

**MARSHALL DAY**  
Acoustics



**PORT OF NAPIER**  
**CURRENT PORT NOISE MAPS (2022)**

Rp 005 20190436 | 12 August 2022

Project: **CURRENT PORT NOISE MAPS (2022)**

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## 1.0 INTRODUCTION

Marshall Day Acoustics Limited (**MDA**) first prepared a noise model for Port of Napier in 1994. This model has regularly been updated to reflect changes in operation, to establish the City of Napier District Plan (**NDP**) Port Noise Control Boundaries and evaluate western reclamation options to name a few. MDA has undertaken attended noise monitoring to verify the shape of the modelled noise contours, and annually reviews noise monitoring data to calibrate the Current Port Noise Maps.

The following report summarises the results of the noise monitoring from the 2021 monitoring period (1 Jul 2021 – 30 Jun 2022).

The Current Port Noise Maps (2022) are calibrated to a level of 62.4 dB  $L_{dn}$  (5 day) at the NMT based on the peak periods from 2016 (the highest in recent years). While this is conservative it acknowledges the variability of peak periods year-on-year and avoids unnecessary rework of the noise model (which remains valid and within acceptable tolerances). It also ensures consistency with the model used for the NDP review.

The Current Port Noise Maps (2022) will be appended to the Port Noise Management Plan.

A glossary of technical terms is included in Appendix A.

## 2.0 PERFORMANCE STANDARDS

The City of Napier District Plan (**NDP**) operative rules apply. NDP Rule 28.15.1 is included for reference in Appendix B. In summary:

- Part (a) includes port noise limits of 65 dB  $L_{dn}$  (5 day) and 68 dB  $L_{dn}$  (1 day). Note:
  - o The 'day night' ( $L_{dn}$ ) descriptor is calculated from the average noise level ( $L_{Aeq}$ ) over the nominated periods (5 days and 1 day respectively), with 10 decibels added to the night-time contributions (2200 – 0700hrs).
  - o These noise limits apply at the Port Inner Noise Boundary (refer planning maps F7 and F8).
  - o The Bluff Hill Noise Monitoring Terminal (**NMT**) is located within the Port Inner Noise Boundary (i.e. closer to the Port). Therefore conservatively, compliance is achieved if the noise limits are not exceeded at the Bluff Hill NMT.
- Parts (b) – (f) relate to noise monitoring, mitigation, management and liaison. They require the Current Port Noise Maps to be updated annually and attached to the Port Noise Management Plan (**NMP**). The current version of the NMP is available on the Port of Napier website: <http://www.napierport.co.nz/community/sustainability/>.

## 3.0 NOISE MONITORING ANNUAL REVIEW (2022)

### 3.1 Bluff Hill NMT

MDA has undertaken an annual review of the Port of Napier noise emissions for the period 1 July 2021 to 30 June 2022. The review is based on the measured ambient noise levels at the Bluff Hill NMT, located near 3 Karaka Road. The Bluff Hill NMT is considered to provide a representative measure of port noise levels received in the community.

The Bluff Hill NMT noise monitoring data provides a reference for the Current Port Noise Maps. It also captures audio recordings of loud events to enable retrospective identification of the noise source. This ensures validity of the measured data. It also enables identification of high noise sources for management purposes. The audio recordings typically depict one of the following noise sources in no particular order:

- Forklift movements or container placement

- Ship engine noise or horns
- Train movements or horns
- Wind or rain
- Local vehicle movements (e.g. Karaka, Seapoint or Breakwater Roads)
- Other (e.g. birds, cicadas, public works, Art Deco aerobatic displays and normal residential activities)

### 3.2 Review Process

The review process is summarised as follows:

- Identify days measured above 62 dB  $L_{dn}$  (5 day) for detailed review
- Review the  $L_{Aeq}$  (15 min) time trace to identify dominant events for aural review
- Analyse a selection of recorded audio samples to determine if controlled by port activity
- Determine the maximum  $L_{dn}$  (5 day) controlled by port activity, and the total number of days above 62 dB  $L_{dn}$  (5 day) in the review period
- Determine compliance with the 65 dB  $L_{dn}$  (5 day) and 68 dB  $L_{dn}$  (1 day) noise limits

### 3.3 Review Findings

The annual monitoring results are summarised in Figure 1 of Appendix C. It identifies 55 days across 10 periods above the 62 dB  $L_{dn}$  (5 day) review threshold. The subsequent review findings are summarised in Table 1.

