.

5.2.3 Activity Noise

Noise emissions from activities within the building are unlikely to be significant, particularly given the provision of air conditioning allowing windows to remain closed. The multi-function group room at the building's western end has glazed sliding doors, opening onto a covered outdoor area. This space will be generally utilised during normal daytime hours of operation for community training and education purposes. The LHD may use the room for staff meetings, presentations, awards and an occasional afternoon barbeques. The space is unlikely to be used outside normal operating hours and no music would be involved. During group functions, noise may transmit to the neighbouring premises through the open door.

For modelling noise generated during a group occupying the multi-function room, we have assumed people speaking at a raised voice level of L_{Aweq} 78 dB per person (for male speech[1] noting published data for female speech is lower). Based on the floor area, we have assumed an occupancy of 25 persons.

The data input to the noise model is summarised in Table 16.

Table 16: Noise Source Data (Reverberant L_p)

Source	Octave Band Centre Frequency (Hz)							dBA
	63	125	250	500	1000	2000	4000	
Raised voice 33% speaking simultaneously L_{weq}	75	77	78	85	83	79	72	87

For modelling of noise from use of the multi-function group room, assumptions have been made regarding the sound insulation performance of the perimeter construction. These assumptions are summarised in Table 17.

[1] Cushing et al *Vocal effort levels in anechoic conditions.* Applied Acoustics vol 72 2011

Table 17: Activity Noise Modelling Assumptions

Source	Contributing Facade Acoustic Allowances
Multi-function group room – occupants talking at raised voice level – no music involved	Western elevation assumed sliding doors open. Southern facade – vertical profile steel cladding, plasterboard on stud internally.

The predicted noise levels at the surrounding potentially sensitive receivers for the operational scenario modelled are shown in Table 21. The results are shown as an overall $L_{Aeq(15min)}$ level and have been rounded to the nearest whole decibel. Results are presented for the first floor level at applicable receivers.

Table 18: Predicted L_{Aeq} dB Noise Levels – Multi-function Group Room Use

Receiver	Receiver Address	Multi-function Group room	Cumulative Incl Mechanical Plant	Criteria		Compliance
				Day 7.00am-6.00pm[1]	Evening 6.00pm-10.00am	
R1	9 Pacific St West elevation ground level	43	43	45	42	Yes[2]
R1	9 Pacific St East elevation first floor	35	38	45	42	Yes
R2	14 Bavarde Ave	15	38	44	43	Yes
R3	20 Bavarde Ave	27	35	46	43	Yes
R4	18 Heradale Pl	26	34	46	43	Yes
R5	14 Heradale Pl	27	35	46	433	Yes

Note 1: 8.00 am on Sundays and public holidays

Note 2: According to NPfI procedures, a 1 dB residual exceedance is considered insignificant and would not be perceptible. Further consideration of mitigation measures is not required.

Based on the results of modelling, noise generated during typical worst-case operational scenarios associated with the future use of the multi-function group room achieve the applicable criteria for the daytime operational period (up to 6.00 pm) at all nearby receivers.

The criteria for evening operation (6.00 pm to 10.00 pm) is generally achieved at all nearby receivers. A potential 1 dB exceedance may occur at the neighbouring residence R1 (9 Pacific Street) with the doors on the western elevation of the multi-function room open.

Evening use of the function space is unlikely.

According to NPfI procedures a 1dB residual exceedance is considered insignificant and specific control measures are not warranted.

5.2.4 Carpark Noise

The site is currently accessed from Pacific Street. The proposed carpark design intends to utilise the same access from Pacific Street. The proposed on-site carpark layout allows for 17 spaces including 2 accessible spaces. Ambulance movements are as needed for emergency purposes. No permanently designated space has been provided.

Noise would also be generated by vehicles entering and leaving the new carpark via the existing access driveway.

A traffic assessment has been prepared for the project by Transport & Traffic Planning Associates *Proposed Community Health Facility 7 Pacific Street Batemans Bay Traffic & Parking Assessment* (ref 23226 rev D) dated May 2024. According to the traffic report, the assessed " maximum attendance" scenario throughout the course of Monday to Friday business hours for the Batemans Bay hospital campus is 74 persons. The projected peak hourly traffic movements are as shown in Table 19.

Table 19: Project Peak Hourly Traffic Generation

	Morning	Afternoon
In	40	9
Out	9	40

Based on previously measured data a maximum sound power level of 86dBA has been adopted for each vehicle travelling along the driveway at low speed (<20 km/hr). The new driveway will be obscured by the new building from the residential property at 9 Pacific Street.

The predicted $L_{Aeq(15min)}$ level generated at the neighbouring residential properties most potentially exposed to vehicle movements on the new driveway are shown in Table 20.

Table 20: Predicted L_{Aeq} dB Noise Levels – Vehicular Movements On-site

Receiver	Receiver Address	Driveway Day 49 movements/hr	Criteria Day/Evening	Compliance
R1	9 Pacific St West elevation ground level	26	45/42	Yes
R1	9 Pacific St East elevation first floor	26		Yes

Based on the results of modelling, noise generated under the assumed vehicle movement scenarios achieve the applicable criterion for all operational time periods.

The new concrete driveway and maintenance road proposed adjacent to the southern site boundary provides access to the emergency generator and new HVAC plant located in undercroft plant area of the BBCH building. The road will be used as required for generator testing, refuelling and maintenance and for maintenance of the new HVAC plant. Vehicular events would be infrequent, generally during daytime hours (with the exception of an emergency) and on this basis, are not considered acoustically significant.

5.3 Road Traffic Noise

A preliminary high-level review of the traffic expected to be generated by the new development has been carried out based on the projected peak hourly volume of 49 vehicles (as discussed in Section 5.2 above).

