

# **ERA Planning and Environment**

---

## **Selfs Point STP expansion, environmental noise assessment**



Report No. 5560a\_AC\_R\_R3

---

**TARKARRI ENGINEERING PTY LTD**

PO Box 506

Kings Meadows TAS 7249

February 2024

**Tarkarri  
Engineering**

---

Air Quality • Acoustics • Environment • Vibration





## DOCUMENT CONTROL

### SELFS POINT STP EXPANSION, ENVIRONMENTAL NOISE ASSESSMENT

**Report No.**

5560a\_AC\_R\_R3

**Prepared for**

ERA  
L1, 125A Elizabeth St  
Hobart  
Tasmania 7000

**Library Code**

ACAO

**Prepared by**

Tarkarri Engineering Pty Ltd  
PO Box 506  
Kings Meadows  
Tasmania 7249

**Contact** Mr Daniel Elson

☎ +61 3 6332 3300

**Mobile** +61(0)411 296 901

Email [daniel@eraplanning.com.au](mailto:daniel@eraplanning.com.au)

**Contact** Dr Alex McLeod

☎ +61 3 6343 2077

**Mobile** +61(0)439 357 297

Email [alex.mcleod@tarkarri.com](mailto:alex.mcleod@tarkarri.com)

**Author**

Alex McLeod  
Director / Principal Consultant

Date: 2 April 2024

**Revision History****Revision No.****Date Issued****Reason/Comments**

0

14/07/2022

Initial release

1

13/12/2023

Redesign

2

14/12/2023

Construction noise

3

02/04/2024

Co-generator noise

**Distribution****Copy No.****Revision No.****Location**

1

3

Project/Client File

2

3

Client

3

3

Tarkarri Engineering Library

**Keywords**

**dBA** – Decibels A-weighted.

**A-weighting** – Weighting of the audible frequencies reflective of the response of the human ear to noise.

**$L_{Aeq,T}$**  – Equivalent continuous A-weighted sound pressure level over a given time (T).

**$L_{A90,T}$**  – A-weighted sound pressure level exceeded for 90 % of a given time period (T), typically known as the background.

**$L_{A10,T}$**  – A-weighted sound pressure level exceeded for 10 % of a given time period (T).



## Table of Contents

|                                               |    |
|-----------------------------------------------|----|
| Executive summary .....                       | 5  |
| 1 Introduction.....                           | 6  |
| 2 Site description .....                      | 6  |
| 3 Existing noise levels .....                 | 9  |
| 3.1 Position 1 – Queens Walk Apartments ..... | 12 |
| 3.2 Position 2 – New Town Rowing Centre.....  | 14 |
| 3.3 Position 3 – New Town Rivulet .....       | 16 |
| 3.4 Position 4 – 119 New Town Rd.....         | 18 |
| 3.5 Position 5 – Friends Rowing Shed .....    | 20 |
| 3.6 Position 6 (control) – 2 Cook St .....    | 23 |
| 3.7 Boundary position.....                    | 25 |
| 3.8 Existing noise level summary.....         | 26 |
| 4 EPN noise emission limits .....             | 26 |
| 5 Future noise levels .....                   | 26 |
| 5.1 Model input data.....                     | 27 |
| 5.2 Atmospheric conditions.....               | 28 |
| 5.3 Model views.....                          | 28 |
| 5.4 Modelling results and discussion .....    | 31 |
| 6 Recommendations.....                        | 35 |
| 6.1 Additional noise sources.....             | 39 |
| Addendum: construction noise .....            | 40 |
| Management approach .....                     | 40 |
| Noise affected levels .....                   | 42 |
| Non-standard hours operations .....           | 42 |

## List of figures

|                                                                              |    |
|------------------------------------------------------------------------------|----|
| Figure 2-1: Aerial view of existing Selfs Point STP and surrounds.....       | 7  |
| Figure 2-2: Proposed Selfs Point STP expansion plan (provided by ERA). ..... | 8  |
| Figure 3-1: Aerial view with position 6 and Figure 3-2 extent marked. ....   | 10 |
| Figure 3-3: Position 1 – Queens Walk Apartments. ....                        | 12 |
| Figure 3-4: Position 1, 1/3-octave band spectrum. ....                       | 13 |
| Figure 3-5: Position 1, narrow band spectrum 0 – 1000 Hz. ....               | 13 |
| Figure 3-6: Position 2 – New Town Rowing Centre. ....                        | 14 |
| Figure 3-7: Position 2, 1/3-octave band spectrum. ....                       | 15 |
| Figure 3-8: Position 2, narrow band spectrum 0 – 1000 Hz. ....               | 15 |
| Figure 3-9: Position 3 – New Town Rivulet.....                               | 16 |
| Figure 3-10: Position 3, 1/3-octave band spectrum. ....                      | 17 |
| Figure 3-11: Position 3, narrow band spectrum 0 – 1000 Hz. ....              | 17 |
| Figure 3-12: Position 4 – 119 New Town Rd. ....                              | 18 |
| Figure 3-13: Position 4, 1/3-octave band spectrum. ....                      | 19 |
| Figure 3-14: Position 4, narrow band spectrum 0 – 1000 Hz. ....              | 19 |
| Figure 3-15: Position 5 – Friends Rowing Shed.....                           | 20 |
| Figure 3-16: Position 5, 1/3-octave band spectrum. ....                      | 21 |
| Figure 3-17: Position 5, narrow band spectrum 0 – 1000 Hz. ....              | 22 |
| Figure 3-18: Position 6 (control) – 2 Cook St.....                           | 23 |
| Figure 3-19: Position 6, 1/3-octave band spectrum. ....                      | 24 |
| Figure 3-20: Position 6, narrow band spectrum 0 – 1000 Hz. ....              | 24 |
| Figure 3-22: Boundary position, unobserved noise statistics. ....            | 25 |
| Figure 5-1: Model plan view. ....                                            | 29 |



|                                                                                                                       |    |
|-----------------------------------------------------------------------------------------------------------------------|----|
| Figure 5-2: Model wire-frame view from the south. ....                                                                | 30 |
| Figure 5-3: Predicted noise contours, ISO. ....                                                                       | 33 |
| Figure 5-4: Predicted noise contours, worst-case weather. ....                                                        | 34 |
| Figure 6-1: Predicted noise contours with noise reductions, ISO. ....                                                 | 37 |
| Figure 6-2: Predicted noise contours with noise reductions, worst-case weather. ....                                  | 38 |
| Figure A-1: NSW EPA noise management levels for construction activity during <b>standard</b><br>operating hours. .... | 41 |
| Figure A-2: NSW EPA noise management levels for construction activity <b>non-standard</b><br>operating hours. ....    | 41 |
| Figure A-3: Photograph of a temporary noise barrier system (taken by Tarkarri Engineering). ....                      | 44 |

## List of tables

|                                                                                                             |    |
|-------------------------------------------------------------------------------------------------------------|----|
| Table 3-1: Measurement locations. ....                                                                      | 9  |
| Table 3-2: Position 1, Ln-statistics. ....                                                                  | 12 |
| Table 3-3: Position 2, Ln-statistics. ....                                                                  | 14 |
| Table 3-4: Position 3, Ln-statistics. ....                                                                  | 16 |
| Table 3-5: Position 4, Ln-statistics. ....                                                                  | 18 |
| Table 3-6: Position 5, Ln-statistics. ....                                                                  | 21 |
| Table 3-7: Position 6, Ln-statistics. ....                                                                  | 23 |
| Table 3-8: Summary noise level ranges. ....                                                                 | 26 |
| Table 5-1: Overall sound power levels and data source information. ....                                     | 27 |
| Table 5-2: 1/1-octave band sound power level spectra. ....                                                  | 28 |
| Table 5-3: Predicted received sound pressure levels. ....                                                   | 31 |
| Table 5-4: Predicted noise source contributions. ....                                                       | 31 |
| Table 6-1: Noise mitigation recommendations. ....                                                           | 36 |
| Table 6-2: Predicted received sound pressure levels with noise reductions. ....                             | 36 |
| Table A-1: Continuous Flight Auger drilling overall sound power levels and data source<br>information. .... | 43 |
| Table A-2: Continuous Flight Auger drilling 1/1-octave band sound power level spectra. ....                 | 43 |
| Figure A-3 presents a photograph showing an example of a temporary noise barrier system. ....               | 43 |

## References

- [1] SoundPLAN Acoustic modelling software - Braunstein & Berndt GmbH.
- [2] ISO 9613-2:1996 Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation.
- [3] CONCAWE The oil companies' international study group for conservation of clean air and water – Europe (est. 1963) report 4/81.



## **Executive summary**

Tarkarri Engineering conducted an environmental noise assessment of a proposed expansion to the Selfs Point sewerage treatment plant (STP).

Existing noise levels surrounding the plant were measured, with noise emissions from the STP not audible and the local noise environment predominantly controlled by traffic noise. Given the measured noise levels, the existing noise emission limits for the plant were considered appropriate and were retained for assessment purposes.

Environmental noise modelling of the expanded plant results in predicted noise emission levels that would be acceptable during the day period but exceed project criteria levels during the evening and night. Noise mitigation recommendations have been provided in section 6 of this report with a view to allowing compliance with the evening night noise emission limits. Once applied predicted levels are below the project criteria levels.



## 1 Introduction

Tarkarri Engineering was commissioned by ERA to conduct an environmental noise assessment for a proposed expansion of the Selfs Point sewerage treatment plant (STP). This forms part of an Environmental Impact Statement (EIS) for the project. The Tasmanian Environment Protection Authority (EPA) have issued project specific guidelines with the section relevant to environmental noise presented below:

### 6.4 Noise emissions

- ...
- Identify relevant noise sensitive situations (cemetery and residences etc.) relevant to the project for both night and day times to a distance where the potential exists for noise from the WWTP to be a significant component of overall noise (e.g. up to 600m from the site boundary to the north and northwest).
- Provide a noise survey of the current noise in key areas both close to the plant and in relevant noise sensitive areas.
- Identify other relevant noise contributions in the area, e.g. the Brooker Highway.
- Provide a notional list of current and expected noise sources – this should be in terms of major component groups and any particularly high-noise equipment.
- Predict, with the use of a suitable noise model, the current and future noise levels from the plant.

## 2 Site description

The Selfs Point STP is located at 12 Selfs Point Rd on the Southern shore of New Town Bay and is bounded by land zoned Port and Marine to the east, Recreation to the west and Community Purpose to the south. Noise sensitive residential premises are located to the north and west across New Town Bay and New Town Rivulet and to the south-west at the Queens Walk Apartments.

The STP would expand into land to the south of the existing plant at 10 Selfs Point Rd with some process units within the existing plant retained.

Figure 2-1 presents an aerial view of the existing STP and surrounds while Figure 2-2 presents a general arrangement of the expanded STP with the location of new and retained process units marked.



Figure 2-1: Aerial view of existing Selfs Point STP and surrounds.





### 3 Existing noise levels

Observed 10-minute measurements were obtained over a 30-minute period at 6 measurement positions surrounding the STP during the day, evening and night. This data has been summarised and averaged measurements presented for each location in the following subsections. Relevant observations have also been noted. All 10-minute observed data is presented in Appendix A. Table 3-1 presents location information for the 6 observed measurement locations along with a boundary location where unobserved noise data was logged.

| Environmental noise measurement positions |                              |                                        |
|-------------------------------------------|------------------------------|----------------------------------------|
| Number                                    | Location                     | Coordinates<br>(Datum: GDA94, Zone 55) |
| 1                                         | Queens Walk Apartments       | 525779E, 5255705N                      |
| 2 *                                       | New Town Rowing Centre       | 525803E, 5256077N                      |
| 3                                         | New Town Rivulet             | 525637E, 5255974N                      |
| 4                                         | 119 New Town Rd              | 525694E, 5256194N                      |
| 5                                         | Friends Rowing Shed          | 525928E, 5256464N                      |
| 6                                         | 2 Cook St (Control)          | 525041E, 5257330N                      |
| BND                                       | Unobserved boundary location | 525954E, 5256134N                      |

\* Not a noise sensitive premises as defined in the STPs existing Environmental Protection Notice, No. 9797/1 (r1).