**Table 1: Bluff Hill NMT monitoring periods**

Period	Dates (days)	Maximum $L_{dn}$ (5 day)	Port Noise contribution > 62 dB $L_{dn}$ (5 day)	Comments
1	7 – 10 Jul 21 (4)	63	No	Wind and rain influenced
2	18 – 30 Jul 21 (13)	64	No	Wind influenced. Highest levels influenced by trains, recycling truck, birds, dogs, and cars
3	7 – 11 Oct 21 (5)	63	No	Wind influenced. Highest levels influenced by recycling truck and birds
4	12 -15 Feb 22 (4)	63	No	Highest levels influenced by cicadas, trains and recycling truck
5	18 – 28 Feb 22 (11)	67	Yes	Highest levels influenced by cicadas, birds, trains, recycling truck and other extraneous short-term events. However, when obvious events excluded, the residual level was port noise controlled. Port controlled 19 – 20 Feb (highest day <b>63.2</b> dB $L_{dn}$ (5 day)).
6	23 - 25 Mar 22 (3)	64	No	Wind influenced. Highest levels influenced by trains, and birds



Period	Dates (days)	Maximum $L_{dn}$ (5 day)	Port Noise contribution > 62 dB $L_{dn}$ (5 day)	Comments
7	20 - 24 Apr 22 (5)	63	Yes	Highest levels influenced by trains, cars, dogs, and recycling truck. However, when obvious events excluded, the residual level was port noise controlled. Port controlled 21 – 24 Apr (highest day <b>63.2</b> dB $L_{dn}$ (5 day)).
8	5 – 8 May 22 (4)	63	Yes	Highest levels influenced by trains, recycle truck, birds, and dogs. However, when obvious events excluded, the residual level was port noise controlled. Port controlled 5 - 7 May (highest day <b>63.0</b> dB $L_{dn}$ (5 day)).
9	1 – 3 Jun 22 (3)	63	No	Wind influenced.
10	9 – 11 Jun 22 (3)	63	No	Wind influenced. Highest levels influenced by trains, cars, residents, recycling truck and birds

Most periods were influenced by seasonal noise events (e.g. wind, rain, cicadas, crickets and bird song etc). Three port-controlled periods were above 62 dB  $L_{dn}$  (5 day). However, port noise readily complied with the 65 dB  $L_{dn}$  (5 day) and 68 dB  $L_{dn}$  (1 day) noise limits in Rule 28.15.1 (a).

The contribution of normal community activities is difficult to identify, quantify and exclude from the measured levels (e.g. residential activity, road traffic and rail movements). However, this further community contribution has historically been estimated to be 56 dB  $L_{dn}$  (5 day). This background community contribution would normally elevate the measured noise levels by approximately 1 decibel.

The highest port-controlled periods were 63.2 dB  $L_{dn}$  (5 day) on 19 Feb and 22 Apr 2022. Excluding the 1 decibel allowance for road traffic contribution, the residual port noise level is predicted to have been approximately 62.2 dB  $L_{dn}$  (5 day) at the Bluff Hill NMT.

### 3.4 Long-Term Monitoring Trends

To put the peak port controlled periods into context, the long-term monitoring trends for the last 10 years are presented in Figure 2 of Appendix C. The peak period and annual median 5 day monitoring periods for each year are summarised in Table 2.

**Table 2: Bluff Hill NMT Historical Annual Noise Monitoring Results**

Year	Median Day/Period		Peak Period (port controlled)
	dB $L_{dn}$ (1day)	dB $L_{dn}$ (5day)	dB $L_{dn}$ (5day)
2022	61	61	63
2021	61	61	63
2020	61	61	62
2019	61	61	63
2018	61	61	63
2017	61	61	62
2016	61	61	63
2015	60	61	63

Year	Median Day/Period		Peak Period (port controlled)
	dB L <sub>dn</sub> (1day)	dB L <sub>dn</sub> (5day)	dB L <sub>dn</sub> (5day)
2014	61	61	64
2013	60	60	63
2012	60	60	62

Overall, peak period port noise has remained relatively constant for the last 10 years. Fluctuations of +/-1 decibels can be expected from year to year and is within monitoring and reporting tolerances.

