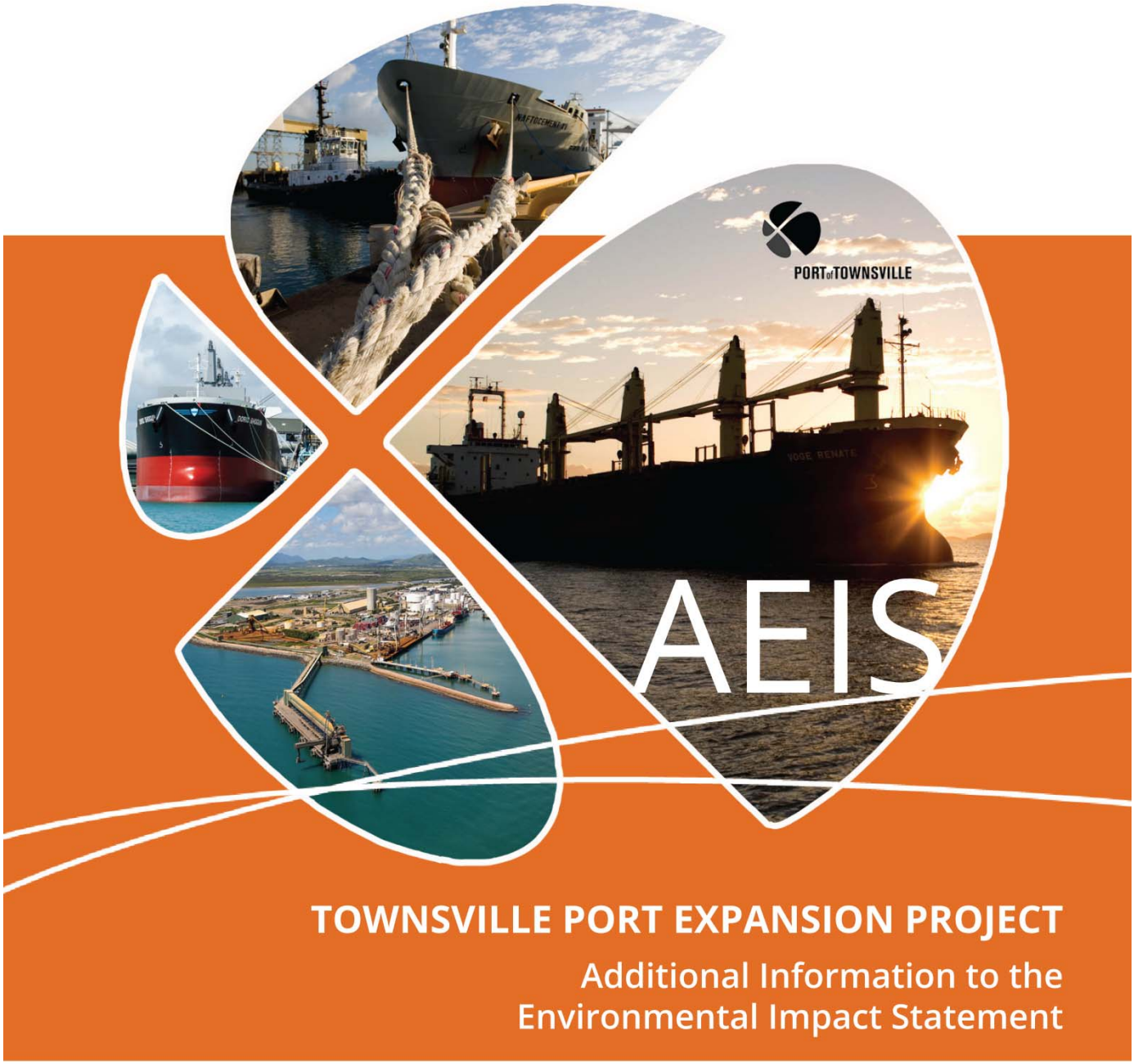


TOWNSVILLE PORT EXPANSION PROJECT

Additional Information to the Environmental Impact Statement

TOWNSVILLE PORT EXPANSION PROJECT

APPENDIX A6

Noise and Vibration Supporting Information

AECOM BMT WBM

Operating Noise Modelling Assumptions

Plant and Equipment

A variety of fixed and mobile equipment types will be utilised during the operational phase of the Port Expansion Project (PEP), each of which will generate noise. The indicative types of equipment to be used at the port expansion are summarised in the following sub-sections.

