

Environmental Noise Assessment Report

Tweed Valley Hospital Project, Kingscliff NSW

Prepared for: Delta Group





ADE
CONSULTING
GROUP

Prepared for:

Delta Group

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ENVIRONMENTAL NOISE ASSESSMENT REPORT
ADE Report No. DLT-01-Q1013 / NMA3 / v3.1f

EXECUTIVE SUMMARY

Environmental noise monitoring was conducted at Tweed Valley Hospital Project, Kingscliff NSW commencing on 26th July 2019 as per Delta Group requirements. This report will ensure environmental noise produced by the construction works on site comply with;

- Lendlease Building Pty Ltd Tweed Valley Hospital – Management Plan – Noise and Vibration dated 15 April 2019 Revision 2.2;
- *NSW Work health and Safety regulation (2017), clause 56 exposure standard for noise* for the duration of the project;
- Conditions C5 – C8 of Schedule 3 of the consent; and
- EPA's Interim Construction Guidelines.

Background Environmental noise monitoring commenced on 26th July 2019 in three (3) separate locations. These locations are along the south eastern boundary of the site, near Cudgen Road (refer to *Appendix I – Aerial Photograph of monitoring locations*). These monitoring locations were chosen to determine if noise being generated from the construction site complies with the levels stated in the above-mentioned guidelines. It has been determined that if the environmental noise levels at the boundary comply with the relevant guideline values, then the noise levels at the neighbouring properties would not be of great concern.

The time construction noise can be generated is regulated by the inclusion of standard construction hours are regulated by Conditions C5 – C8 of Schedule 3 of the consent. According to condition C5, the recommended standard hours for construction work are:

Normal Construction – Monday to Friday 7am to 6pm,
Saturday 8am to 1pm
No work on Sundays or public holidays

Activities may be undertaken outside of these hours in condition C5 of Schedule 3, will need to meet the requirements in conditions C6 – C8 of Schedule 3 refer to section 1.1.

The background noise level has been assessed for the project and the EPA's Interim Guidelines mention that the Management level of noise LAeq (15 min) should not be greater than 10 decibels above the background noise level during the normal construction times and no greater than 5 decibels above background levels outside of the normal construction times.

Background noise monitoring was conducted from the 27th July 2019 to 31st July 2019, the LAeq (15 min) background noise levels are summarised in Table 1 and Maximum Peaks summarised in Table 2.

The average LAeq (15min) background and earthworks noise results for the month of October are shown in Table 3 and peak noise levels shown in Table 4.

Table 1. Average LAeq (15min) Background Noise monitoring period (measured in A weighted decibels) for Tweed Valley Hospital Project Monitoring.

Location	Day Average	Evening Average	Night Average
West	63.3	58.1	51.8
Central	62.9	57.3	51.4
East	59.9	55.5	49.7

Table 2. Maximum Peaks for the Background Noise monitoring period (measured in C weighted decibels) for Tweed Valley Hospital Project Monitoring.

Location	Day Peak	Evening Peak	Night Peak
West	112.6	93.1	91.9
Central	115.7	93.1	90.8
East	115.8	94.1	94.9

Summary of Exceedances of Criteria A in October 2019

21st October 2019:

- An exceedance of 76.2dB LAeq (15 min {A}) was detected at 14:45 at the Eastern monitoring location.

ADE was advised that lopped trees were being loaded into a truck nearby and this was the reason for the exceedance.

29th October 2019:

- Three exceedances were detected on Tuesday, the 29th of October at the Central monitoring location
 - 75.6dB LAeq (15 min {A}) at 08:45am;
 - 76.4dB LAeq (15 min {A}) at 09:45am; and
 - 76.4dB LAeq (15 min {A}) at 10:00am.
- Six exceedances were detected on Tuesday, the 29th of October at the Eastern monitoring location
 - 77.1dB LAeq (15 min {A}) at 08:45am;
 - 77.3dB LAeq (15 min {A}) at 09:45am;
 - 76.0dB LAeq (15 min {A}) at 12:00pm;
 - 75.1dB LAeq (15 min {A}) at 12:30pm;
 - 76.6dB LAeq (15 min {A}) at 14:00pm; and
 - 78.1dB LAeq (15 min {A}) at 14:30pm.