The highest peak period in recent years was measured during the 2016 review period. The calibration level, excluding an allowance for road traffic contribution, is 62.4 dB L<sub>dn</sub> (5 day) at the Bluff Hill NMT. The subsequent review periods were marginally quieter, but it was retained as the calibration level used in the noise model and noise maps. This was also used for calibrating the noise model used to inform the NDP review<sup>1</sup>. The 2022 peak period aligns with the 2016 peak period, so the model calibration level is still representative.

### 3.5 Noise Complaints

The review period includes 16 noise complaints logged in the complaints register. We understand that all were investigated, a response then provided to the complainant (where they provided contact details), and the summary forwarded to Council in accordance with the complaints response process. In summary:

- There were 7 general complaints. They included complaints related to wood loading onto containers, low frequency machinery noise and trucks.
- One complaint was related to the loudspeaker at the penguin sanctuary.
- 8 complaints in total related to noise from vessels. They included complaints about low frequency noise from the Rio vessel class (e.g. Madeira, Monte Rosa). The low frequency 'rumble' is associated with the auxiliary generators operating while at berth. While technically beyond the control of the port, New Zealand ports are collectively aware of the low frequency noise issue with these vessels and working to influence shipping companies to mitigate the noise emissions at source. Other vessel noise complaints related to the Louise, Rotterdam Bridge, Navios Miami, Mattina and a cattle vessel.

The solution for the Rio Class vessels was led by Port Otago and featured two parts:

- One generator on each Rio-class vessel was fitted with an inline reactive silencer. This is best experienced by watching [this video](#) with headphones. However, the roll out of these mitigation measures have been suspended due to Covid-19 restricted access, as discussed in these [communications](#). For example, the Monte Rosa featured repeatedly in low frequency ship noise complaints. The Monte Rosa is one where a silencer has been ordered, but not yet fitted.
- We understand supplementary management protocol has been implemented. This consists of only operating the silenced generator in port where practicable. Note that the second generator requirement can be for several legitimate reasons. For example, a second generator (unsilenced) may be needed to run bow thruster for arrival and departure. The standing orders should be reviewed to ensure they are effective.

A similar approach is being discussed for the CMA CGM shipping line vessels. That engagement is being primarily led by Lyttleton Port Company (LPC).

<sup>1</sup> MDA report 'Rp 002 r01 20190436 CMF (Port of Napier Noise Control Boundaries)', dated 27 Feb 2020

## 4.0 CURRENT PORT NOISE MAPS (2022)

### 4.1 Noise Contours

The Current Port Noise Maps (2022) are included in Appendix D. They are calibrated to a level of 62.4 dB  $L_{dn(5\text{ day})}$  at the NMT for reasons discussed in Sections 3.3 and 3.4. There have not been any material changes to port layout or operations. As such, we have not updated the noise model in this review cycle. This avoids unnecessary rework of the noise model which remains valid and within acceptable tolerances.

We understand Wharf 6 will be operational later this year. We recommend a full review of the noise model as part of the next annual review, including attended noise monitoring on Bluff Hill at multiple locations for noise contour shape verification. We recommend the attended monitoring be undertaken during a busy night in late February or early March to align with the traditional peak period.

The Figures are summarised as follows:

- Figures 1A and 1B: The noise contours at 1.5m above ground level enable comparison with noise survey measurements undertaken in accordance with New Zealand Standard NZS 6801:2008 “Acoustics – Measurement of environmental sound”, which is the revision of the 1999 version referred to in rule 28.15.1 (f).
- Figures 2A and 2B: The noise contours at 4m above ground level align with the Bluff Hill NMT microphone height. This may also represent the noise level received at the upper level of a double story dwelling with good sight lines of Port activities.
- Figures 3A, 3B and 3C: The 3D façade noise map predicts noise levels received at the façades of existing dwellings. The plan view façade noise maps display the highest noise level received on the façades. This is useful for amenity or sound insulation purposes.
- Figure 4: Presents the modelling inputs and assumptions.

The facade noise map building types categories are as follows:

- Residential Building
- Residential Building (Insulated)
- Industrial Building

Residential Buildings (Insulated) include:

- New dwellings within the Port Outer Noise Boundary.  
NCC supplied a list of Resource Consents to identify new dwellings since the port noise provisions were originally notified in 2003<sup>2</sup>. A further new dwelling has recently been consented and built at 16 Hornsey Road. These dwellings are currently not eligible for the Port Noise Mitigation in NDP Appendix 33B.
- Modifications or extensions to existing dwellings.  
The NCC list of Resource Consents was less conclusive for this purpose. Depending on the works undertaken, the dwelling may still be eligible for the Port Noise Mitigation in NDP Appendix 33B in full, in part, or not at all. Therefore, no dwellings have been categorised as Residential Buildings (Insulated) on this basis alone. It is assumed they remain eligible unless Council records demonstrate otherwise.