The equipment sound power levels used in the environmental noise modelling are based on levels measured during a site visit to the existing Port in June 2011 and checked against equipment noise measurements taken by AECOM at other ports in Australia. It is noted that noise from ships moving in and out of the port has not been incorporated into the noise model. This is because shipping does not represent a significant noise source; it occurs for short periods of time only, and is infrequent compared with the continuous operation of the plant and equipment serving the ships at berth.

Published noise levels for stationary equipment often differ from the noise levels produced by the same equipment moving around on site. The noise emission of machinery can vary with a number of factors, including the age and condition of the machine, the type of terrain the machine is operating on, the type of operation the machine is performing, the quality of lubricants and oils, and the ability of the operator.

Whilst the actual sound power levels can vary, the levels used in the environmental noise model are indicative of the predicted level when proper maintenance and operating procedures are followed. Table 1 provides assumptions for sound power levels, the average height of the noise source and the forecast number of items used in the noise model.

Table 1 Indicative sound power levels of equipment proposed for the PEP

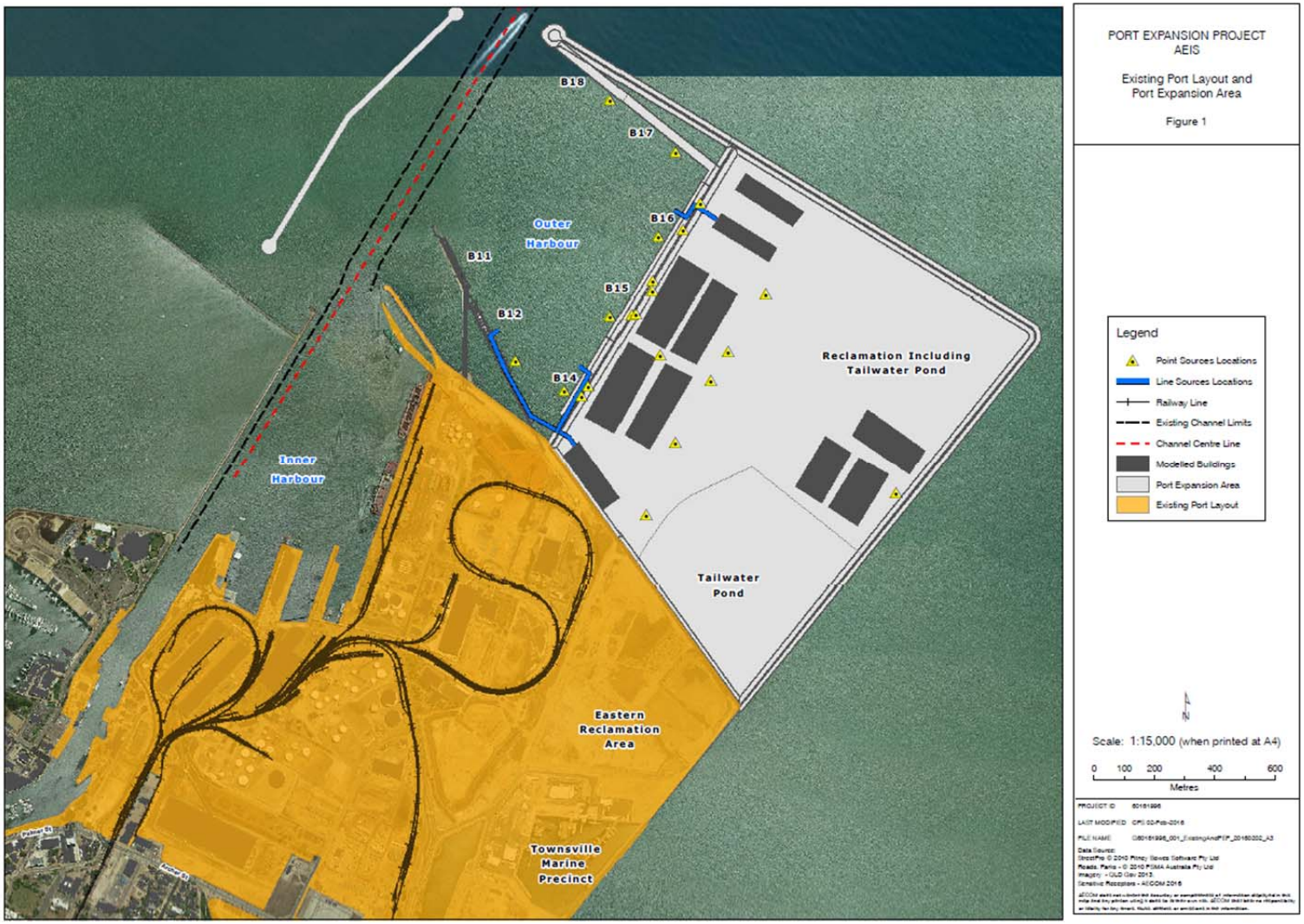
Noise source	Number operating	Height of Noise Source (m)	Overall L_W Level, dB(A)	A-weighted sound levels (dB(A))							
				31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Forklift	4	1	109	109	118	122	110	103	100	96	88
Semi trailer moving	9	1	98	96	109	106	98	94	93	90	83
Vessel Exhaust noise	6	20	111	122	117	117	113	110	103	98	90
30 tonne crane	2	30	112	120	120	121	114	109	104	100	93
Conveyor/Ship Loader	3	10	87 per metre	97	93	93	84	84	83	75	68