Table 3-1: Measurement locations.

Extended unobserved measurements were obtained at the boundary (BND) position. The following 10-minute statistical data is provided graphically in subsection 3.7 as follows:

- $L_{Aeq}$
- $L_{A10}$
- $L_{A90}$

For sake of clarity, the other 5 data sets are not shown.

Short duration spectral data was obtained during each observed measurement and is shown graphically in two data sets in each subsection as follows: -

- 1/3-octave band spectra
- Narrow band data 0 to 1000 Hz (0.15625 Hz resolution)

Where appropriate, significant tones have been marked in the narrow band spectra and potential sources noted.

The following instrumentation was used during the survey: -

- Environmental noise analyser Larson Davis 831 s/n 1168.
- Environmental noise analyser Larson Davis 831C s/n 11207.
- Spectrum analyser Larson Davis 831 s/n 1169.
- Acoustic Calibrator CA250 s/n 2706.

All instruments were field calibrated prior to use and wind socks were used on microphones for all measurements.

Figures 3-1 and 3-2 present aerial views with the measurement locations marked.



Figure 3-1: Aerial view with position 6 and Figure 3-2 extent marked.

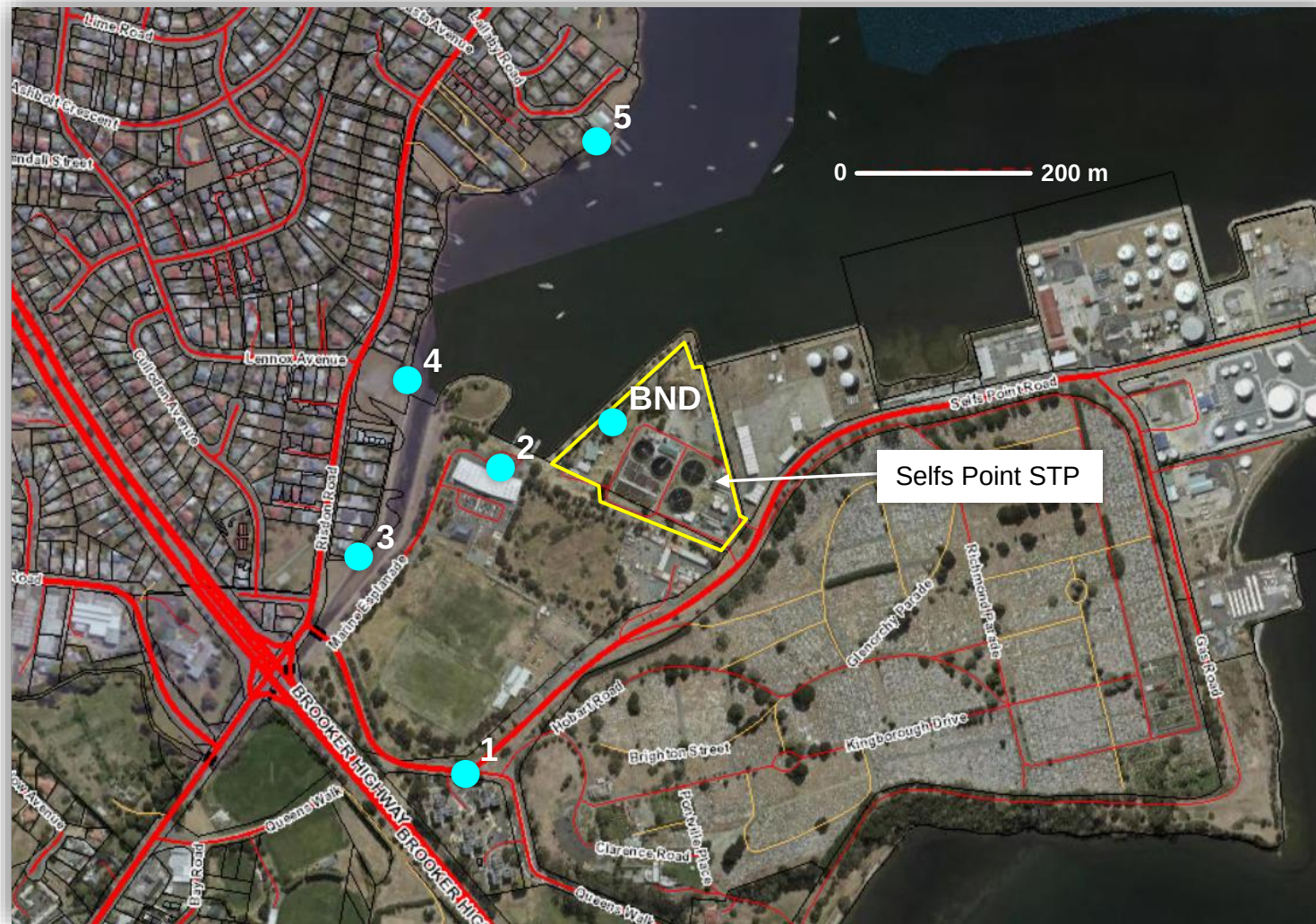


Figure 3-2: Aerial view with survey positions marked



### 3.1 Position 1 – Queens Walk Apartments

Position 1 is located on the northern side of the Queens Walk Apartments.  $L_{Aeq}$  levels at this location are controlled by traffic, both local and on the Brooker Hwy. At night under lower traffic levels industrial noise from the Lutana area to the north. The STP wasn't audible at this location.



Figure 3-3: Position 1 – Queens Walk Apartments.

| 1 – Queens Walk Apartments |        |       |           |            |            |      |      |      |      |      |                          |                                                                                                                     |
|----------------------------|--------|-------|-----------|------------|------------|------|------|------|------|------|--------------------------|---------------------------------------------------------------------------------------------------------------------|
| Period                     | Date   | Time  | $L_{Aeq}$ | $L_{Amin}$ | $L_{Amax}$ | LA1  | LA10 | LA50 | LA90 | LA99 | Weather                  | Audible sources                                                                                                     |
| Day                        | 25-Mar | 8:37  | 67.2      | 50.7       | 82.4       | 78.3 | 71.4 | 60.1 | 55.9 | 52.0 | Overcast<br>Mod breeze N | <u>External:</u><br>Hwy traffic<br>Local traffic<br>Voices<br>Birds<br>Leaf rustle<br><u>STP:</u><br>Inaudible      |
| Evening                    | 24-Mar | 18:13 | 67.1      | 50.4       | 82.2       | 78.5 | 71.0 | 59.4 | 54.6 | 52.3 | Overcast<br>Light breeze | <u>External:</u><br>Hwy traffic<br>Local traffic<br>Voices<br>Leaf rustle<br><u>STP:</u><br>Inaudible               |
| Night                      | 25-Mar | 0:26  | 57.3      | 40.0       | 79.1       | 69.1 | 56.3 | 48.8 | 45.0 | 42.2 | Clear<br>Calm            | <u>External:</u><br>Hwy traffic<br>Local traffic<br>Voices<br>Birds<br>Industrial noise<br><u>STP:</u><br>Inaudible |

Table 3-2: Position 1, Ln-statistics.

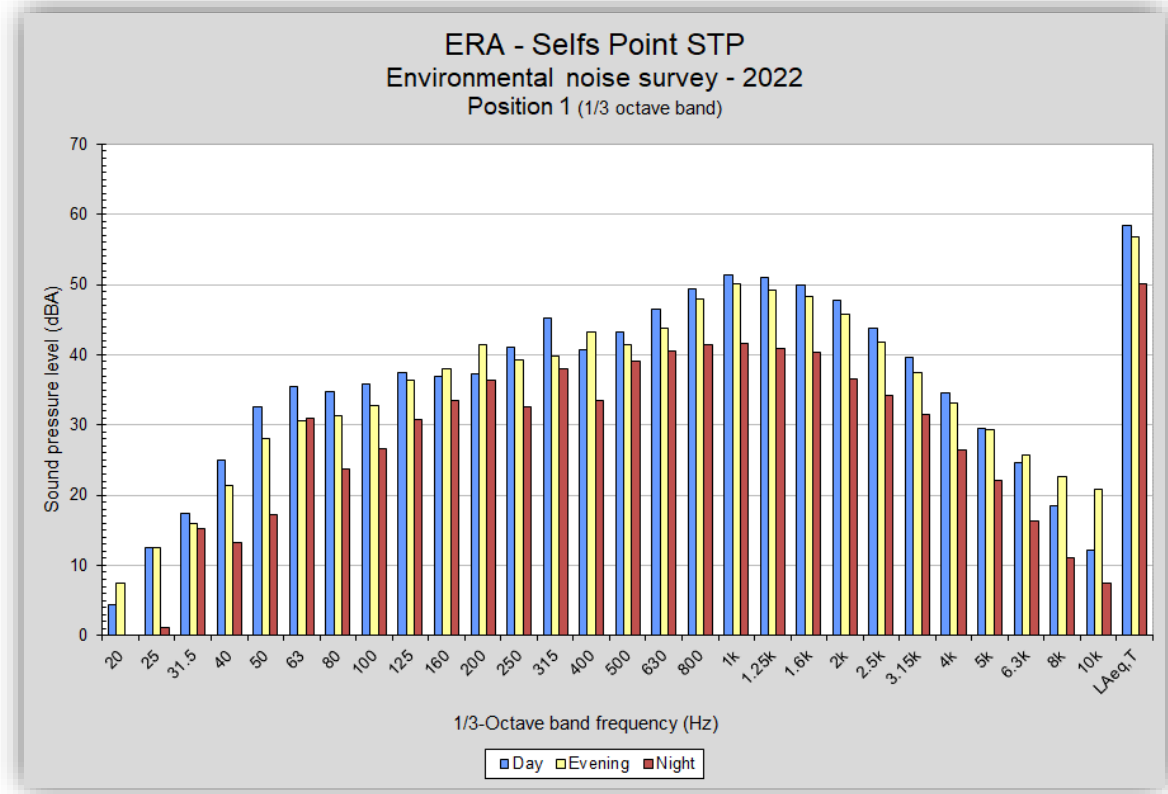


Figure 3-4: Position 1, 1/3-octave band spectrum.

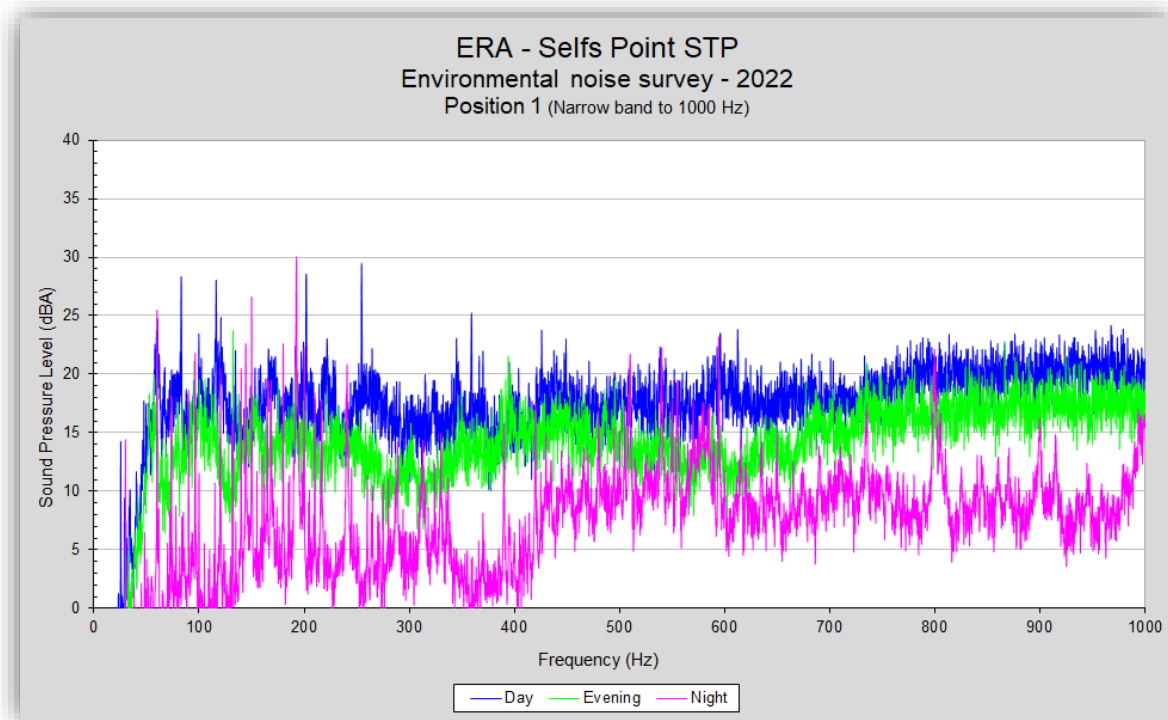


Figure 3-5: Position 1, narrow band spectrum 0 – 1000 Hz.



