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PrimePort Timaru

Port noise contours

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1.0 BACKGROUND

Acoustic Engineering Services (AES) was engaged by PrimePort Timaru to develop noise contours in accordance with NZS 6809:1999 *Acoustics – Port Noise Management and Land Use Planning*.

PrimePort Timaru's operations include a variety of domestic and international import and export activities, including containers, steel, cement, bulk products (logs etc.), and fish. The existing layout of the port, with specific areas that are relevant to PrimePort's operations labelled, is shown in figure 1.1 below.

Figure 1.1 – Timaru Port existing layout

2.0 EXISTING ACTIVITY

From our correspondence with PrimePort, and our observations on site, the primary noise generating activities conducted on site, as part of the normal operation of the port are as outlined below:

- Container activity:
    - Container cranes loading and unloading from ships
    - Refrigerated container (reefer) compressors
    - Reach stacker movements
    - Truck movements
- Steel activity:
    - On-ship cranes unloading steel from ships
    - Forklift movements
    - Storage area movements
- Cement activity:
    - Exterior noise from the Holcim vacuum pump room
    - Unloading operation from a Holcim ship
- Bulk products activity:
    - On-ship cranes unloading bulk products from ships
    - Truck movements
- Fishing activity
    - Hiab cranes unloading crates from ships
    - Forklift movements
    - Truck movements
- Shunt trains

Details and assumptions related to each of the above sources given in section 3.1 below.

2.1 Site visits and attended measurements

AES has made a number of visits to the Timaru Port site since 2018 to measure and observe existing sources of operational noise. Some of these visits were part of previous noise monitoring projects.

Two site visits took place in 2021 with the express purpose of observing, measuring, and documenting noise sources, for inclusion in the current noise contour modelling project. Oliver Hutchison of AES visited the site on the 27th of September and 26th of October 2021 during the day time, to observe and measure noise from the existing activity on the site. Measurements were undertaken in general accordance with NZS 6801:2008.

During the time of both our visits, weather was clear, with light winds and mild temperatures (14 – 15°C). Measurements were undertaken using a Brüel & Kjær Type 2250 Class 1 Sound Analyser. The analyser was field calibrated before measurements, and the calibration checked after measurements. No significant change was noted (<0.1 dB).

During our first visit (September 2021), we measured sources associated with steel, container, and bulk products handling, and noise from fishing wharves. During our second site visit (October 2021), we measured sources associated with container handling. Measurements of cement handling were undertaken in 2018 as part of previous noise compliance monitoring.

Some sources were unable to be directly measured due to operational or safety reasons. These include shunt trains, and the rail mounted air pump / vacuum used for cement unloading from a ship. As detailed in section 3.1 below, our assumptions for these sources are based on research we have conducted into similar sources that we have on file.

3.0 PLANNED FUTURE ACTIVITY

In addition to surveying the existing noise generating activities of PrimePort's operation, future planned development over the next 10 years have been taken into account in the final port noise contour modelling. Based on our correspondence with PrimePort, we understand that the following future developments are planned, and these have been accounted for in the Scenario 1.2 modelling in section 5.2 of this report:

- Demolition of the No.3 wharf, and the extension of the North Mole wharf to the south creating an additional berth on the North Mole Wharf for steel and container handling.
- A proposed new wharf at Evans Bay, to be used for bulk product handling.

We understand that future development projects are at various stages of planning, and all are dependent on the materialisation of projected growth in demand for import and export services at Timaru Port. Based on our discussion with PrimePort, we understand that some future development projects are unlikely to occur within the next 10 years, and these projects have not been included in the modelling, as follows:

- Demolition of the existing PrimePort administration building, and the adjacent Transit Shed. Expansion of the North Mole Wharf container storage area to the south (the green area shown in figure 3.1 below).
- Additional Holcim cement storage facility adjacent to the existing facility.

Various future port noise development projects can be seen in figure 3.1 below.