<sup>2</sup> Plan Change 410, Port Noise Provisions, Notified 16 April 2003 (Operative 1 June 2009)



- Port Napier mitigated dwellings (offered to houses between 60 and 65 dB  $L_{dn(5\text{ day})}$ ). These are dwellings that have been mitigated in accordance with the Port Napier noise mitigation scheme set out in Section 5.1 of the Port Noise Management Plan.

#### 4.2 Sound Insulation Requirements for Existing Dwellings

Table 3 summarises the predicted number of existing dwellings eligible for port noise mitigation schemes in NDP Appendix 33B and Port Noise Management Plan Section 5.1.

**Table 3: Dwellings in the Port Noise Boundaries**

Façade Noise Level	Current (2022)	Noise Mitigation Scheme
> 68 dB $L_{dn(5\text{ day})}$ 'purple' zone	0	Not relevant
65 – 68 dB $L_{dn(5\text{ day})}$ 'red' zone	0	NDP Appendix 33B (if not already mitigated below)
60 – 65 dB $L_{dn(5\text{ day})}$ 'yellow' zone	23	Port Noise Management Plan Section 5.1: - 18 mitigation complete - 5 assessed and in process - Others to be considered annually as appropriate
55 – 60 dB $L_{dn(5\text{ day})}$ 'green' zone	37	Not eligible

#### 5.0 CONCLUSIONS

In summary:

- The highest port noise contribution during the 2022 review period was 63.2 dB  $L_{dn(5\text{ day})}$  at the NMT. This is one decibel higher than what has been used to calibrate the Current Port Noise Maps since the 2016 iteration.
- We consider the Current Port Noise Maps remain representative but highlight a more detailed modelling and monitoring review is required next March – April to coincide with the traditional peak operating period with Wharf 6 now operational.
- Port noise complied with the noise limits in Napier District Plan Rule 28.15.1 part (a).

## APPENDIX A GLOSSARY OF TECHNICAL TERMINOLOGY

<b>NZS 6801:2008</b>	New Zealand Standard NZS 6801:2008 <i>“Acoustics – Measurement of environmental sound”</i>
<b>NZS 6809:1999</b>	New Zealand Standard NZS 6809:1999 <i>“Acoustics – Port Noise Management and Land Use Planning”</i>
<b>dB</b>	Decibel. The unit of sound level. Expressed as a logarithmic ratio of sound pressure $P$ relative to a reference pressure of $P_r=20 \mu\text{Pa}$ i.e. $\text{dB} = 20 \times \log(P/P_r)$
<b>dBA</b>	The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) so as to more closely approximate the frequency bias of the human ear.
<b>A-weighting</b>	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
<b><math>L_{\text{Aeq}}(t)</math></b>	<p>The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level.</p> <p>The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.</p>
<b><math>L_{\text{Amax}}</math></b>	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
<b><math>L_{\text{dn}}</math></b>	The day night noise level which is calculated from the 24 hour $L_{\text{Aeq}}$ with a 10 dB penalty applied to the night-time (2200-0700 hours) $L_{\text{Aeq}}$ .
<b><math>L_p</math> or SPL</b>	Sound Pressure Level. A logarithmic ratio of a sound pressure measured at distance, relative to the threshold of hearing ( $20 \mu\text{Pa}$ RMS) and expressed in decibels.
<b><math>L_w</math> or SWL</b>	Sound Power Level. A logarithmic ratio of the acoustic power output of a source relative to $10^{-12}$ watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.
<b>Frequency</b>	The number of pressure fluctuation cycles per second of a sound wave. Measured in units of Hertz (Hz).
<b>Hertz (Hz)</b>	Hertz is the unit of frequency. One hertz is one cycle per second. One thousand hertz is a kilohertz (kHz).
<b>Noise</b>	A sound that is unwanted by, or distracting to, the receiver.
<b>Ambient</b>	The ambient noise level is the noise level measured in the absence of the intrusive noise or the noise requiring control. Ambient noise levels are frequently measured to determine the situation prior to the addition of a new noise source.
<b>Special Audible Characteristics</b>	Distinctive characteristics of a sound which are likely to subjectively cause adverse community response at lower levels than a sound without such characteristics. Examples are tonality (e.g. a hum or a whine) and impulsiveness (e.g. bangs or thumps). In this case, port noise limits are set specifically for port noise character. Therefore, port noise character would be reasonably expected and not ‘special’ (e.g. would not apply to log or container handling activities).