3.2 Position 2 – New Town Rowing Centre

Position 2 is located on the northern side of the New Town Rowing Centre, approx. 70 m from the STP site boundary. Music and voices from a function in the centre were audible during the measurement period. Fan tones from the centre were audible and clearly tonal and controlled background noise levels along with distant traffic noise from the Brooker Hwy. The STP wasn’t audible.



Figure 3-6: Position 2 – New Town Rowing Centre.

| 2 – New Town Rowing Centre |        |       |      |       |       |      |      |      |      |      |                        | Audible sources                                                                                               |
|----------------------------|--------|-------|------|-------|-------|------|------|------|------|------|------------------------|---------------------------------------------------------------------------------------------------------------|
| Period                     | Date   | Time  | LAeq | LAmin | LAmaz | LA1  | LA10 | LA50 | LA90 | LA99 | Weather                |                                                                                                               |
| Evening                    | 24-Mar | 18:49 | 59.1 | 45.1  | 74.7  | 66.9 | 62.2 | 56.2 | 50.3 | 47.3 | Cloudy<br>Light breeze | <u>External:</u><br>Birds<br>Voices<br>Music<br>Fan tones<br>Hwy noise<br>Impacts<br><u>STP:</u><br>Inaudible |

Table 3-3: Position 2, Ln-statistics.

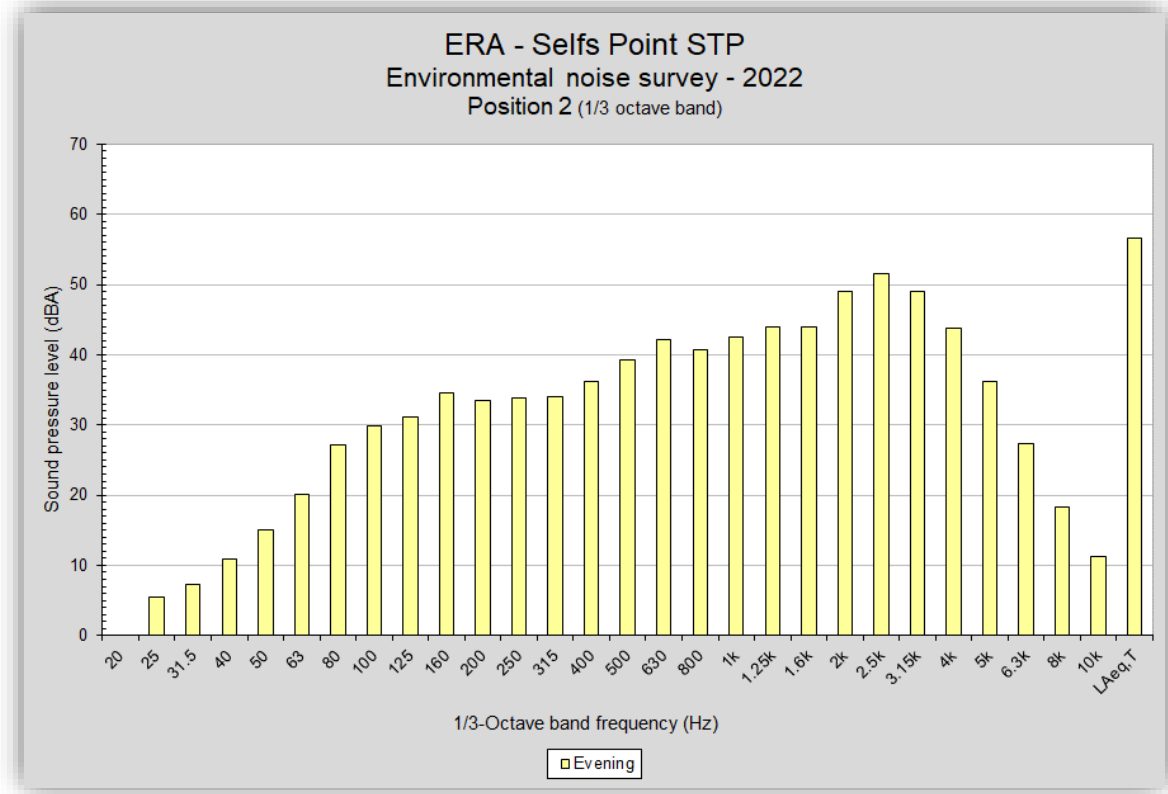


Figure 3-7: Position 2, 1/3-octave band spectrum.

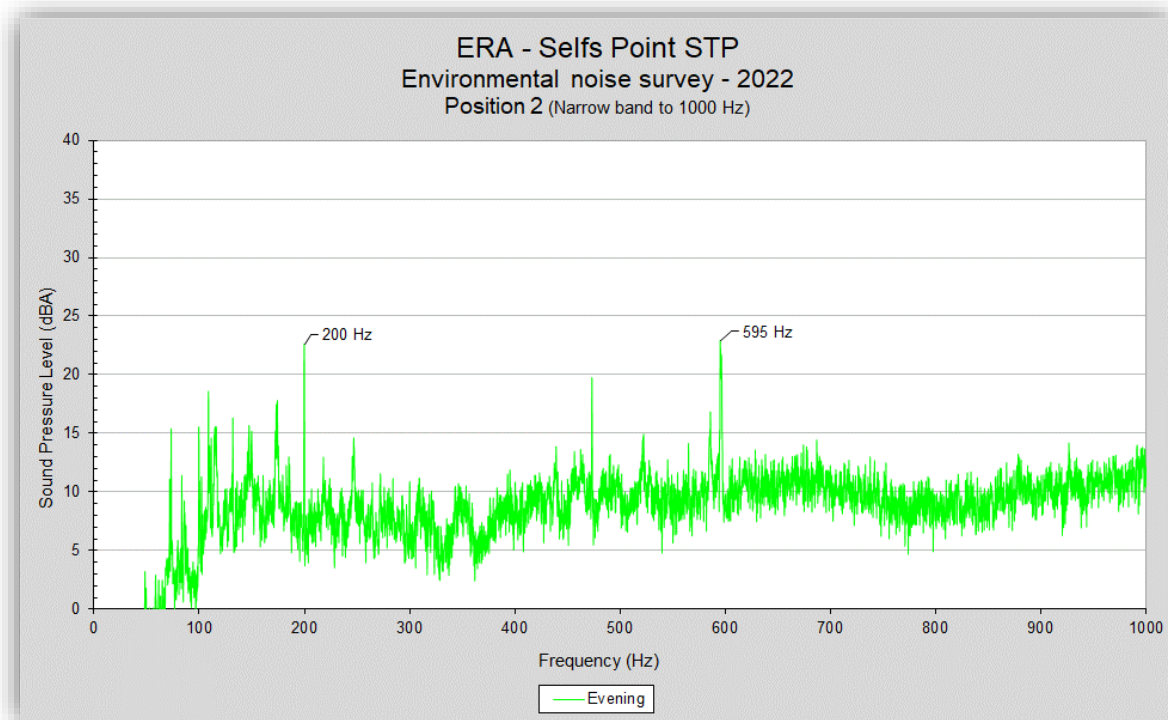


Figure 3-8: Position 2, narrow band spectrum 0 – 1000 Hz.



### 3.3 Position 3 – New Town Rivulet

Position 3 is located on the western side of the New Town Rivulet to the rear of residential properties. Traffic on the Brooker Hwy was the dominant noise source at this location. At night under lower traffic levels industrial noise from the Lutana area to the north was audible and controlled background noise levels. The STP wasn't audible



Figure 3-9: Position 3 – New Town Rivulet.

| 3 – New Town Rivulet |        |       |      |        |        |      |      |      |      |      |                       |                                                                                                      |
|----------------------|--------|-------|------|--------|--------|------|------|------|------|------|-----------------------|------------------------------------------------------------------------------------------------------|
| Period               | Date   | Time  | LAeq | L Amin | L Amax | LA1  | LA10 | LA50 | LA90 | LA99 | Weather               | Audible sources                                                                                      |
| Day                  | 25-Mar | 8:02  | 60.3 | 48.8   | 75.8   | 70.7 | 63.1 | 56.3 | 53.1 | 50.5 | Clear<br>Mod breeze N | <u>External:</u><br>Hwy traffic<br>Local traffic<br>Birds<br>Leaf rustle<br><u>STP:</u><br>Inaudible |
| Evening              | 24-Mar | 20:01 | 53.6 | 44.8   | 69.8   | 62.1 | 55.3 | 51.6 | 48.1 | 46.1 | Cloudy<br>Mod breeze  | <u>External:</u><br>Leaf rustle<br>Hwy traffic<br>Voices<br>Insects<br><u>STP:</u><br>Inaudible      |
| Night                | 24-Mar | 23:51 | 46.4 | 33.3   | 63.4   | 56.1 | 49.0 | 43.7 | 38.1 | 35.0 | Clear<br>Light breeze | <u>External:</u><br>Birds<br>Hwy traffic<br>Industrial noise<br><u>STP:</u><br>Inaudible             |

Table 3-4: Position 3, Ln-statistics.

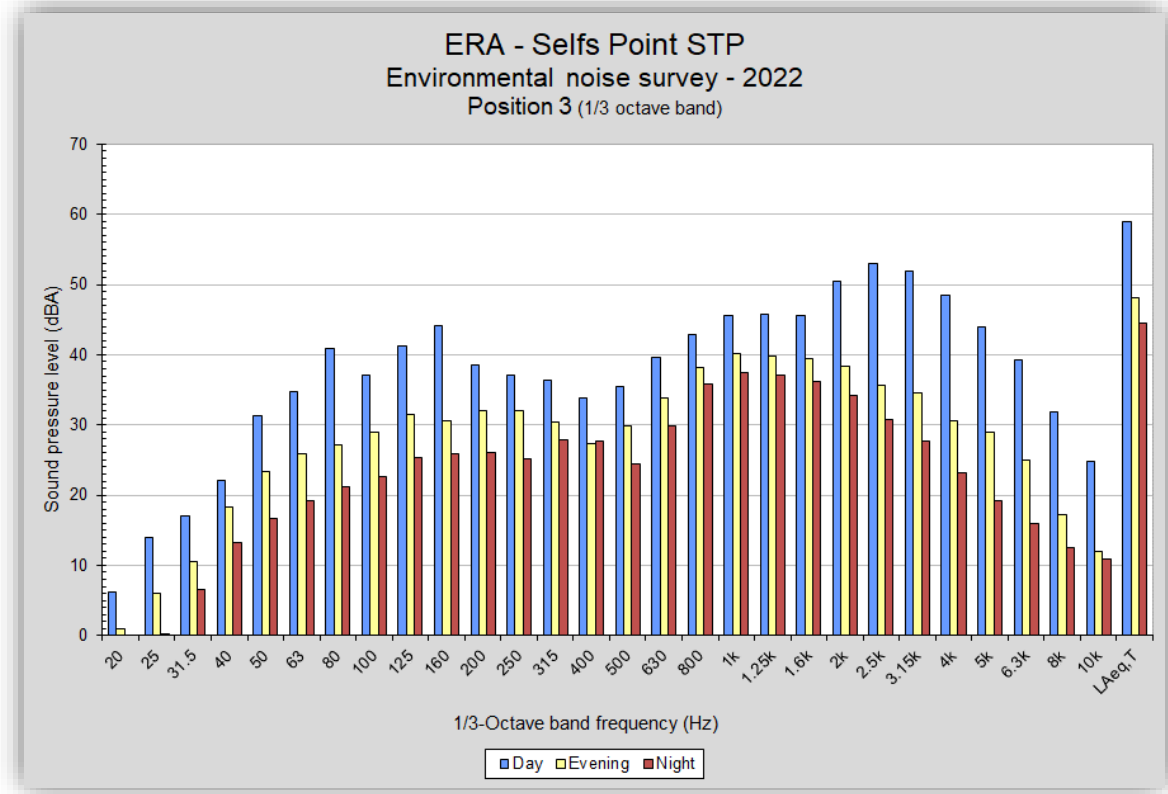


Figure 3-10: Position 3, 1/3-octave band spectrum.