ADE was advised that excavators were working in close proximity to the monitors and this was the reason for exceedances at both the Central and Eastern monitoring locations.

Also, the above-mentioned exceedances are short-term, and noise levels are not above 75dB (A) when averaged across the daytime noise monitoring period.

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DEFINITIONS

Ambient Noise:	The totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far.
Background Noise Level:	The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of a given time interval, T (LA ₉₀ , T).
Decibel (dB):	The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ration between RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20µPa).
dB(A):	An “A-weighted decibel” – measure of the overall noise level of sound across the audible frequency range (20Hz – 20 KHz) with A-frequency weighting to compensate for the varying sensitivity of the human ear to sounds at the different frequencies.
Free-field Conditions:	These are conditions in which the radiation from sound sources is unaffected by the presence of any reflecting boundaries. In practice it is a field in which the boundaries are negligible over the frequency range of interest. In environmental noise, true free field measurement conditions are seldom achieved and generally the microphone will be positioned at a height of between 1.2 and 1.5 metres above ground level. In this surveys case, the microphone has been placed 500mm above the surrounding fence to allow for the reflection of the fence. To minimise the influence of reflections, measurements are generally made at last 3.5 metres from any reflecting surface other than the ground.
Hertz (Hz):	The unit of sound frequency in cycles per second.
Impulsive Noise:	A noise that is of a short duration (typically less than one second), the sound pressure level of which is significantly higher than the background. In determining whether a tonal adjustment applies reference is made to ISO1996-2 (1987) – Section 4.1.
L_{Aeq, T}:	The value of the steady continuous A-weighted sound pressure level that, within a measurement time interval, T, has the same mean square sound pressure as the sound under consideration whose level varies with time during the interval T.
L_{Amax}:	The maximum RMS, A-weighting sound pressure level occurring within a specified time period; the time weighting fast or slow is usually specified.
Noise:	Any sound, that has the potential to cause disturbance, discomfort or psychological stress to a subject exposed to it, or any sound, that could cause actual physiological harm to a subject exposed to it, or physical damage to any structure exposed to it, is known as noise.

Noise Sensitive Location:	Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.
Residual Noise:	The ambient noise remaining at a given position in a given situation when the specific sources is suppressed to a degree such that it does not contribute to the ambient noise (residual noise level is reassured in terms of LAeq, T)
RMS (Root mean square):	The RMS value of a set of numbers is the square root of the average of their squares.
Sound Exposure Level (SEL):	This is the measurement of the A-weighting sound energy used to describe noise events such as the passing of a train or an aircraft; it is the A-Weighting sound pressure level if occurring over a period of 1 second, would contain the same amount of A-weighted sound energy as the event.
Specific Noise Level:	A component of the ambient noise which can be specifically identified by acoustical means and may be associated with a specific source. In BS4142, there is a more precise definition as follows "the equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval (LAeq, T)
Time Weighting:	One of the averaging times (Fast, Slow, Impulsive) used for the measurement of RMS sound pressure level in sound level metres.

1 INTRODUCTION

1.1 Project Background

Delta Group are undertaking Earthworks for the Tweed Valley Hospital Project located at 771 Cudgen Road, Kingscliff NSW, hereafter referred to as 'the Site'. The Site was previously agricultural land and excavation and piling works were on going during October 2019.

The purpose of this Noise Monitoring Assessment (NMA) report is to assess the impacts construction activities from the Tweed Valley Hospital Project have had on noise levels on site and ensure compliance with the Tweed Valley Hospital –Management Plan – Noise and Vibration condition C19 below and the Criteria listed in Section 1.4.