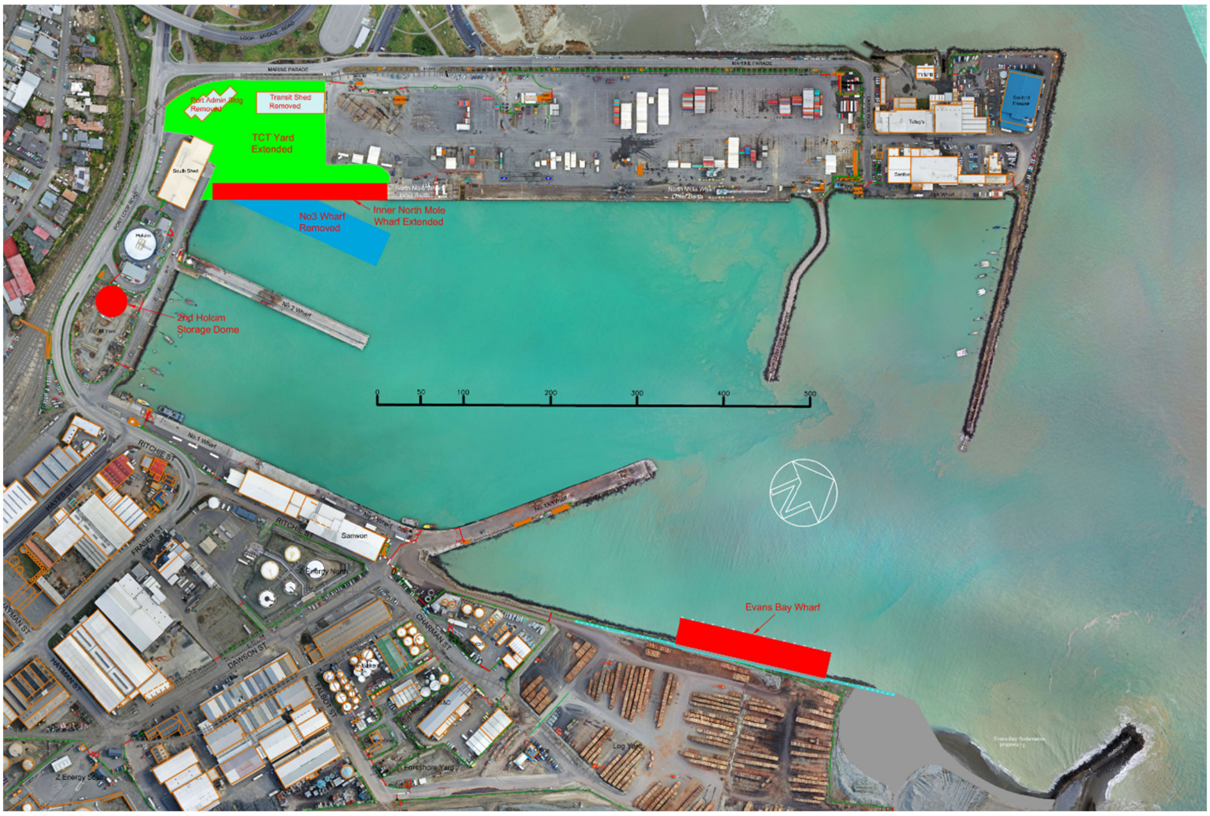


Figure 3.1 – Timaru Port future development projects

4.0 NOISE MODELLING

4.1 Model parameters

SoundPlan computational noise modelling based on ISO 9613 *Acoustics – Attenuation of sound outdoors – Part 2: General method of calculation* has been used to calculate the propagation of noise from all major noise sources identified. Modelling has taken into account the topography of the area, built environment, worst-case downwind conditions, and sound power levels of the noise sources. Geospatial data was sourced from various locations to build the noise model, as outlined in table 4.1 below.

Table 4.1 – Sources of geospatial data used

Data type	Source	Dataset
Terrain	Canterbury Maps	NZAM_10027_2010
Property boundaries	LINZ	NZ Property Titles
Aerial imagery	Canterbury Maps	Latest Imagery (ImageServer)
Buildings	LINZ	NZ Building Outlines

Terrain data based on LiDAR survey was used with a 1 m vertical resolution. Ground absorption factor was set at 0.6 for land areas (0 = hard, 1 = soft), and 0 for water. Buildings were set with a typical height of 6 metres. The reflection order was set to 1. The height of the noise contour grid was set to 1.5 metres above the ground level. The grid spacing of the model (distance between calculated nodes) was set to 5 metres.

Noise modelling involved and iterative process, and constant dialogue with PrimePort, to construct realistic operational scenarios for each type of source.

Characteristics of the individual noise sources modelled are given in tables 4.2 through 4.6 below.