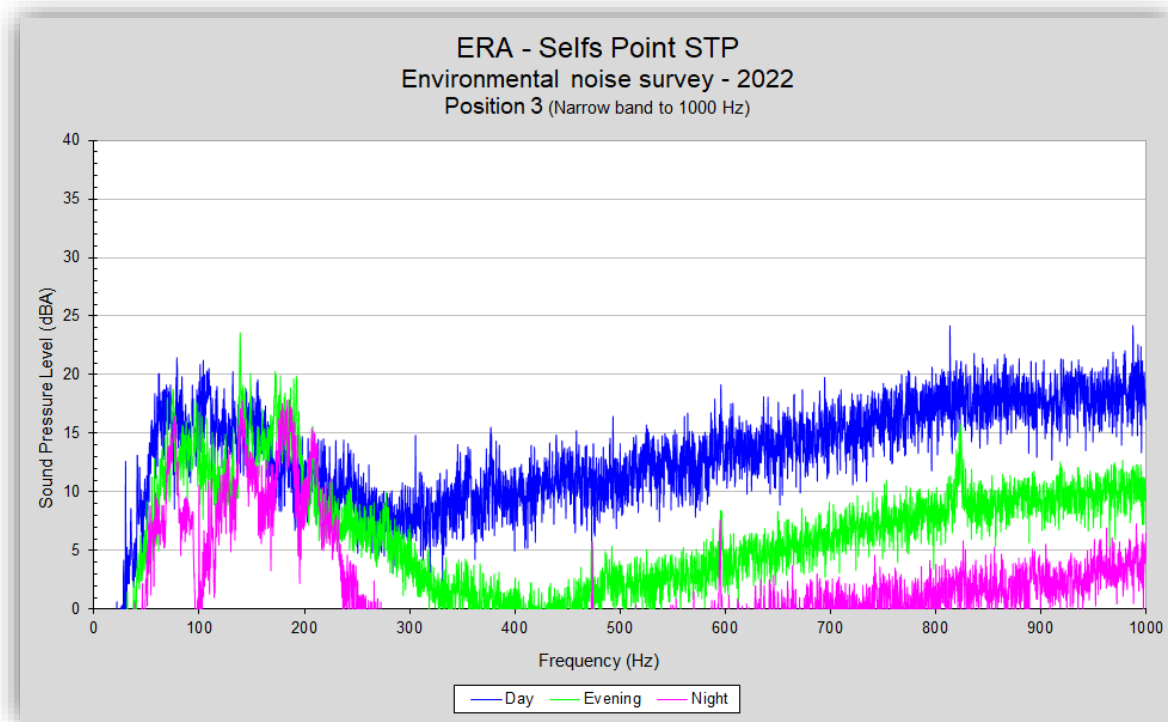


Figure 3-11: Position 3, narrow band spectrum 0 – 1000 Hz.



### 3.4 Position 4 – 119 New Town Rd

Position 4 is located on the northern shore of New Town Bay opposite Selfs Point. Highway noise and bird activity are dominant noise sources at this location. In the evening and night again industrial noise from the Lutana area became audible. The STP wasn't audible.



Figure 3-12: Position 4 – 119 New Town Rd.

| 4 – 119 New Town Rd |        |       |      |        |        |      |      |      |      |      |                        | Audible sources                                                                                                |
|---------------------|--------|-------|------|--------|--------|------|------|------|------|------|------------------------|----------------------------------------------------------------------------------------------------------------|
| Period              | Date   | Time  | LAeq | L Amin | L Amax | LA1  | LA10 | LA50 | LA90 | LA99 | Weather                |                                                                                                                |
| Day                 | 24-Mar | 16:12 | 63.0 | 44.1   | 89.4   | 75.5 | 61.9 | 53.2 | 48.8 | 46.2 | Cloudy<br>Light breeze | <u>External:</u><br>Hwy traffic<br>Local traffic<br>Birds<br>Helicopter<br><u>STP:</u><br>Inaudible            |
| Evening             | 24-Mar | 19:27 | 52.5 | 41.4   | 70.7   | 63.7 | 53.6 | 48.5 | 44.9 | 42.4 | Cloudy<br>Light breeze | <u>External:</u><br>Hwy noise<br>Birds<br>Local traffic<br>Dog<br>Industrial noise<br><u>STP:</u><br>Inaudible |
| Night               | 24-Mar | 23:17 | 41.8 | 34.9   | 62.6   | 50.8 | 44.1 | 39.6 | 37.2 | 36.0 | Clear<br>Calm          | <u>External:</u><br>Hwy noise<br>Birds<br>Local traffic<br>Industrial noise<br><u>STP:</u><br>Inaudible        |

Table 3-5: Position 4, Ln-statistics.

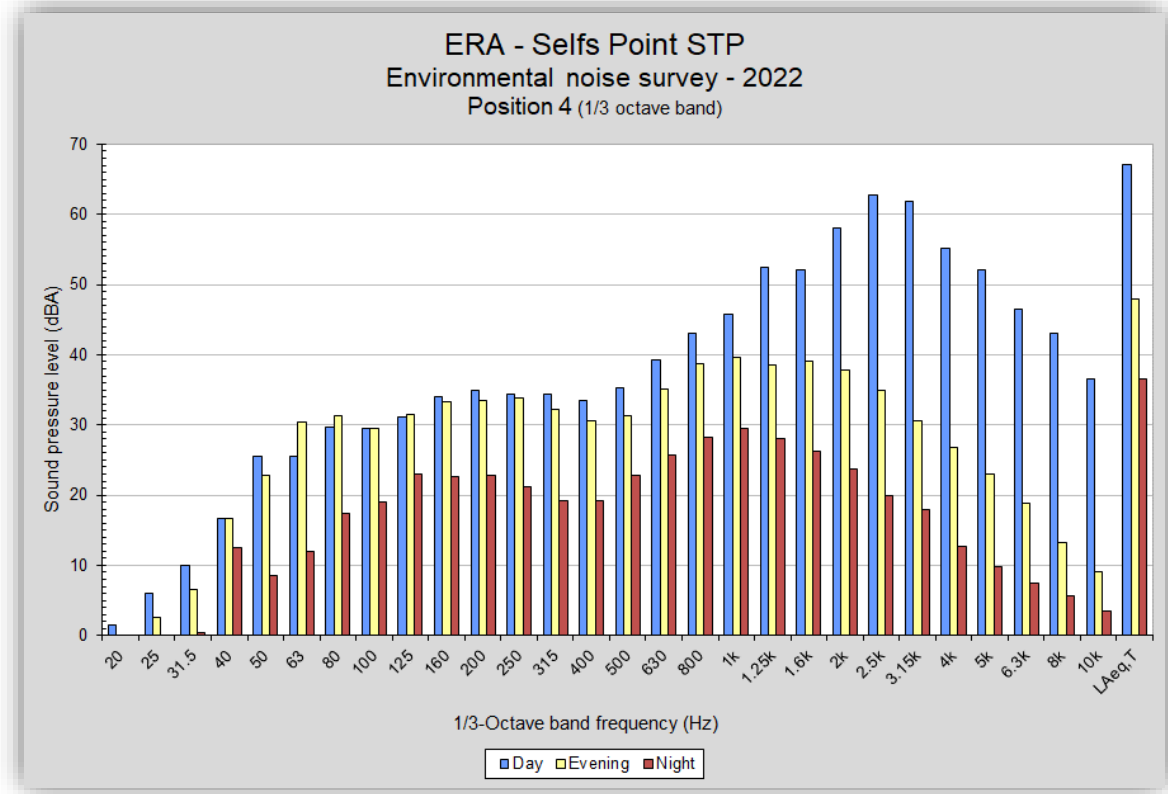


Figure 3-13: Position 4, 1/3-octave band spectrum.

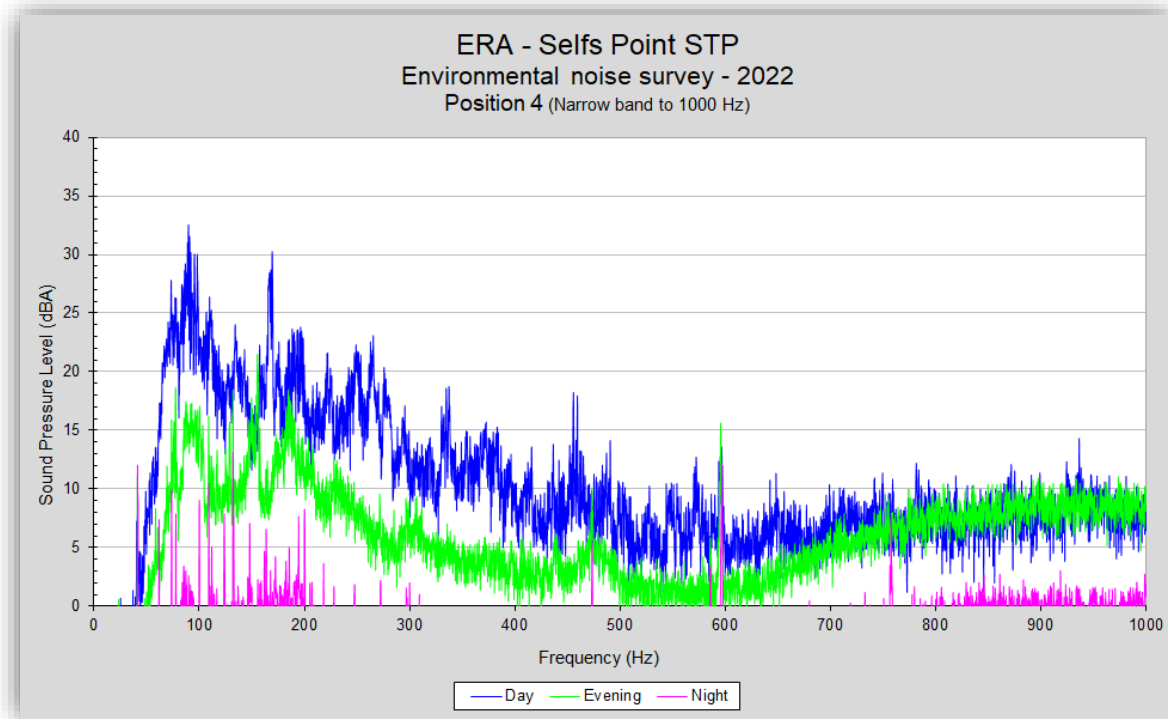


Figure 3-14: Position 4, narrow band spectrum 0 – 1000 Hz.



### 3.5 Position 5 – Friends Rowing Shed

Position 5 is located on the northern shore of New Town Bay adjacent to the Friends School Rowing Club. Traffic, both local and Brooker Hwy, and lapping water and bird activity were dominant noise sources at this location. Again, at night industrial noise from the north (Lutana area) became audible. The STP wasn't audible.