C5	Construction, including the delivery of materials to and from the site, may only be carried out between the following hours: a) between 7am and 6pm, Mondays to Fridays; and b) between 8am and 1pm, Saturdays. No work may be carried out on Sundays or public holidays
C6	Activities may be undertaken outside of the hours in condition C5 of the Schedule 3, if required: a) by the Police or a public authority for the delivery of vehicles, plant or materials: or b) in an emergency to avoid the loss of life, damage to property or to prevent environmental harm: or c) where the works are inaudible at the nearest sensitive receivers; or d) where a variation is approved in advance in writing by the Planning Secretary or his nominee if appropriate justification is provided for the works.
C7	Notification of such activities must be given to affected residents before undertaking the activities or as soon as is practical afterwards.
C8	The construction hours must include respite periods and specific times for activities during the day (outside the sensitive times), as required by condition B28(g) of Schedule 3 of this consent, for the high noise generating construction activities (such as activities that would reach or exceed the Highly Affected Level as defined in the ICNG).
C19	Unattended long-term construction noise monitoring must be undertaken during the Stage 1 works. The location of the unattended logger must be in accordance with the approved CNVMP required by condition B28 of Schedule 3. These loggers must be maintained and checked by a suitably qualified acoustician. The logger must automatically send a message to the suitably qualified acoustician once noise levels from construction works on the Site exceed 75dBA LAeq(15min) at the residential and non-residential receivers in Catchments A / B, Kingscliff TAFE and Kingscliff High School, to ensure that the mitigation measures specific to this exceedance are implemented on the Site at that time. The results of this monitoring must be provided to the Department for information on a monthly basis after the commencement of the Stage 1 construction works.

1.2 Monitoring locations

The Site is located 771 Cudgen Road, bounded Tweed Coast Road to the West, Turncock Street to the East and Cudgen Road adjacent to the South at Kingscliff, NSW (refer to *Appendix I – Aerial Photograph of monitoring locations*).

The noise monitoring locations are all within the confines of the construction barriers and were provided by Delta Group.

Noise emissions are recorded at these locations to determine the noise levels at the eastern and southern boundaries of the project during the alterations on site. Noise monitoring commenced on 26th July 2019 and continued until 31st July 2019 to determine the background noise levels of the area prior to the commencement of any project works. These background noise levels were determined for the various time periods during the 24-hour day. These being:

Day: 7am to 6pm
Evening: 6pm to 10pm
Night: 10pm to 7am

Construction and site work noise level recording commenced on 1st August 2019 and will continue for the duration of the project.

1.3 Monitoring Frequency

Monitoring is to be carried out for the duration of the project in these locations to ensure no excess noise is being generated as a result of construction activities. The noise monitoring includes measuring of the following parameters:

- (a) L_{Aeq} (A-weighted, equivalent sound level measured over a stated period of time.)
- (b) L_{APeak} (true peak of the sound pressure wave.)
- (c) L_{AFMax} (A-weighted, fast, maximum sound level)
- (d) L_{Aeq} (C-weighted, equivalent sound level measured over a stated period of time.)

1.4 Noise Level Criteria

Criteria A – 75dB LAeq (15min) as stated in the Tweed Valley Hospital –Management Plan – Noise and Vibration.

Criteria B – Should not be greater than 10 decibels above the background noise level during the normal construction times as per the EPA's Interim Guidelines.

Criteria C – 140dB (C) as stated in NSW Work health and Safety regulation (2017), clause 56 exposure standard for noise.

1.5 Survey Instrumentation and Methodology

At all locations, the Sound Level Meter (SLM) was enclosed in a tough case which remained at ground level with an extension pole attached to the case with the microphone mounted on top of the pole. The height of the microphone was approximately 1.5 metres above the ground level. The microphone was located at this height as it is representative height of workers and other receivers.

A wind shield was placed on each microphone to reduce any wind interference during the measurements. The sound meter's microphone is orientated toward the noise sources for all measurements and the area in between the sound level and the noise source was free from any temporary obstacles.

Measurements were carried out since the commencement of the background monitoring on the 26th July 2019 and record in all weather conditions.