4.2 Noise sources

4.2.1 Container activity

Table 4.2 – Container activity noise sources

Source	Location	Sound power level (L_{wA})	Source attributes	Level of activity
Liebherr mobile harbour crane	NMW	109	▪ Sound source located at the centre height of the onboard diesel engine of the crane, approximately 5 m above ground level ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on results measured on site and reflects the sound level created by a single crane under load during a container lift. Actual emissions would be expected to be lower during times of inactivity	Existing: ▪ 2 cranes are active both servicing a single ship at the North Mole Wharf outer berth, 24 hours, for 2 days Future ▪ An additional single crane is active servicing a single ship at the North Mole Wharf inner berth 24 hours, for 3 days

Table 4.2 (ctd) – Container activity noise sources

Source	Location	Sound power level (L_{WA})	Source attributes	Level of activity
Containers banging on ship during unload or onload	NMW	118	▪ Sound source located on the ship, at a height of 12 m above ground level ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on results measured on site of an empty 40' container hitting another container (metal on metal sound) and reflects the sound level created by a single container (instantaneous impact sound) ▪ Our model has conservatively assumed that the noise from container impacts will be present for 30 seconds in each one hour period. This is consistent with an operational speed of 30 container movements per hour per crane	Existing: ▪ 2 cranes are active both servicing a single ship at the North Mole Wharf outer berth, 24 hours, for 2 days Future ▪ An additional single crane is active servicing a single ship at the North Mole Wharf inner berth 24 hours, for 3 days
Containers banging on the ground during unload or onload	NMW	123	▪ Sound source located at ground level ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on results measured on site of an empty 40' standard container hitting concrete and reflects the sound level created by a single container (instantaneous impact sound) ▪ Our model has conservatively assumed that the noise from container impacts will be present for 30 seconds in each one hour period. This is consistent with an operational speed of 30 container movements per hour per crane	Existing: ▪ 2 cranes are active both servicing a single ship at the North Mole Wharf outer berth, 24 hours, for 2 days Future ▪ An additional single crane is active servicing a single ship at the North Mole Wharf inner berth 24 hours, for 3 days

Table 4.2 (ctd) – Container activity noise sources

Source	Location	Sound power level (L_{WA})	Source attributes	Level of activity
Reefer containers	NMW	89	▪ Sound source located at 1 m and 3.4 m above ground level (double stacked containers) ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on results measured on site of a single 40' reefer container compressor during its duty cycle ▪ Our model has conservatively assumed that all reefer compressors will be active simultaneously, and all will be active constantly. In reality we would expect the real noise level produced to be lower due to individual compressors powering on and off (duty cycles)	Existing: ▪ 24 hours, 5 days ▪ 15 double-stacked rows of containers (600 containers total) were modelled, spread around the NMW Future: ▪ 24 hours, 5 days ▪ 22 double-stacked rows of containers (880 containers total) were modelled, spread around the NMW
Container trucks	Existing container truck route	102	▪ Sound source located at 1.5 m above ground level, being the approximate centre height of a truck engine ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on results measured on site of a single 40' standard container being loaded onto a truck (instantaneous impact sound)	Existing: ▪ 24 hours, 5 days ▪ 15 trucks per hour visiting the site during all hours of the day Future: ▪ 24 hours, 5 days ▪ 30 trucks per hour visiting the site during all hours of the day
Container banging during load onto a truck	Existing container truck loading zone	118	▪ Sound source located at 1 m above ground level, being the approximate height of a container truck bed ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on results measured on site of a single container truck	Existing: ▪ 24 hours, 5 days ▪ 15 trucks per hour visiting the site during all hours of the day Future: ▪ 24 hours, 5 days ▪ 30 trucks per hour visiting the site during all hours of the day

Table 4.2 (ctd) – Container activity noise sources

Source	Location	Sound power level (L_{WA})	Source attributes	Level of activity
Container reach stacker	NMW	107	▪ Sound source located at 1.5 m above ground level, being the approximate centre height of a container stacker engine ▪ Due to wide area of possible sound source locations, the sound source is modelled as an area source covering the entire area used by container stackers ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on results measured on site of a single container stacker	<u>Existing and future:</u> ▪ 24 hours, 5 days ▪ 1 reach stacker is active around the site during all hours of the day ▪ 1 reach stacker is active around the site during the day time period only (0700 – 2200)