Figure 3-15: Position 5 – Friends Rowing Shed.

| 5 – Friends Rowing Shed |        |       |      |        |        |      |      |      |      |      |                        | Audible sources                                                                                                                           |
|-------------------------|--------|-------|------|--------|--------|------|------|------|------|------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Period                  | Date   | Time  | LAeq | L Amin | L Amax | LA1  | LA10 | LA50 | LA90 | LA99 | Weather                |                                                                                                                                           |
| Day                     | 24-Mar | 15:36 | 52.0 | 41.1   | 69.8   | 61.1 | 55.1 | 48.3 | 44.6 | 42.6 | Cloudy<br>Mod breeze N | <u>External:</u><br>Birds<br>Motor boat<br>Hwy traffic<br>Local traffic<br>Lapping water<br>Voices<br>Impacts<br><u>STP:</u><br>Inaudible |
| Evening                 | 24-Mar | 20:51 | 42.1 | 34.1   | 61.9   | 50.8 | 44.0 | 39.3 | 37.0 | 35.2 | Clear<br>Light breeze  | <u>External:</u><br>Lapping water<br>Leaf rustle<br>Birds<br>Hwy traffic<br>Industrial noise<br><u>STP:</u><br>Inaudible                  |



| Period | Date   | Time  | LAeq | Lamin | LAmx | LA1  | LA10 | LA50 | LA90 | LA99 | Weather                  | Audible sources                                                                                                             |
|--------|--------|-------|------|-------|------|------|------|------|------|------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Night  | 24-Mar | 22:40 | 39.6 | 33.6  | 57.0 | 48.1 | 41.4 | 37.3 | 35.6 | 34.7 | Clear<br>Light<br>breeze | <u>External:</u><br>Lapping water<br>Leaf rustle<br>Birds<br>Hwy traffic<br>Industrial<br>noise<br><u>STP:</u><br>Inaudible |

Table 3-6: Position 5, Ln-statistics.

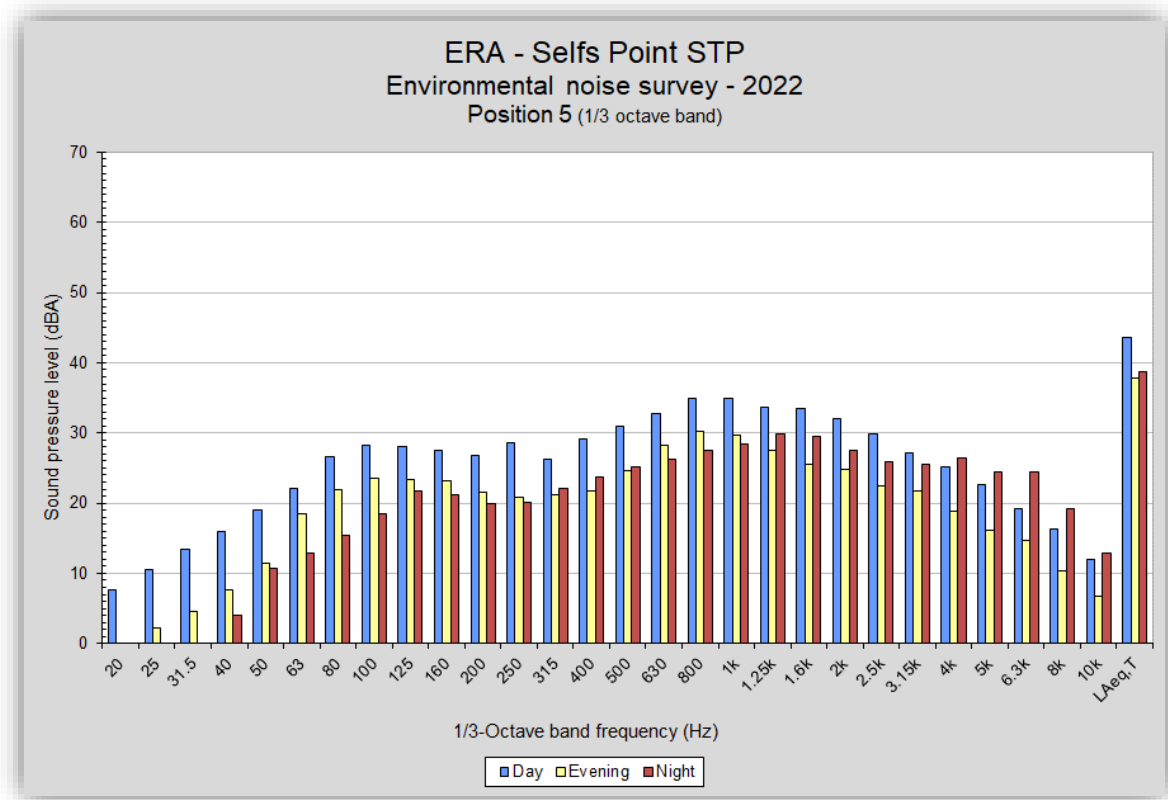


Figure 3-16: Position 5, 1/3-octave band spectrum.

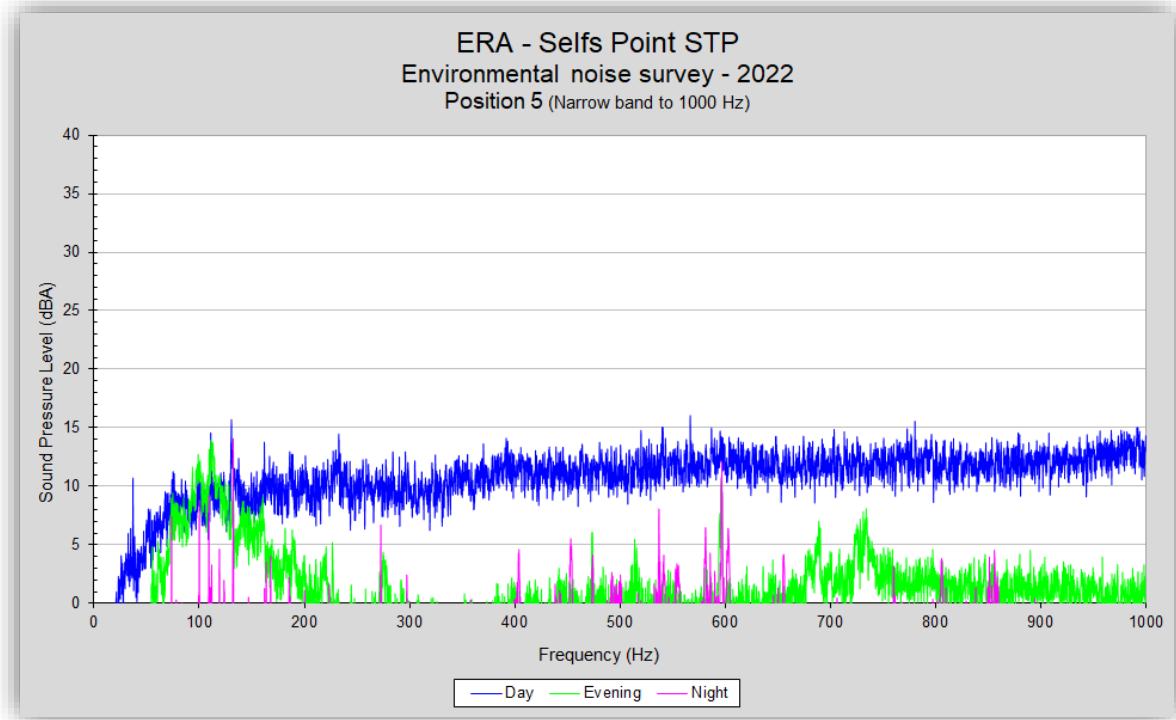


Figure 3-17: Position 5, narrow band spectrum 0 – 1000 Hz.



### 3.6 Position 6 (control) – 2 Cook St

Position 6 is located approx. 1.5 km north north-west of the STP and was utilised as a control location. The noise environment was dominated by Brooker Hwy traffic with industrial noise from the Lutana area controlling background during the evening and night. The STP wasn't audible.



Figure 3-18: Position 6 (control) – 2 Cook St.

| 6 – 2 Cook St (control) |        |       |      |        |        |      |      |      |      |      |                          |                                                                                                        |
|-------------------------|--------|-------|------|--------|--------|------|------|------|------|------|--------------------------|--------------------------------------------------------------------------------------------------------|
| Period                  | Date   | Time  | LAeq | L Amin | L Amax | LA1  | LA10 | LA50 | LA90 | LA99 | Weather                  | Audible sources                                                                                        |
| Day                     | 24-Mar | 14:57 | 51.4 | 44.8   | 68.3   | 58.6 | 52.2 | 49.5 | 47.5 | 45.8 | Overcast<br>Light breeze | <u>External:</u><br>Hwy traffic<br>Local traffic<br>Birds, dogs<br>Impacts<br><u>STP:</u><br>Inaudible |
| Evening                 | 24-Mar | 21:29 | 43.5 | 35.1   | 62.6   | 51.6 | 45.4 | 41.7 | 38.5 | 36.3 | Clear<br>Light breeze    | <u>External:</u><br>Hwy traffic<br>Industrial noise<br><u>STP:</u><br>Inaudible                        |
| Night                   | 24-Mar | 22:00 | 42.8 | 34.7   | 60.5   | 50.5 | 43.8 | 40.6 | 37.8 | 36.0 | Clear<br>Light breeze    | <u>External:</u><br>Hwy traffic<br>Industrial noise<br>Voices<br><u>STP:</u><br>Inaudible              |

Table 3-7: Position 6, Ln-statistics.

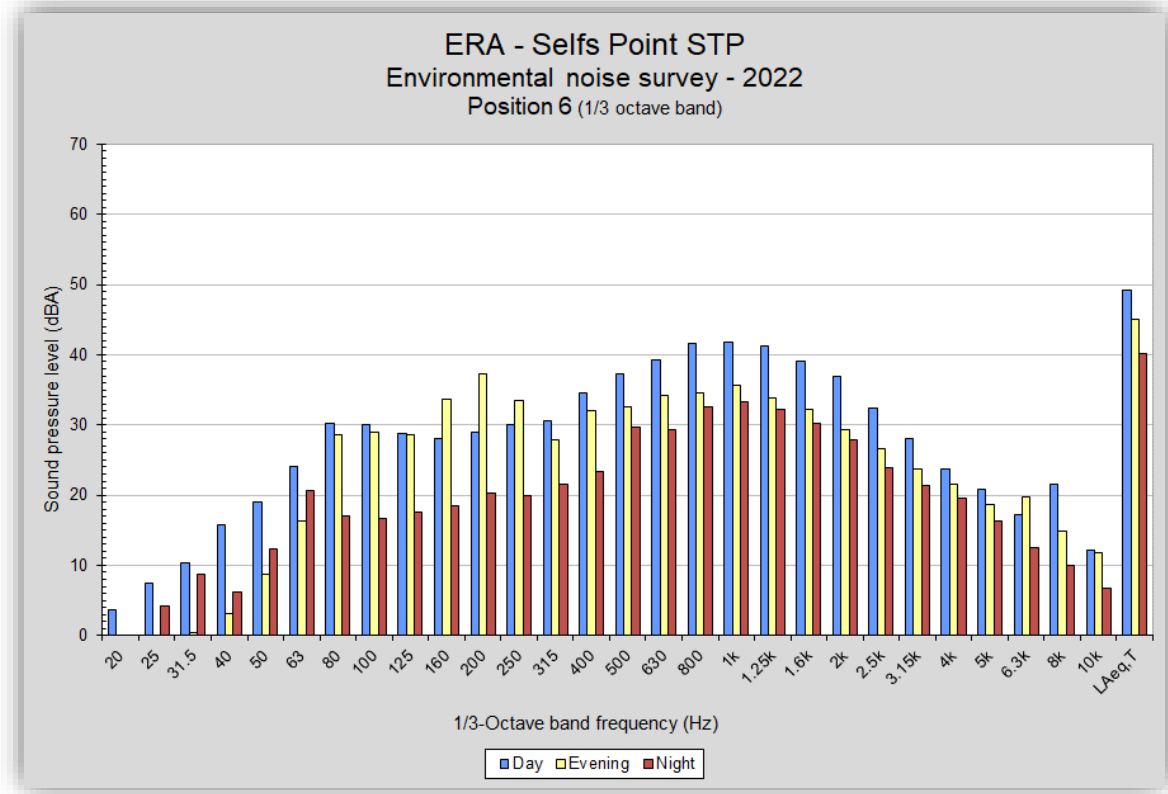


Figure 3-19: Position 6, 1/3-octave band spectrum.