At typical residential frontages along Pacific Street, the resulting $L_{Aeq(1hr)}$ is 42 dB. This complies with the RNP recommended $L_{Aeq(1hr)}$ design limits of 55 dB and 50 dB for day and night, respectively.

In conjunction with the existing traffic generation the additional vehicle movements per hour is considered to have a minimal impact on the surrounding road network, and is expected to be within the 2dB increase margin.

6.0 CONCLUSION

MDA has conducted an assessment of noise potentially generated during construction and typical operations of new Community Health Centre at the Batemans Bay Hospital. The assessment has included a review of the site and surrounding area, results of acoustical measurements to characterise the ambient noise environment, establishment of noise criteria, development of a noise model to predict potential noise emissions to surrounding potentially sensitive properties and a comparison of predicted noise levels with regard to recommended guidelines.

6.1 Construction

At this stage detailed information on construction including work scheduling and equipment selection is not available. As such, comprehensive assessment of construction noise and vibration is unable to be conducted. Based on the structural concept documented by GHD in the *Part 3 Schematic Design Report* (GHD S4 Rev 1 18.03.2024) and the preliminary civil general arrangement plan (dated 28.02.2024), initial review of the demolition and intensive earthworks stages, noise emissions to the closest sensitive receivers to the site are not expected to exceed the highly noise affected noise goals of 75dBA.

Noise generated during periods of intensive works has however been predicted to potentially exceed the noise management levels at existing sensitive receivers immediately surrounding the site during standard hours. These exceedances should be managed with available feasible and practicable management techniques. Compliance with the management levels for construction noise is expected to be achieved at receivers located at distances of approximately 100m or greater from the works site .

Upon appointment of a Contractor and proposed construction methodologies and plant and equipment are finalised it will be necessary prepare a Construction Noise and Vibration Management Plan (CNVMP).

6.2 Mechanical Plant

Based on preliminary mechanical services design and equipment selection, the project noise trigger levels appear capable of being achieved at surrounding receivers. It will however be necessary to carry out specific acoustic design based on design documentation and equipment selections.

6.3 On-Site Activities

Noise associated with the operation of internal spaces within the new facility is unlikely to be acoustically significant. Based on the assumed operating scenario for the multi-function group room usage, noise emissions are generally expected to comply with the intrusive noise criteria at surrounding receivers.

6.4 Carpark

Based on the vehicular movements entering and leaving the carpark as projected by the project traffic consultants Transport & Traffic Planning Associates, noise from the vehicle movements is expected to be within the project-specific noise trigger levels at the neighbouring residential properties.

The new southern access road will be used by maintenance vehicles only. Infrequent use is expected and would generally occur during daytime hours. On this basis, associated vehicular activity is not considered acoustically significant.

6.5 Additional Road Traffic

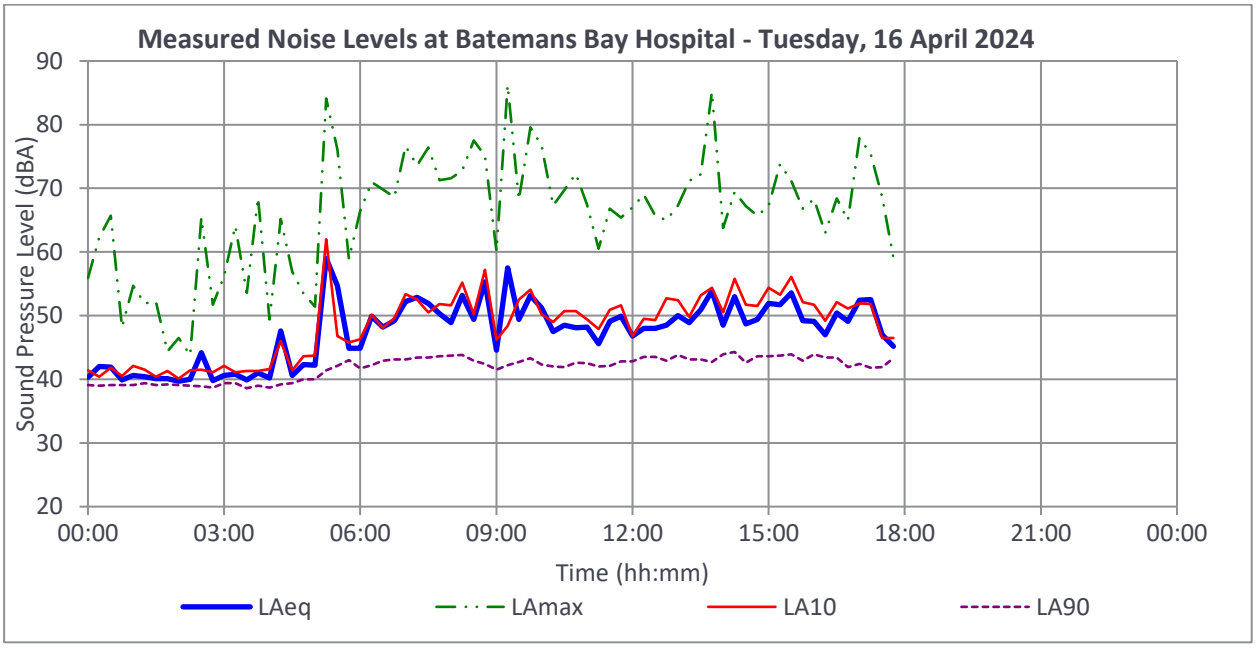
Based on the traffic generation rates as documented in Transport & Traffic Planning Associates *Proposed Community Health Facility 7 Pacific Street Batemans Bay Traffic & Parking Assessment* (ref 23226 rev D) dated May 2024, the RNP recommended noise limits for day and night-time periods would not be exceeded.