4.2.2 Steel activity

Table 4.3 – Steel activity noise sources

Source	Location	Sound power level (L_{WA})	Source attributes	Level of activity
On-ship crane	NMW, inner berth	86	▪ Sound source located at the height of the control box of the on-ship crane ▪ Modelled spectrum based on results measured on site. The sound source is predominantly hydraulic winch motor noise ▪ Sound power level is based on results measured on site and reflects the sound level created by a single crane under load during a steel lift. Actual emissions would be expected to be lower during times of inactivity	<u>Existing and future:</u> ▪ 24 hours, 5 days ▪ 2 cranes are active on a single ship at the North Mole Wharf inner berth (worst-case location)

Table 4.3 (ctd) – Steel activity noise sources

Source	Location	Sound power level (L_{WA})	Source attributes	Level of activity
Steel forklift	NMW, inner berth and existing steel storage area	107	▪ Sound source located at 1.5 m above ground level, being the approximate centre height of a steel forklift engine ▪ Due to wide area of possible sound source locations, the sound source is modelled as an area source covering the entire area used by steel forklifts ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on results measured on site of a single steel forklift	<u>Existing and future:</u> ▪ 24 hours, 5 days ▪ 2 steel forklifts are active around the site during all hours of the day
Steel handling noise	NMW, inner berth and existing steel storage area	125	▪ Sound source located at ground level ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on results measured on site of the instantaneous impact sound as steel is handled by forklifts ▪ Our model has conservatively assumed that the noise from steel handling will be present for 60 seconds in each one hour period, per forklift. This is consistent with an operational speed of 30 steel movements per hour per forklift	<u>Existing and future:</u> ▪ 24 hours, 5 days ▪ 2 steel forklifts are active around the site during all hours of the day

4.2.3 Cement activity

Table 4.4 – Cement activity noise sources

Source	Location	Sound power level (L_{WA})	Source attributes	Level of activity
Rail mounted air pump / vacuum	No. 2 wharf	112	▪ Sound sources located on the wharf, adjacent to a vessel ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on research data due to the fact that we have not been able to directly measure this source	Existing and future: ▪ 24 hours, 5 days
Cement pumping plant room, silo compressors	Holcim plant room, south of No. 2 wharf	98	▪ Sound sources located at the height of the louvres on the northwest, northeast, and southeast façades of the cement pumping plant room ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on results measured on site and reflects the average sound level in the vicinity of the cement plant room during a pumping operation	Existing and future: ▪ 24 hours, 5 days
Cement trucks	Holcim plant area, south of No. 2 wharf	102	▪ Sound source located at 1.5 m above ground level, being the approximate centre height of a truck engine ▪ Modelled spectrum based on results of similar trucks measured on site ▪ Sound power level is based on results measured on site of similar trucks measured on site	Existing and future: ▪ 24 hours, 5 days ▪ 5 trucks per hour visiting the cement terminal during all hours of the day

4.2.4 Bulk product activity

Table 4.5 – Bulk product activity, noise sources

Source	Location	Sound power level (L_{WA})	Source attributes	Level of activity
On-ship crane	No. 1 wharf No. 1 Extension wharf Proposed Evans Bay wharf	86	▪ Sound source located at the height of the control box of the on-ship crane ▪ Modelled spectrum based on results measured on site. The sound source is predominantly hydraulic winch motor noise ▪ Sound power level is based on results measured on site and reflects the sound level created by a single crane under load during a lift. Actual emissions would be expected to be lower during times of inactivity	<u>Existing:</u> ▪ 24 hours, 5 days ▪ 2 cranes are active on a single ship at the No. 1 wharf ▪ 2 cranes are active on a single ship at the No. 1 Extension wharf <u>Future:</u> ▪ 24 hours, 5 days ▪ Additional 2 cranes are active on a single ship at the proposed Evans Bay wharf
Log handler	Evans Bay log storage area	107	▪ Sound source located at 1.5 m above ground level, being the approximate centre height of a log handler engine ▪ Due to wide area of possible sound source locations, the sound source is modelled as an area source covering the entire area used by log handler ▪ Modelled spectrum based on results of similar equipment measured on site ▪ Sound power level is based on results measured on site of a single log handler	<u>Existing and future:</u> ▪ 24 hours, 5 days ▪ 1 log handler is active around the site during all hours of the day ▪ 1 log handler is active around the site during the day time period only (0700 – 2200)
Maffi trucks	No. 1 wharf and No 1 Extension wharf to Evans Bay log storage area	102	▪ Sound source located at 1.5 m above ground level, being the approximate centre height of a truck engine ▪ Modelled spectrum based on results of similar trucks measured on site ▪ Sound power level is based on results measured on site of similar trucks measured on site	<u>Existing and future:</u> ▪ 24 hours, 5 days ▪ 20 truck movements per hour (10 return trips) between the No. 1 wharf and the log storage yard during all hours of the day ▪ 20 truck movements per hour (10 return trips) between the No. 1 Extension wharf and the log storage yard during all hours of the day