The primary measurement parameter was the equivalent continuous A-weighted Sound Pressure Level, L_{Aeq} 15. The L_{Aeq} 15 is the average sound level recorded over 15 minutes. The A-weighting is used as it places emphasis on the middle frequencies of the noise spectrum, while putting less emphasis on the higher and lower frequencies. This emulates the way the human ear responds to sound.

An alarm beacon was set-up with the noise monitors in order to alert Delta Group and the Site Supervisor in the case of an exceedance in real-time. If the alarm was triggered, Delta Group and the Site Supervisor would receive an email and need to note the date and time, document the activity and consider implementing controls and work practices reviewed before re-commencing works.

1.6 Existing Noise Environment

The main noise sources in the area are:

- Construction noise from the site, including trucks moving to and from the site;
- Traffic noise (trucks and cars) from the adjacent roads (Cudgen Road);
- Foot traffic noises from workers/people walking around and past the site; and
- Noises from the workers and mobile plant who use the parking area.

2 RESULTS

A summary of the short term (LAeq 15 minute) Criteria A exceedances are presented below.

21st October 2019:

- An exceedance of 76.2dB LAeq (15 min {A}) was detected at 14:45 at the Eastern monitoring location.

29th October 2019:

- Three exceedances were detected on Tuesday, the 29th of October at the Central monitoring location
 - 75.6dB LAeq (15 min {A}) at 08:45am;
 - 76.4dB LAeq (15 min {A}) at 09:45am; and
 - 76.4dB LAeq (15 min {A}) at 10:00am.
- Six exceedances were detected on Tuesday, the 29th of October at the Eastern monitoring location
 - 77.1dB LAeq (15 min {A}) at 08:45am;
 - 77.3dB LAeq (15 min {A}) at 09:45am;
 - 76.0dB LAeq (15 min {A}) at 12:00pm;
 - 75.1dB LAeq (15 min {A}) at 12:30pm;
 - 76.6dB LAeq (15 min {A}) at 14:00pm; and
 - 78.1dB LAeq (15 min {A}) at 14:30pm.

In all occasions presented above the client was informed of the noise exceedance and ADE advised appropriate actions as per the Tweed Valley Hospital –Management Plan – Noise and Vibration.

The background and earthworks noise survey results from 1st October 2019 to 31st October 2019 for all monitors are summarised in Table 3 and Peak noise levels summarized in Table 4 below. Results outside of normal construction hours (7am – 6pm) have been excluded from the Tables 3 and 4 as they are not required.

Table 3. Averaged Daily Results of LAeq (15 min) Background and Earthworks Noise Results (measured in A weighted decibels) for Tweed Valley Hospital Project Monitoring.

Date	Day	West	Central	East
		Day Time	Day Time	Day Time
Criteria B Levels		73.3	72.9	69.9
01.10.2019	Tuesday	65.0	62.8	59.4
02.10.2019	Wednesday	64.8	62.6	59.6
03.10.2019	Thursday	65.3	No Data Due to Stockpile being put over solar panels.	60.3
04.10.2019	Friday	65.5		60.8
05.10.2019	Saturday	62.8		60.4
06.10.2019	Sunday	60.6		58.6
07.10.2019	Monday	60.9		58.6
08.10.2019	Tuesday	62.3		59.7
09.10.2019	Wednesday	64.8		60.6
10.10.2019	Thursday	64.5		60.3
11.10.2019	Friday	65.1	61.3	60.3

Table 3. Continued...