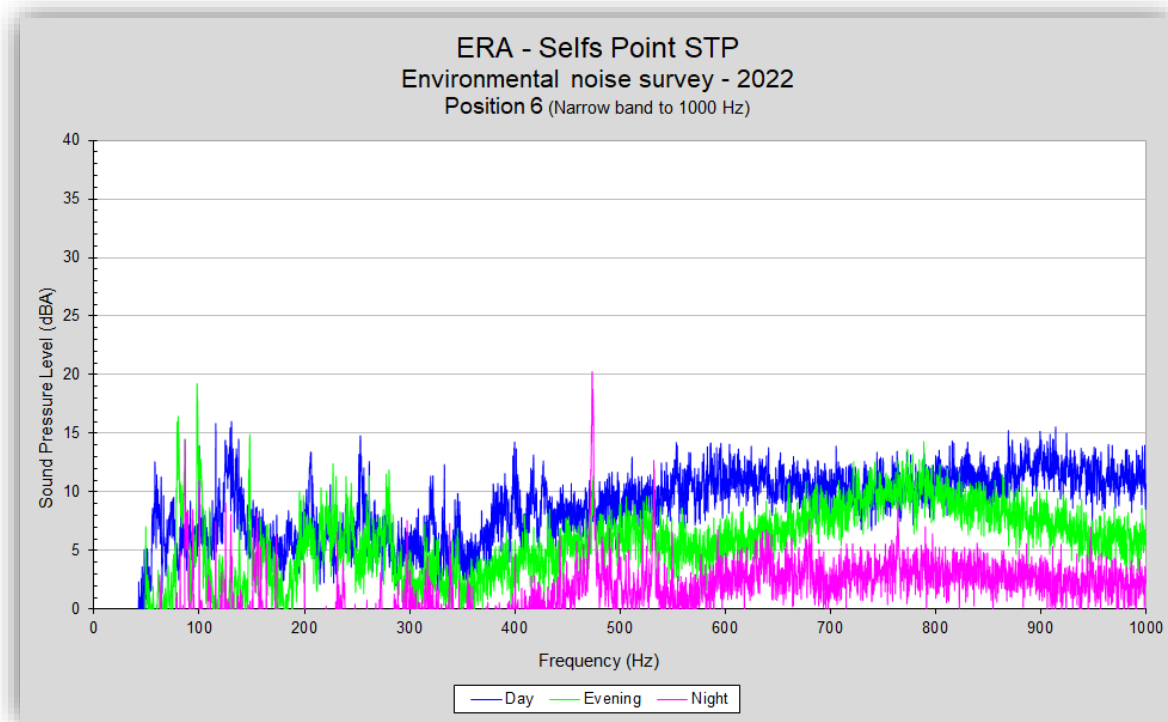


Figure 3-20: Position 6, narrow band spectrum 0 – 1000 Hz.



### 3.7 Boundary position

Unobserved noise levels were logged at a location near the northern boundary of the STP.  $L_{Aeq}$  and  $L_{A10}$  levels fluctuated during the day as a result of wind movement through local foliage, bird activity and traffic.  $L_{A90}$  levels were generally consistent, typically varying between 44 dBA and 50 dBA, and controlled by noise generated in the STP. Sources audible at this location from the STP included pumps and water flow.



Figure 3-21: Boundary position.

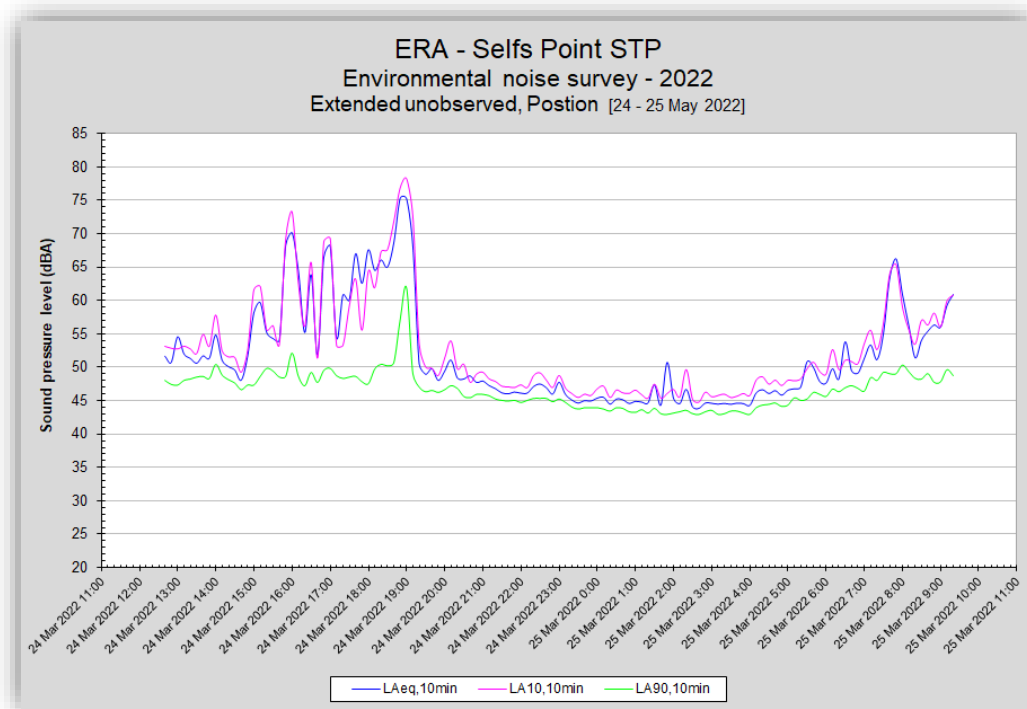


Figure 3-22: Boundary position, unobserved noise statistics.



### 3.8 Existing noise level summary

The noise environment at sensitive locations surround the Selfs Point STP was generally controlled by traffic both on the Brooker Hwy and locally. During the night period as traffic levels dropped off noise from the industrial area to the north (i.e. Lutana area) was clearly audible and controlled the background. The STP wasn't audible during any of the observed measurements conducted outside of the STP land (it was audible on site at the boundary).

Table 3-8 presents summary noise statistics from the survey data presented above.

| Summary noise level ranges (dBA) |                        |                        |                        |
|----------------------------------|------------------------|------------------------|------------------------|
| Period                           | L <sub>Aeq,10min</sub> | L <sub>A10,10min</sub> | L <sub>A90,10min</sub> |
| Day                              | 69 - 47                | 74 - 49                | 56 - 43                |
| Evening                          | 68 - 42                | 73 - 42                | 56 - 37                |
| Night                            | 60 - 38                | 59 - 40                | 47 - 35                |

Table 3-8: Summary noise level ranges.

## 4 EPN noise emission limits

The following is stated under condition N1 of Environmental Protection Notice (EPN) No. 9797/1 (r1):

- Noise emissions from the activity when measured at any noise sensitive premises in other ownership and expressed as the equivalent continuous A-weighted sound pressure level must not exceed:
  - 50 dB(A) between 0800 hours and 1800 hours (Day time); and
  - 40 dB(A) between 1800 hours and 2200 hours (Evening time); and
  - 35 dB(A) between 2200 hours and 0800 hours (Night time)
- Where the combined level of noise from the activity and the normal ambient noise exceeds the noise levels stated above, this condition will not be considered to be breached unless the noise emissions from the activity are audible and exceed the ambient noise levels by at least 5 dB(A).
- The time interval over which noise levels are averaged must be 10 minutes or an alternative time interval specified by the Director.
- Measured noise levels must be adjusted for tonality, impulsiveness, modulation and low frequency in accordance with the *Tasmanian Noise Measurement Procedures Manual*.
- All methods of measurement must be in accordance with the *Tasmanian Noise Measurement Procedures Manual*.

The above condition remains appropriate here given the existing noise levels measured in the areas surrounding the existing STP. Retention of the above conditions for assessment purposes here provides protection of local environmental values and retains a reserve capacity in the acoustic environment.

## 5 Future noise levels

SoundPLAN<sup>[1]</sup> software was used for carrying out detailed noise emission spectra and contour modelling of the expanded STP. This program allows the use of the ISO 9613-2<sup>[2]</sup> and



CONCAWE<sup>[3]</sup> calculation methods for modelling atmospheric attenuation/amplification of noise. Parameters influencing sound propagation and attenuation include:

- Source type (point, line, plane).
- Relative source and receiver height.
- Topography and barriers.
- Industrial buildings as sources and/or barriers.
- Ground and air absorption.
- Distance attenuation.
- Atmospheric conditions (Pasquill stability, temperature, humidity and vector wind speed).
- Reflecting surfaces.
- Source directivity.

As all propagation and attenuation parameters are frequency dependent, all input source data has been based on 1/3-octave band sound power spectra.

Geo-referenced topographic data was based 5 m interval contour data obtained from LISTdata and 1 m contouring of LiDAR data of the area surrounding the plant .

Layout data and equipment locations for the expansion were based off 75 % design data provided by ERA.

All source and geodata is referenced to the Map Grid of Australia (MGA).

## 5.1 Model input data

Input sound power (SWL) spectra were taken from Tarkarri Engineering library data.. Table 5-1 and 5-2 present overall SWLs, equipment details and 1/1-octave band SWL spectra.

| Overall sound power levels (dBA)  |     |                                                                                                                                                                                                                       |
|-----------------------------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Source                            | SWL | Comment                                                                                                                                                                                                               |
| Generic pump                      | 91  | Tarkarri Engineering SWL library data, used for all pumps on-site (see Figure 5-1 for pump location details)                                                                                                          |
| Inlet works                       | 92  | Tarkarri Engineering SWL library data.                                                                                                                                                                                |
| Blower building                   | 104 | SWLs based on Tarkarri Engineering library data for internal reverberant noise levels from equivalent source areas in STPs with transmission through a standard metal deck shed structure.                            |
| Sludge dewatering building        | 90  |                                                                                                                                                                                                                       |
| Tanker waste screen building      | 85  |                                                                                                                                                                                                                       |
| Odour Control Unit (OCU) fan case | 96  | Single fan value, from Tarkarri Engineering library data for a OCU fan casing                                                                                                                                         |
| OCU fan inlet ductwork            | 100 | Inlet duct radiated noise from Tarkarri Engineering library data.                                                                                                                                                     |
| Co-generator                      | 91  | Avus500 plus package unit, SWL data from manufacturers document. Enclosure radiated, air inlet and discharge, engine exhaust and cooler fan noise modelled separately. <b>NB:</b> Emergency cooler fans not modelled. |

Table 5-1: Overall sound power levels and data source information.



| 1/1-octave band sound power levels spectra (dBA) |                |    |     |     |     |    |    |    |    |            |
|--------------------------------------------------|----------------|----|-----|-----|-----|----|----|----|----|------------|
| Source                                           | Frequency (Hz) |    |     |     |     |    |    |    |    | Total      |
|                                                  | 31.5           | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k |            |
| Generic pump                                     | 47             | 55 | 70  | 78  | 85  | 87 | 84 | 79 | 73 | <b>91</b>  |
| Inlet works                                      | 72             | 83 | 86  | 82  | 83  | 85 | 82 | 72 | 60 | <b>92</b>  |
| Blower building                                  | 68             | 96 | 100 | 89  | 86  | 91 | 98 | 87 | 80 | <b>104</b> |
| Sludge dewatering building                       | 64             | 73 | 83  | 78  | 83  | 83 | 82 | 75 | 65 | <b>90</b>  |
| Tanker waste screen building                     | 59             | 68 | 78  | 73  | 79  | 79 | 77 | 71 | 61 | <b>85</b>  |
| OCU fan case                                     | 50             | 66 | 77  | 82  | 89  | 91 | 91 | 84 | 75 | <b>96</b>  |
| OCU fan inlet ductwork                           | 52             | 70 | 82  | 85  | 92  | 95 | 97 | 86 | 75 | <b>100</b> |
| Co-generator                                     | -              | 70 | 78  | 87  | 81  | 84 | 81 | 78 | 84 | <b>91</b>  |

Table 5-2: 1/1-octave band sound power level spectra.

## 5.2 Atmospheric conditions

SoundPLAN<sup>[1]</sup> allows the use of the ISO 9613<sup>[2]</sup> and CONCAWE<sup>[3]</sup> prediction algorithms to model the attenuation /amplification of noise in the environment. In this study the following propagation conditions were considered:

- **ISO 9613** prediction algorithm with default settings.
- **CONCAWE worst case propagation (wcw)**: CONCAWE models atmospheric attenuation using Pasquill stability indices in combination with vector wind speed and direction to determine appropriate frequency dependent attenuation/amplification. This condition considers all receiver points to be downwind with a Pasquill stability class F and a vector wind speed of 2 m/s. Under these conditions noise contours will typically represent the highest predicted noise levels at any location.