Table 4.5 (ctd) – Bulk product activity, noise sources

Source	Location	Sound power level (L_{WA})	Source attributes	Level of activity
Log trucks (deliveries)	Log storage area	102	▪ Sound source located at 1.5 m above ground level, being the approximate centre height of a truck engine ▪ Modelled spectrum based on results of similar trucks measured on site ▪ Sound power level is based on results measured on site of similar trucks measured on site	Existing and future: ▪ 0700-1700 hours, 5 days ▪ 10 trucks per hour visiting the site

4.2.5 Fishing activity

Table 4.6 – Fishing activity noise sources

Source	Location	Sound power level (L_{WA})	Source attributes	Level of activity
Hiab cranes, trucks, forklifts, associated loading and unloading noise	No. 1 wharf inner berth No. 3 wharf NMW fishing wharf	105	▪ Modelled spectrum based on results of measured on site ▪ Sound power level is based on results measured on site in the vicinity of fishing operations	Existing and future: ▪ 24 hours, 5 days

4.2.6 Shunt train activity

Table 4.7 – Shunt train activity noise sources

Source	Location	Sound power level (L_{wA})	Source attributes	Level of activity
NMW container shunt train	From the Kiwirail corridor to the end of the NMW	133	▪ Sound source located at 3 m above ground level, being the approximate centre height of the shunt locomotive engine ▪ Due to wide area of possible sound source locations, the sound source is modelled as a line source covering the shunt siding from the edge of the Kiwirail corridor, to the end of the line at the North Mole Wharf ▪ Spectrum based on an example spectrum for a train held on file ▪ Sound power level is based on research into typical freight train sound power ▪ Our model has assumed that a shunt takes 2 minutes to pass by a given location on the line (travelling at approximately 10 km / h)	Existing: ▪ 1 train daily during the night time period Future: ▪ Additional 1 train daily during the day time period

Table 4.7 (ctd) – Shunt train activity noise sources

Source	Location	Sound power level (L_{WA})	Source attributes	Level of activity
Evans Bay log shunt train	From the Kiwirail corridor to the end of the Evans Bay log storage area	133	▪ Sound source located at 3 m above ground level, being the approximate centre height of the shunt locomotive engine ▪ Due to wide area of possible sound source locations, the sound source is modelled as a line source covering the shunt siding from the edge of the Kiwirail corridor, to the Evans Bay log storage area ▪ Spectrum based on an example spectrum for a train held on file ▪ Sound power level is based on research into typical freight train sound power ▪ Our model has assumed that a shunt takes 2 minutes to pass by a given location on the line (travelling at approximately 10 km / h)	Future: ▪ 1 train weekly during the night time period

5.0 SCENARIOS

5.1 Scenario 1.1 – All sources, existing full port scenario

This scenario considers noise from all sources associated with a 'full port' scenario, under the existing port layout. The types of activity occurring at each wharf can be seen in table 5.1 below. The resulting noise contours can be seen in appendix 1.1.

Table 5.1 – Existing full port scenario, assumed ships in port

NMW, outer berth	NMW, inner berth	No. 1 wharf	No. 1 Extension wharf	No. 2 wharf	No. 3 wharf	TCT wharf extension	Evans Bay wharf
Container	Steel	Fishing, bulk product	Bulk product	Cement	Fishing	-	-

5.2 Scenario 1.2 – All sources, future full port scenario

This scenario considers noise from all sources associated with a 'full port' scenario, under the future port layout. The types of activity occurring at each wharf can be seen in table 5.2 below. The resulting noise contours can be seen in appendix 1.2.