Date	Day	West	Central	East
		Day Time	Day Time	Day Time
Criteria B Levels		73.3	72.9	69.9
12.10.2019	Saturday	63.7	62.8	60.5
13.10.2019	Sunday	62.5	61.7	59.6
14.10.2019	Monday	64.7	62.4	59.7
15.10.2019	Tuesday	65.8	62.7	60.1
16.10.2019	Wednesday	65.6	63.7	60.9
17.10.2019	Thursday	67.2	64.2	61.7
18.10.2019	Friday	65.2	62.0	60.1
19.10.2019	Saturday	61.6	60.8	59.1
20.10.2019	Sunday	62.4	61.6	60.1
21.10.2019	Monday	63.8	64.9	64.8
22.10.2019	Tuesday	63.7	62.9	63.3
23.10.2019	Wednesday	64.9	61.6	60.0
24.10.2019	Thursday	64.4	63.4	58.6
25.10.2019	Friday	65.7	62.3	59.1
26.10.2019	Saturday	63.2	62.0	58.8
27.10.2019	Sunday	62.3	60.0	59.5
28.10.2019	Monday	64.8	62.5	63.4
29.10.2019	Tuesday	63.6	67.1	70.1
30.10.2019	Wednesday	64.2	62.2	65.3
31.10.2019	Thursday	63.1	61.3	64.0

Note – **Bold** results exceed the Criteria B Levels

In Table 3 above there is one exceedance of 70.1dB (A) on the 29th October 2019 at the Eastern monitoring location.

Table 4. Peak Noise Results (measured in C weighted decibels) at the Site for Tweed Valley Hospital Project Monitoring.

Date	Day	West	Central	East
		Day Time	Day Time	Day Time
Criteria C Levels		140	140	140
01.10.2019	Tuesday	95.7	94.7	93.7
02.10.2019	Wednesday	94.2	90.0	94.8
03.10.2019	Thursday	94.9	No Data Due to Stockpile being put over solar panels.	95.5
04.10.2019	Friday	94.5		97.0
05.10.2019	Saturday	93.4		94.8
06.10.2019	Sunday	95.3		94.9
07.10.2019	Monday	94.5		95.2
08.10.2019	Tuesday	98.4		96.2
09.10.2019	Wednesday	102.9		101.0
10.10.2019	Thursday	92.0		94.0
11.10.2019	Friday	95.7	112.7	92.0
12.10.2019	Saturday	92.4	88.2	93.9
13.10.2019	Sunday	93.3	93.5	100.8
14.10.2019	Monday	90.2	90.3	94.9
15.10.2019	Tuesday	96.0	94.0	94.1
16.10.2019	Wednesday	101.1	100.3	96.5
17.10.2019	Thursday	104.3	100.6	102.0
18.10.2019	Friday	94.9	90.4	97.1
19.10.2019	Saturday	92.8	89.6	92.8
20.10.2019	Sunday	93.5	95.6	100.8
21.10.2019	Monday	93.1	91.9	97.0
22.10.2019	Tuesday	94.6	93.8	95.7
23.10.2019	Wednesday	104.3	92.0	92.8
24.10.2019	Thursday	94.1	97.8	95.4
25.10.2019	Friday	95.6	95.7	97.8
26.10.2019	Saturday	101.1	98.9	100.2
27.10.2019	Sunday	103.0	98.6	103.7
28.10.2019	Monday	101.6	102.4	97.4
29.10.2019	Tuesday	94.8	111.2	108.6
30.10.2019	Wednesday	91.6	94.8	99.4
31.10.2019	Thursday	91.2	91.6	100.9

Note – **Bold** results exceed Criteria C levels.

2.1 Bureau of Meteorology (BOM) Climate Data

Summary of climate data for Coolangatta has been included in Table 5 below.

Table 5. Summary of Climate Data at Coolangatta, QLD.