**APPENDIX B NAPIER DISTRICT PLAN, PORT INDUSTRIAL ZONE, RULE 28.15**

<p><b>28.15 Noise</b></p> <p>1. The following noise conditions shall apply to all land uses, other than those exempted in Rule 57.5 and container repair, and maintenance activities (See Rule 28.15.2 below):</p> <p>a) All land uses within the zone must be conducted so as to ensure the following noise limits are not exceeded at any point beyond the Port Inner Noise Boundary shown on the planning maps:</p> <table border="0"> <tr> <td>Over any 5 consecutive day period</td> <td><math>L_{dn}</math> 65 dBA</td> </tr> <tr> <td>On any day</td> <td><math>L_{dn}</math> 68 dBA</td> </tr> <tr> <td>2200 hours to 0700 hours the following day</td> <td><math>L_{eq}</math> (9hour) 60 dBA</td> </tr> <tr> <td></td> <td><math>L_{eq}</math> (15min) 65 dBA</td> </tr> <tr> <td>2200 hours to 0700 hours the following day</td> <td><math>L_{max}</math> 85dBA</td> </tr> </table> <p>NOTE: To demonstrate non-compliance it shall only be necessary to show non-compliance with any one noise limit.</p> <p>b) The Port Operator shall include in a Port Noise Management Plan minimum monitoring and reporting requirements for noise management as set out in Appendix 33A.</p>	Over any 5 consecutive day period	$L_{dn}$ 65 dBA	On any day	$L_{dn}$ 68 dBA	2200 hours to 0700 hours the following day	$L_{eq}$ (9hour) 60 dBA		$L_{eq}$ (15min) 65 dBA	2200 hours to 0700 hours the following day	$L_{max}$ 85dBA	<p><b>Matters:</b></p> <ul style="list-style-type: none"> <li>- The sound level likely to be generated.</li> <li>- The nature and frequency of the noise including any special audible characteristics.</li> <li>- The effects of noise on amenity values.</li> <li>- The length of time for which specified noise levels is exceeded, especially at night.</li> <li>- The likely adverse effects beyond the zone.</li> <li>- The mitigation measures to reduce noise generation.</li> <li>- Whether an acoustic insulation treatment offer has been made to affected noise sensitive activities.</li> <li>- In the case of an acoustic insulation offer being made the likely effectiveness of the acoustic insulation in mitigating noise within habitable spaces to an acceptable level.</li> </ul>
Over any 5 consecutive day period	$L_{dn}$ 65 dBA										
On any day	$L_{dn}$ 68 dBA										
2200 hours to 0700 hours the following day	$L_{eq}$ (9hour) 60 dBA										
	$L_{eq}$ (15min) 65 dBA										
2200 hours to 0700 hours the following day	$L_{max}$ 85dBA										
<p>c) Where any noise sensitive activity is partly or wholly contained within the area seaward of a noise contour line that is 65 dBA <math>L_{dn}</math> (5 day average) as shown on the current Port Noise Contour Map attached to the Port Noise Management Plan; or</p> <p>Where sound level monitoring indicates that port noise equals or exceeds 65 dBA <math>L_{eq}</math> (15 minutes 10pm-7am) on more than three occasions (more than 24 hours apart) during any rolling 12 month period within the boundary of a noise sensitive activity:</p> <p>The Port Operator shall comply with the matters set out in Appendix 33B(1).</p> <p>d) Where any noise sensitive activity is partly or wholly contained within the area seaward of a noise contour line that is 68 dBA <math>L_{dn}</math> (5 day average) as shown on the current Port Noise Contour Map attached to the Port Noise Management Plan; or</p> <p>Where sound level monitoring indicates that port noise equals or exceeds 68 dBA <math>L_{eq}</math> (15 minutes 10pm-7am) on more than three occasions (more than 24 hours apart) during any rolling 12 month period within the boundary of a noise sensitive activity:</p> <p>The Port Operator shall comply with the matters set out in Appendix 33B(2).</p> <p>e) The Port Operator shall establish, maintain and participate in a Port Noise Liaison Committee which shall operate in accordance with the requirements set out in Appendix 33C.</p> <p>f) Noise must be measured in accordance with the provisions of New Zealand Standard NZS6801:1999 "Acoustics: Measurement of Environmental Sound" and New Zealand Standard NZS6809:1999 "Acoustics: Port Noise Management and Land Use Planning".</p>											