Table 5.2 – Future full port scenario, assumed ships in port

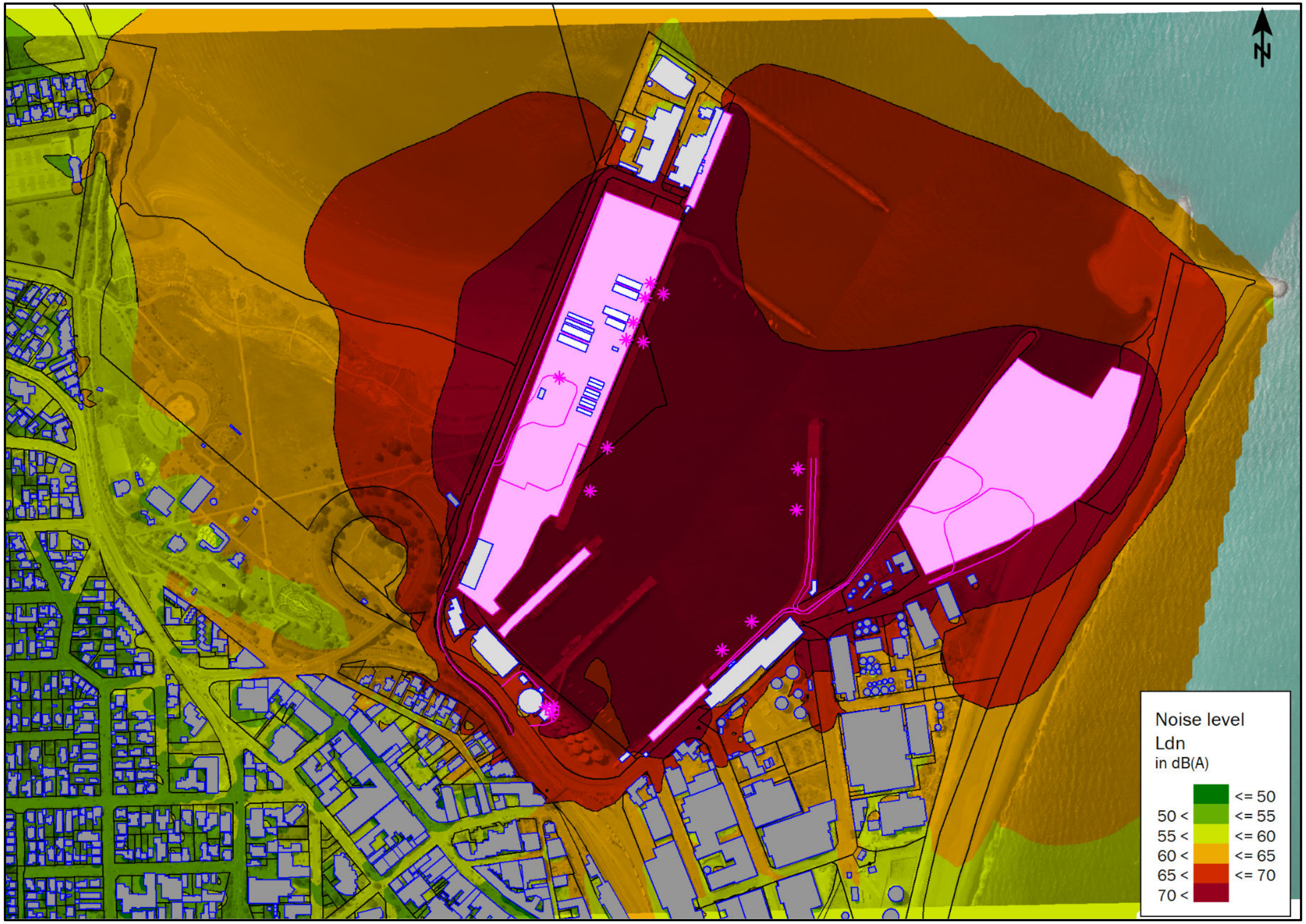
NMW, outer berth	NMW, inner berth	No. 1 wharf	No. 1 Extension wharf	No. 2 wharf	No. 3 wharf	TCT wharf extension	Evans Bay wharf
Container	-	Fishing, bulk product	Bulk product	Cement	(demolished)	Combined container and steel ship	Bulk product