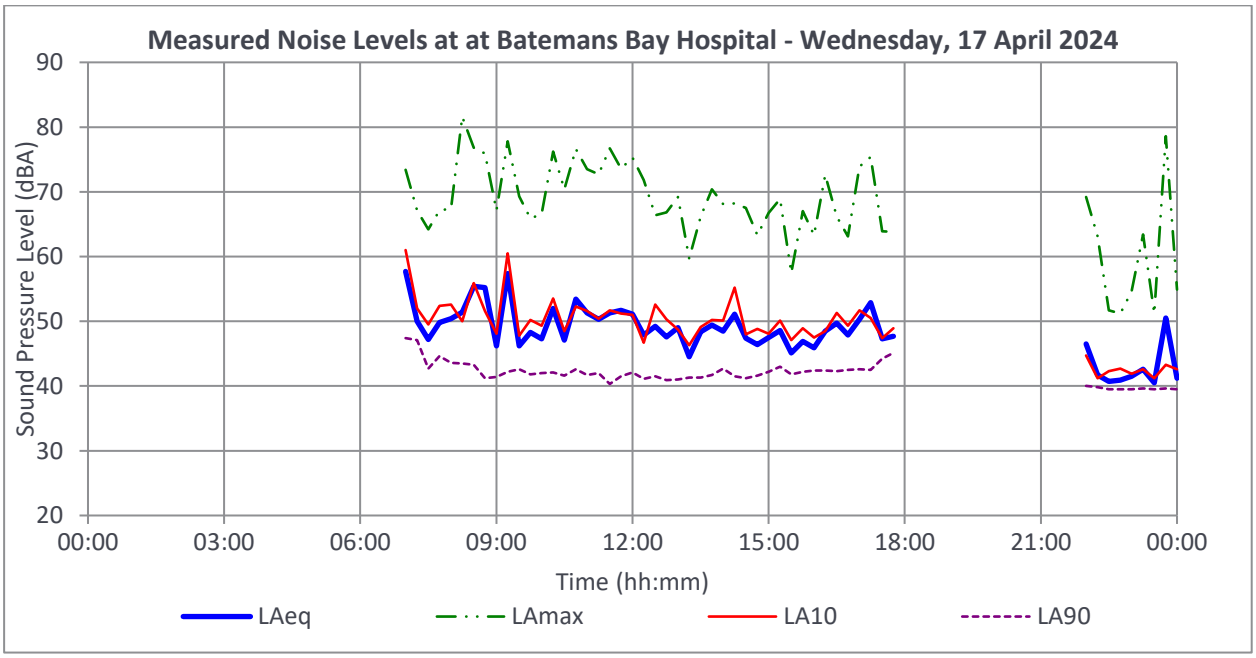
In conclusion, construction and operation of the proposed development can be supported on the basis of the expected satisfactorily low noise impacts.