## APPENDIX C BLUFF HILL NMT MEASUREMENTS

Figure 1: Annual Noise Monitoring Results (1 July 2021 to 30 June 2022)

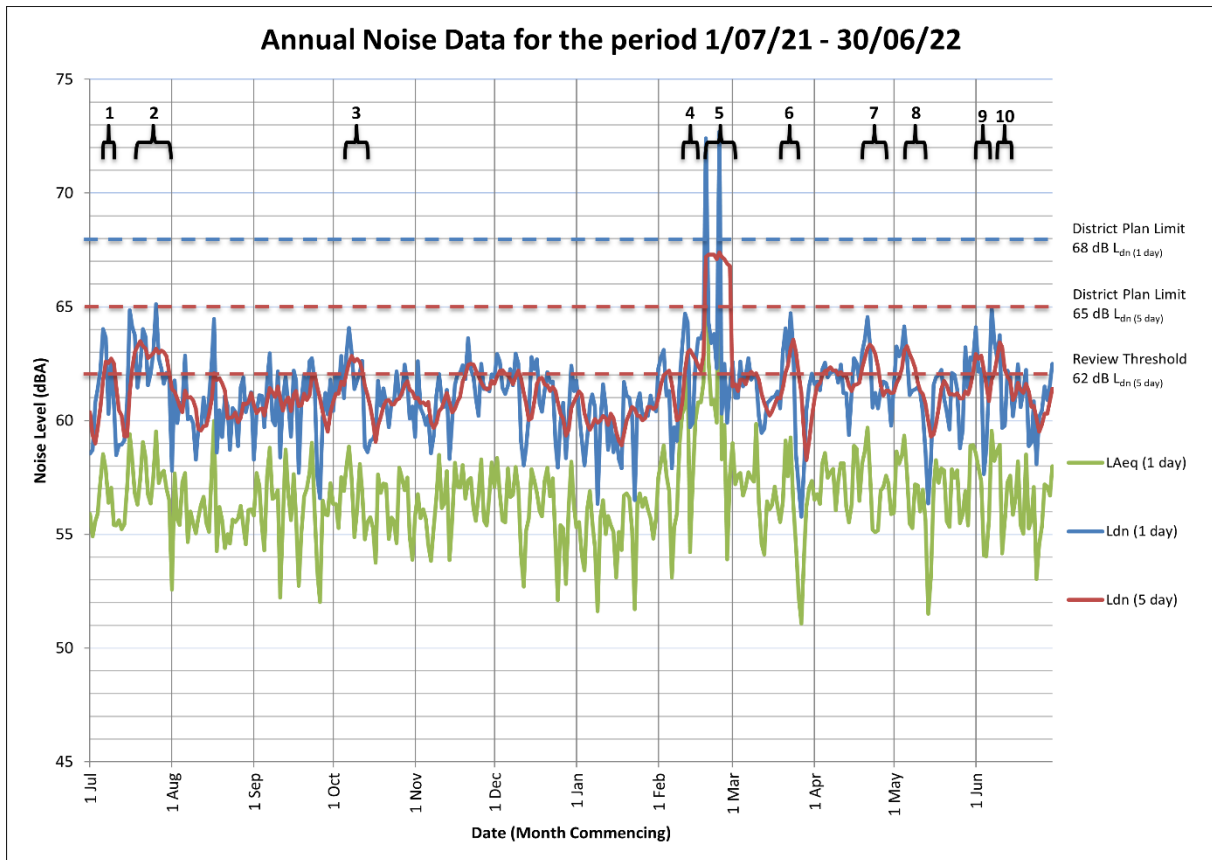
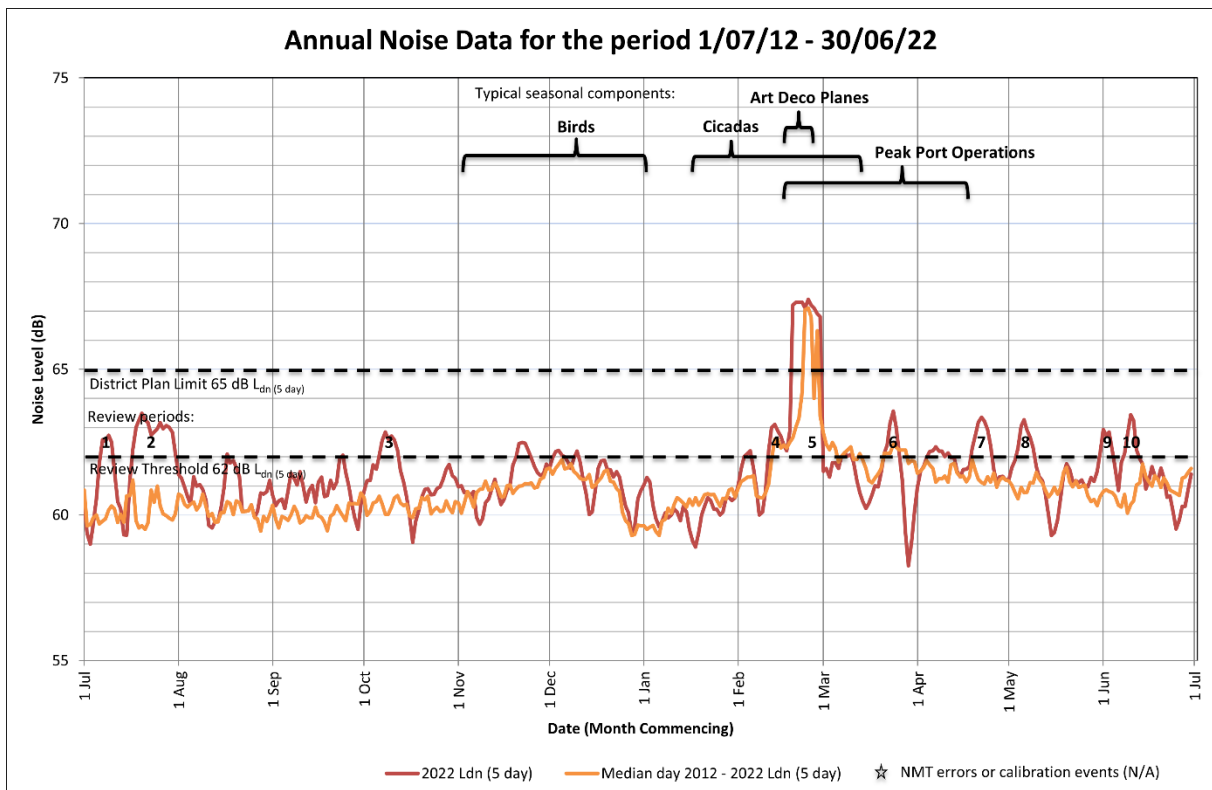