6.0 CONTROL BOUNDARIES

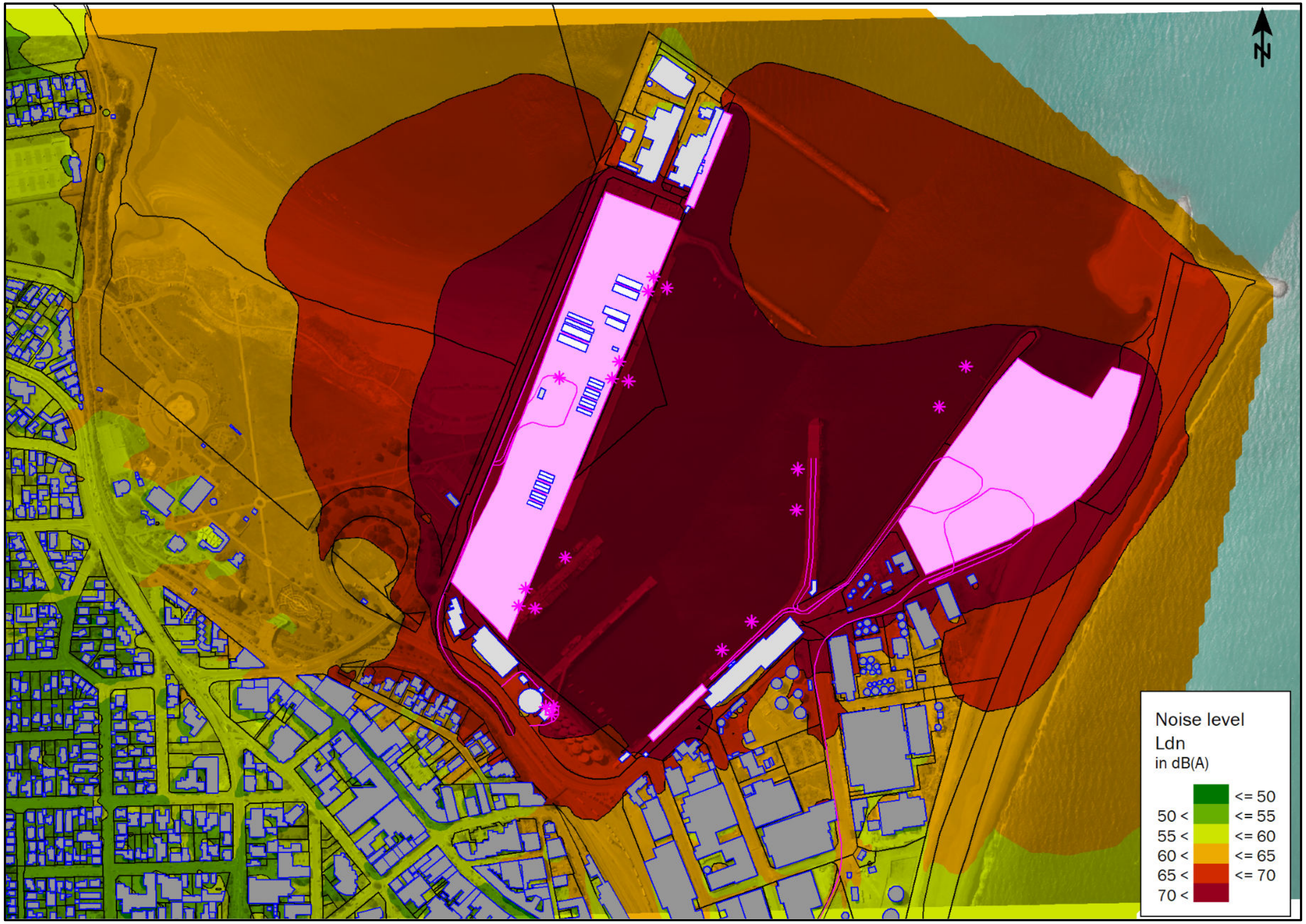
Subsequent to the completion of noise modelling, the Inner and Outer Control Boundaries were drawn in accordance with NZS 6809:1999, and were based on the scenario 1.2 model above, allowing for planned increases in activity over the next five to 10 years.

The Inner Control Boundary was located just beyond the extent of the 65 dB L_{dn} contour line, and was snapped to the boundaries of properties that the noise model showed would likely experience noise levels of 65 dB L_{dn} or higher within the site boundary. The Outer Control Boundary was similarly drawn, located just beyond the extent of the 57 dB L_{dn} contour line. The 57 dB L_{dn} line was selected for the Outer Control Boundary as an appropriate internal port noise level is very likely to be achieved where external port noise levels are 55 to 57 dB L_{dn}, and so this will increase the efficiency of any Rule requiring review and possible upgrade of new dwellings between the Inner and Outer Control Boundaries. As noted previously, property boundary data was sourced from LINZ.