Date	Wind direction	Highest wind gusts (km/h)	Maximum time of wind gust	Minimum temperature (°C)	Maximum temperature (°C)	Rain (mm)
01.10.2019	SSE	46	15:48	16.9	23.3	3.8
02.10.2019	E	31	10:07	13.3	22.9	0.4
03.10.2019	NNE	31	09:59	9.4	23.6	0
04.10.2019	N	41	15:49	13.9	24.6	0
05.10.2019	SSE	57	15:05	16.9	27.1	0
06.10.2019	NNW	35	22:28	15.6	23.8	0
07.10.2019	N	44	09:16	19.7	25.7	0
08.10.2019	SSE	54	21:53	19.8	27.4	0
09.10.2019	SE	54	13:39	17.6	23.7	0
10.10.2019	ESE	48	13:00	15.1	23.2	0
11.10.2019	ENE	30	10:57	13.6	22.4	0
12.10.2019	NE	43	01:35	12.5	20.0	30.8
13.10.2019	SE	48	14:46	12.6	23.0	5.4
14.10.2019	NE	28	11:40	11.6	23.5	0
15.10.2019	N	43	11:04	16.3	26.4	0
16.10.2019	N	50	17:09	20.0	27.0	0
17.10.2019	N	59	13:21	20.5	26.2	0
18.10.2019	S	46	04:44	17.6	26.0	1.8
19.10.2019	NNE	30	15:13	15.7	24.5	0
20.10.2019	SSE	59	11:03	12.5	25.8	0
21.10.2019	SE	46	11:15	16.7	24.8	0.6
22.10.2019	ESE	35	12:54	12.7	24.3	0
23.10.2019	ESE	37	13:30	13.5	25.3	0
24.10.2019	NNE	35	10:43	12.7	25.3	0
25.10.2019	N	43	13:39	16.1	25.6	0
26.10.2019	N	54	13:25	18.5	26.0	0
27.10.2019	SE	56	12:35	19.5	28.3	0
28.10.2019	SE	52	13:56	18.9	26.4	0
29.10.2019	ESE	31	08:12	16.2	25.5	0
30.10.2019	NNE	30	12:33	14.1	25.5	0
31.10.2019	NE	31	13:19	14.2	25.9	0

3 Discussion

As mentioned in the Lendlease Building Pty Ltd Tweed Valley Hospital – Management Plan – Noise and Vibration dated 15 April 2019 Revision 2.2, Figure 1 below details the noise management levels of the nearby receivers.

Work Hours					
Comply with approved work hours. Monday to Friday 7:00 am to 6:00 pm; Saturday: 8:00 am to 1:00 pm TO BE CONFIRMED WITH SSD FINAL CONDITIONS	At all times	Identify and communicate approved work hours/days. Plan works and complete within approved hours. Provide notification to the community.	CM/SM	Documented approval received for work outside of approved hours. Monitoring of work outside of approved hours.	Timely approval of work outside of hours. No complaints. No work outside of approved hours without prior impact assessment and approval from the relevant regulatory authority. No fines.
If work needs to be performed due to unforeseen circumstances (e.g. concrete pour) outside the hours nominated, consent from the Department of Planning must be obtained.	At all times	Prior notice and approval from the Department of Planning must be sought.	GF	Continuous as required.	No complaints from public or adjoining residents or authorities.
Provide advanced notification to potentially affected community stakeholders of out of hour's work/deliveries and high noise or vibration activities.	Prior to works commencing	Prepare appropriate information and distribute to the community at least 3 days prior to the works occurring.	CM/SM	Feedback recorded.	No community complaints. Positive relationship established with project neighbours.
Where applicable if work activities involve noisy works, controls measure MUST be detail as part of the Work Method Statement	Prior to works commencing	In accordance with the Noise and Vibration Management Plan.	Contractor	Continuous	Work Method Statement to contain details of schedule of work and equipment being used.
Where applicable, activities that are found to exceed the 75dB (highly affected noise level) at receivers, respite periods (such as three hours on and 1 hour off).	During noisy works.	Regular monitoring to be undertaken and controls addressed during pre-starts and tool box talks if required,	CM/SM	Noise monitoring results. Number of complaints.	No complaints. No exceedances of predicted levels.

MANAGEMENT PLAN - NOISE AND VIBRATION
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LENDLEASE BUILDING MANAGEMENT SYSTEM

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Figure 1. Noise Management Levels of nearby receivers taken from Lendlease Building Pty Ltd Tweed Valley Hospital – Management Plan – Noise and Vibration dated 15/6/2018.

The background levels that were obtained in the three (3) sampling locations were less than those of the above table. The background levels that were taken as part of this noise survey are believed to be representative of the background noises that would be experienced on site.