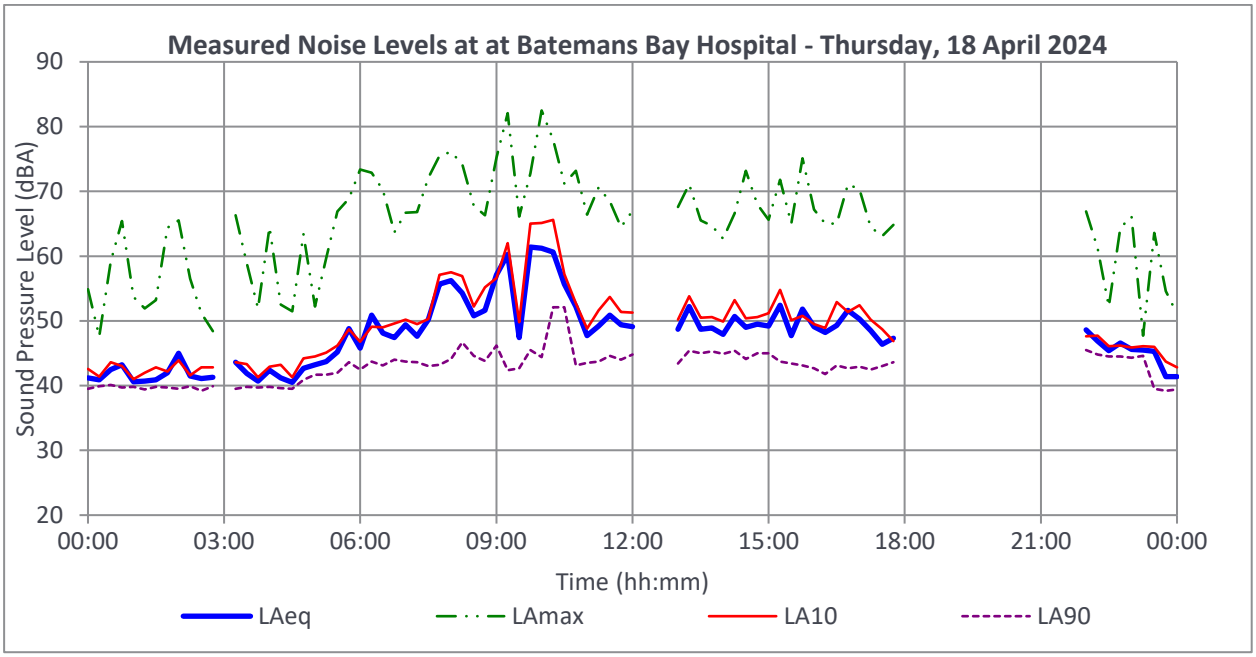
APPENDIX A GLOSSARY OF TERMINOLOGY

SPL or L_P	Sound Pressure Level A logarithmic ratio of a sound pressure measured at distance, relative to the threshold of hearing (20 µPa RMS) and expressed in decibels.
SWL or L_W	Sound Power Level A logarithmic ratio of the acoustic power output of a source relative to 10^{-12} watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.
dB	Decibel The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of Pr=20 µPa i.e. dB = 20 x log(P/Pr)
dBA	The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) so as to more closely approximate the frequency bias of the human ear.
$L_{Aeq\,(t)}$	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
$L_{A90\,(t)}$	The A-weighted noise level equalled or exceeded for 90% of the measurement period. This is commonly referred to as the background noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
L_{A10}	The A-weighted sound level exceeded for 10% of the measurement period, measured in dB. Commonly referred to as the average maximum noise level.
L_w	Sound Power Level. The calculated level of total sound power radiated by a sound source. Usually A-weighted i.e. L_{WA}.
NRC	Noise Reduction Coefficient. A single number rating of a material's ability to absorb sound. Calculated by averaging its absorption coefficients in the 250 – 2000 Hz octave bands. An NRC of 0 means it is fully reflective and an NRC of 1 means it is fully absorptive at those frequencies