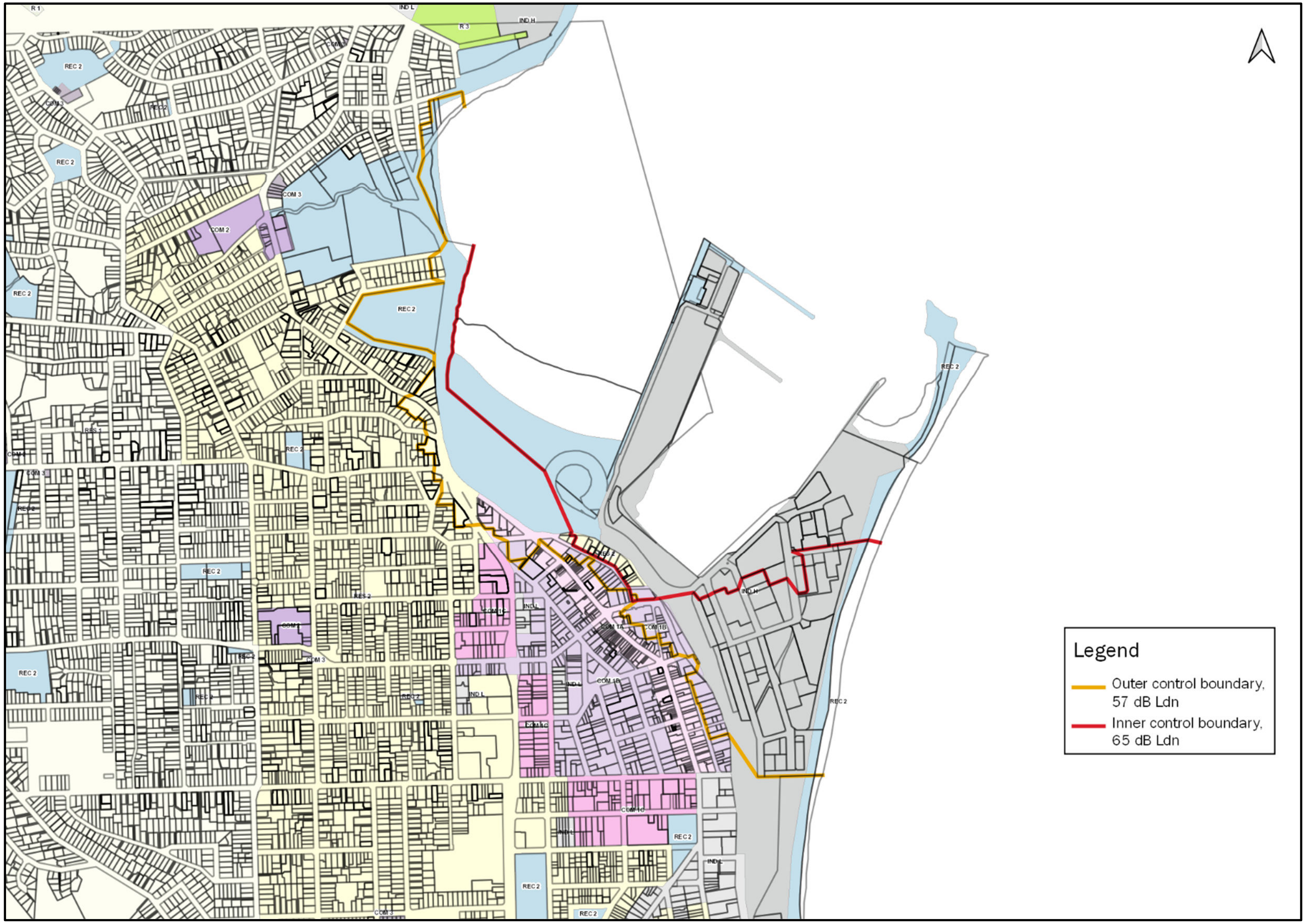
The resulting control boundaries can be seen in appendix 1.3.



Appendix 1.1 – Scenario 1.1 – All sources, existing full port scenario



Appendix 1.2 – Scenario 1.2 – All sources, future full port scenario



Appendix 1.3 – Location of inner and outer control boundaries, with ODP zones