The background noise levels for Western and Central locations were similar, with levels at the eastern locations generally lower. The background and earthworks noise were generally slightly higher at the western and central sites for the month of October. The noise levels at the Eastern site were generally lower than at the other two sites, however the occasional high peak was observed towards the end of the month.

A period of no data from the 3rd – 10th of October at the central location was caused by stockpiled soil covering the solar panels. ADE was present on-site during the 11th of October and relocated the monitors in consultation with the client. It was deemed that the new location of the monitors remains suitable to assess noise impacts on educational and residential receptors adjacent the site. Please note that the telemetry system is unable to notify users in the event the solar panels are obstructed and therefore limiting power to the unit.

10 exceedances of criteria A were recorded throughout the month and on all occasions, ADE was advised by the client that excavators were working within 10 metres of the noise monitors.

If this distance is doubled to 20 metres the noise level will decrease by half or by 3dB. The highest exceedance was 78.1dB (15min {A}) which means the receiver needs to be >20 metres from the noise source for the noise level to decrease by 3.1dB to 75dB or below. In all exceedances mentioned above the identified receivers are >20 metres from the noise source. Also, the above-mentioned exceedances are short-term, and noise levels are not above 75dB (A) when averaged across the daytime noise monitoring period.

ADE adopted the peak exposure standard of 140dB(C) according to the *NSW Work health and Safety regulation (2017), clause 56 exposure standard for noise* for the duration of the project. No values exceeded this standard (refer to table 4).

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4 Conclusion

Analysis of the results from the noise monitoring indicate the works to date have had very minor effects to noise levels experienced on the site boundary at all three monitoring sites.

Ten (10) exceedances were noted throughout October 2019, ADE was advised that excavation works were being conducted near the monitors on all occasions. Due to the proximity of works, the short-term nature of these exceedances (experienced over a 15-minute period) and the distance between the noise source and the receiver these exceedances would not reach the receptors off-site above the adopted criteria of 75dB.

Additionally, the daytime averages on the 29th October 2019 at the Central and Eastern location were 67.1 and 70.1dB (A) respectively, which is below the 75dB as can be seen in table 3 above.

No peak noise levels exceeded the exposure standard set out by *NSW Work health and Safety regulation (2017), clause 56 exposure standard for noise* of 140dB(C).

Appendix I - Aerial Photograph of Monitoring Locations

Sydney Office:
ADE Consulting Group Pty Ltd
Unit 6 / 7 Millennium Court
Silverwater, NSW 2128