APPENDIX B AMBIENT NOISE MONITORING RESULTS



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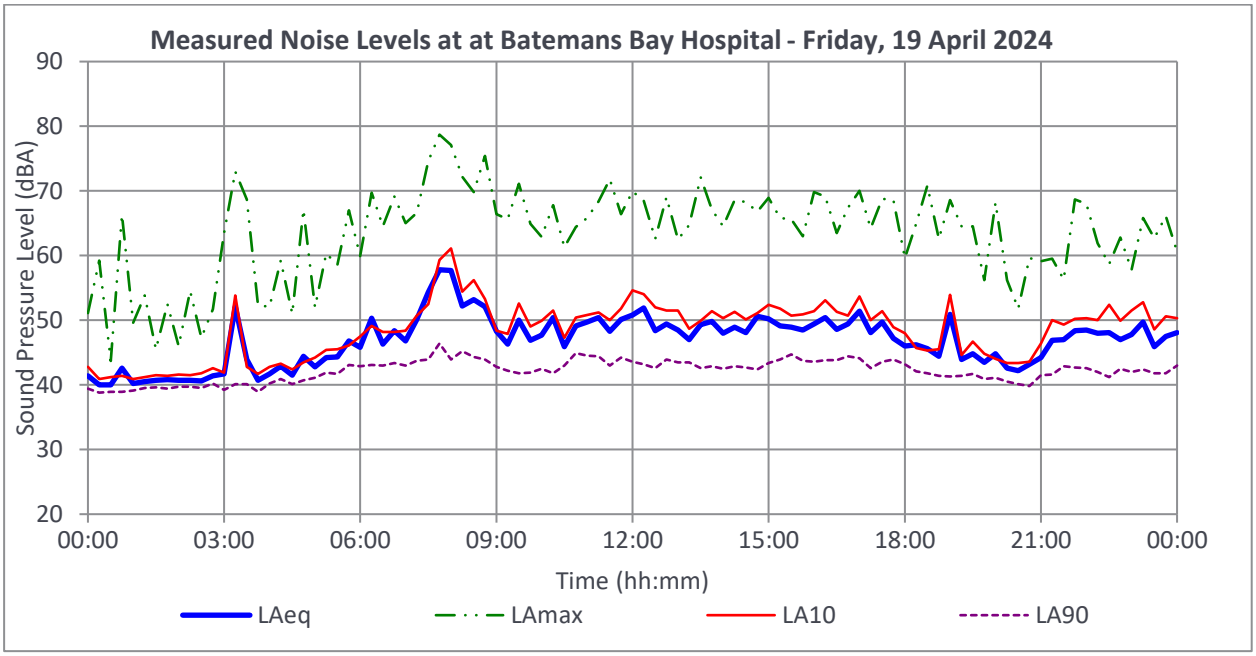
LA10
LA90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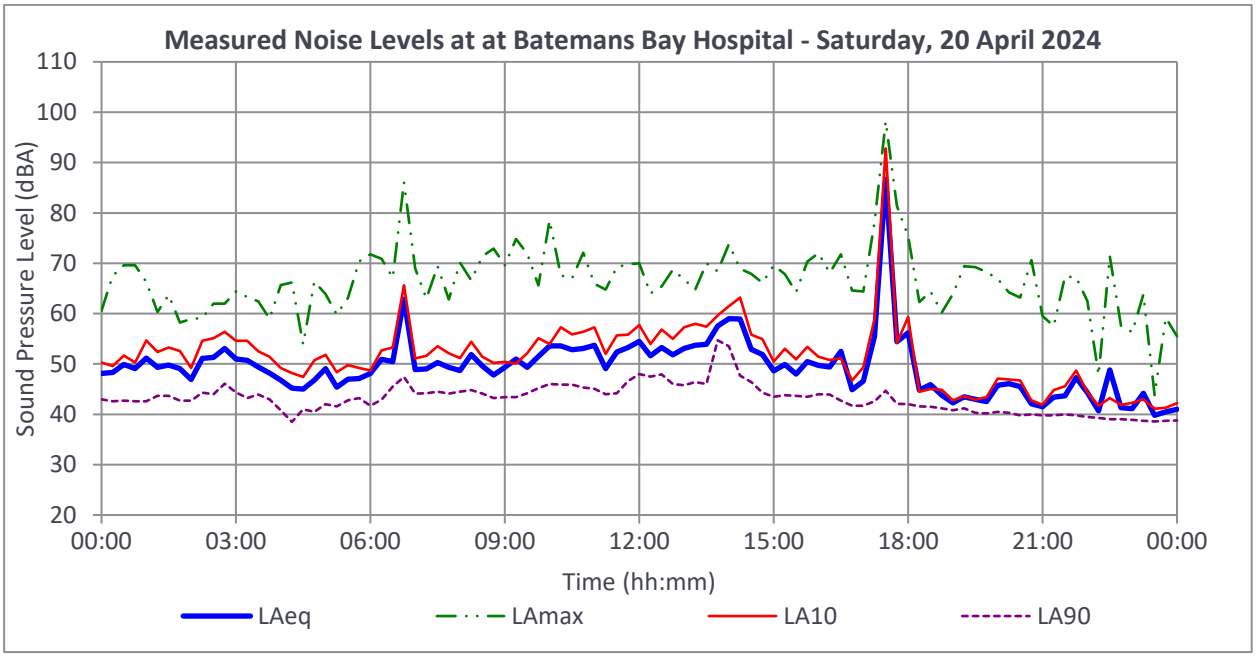
18:00
21:00
00:00
Time (hh:mm)
LAeq
LAmax
LA10
LA90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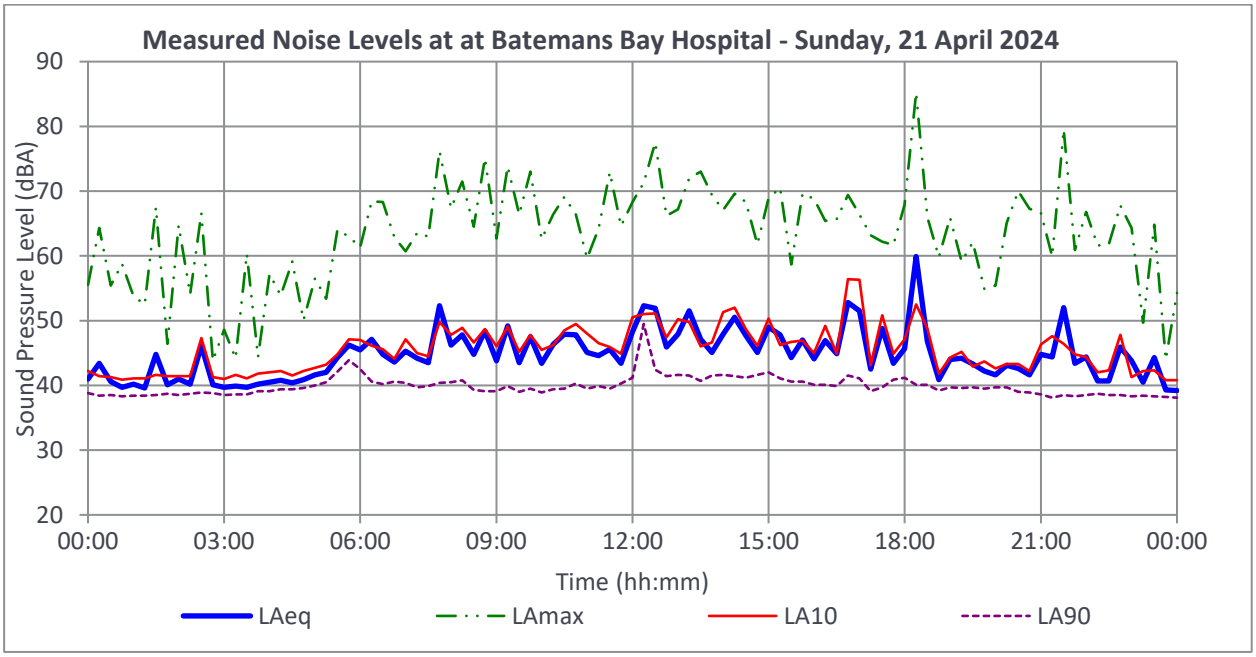
00:00
Time (hh:mm)
LAeq
LAmax
LA10