**NB:** Under both algorithms a relative humidity of 70 %, air pressure of 1013.3 mbar and temperature of 10 °C was modelled.

## 5.3 Model views

Figure 5-1 presents a model plan view with the location of the sources listed in Tables 5-1 and 5-2 marked (pumps differentiated and are named and the number modelled per point source indicated). The new STP land boundary is shown in yellow for reference. Figure 5-2 presents a wire-frame model view from the south.

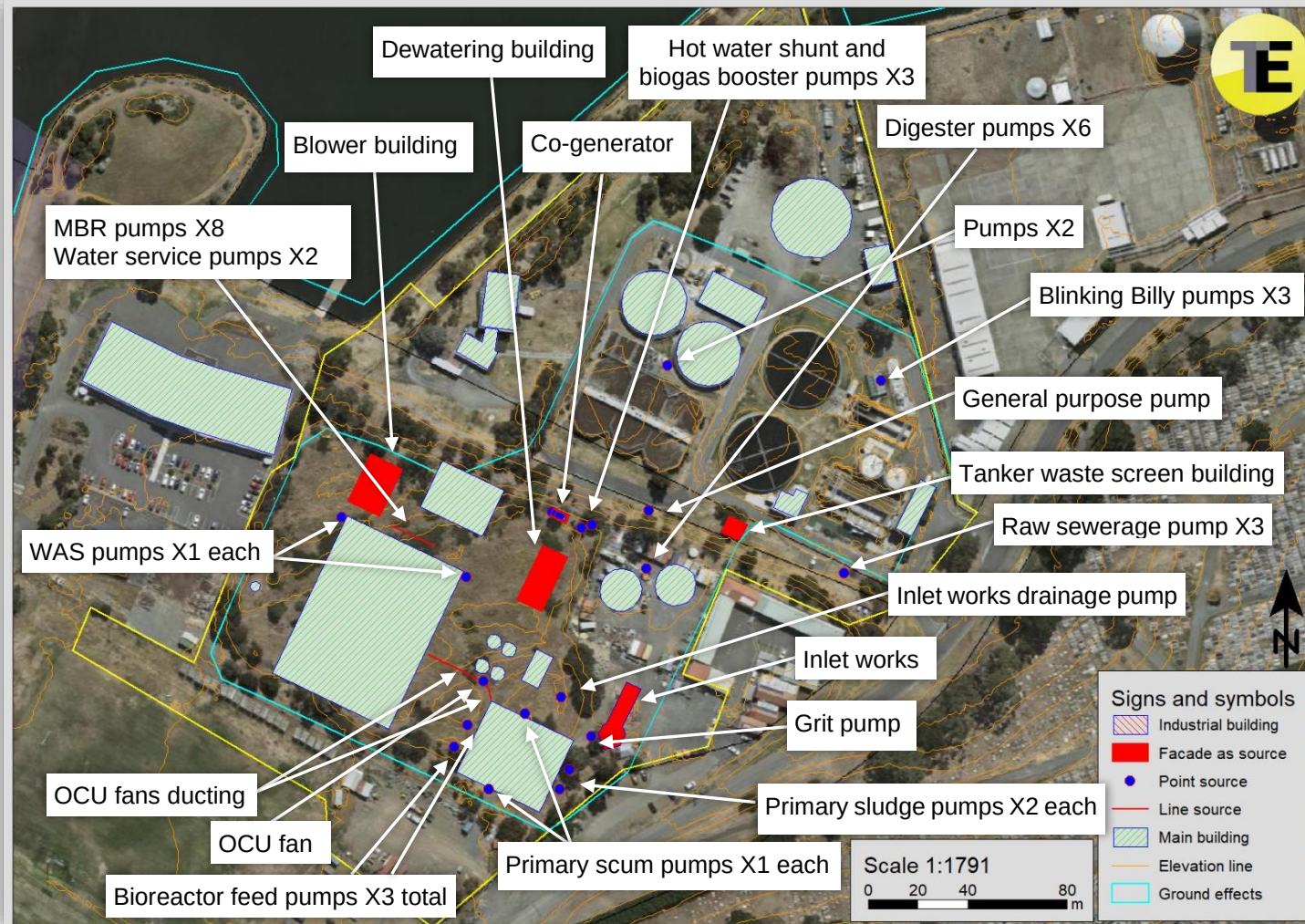


Figure 5-1: Model plan view.

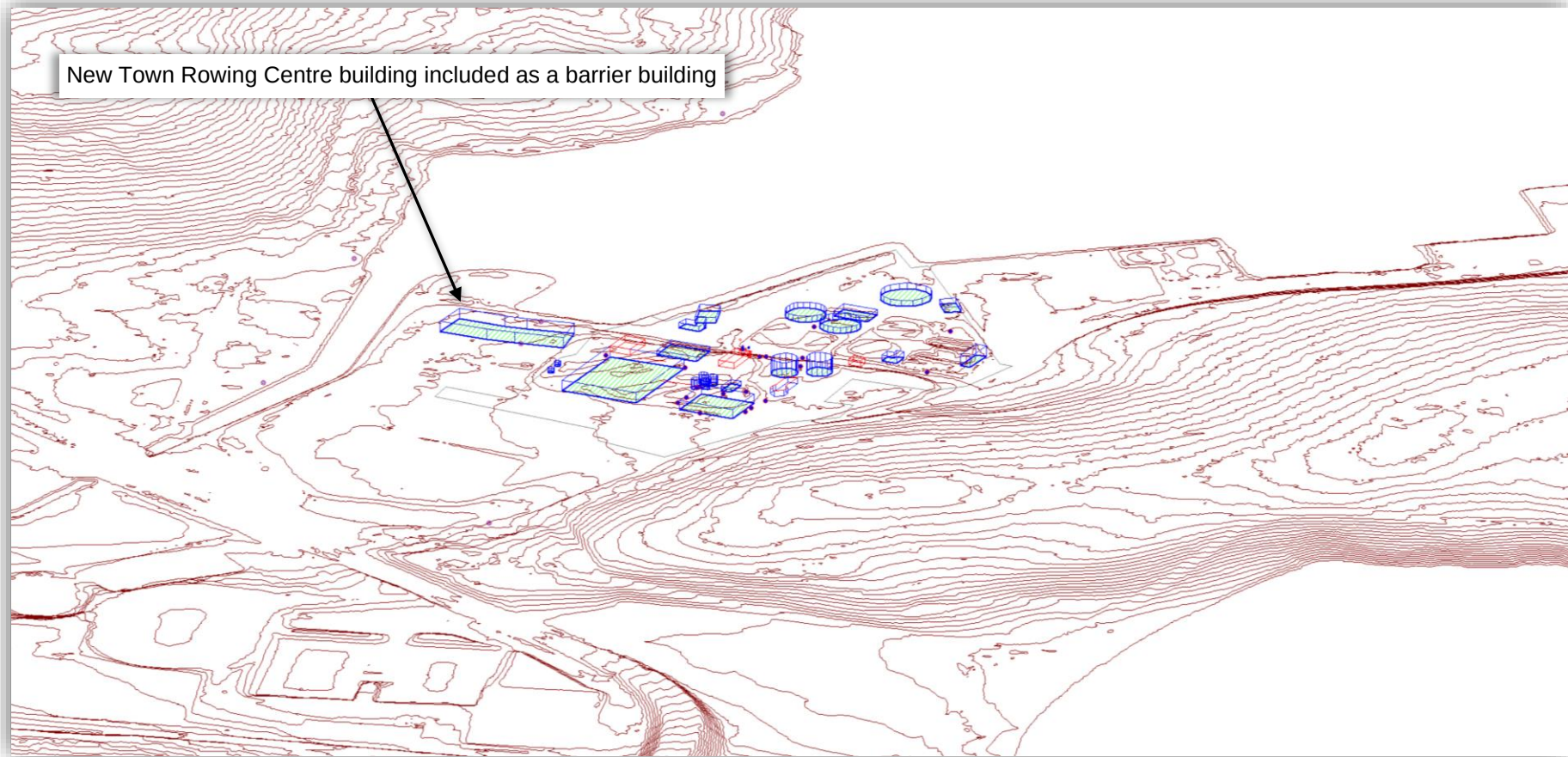


Figure 5-2: Model wire-frame view from the south.



## 5.4 Modelling results and discussion

Table 5-3 presents predicted sound pressure levels at receiver locations equivalent to the observed monitoring locations utilised for the existing noise. Position 2 is split into 2 receiver positions either side (to the north and south) of the rowing centre building. Predicted levels for ISO and worst-case weather conditions are provided.

| Predicted received sound pressure levels (dBA) |     |            |
|------------------------------------------------|-----|------------|
| Receiver                                       | ISO | Worst-case |
| 1                                              | 44  | 46         |
| 2A *                                           | 52  | 54         |
| 2B *                                           | 58  | 60         |
| 3                                              | 45  | 48         |
| 4                                              | 45  | 48         |
| 5                                              | 43  | 46         |

\* Not noise sensitive

Table 5-3: Predicted received sound pressure levels.

From the above:

- The noise levels predicted are below the day noise limit under the sites EPN conditions.  
**NB:** Receivers 2A and 2B don't constitute noise sensitive locations as defined in the site's EPN (see below). Predicted levels at these receivers are below existing ambient noise levels measured at the rowing centre.  
 i.e. **Noise Sensitive Premises** means residences and residential zones (whether occupied or not), schools, hospitals, caravan Parks and similar land uses involving the presence of individual people for extended periods, except in the course of their employment or for recreation.
- During the evening and night periods the predicted noise levels with no mitigation measures in place are well above EPN noise emission limits

Table 5-4 provides a breakdown of the contribution from each source (pumps are grouped together) to the overall predicted received sound pressure level at each receiver under worst case weather conditions.

| Predicted noise source contributions (dBA) |           |           |           |           |           |           |
|--------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Source                                     | 1         | 2A        | 2B        | 3         | 4         | 5         |
| Pumps (all)                                | 40        | 47        | 56        | 41        | 43        | 43        |
| Inlet works                                | 30        | 28        | 32        | 28        | 27        | 25        |
| Blower building                            | 37        | 53        | 58        | 46        | 46        | 42        |
| Sludge dewatering building                 | 29        | 35        | 36        | 29        | 29        | 27        |
| Tanker waste screen building               | 9         | 29        | 19        | 12        | 24        | 22        |
| OCU                                        | 44        | 26        | 31        | 31        | 29        | 31        |
| Co-generator                               | 24        | 36        | 31        | 25        | 28        | 28        |
| <b>Total</b>                               | <b>46</b> | <b>54</b> | <b>60</b> | <b>47</b> | <b>48</b> | <b>46</b> |

  Top 2 contributing noise sources.

Table 5-4: Predicted noise source contributions.



From the above:

- The source contribution data indicates that the pumps distributed across the site (when considered as an aggregated noise source) is the dominant noise source contributor.
- There is also significant contribution from noise breakout from the blower building along with radiated noise from the OCU fan casings and ductwork (at locations where this source isn't shielded by other structures).

To assist with the visualisation of the predicted noise emissions from the expanded STP, Figures 5-3 and 5-4 present predicted noise emission contours projected onto aerial photographic coverage for prediction under ISO and worst-case weather.



Figure 5-3: Predicted noise contours, ISO.



Figure 5-4: Predicted noise contours, worst-case weather.