Figure 2: Historical Noise Monitoring Trends (1 July 2012 to 30 June 2022)



#### **APPENDIX D CURRENT PORT NOISE MAPS (2022)**

- Figure 1A Noise Contours 1.5m above ground (5 decibel intervals)
- Figure 1B Noise Contours 1.5m above ground (1 decibel intervals)
- Figure 2A Noise Contours 4m above ground (5 decibel intervals)
- Figure 2B Noise Contours 4m above ground (1 decibel intervals)
- Figure 3A Façade Noise Map (1 decibel intervals 3D perspective)
- Figure 3B Façade Noise Map (5 decibel intervals plan view)
- Figure 3C Façade Noise Map (1 decibel intervals plan view)
- Figure 4 Model 5-day Operational Scenario



Noise level  
(dB L<sub>dn</sub> 5-day)



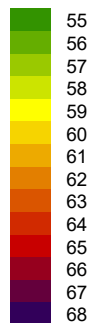
Port Noise Control Boundaries

- Operative Inner Port Noise Boundary
- Operative Outer Port Noise Boundary





Noise level  
(dB L<sub>dn</sub> 5-day)



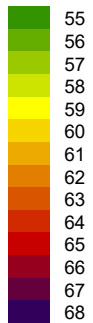


Noise level  
(dB L<sub>dn</sub> 5-day)