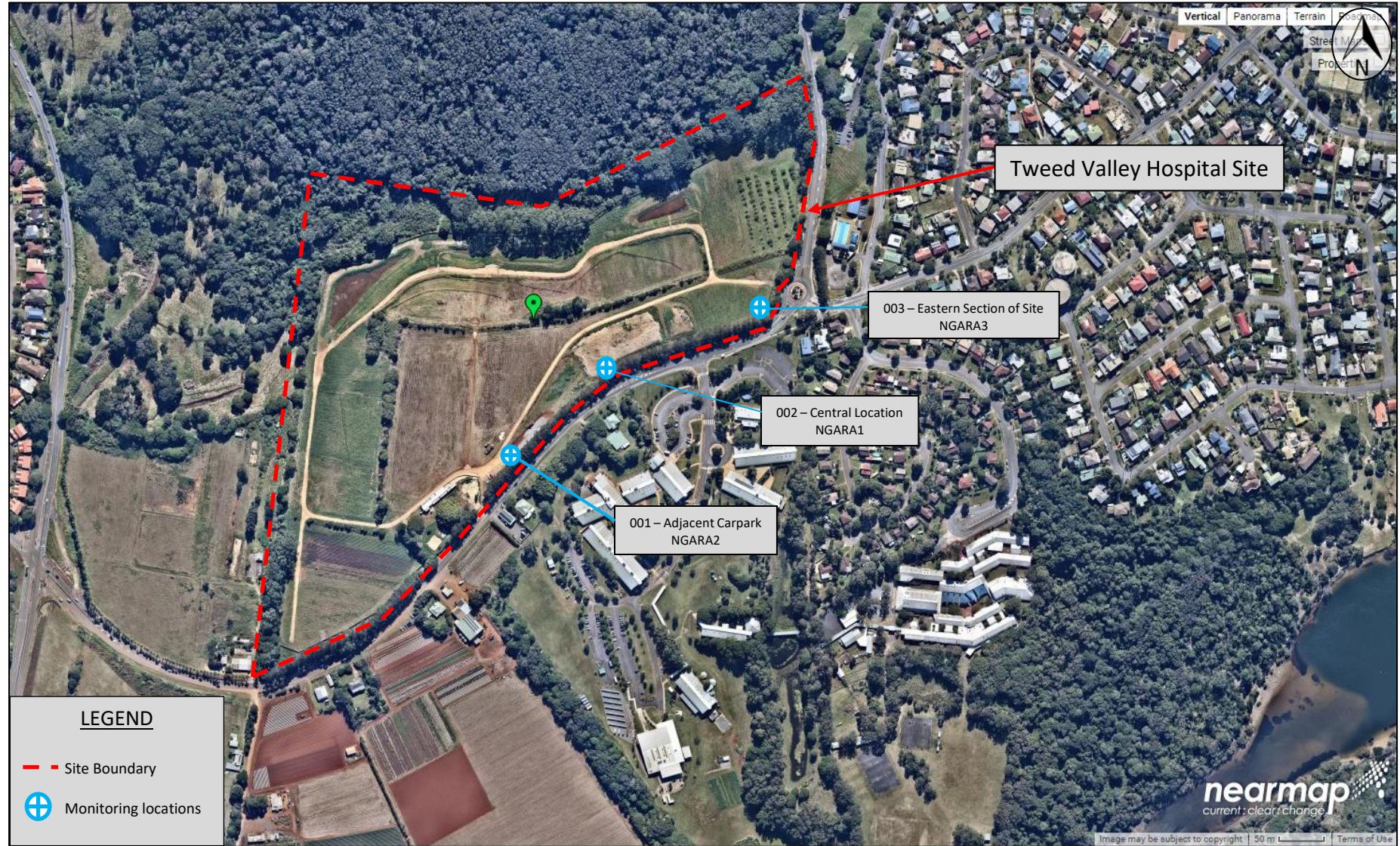
Melbourne Office:
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Unit 4 / 95 Salmon Street
Port Melbourne, VIC 3207

Newcastle Office:
ADE Consulting Group Pty Ltd
Unit 9 / 103 Glenwood Drive
Thornton, NSW 2322

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Aerial photograph of the DLT works area at Kingscliff



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Appendix II - Monitoring Locations

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Representative photo of the monitoring location 001 – adjacent carpark, as observed on the 06.11.2019

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Representative photo of the monitoring location 002 – central location, as observed on the 06.11.2019.

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Representative photo of the monitoring location 003 – eastern section of site, as observed on the 06.11.2019.

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Appendix III - References

- AIOH Position Paper, Occupational Noise and Its Potential for Health Issues, published by the Australian Institute of Occupational Hygienist (AIOH), May 2016.
- AIOH guidebook, Occupational Hygiene Monitoring & Compliance strategies.
- Guidelines for Writing Occupational Hygiene Reports 3rd Edition, April 2017, Australian Institute of Occupational Hygienists Inc.
- EPA (Environmental Protection Agency) Interim Construction Guidelines, Department of Environment & Climate Change, NSW, June 2009.
- Lendlease Building Pty Ltd Tweed Valley Hospital – Management Plan – Noise and Vibration dated 15 April 2019 Revision 2.2
- *NSW Work health and Safety regulation (2017)*

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Appendix IV - ADE Site Time Summary

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Date of site visit
Friday 11.10.2019
Monday 28.10.2019
Wednesday 06.11.2019

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