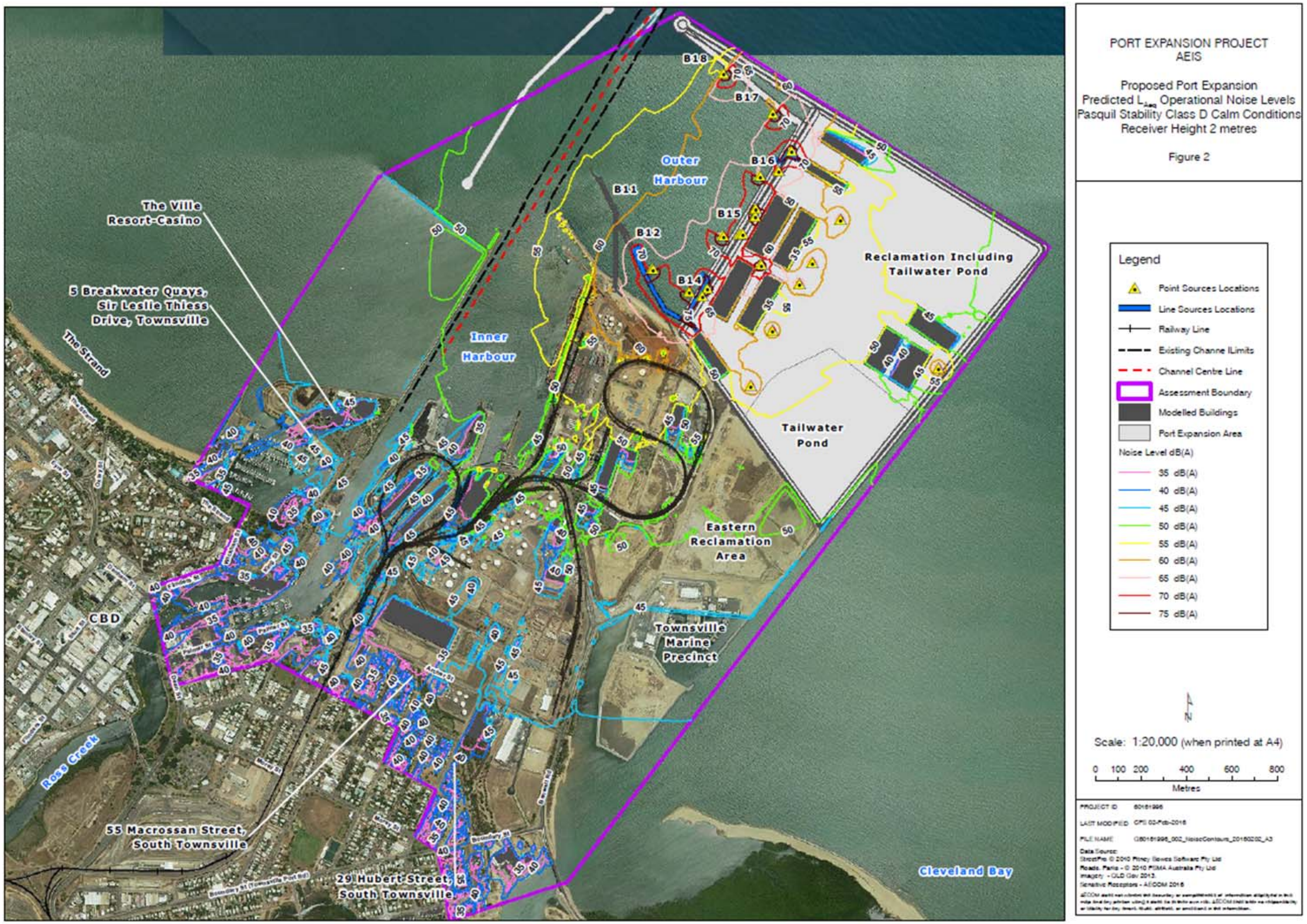
Noise Model Locations

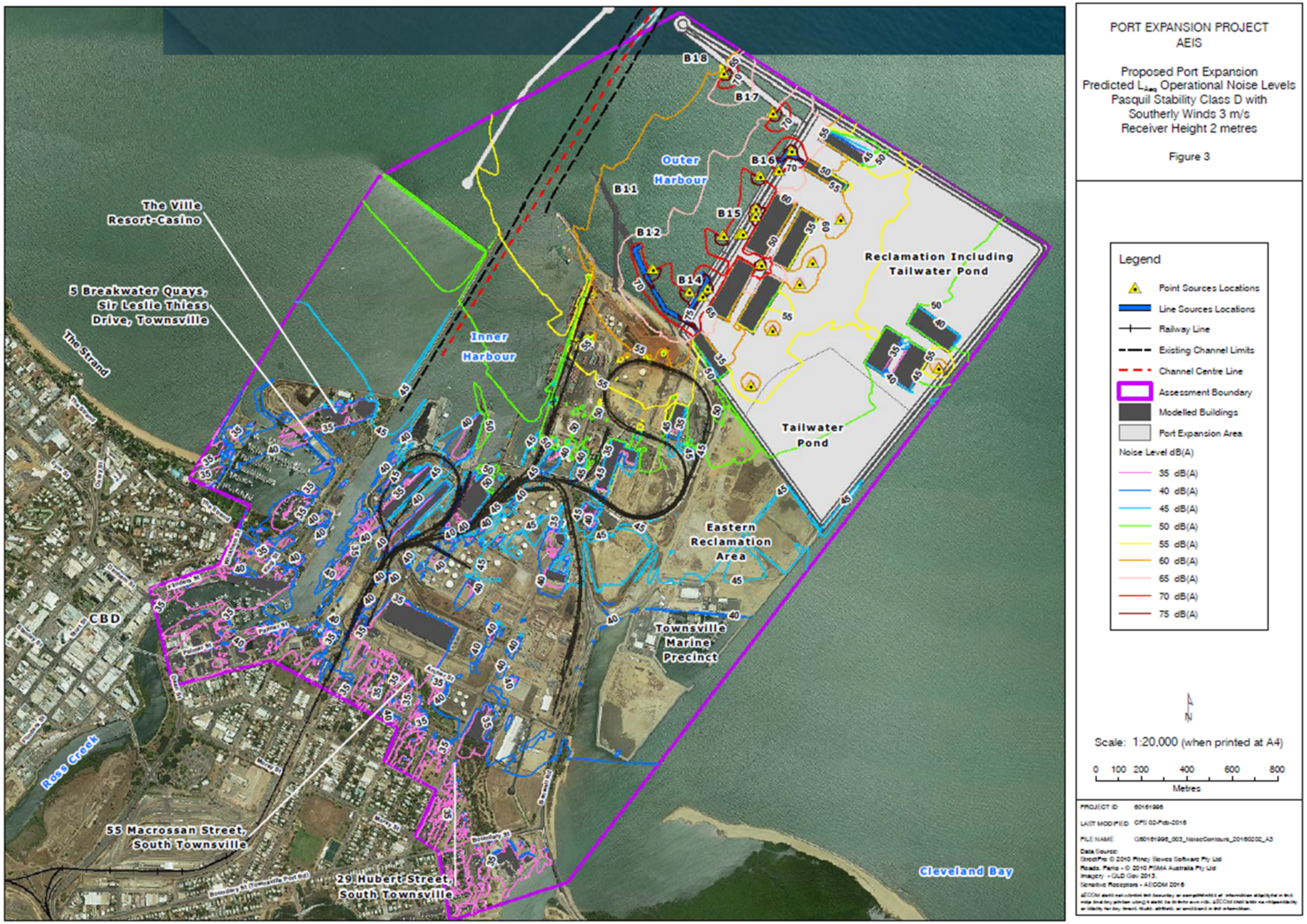
Locations of the mobile equipment have been based on observations of existing working relationships between loading / unloading / transportation equipment and the ships at berth made by AECOM personnel during site visits to the port. Locations were chosen to represent 'typical worst case' mobile plant locations. Fixed equipment locations were estimated.