LA90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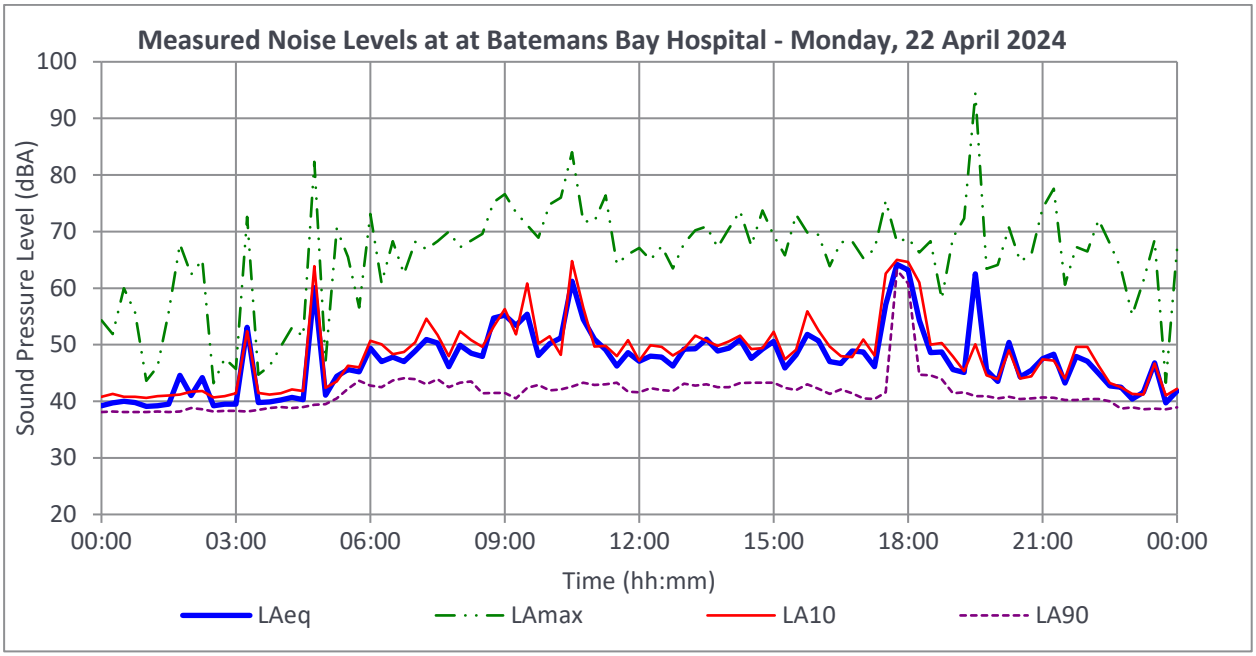
Time (hh:mm)
LAeq
LAmax
LA10
LA90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Time (hh:mm)
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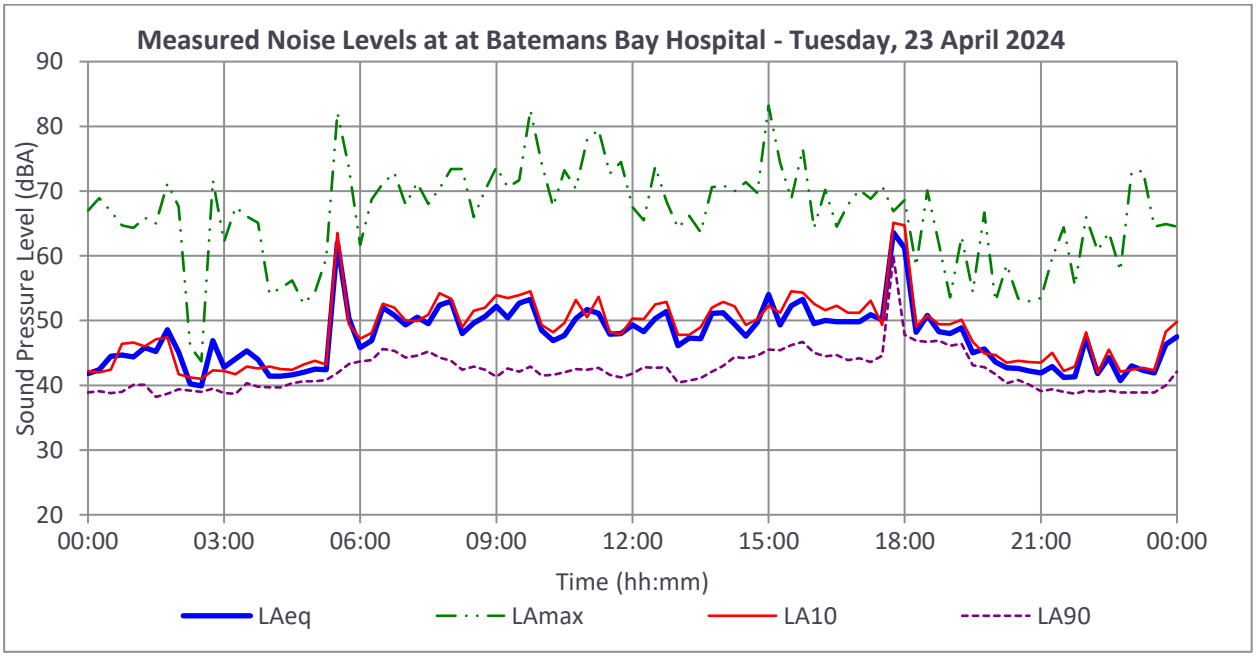
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Time (hh:mm)
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LAmax