## 6 Recommendations

With predicted noise levels exceeding the evening, and particularly, the night noise emission limits, noise mitigation recommendations are provided in Table 6-1 below. Noise reduction recommendations are also provided and are designed to bring predicted levels within the model to below 35 dBA (i.e. night noise emission limit) at sensitive receiver locations. Mitigation recommendations are generic given the 75 % design stage of the project and one or a combination of the options provided for each source may be used.

| Noise mitigation recommendations |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Source                           | Noise reduction (dB) | Noise mitigation options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Pumps (all) *                    | 10                   | <p>Noise mitigation options include:</p> <ul style="list-style-type: none"> <li>• 'Quiet' pump selection, i.e. pump specification for SWL no greater than 80 dBA.</li> <li>• Acoustic enclosures or acoustic barriers for pump sets.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Inlet works                      | 10                   | <p>Noise mitigation options include:</p> <ul style="list-style-type: none"> <li>• Provide local acoustic enclosures for equipment to reduce noise levels.</li> <li>• Enclose area to provide better containment.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Blower building                  | 20                   | <p>Noise mitigation options include:</p> <ul style="list-style-type: none"> <li>• Provide local acoustic enclosures for equipment within the building to reduce internal reverberant noise level.</li> <li>• <b>NB:</b> Most blowers come as a package unit with an acoustic enclosure. The data used here was for a space with package blowers in enclosures each with a SWL of 95 dBA. Units with lower SWLs could be sourced (i.e. either quieter blowers and/or better enclosures).</li> <li>• Increase the sound transmission loss of the building to provide better containment. This may be achieved by increasing the mass and structural stiffness of the construction and/or through composite construction design.</li> <li>• Provide internal acoustically absorbent internal lining for the building control reverberation.</li> </ul> |
| Sludge dewatering building       | 5                    | <p>Noise mitigation options include:</p> <ul style="list-style-type: none"> <li>• Provide local acoustic enclosures for equipment within the building to reduce internal reverberant noise level.</li> <li>• Increase the sound transmission loss of the building to provide better containment. This may be achieved by increasing the mass and structural stiffness of the construction and/or through composite construction design.</li> <li>• Provide internal acoustically absorbent internal lining for the building control reverberation.</li> </ul>                                                                                                                                                                                                                                                                                       |



|                              |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tanker waste screen building | -  | Acceptable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| OCU                          | 15 | <p>Noise mitigation options include:</p> <ul style="list-style-type: none"> <li>• 'Quiet' fan selection<br/><b>NB:</b> This option is particularly import to consider with regard to the potential for intrusive noise characteristics such as excessive low frequency and tonality which fans have the potential to produce.</li> <li>• Acoustic enclosure for fan casings</li> <li>• Inlet silencer to reduce duct radiated noise<br/><b>NB:</b> Potential issues with long term performance due to foul air.</li> <li>• Acoustic lagging of inlet ductwork</li> </ul> |

\* Some pump groups may require additional noise reduction, e.g. Digester pumps, MBR pumps and WAS pumps.

Table 6-1: Noise mitigation recommendations.

Table 6-2 presents predicted sound pressure levels at receiver locations with the noise reductions discussed above in place and demonstrates compliance with the sites noise emission limits. To assist with the visualisation of the predicted noise emissions from the expanded STP with the above noise reductions in place, Figures 6-1 and 6-2 present predicted noise emission contours projected onto aerial photographic coverage for prediction under ISO and worst-case weather conditions.

| Predicted received sound pressure levels (dBA) with noise reductions |     |            |
|----------------------------------------------------------------------|-----|------------|
| Receiver                                                             | ISO | Worst-case |
| 1                                                                    | 31  | 34         |
| 2A *                                                                 | 38  | 41         |
| 2B *                                                                 | 44  | 45         |
| 3                                                                    | 32  | 34         |
| 4                                                                    | 32  | 35         |
| 5                                                                    | 30  | 33         |

\* Not noise sensitive

Table 6-2: Predicted received sound pressure levels with noise reductions.



Figure 6-1: Predicted noise contours with noise reductions, ISO.



Figure 6-2: Predicted noise contours with noise reductions, worst-case weather.



## **6.1 Additional noise sources**

Truck traffic within the expanded STP isn't considered as a noise source in this assessment, however, this is likely to be a day activity only and the high ambient noise levels in the area (predominantly from local and Hwy traffic) and the higher day noise limit are such that movements on site are unlikely to generate excessive noise impact.



## Addendum: construction noise

For the construction works for the Selfs Point STP expansion noise impact would be management under a specific noise management plan developed in conjunction with TasWater and the construction contractor. Below is an outline of the approach and general principles in relation to the plan.

### Management approach

The *Environment Protection Policy (Noise) 2009* (made under section 96K of the *Environmental Management and Pollution Control Act 1994*) is a framework for noise management in Tasmania through the setting out of objectives and principles for noise control with human health as a value to be protected. It does not include implementation measures, which are dealt with through other instruments such as regulations and planning schemes.

The environmental values identified in the Noise EPP are the qualities of the acoustic environment that are conducive to:

- the wellbeing of the community or a part of the community, including its social and economic amenity; or
- the wellbeing of an individual, including the individual's –
  - health; and
  - opportunity to work and study and to have sleep, relaxation and conversation without unreasonable interference from noise.

The focus of the Noise EPP is on ongoing noise and the intensification of generation overtime. Tarkarri Engineering proposes a quantitative management approach as outlined under the *NSW EPA Draft Construction Noise Guideline*. This is deemed suitable for temporary construction works where flexible noise management levels are preferred. The guidelines objectives are in accordance with the principles of the Noise EPP and while it acknowledges that some noise from construction is inevitable 'The key objective ... to ensure that noise impacts from construction and maintenance projects are kept to a minimum. This is achieved by ensuring all reasonable and feasible mitigation measures are identified, their selection is justified, and the community is engaged in a transparent and honest manner on the likely impacts and the mitigation to manage noise from the proposal.'

Noise management levels from the guidelines are provided below:



| Table 3 Noise at residences using quantitative assessment – during the recommended standard hours: noise affected and highly noise affected management levels |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Time of day                                                                                                                                                   | Management level<br><small>L<sub>Aeq, 15min</sub> 1, 2, 3, 4, 5</small> | How to apply                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Recommended standard hours<br>Monday to Friday 0700 to 1800<br>Saturday 0800 to 1300<br>No work on Sundays or public holidays                                 | Noise affected<br>RBL + 10dB                                            | Where the predicted or measured L <sub>Aeq, 15min</sub> is greater than the noise affected management level, the proponent shall apply all feasible and reasonable work practices to meet this level.<br>As a matter of good practice, noise should be reduced as far as reasonably practicable.<br>The proponent should notify all potentially impacted residents.                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                               | Highly noise affected<br>75dB(A)                                        | Where noise is above the highly noise affected management level, all feasible and reasonable mitigation shall be applied as well as engagement with the consent authority or regulator to identify other measures to manage noise impacts.<br>Where appropriate, engagement with the community is encouraged to determine the preferred mitigation approach, such as: <ul style="list-style-type: none"><li>• negotiated agreements and/or respite periods to restrict work activity</li><li>• identification of times when the community is less sensitive to noise, including options for longer periods of construction in exchange for restrictions on construction times.</li></ul> |

Figure A-1: NSW EPA noise management levels for construction activity during **standard** operating hours.

| Table 4 Noise at residences using quantitative assessment – outside the recommended standard hours: noise affected and highly noise affected management levels |                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Time of day                                                                                                                                                    | Management level<br><small>L<sub>Aeq, 15min</sub> 1, 2, 3, 4, 5, 6</small> | How to apply                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Outside recommended standard hours                                                                                                                             | Noise affected<br>RBL + 5dB                                                | Strong justification is required for works outside the recommended standard hours.<br>The proponent shall apply all feasible and reasonable work practices to meet the noise affected management level.<br>Where this cannot be met, residual impacts should be quantified, and potentially impacted residents notified.<br>The supplementary mitigation described in Table 5 must also be considered, subject to the application notes in section 5.4.                                                         |
|                                                                                                                                                                | Highly noise affected<br>65dB(A)                                           | The highly noise affected management level represents the point above which the supplementary mitigation described in Table 5 must be considered, subject to the application notes in section 5.4.<br>The proponent must justify the selection of feasible and reasonable mitigation, including the supplementary mitigation, with emphasis on consultation with the community and the consent authority or regulator, and community views on work scheduling and respite periods, as described in section 5.4. |

Figure A-2: NSW EPA noise management levels for construction activity **non-standard** operating hours.



A summary of typical measures from the guidelines is provided below.

Where works are predicted to exceed the noise affected management level:

1. Notify the community of the location, type, and duration of works and mitigation measures.
2. Routinely audit noise from project where this has demonstrable benefits.
3. Select appropriate mitigation measures where feasible and reasonable.

Where works are predicted to exceed the highly noise affected management level:

1. Seek community views on preferred working hours, respite periods and/or compensation. Select feasible and reasonable mitigation emphasising the community's preferences.

Further to the above the following general actions would be adopted as part of the construction works:

- Establish best work practices for adopting quieter work methods were available.
- Regular inspection and maintenance of work equipment.
- Effective notification of stakeholders to manage community expectations.
- Use of quieter equipment, restricting movement or scheduling respite periods and varying intensity of works were feasible and reasonable to do so.
- Establishment of a community representative and complaints register.

### Noise affected levels

Based on ambient noise levels presented in Table 3.8 in section 3 of this report the following noise affected noise management levels (NMLs) are proposed for the project:

- Standard hours: 53 dBA  $L_{Aeq,10min}$ .
- Non-standard hours: 40 dBA  $L_{Aeq,10min}$ .

### Non-standard hours operations

Tarkarri Engineering was asked to address a specific works for the predrilling for Controlled Modulus Column piling using a Continuous Flight Auger drilling rig to assist in informing the management plans development. This activity would occur across the site in all areas under the footprint of the works area and at the location of the effluent Balance tank (in existing STP site). This activity would occur 24 hrs a day for approx. a 9-month period.

Three potential sources of noise were identified for this operation with input SWL spectra taken from Tarkarri Engineering library data. Tables A-1 and A-2 present overall SWLs, equipment details and 1/1-octave band SWL spectra.



| Overall sound power levels (dBA) |     |                                                               |
|----------------------------------|-----|---------------------------------------------------------------|
| Source                           | SWL | Comment                                                       |
| Drill rig engine                 | 104 | Tarkarri Engineering SWL library data for CAT 345B excavator. |
| Drill rig hydraulic drive        | 90  | Tarkarri Engineering SWL library data. Located 5 m a.g.l      |
| Excavator                        | 94  | Tarkarri Engineering SWL library data                         |

Table A-1: Continuous Flight Auger drilling overall sound power levels and data source information.

| 1/1-octave band sound power levels spectra (dBA) |                |    |     |     |     |    |    |    |    |            |
|--------------------------------------------------|----------------|----|-----|-----|-----|----|----|----|----|------------|
| Source                                           | Frequency (Hz) |    |     |     |     |    |    |    |    | Total      |
|                                                  | 31.5           | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k |            |
| Drill rig engine                                 | 70             | 78 | 91  | 92  | 99  | 98 | 98 | 92 | 84 | <b>104</b> |
| Drill rig hydraulic drive                        | 49             | 57 | 66  | 83  | 85  | 85 | 83 | 77 | 73 | <b>90</b>  |
| Excavator                                        | 50             | 66 | 85  | 85  | 89  | 87 | 87 | 83 | 73 | <b>94</b>  |

Table A-2: Continuous Flight Auger drilling 1/1-octave band sound power level spectra.

Utilising the environmental noise model outlined in section 5 the above noise sources were tested in the model at multiple locations under both the ISO and worst-case weather model algorithms. The results showed that for operation of the rig across the site footprint predicted noise emission levels at sensitive receiver locations were below the standard hours noise affected NML. During non-standard hours the noise affected NML was exceeded by up to 8 dB with the dominant noise source the drill rig engine.

Testing of temporary noise barriers up to a height of approx. 0.8 m above the drill rig engine height on two to three sides of the unit was tested in the model. This reduced predicted noise levels to below the non-standard hours noise affected NML. This indicates that this feasible and reasonable work practice has the potential to control noise emissions from this activity during non-standard working hours to a level that wouldn't require actions in accordance with those outlined in Figure A-2.

**NB:** Confirmation of the noise input data for the drill rig, as outlined in Tables A-1 and A-2, will be conducted, utilising measured data from an equivalent rig, as part of the noise management plan development to verify the validity of the results presented here.

Figure A-3 presents a photograph showing an example of a temporary noise barrier system.



Figure A-3: Photograph of a temporary noise barrier system (taken by Tarkarri Engineering).