Figure 1 shows the existing port layout and proposed PEP area. Figures 2 to 4 show predicted operational noise levels in calm and windy conditions.

Noise Contour Plots – Operational Port Expansion




PORT EXPANSION PROJECT
AEIS
Proposed Port Expansion
Predicted L_{Aeq} Operational Noise Levels
Pasquil Stability Class D Calm Conditions
Receiver Height 2 metres
Figure 2
Legend
Point Sources Locations
Line Sources Locations
Railway Line
Existing Channe lLimits
Channel Centre Line
Assessment Boundary
Modelled Buildings
Port Expansion Area
Noise Level dB(A)
35 dB(A)
40 dB(A)
45 dB(A)
50 dB(A)
55 dB(A)
60 dB(A)
65 dB(A)
70 dB(A)
75 dB(A)
N
Scale: 1:20,000 (when printed at A4)
0 100 200 400 600 800
Metres
The Ville Resort-Casino
5 Breakwater Quays, Sir Leslie Thiess Drive, Townsville
The Strand
CBD
Ross Creek
55 Macrossan Street, South Townsville
29 Hubert Street, South Townsville
Inner Harbour
Outer Harbour
B11
B12
B14
B15
B16
B17
B18
Reclamation Including Tailwater Pond
Tailwater Pond
Eastern Reclamation Area
Townsville Marine Precinct
Cleveland Bay


PORT EXPANSION PROJECT
AEIS
Proposed Port Expansion
Predicted L_{Aeq} Operational Noise Levels
Pasquil Stability Class D with
Southerly Winds 3 m/s
Receiver Height 2 metres
Figure 3
Legend
Point Sources Locations
Line Sources Locations
Railway Line
Existing Channel Limits
Channel Centre Line
Assessment Boundary
Modelled Buildings
Port Expansion Area
Noise Level dB(A)
35 dB(A)
40 dB(A)
45 dB(A)
50 dB(A)
55 dB(A)
60 dB(A)
65 dB(A)
70 dB(A)
75 dB(A)
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Metres
PROJECT ID 60161996
LAST MODIFIED CPS 02-Feb-2016
FILE NAME G60161996_003_NoiseContours_20160202_A3
Data Source:
StreetPro © 2010 Pitney Bowes Software Pty Ltd
Roads, Parks - © 2010 PSMA Australia Pty Ltd
Imagery - QLD Gov 2013.
Sensitive Receptors - AECOM 2016
The Ville Resort-Casino
5 Breakwater Quays, Sir Leslie Thiess Drive, Townsville
The Strand
CBD
Rose Creek
55 Macrossan Street, South Townsville
29 Hubert Street, South Townsville
Outer Harbour
Inner Harbour
B11
B12
B14
B15
B16
B17
B18
Reclamation Including Tailwater Pond
Tailwater Pond
Eastern Reclamation Area
Townsville Marine Precinct
Cleveland Bay