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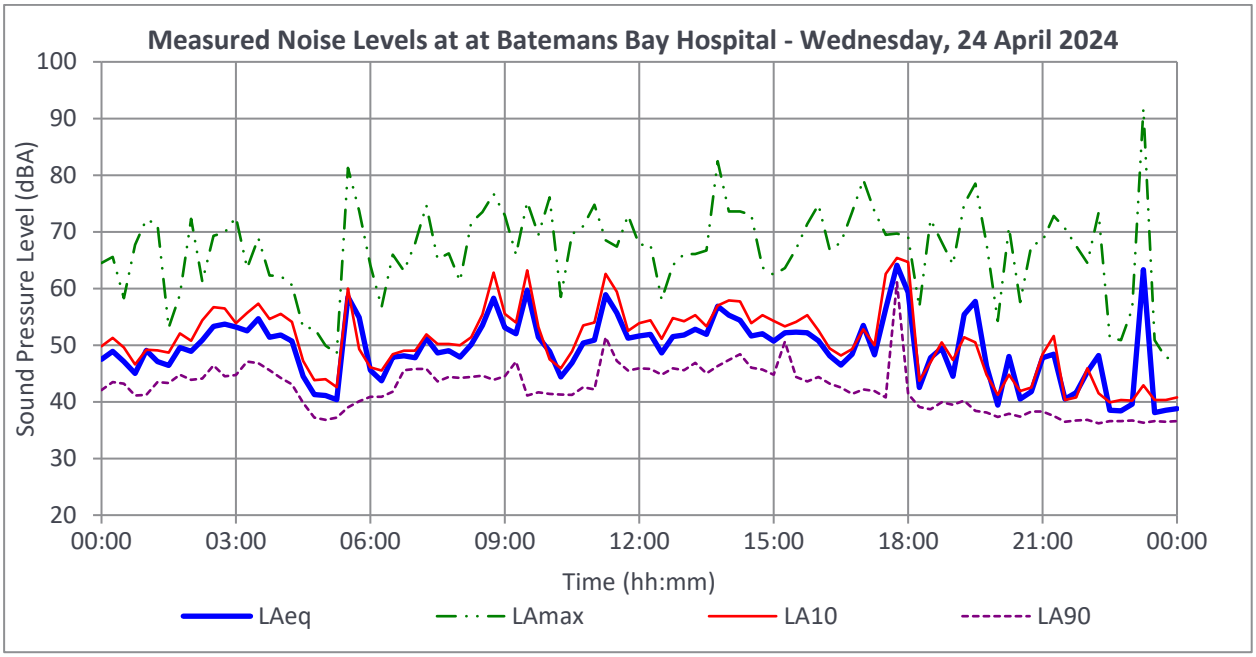
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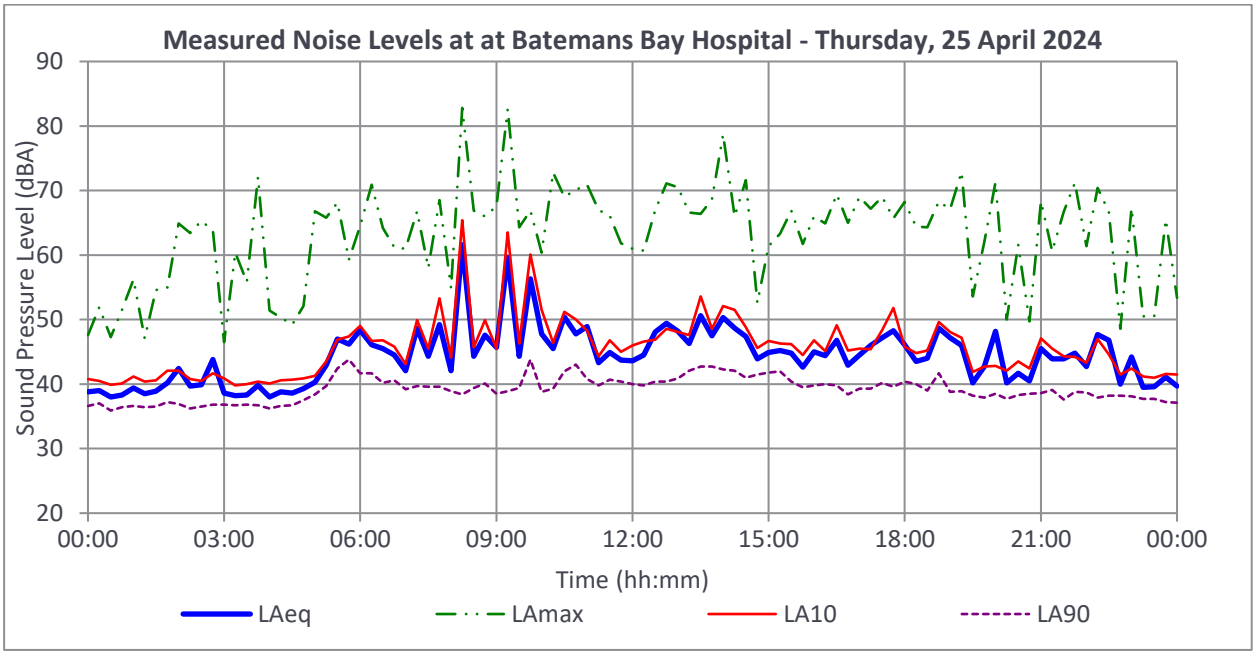
Time (hh:mm)
LAeq
LAmax
LA10
LA90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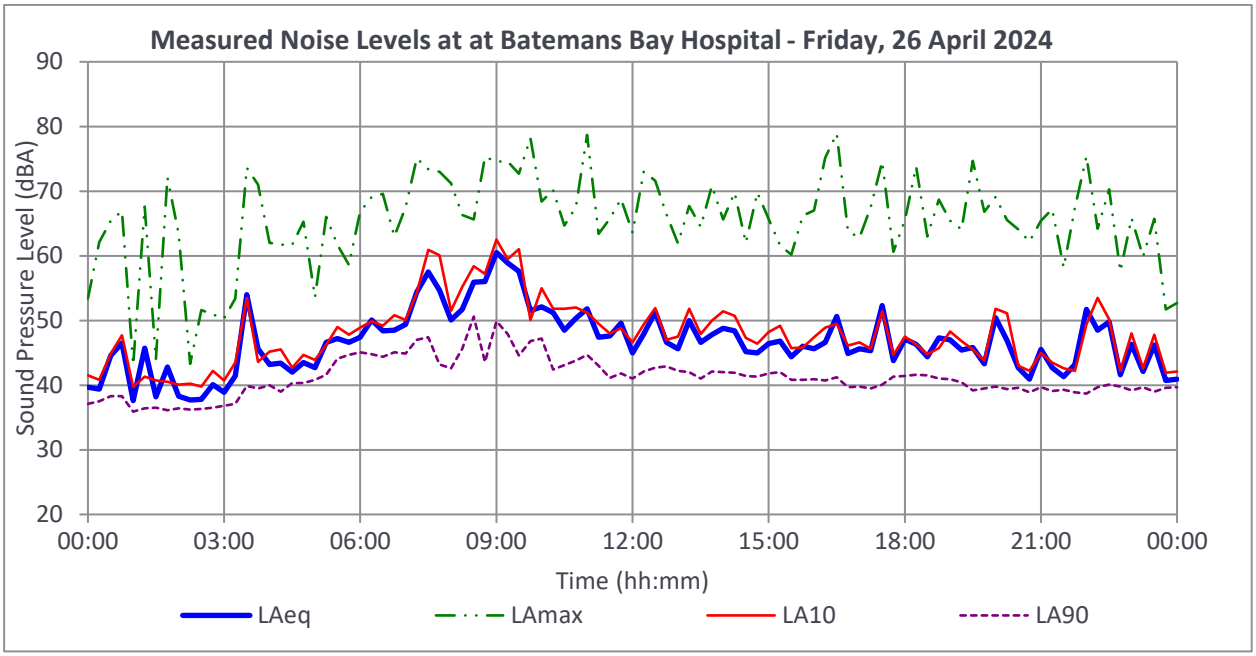
Time (hh:mm)
LAeq
LAmax
LA10
LA90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Time (hh:mm)