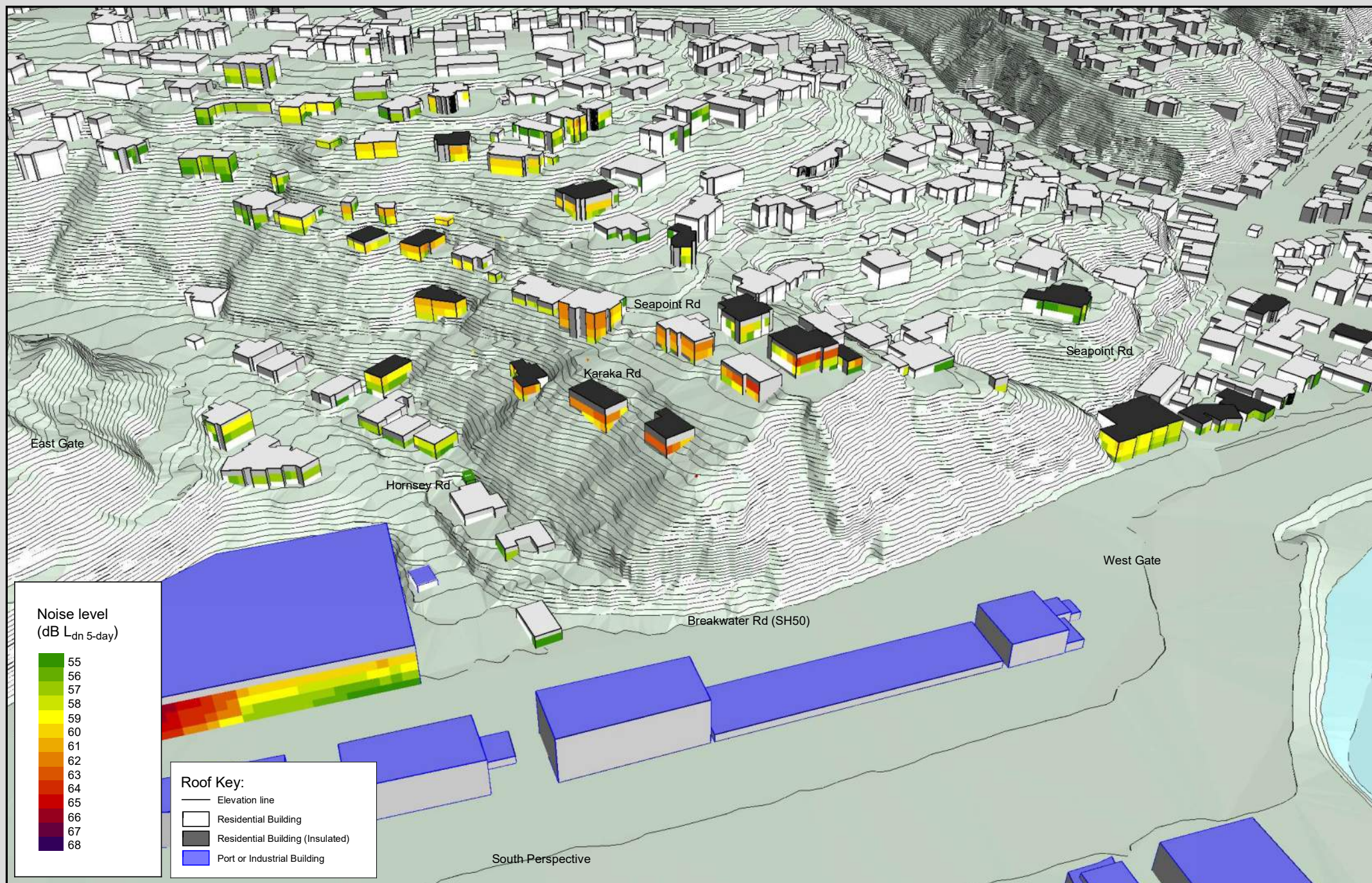




Noise level  
(dB L<sub>dn</sub> 5-day)

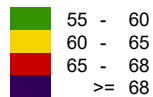




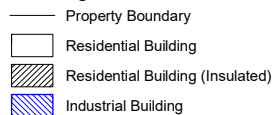




Noise level  
(dB L<sub>dn</sub> 5-day)

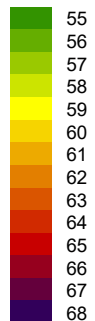


Buildings:





Noise level  
(dB L<sub>dn</sub> 5-day)



Buildings:

- Property Boundary
- Residential Building
- ▨ Residential Building (Insulated)
- ▤ Industrial Building





An aerial photograph showing an industrial facility on the left, characterized by several large, white, spherical storage tanks and various industrial buildings. To the right of the facility is a residential neighborhood with numerous small, white houses and green trees. A road, labeled 'BAYVIEW' and 'WILSON', runs between the industrial area and the residential area. The image is oriented horizontally.