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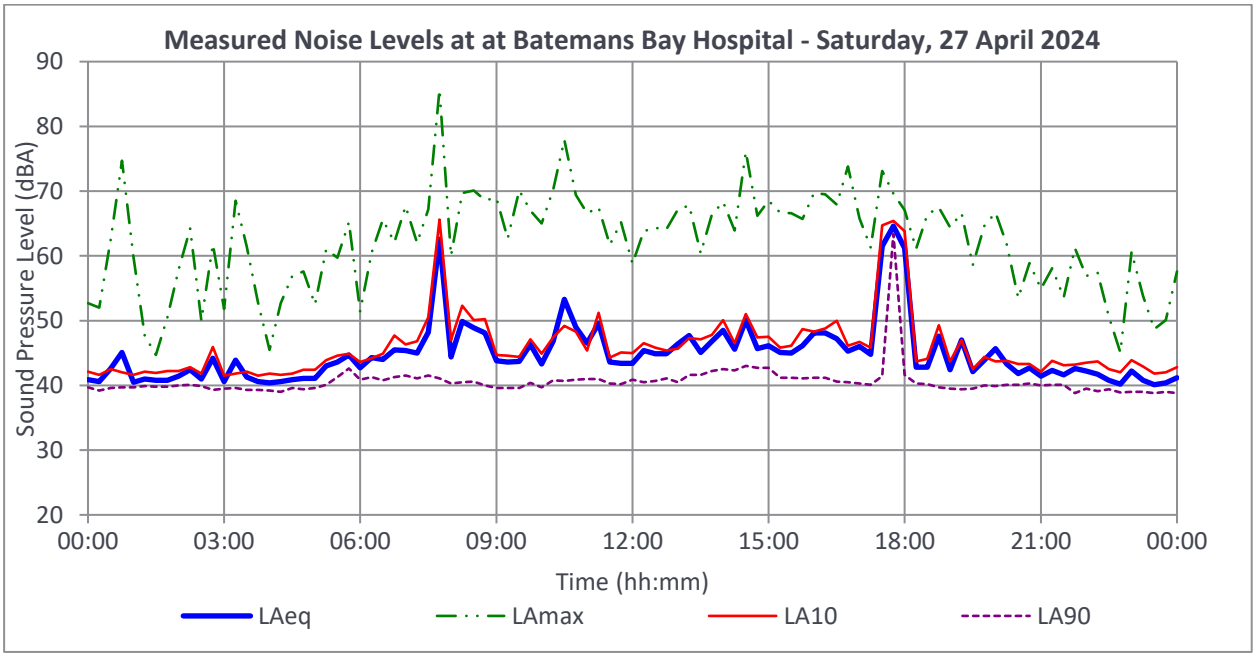
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Time (hh:mm)
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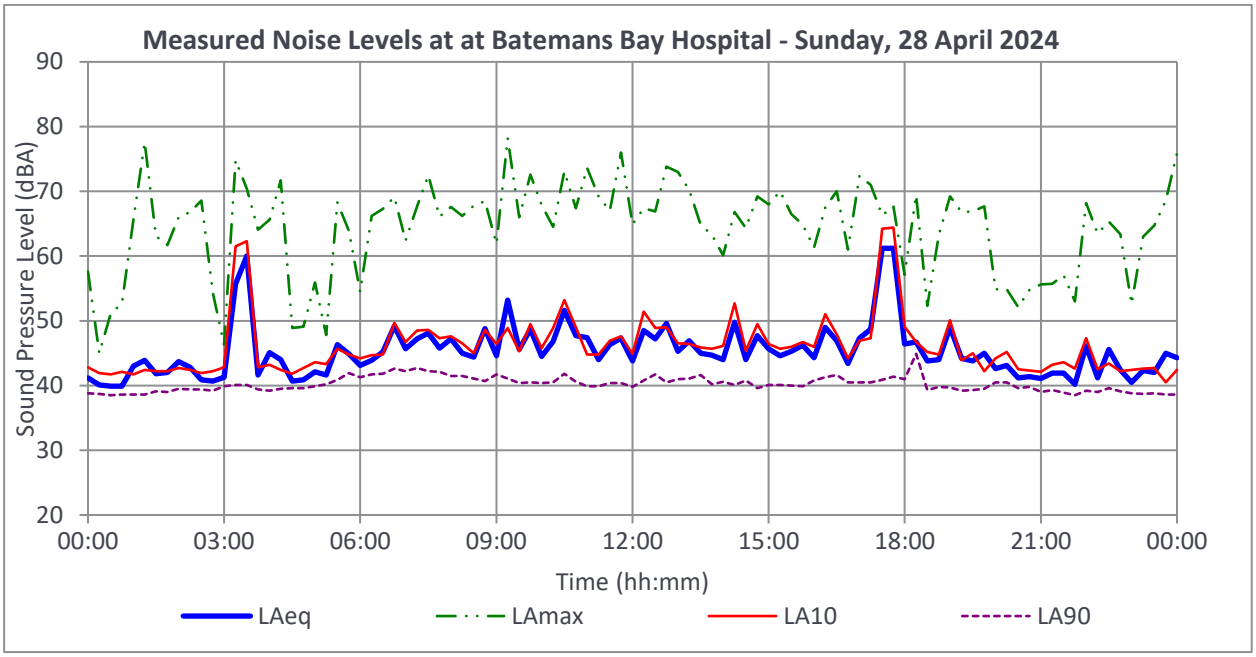
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Time (hh:mm)
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LAmax
LA10
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