PORT EXPANSION PROJECT
AEIS
Proposed Port Expansion
Predicted L_{Aeq} Operational Noise Levels
Pasquil Stability Class D with
South-easterly Winds 3 m/s
Receiver Height 2 metres
Figure 4
Legend
Point Sources Locations
Line Sources Locations
Railway Line
Existing Channel Limits
Channel Centre Line
Assessment Boundary
Modelled Buildings
Port Expansion Area
Noise Level dB(A)
35 dB(A)
40 dB(A)
45 dB(A)
50 dB(A)
55 dB(A)
60 dB(A)
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Scale: 1:20,000 (when printed at A4)
0 100 200 400 600 800
Metres
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Imagery - QLD Gov 2013.
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The Ville Resort-Casino
5 Breakwater Quays, Sir Leslie Thiess Drive, Townsville
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B18
Reclamation Including Tailwater Pond
Tailwater Pond
Eastern Reclamation Area
Townsville Marine Precinct
CBD
Ross Creek
55 Macrossan Street, South Townsville
29 Hubert Street, South Townsville
Cleveland Bay

Operational Noise Goals

Summary of Operational Noise Goals

Noise goals for the PEP are summarised in Table 2 below.

Table 2 Summary of noise goals applicable at nearest noise sensitive receivers

Period	Time	Environmental Protection Policy (Noise) 2008 $L_{Aeq, adj, 1hr}$ dB(A)	Planning for Noise Control $L_{Aeq,1hr}$ dB(A)	World Health Organisation guidelines L_{Aeq} dB(A)	ECOACCESS Low Frequency dB(Lin)
Day	7am – 6pm	50	28 – 48*	40 – 45	50 dB(Lin) Screening test (indoors)
Evening	6pm – 10pm	50	28 – 46*	40 – 45	
Night	10pm – 7am	45	28 – 44*	35 – 40	

*Note: These are specific for each noise sensitive receiver. Table 3 below displays the Planning for Noise Control noise goals for each noise sensitive receiver.

Table 3 Summary of Planning for Noise Control goals

Location	Planning for Noise Control goals, $L_{Aeq, 1hr}$ dB(A)		
	Day	Evening	Night
29 Hubert Street, South Townsville	41	42	41
55 Macrossan Street, South Townsville	44	38	35
5 Breakwater Quays, Sir Leslie Thiess Drive, Townsville	45	46	44
The Ville Resort - Casino, Townsville	48	48	42
1 Esplanade, Picnic Bay, Magnetic Island	28	28	28

The above noise goals are based on the legislation and policies discussed hereafter.

Environmental Protection Act 1994

Section 440Q (2) of the Act states that:

2 *A person does not contravene a noise standard by causing an environmental nuisance mentioned in schedule 1, part 1.*

Schedule 1 *Exclusions relating to environmental nuisance or environmental harm* of the Act outlines a number of activities which are excluded from being classified as contravening a noise standard. The Schedule states:

Part 1 Environmental nuisance excluded from ss 440 and 440Q

1 *Safety and transport noise*

Environmental nuisance caused by any of the following types of noise –

(d) noise from operating a ship, including noise from –

(i) machinery and equipment; or

(ii) shore and ship based port operations for loading onto a ship, or unloading from a ship, items other than bulk goods; or

(iii) ship to shore communications relating to safe berthing and cargo handling; or

(iv) a ship's horn;

The purpose of this Environmental Impact Statement is to inform the application process of the expected impact of the port expansion, rather than necessarily address the issue of environmental nuisance as defined by the Act. Therefore, the general environmental noise goals which would otherwise apply are applied in this assessment as a guide to the understanding of what would constitute "acceptable" environmental noise emissions from an industrial facility.

Environmental Protection (Noise) Policy 2008

Part 3 of the Environmental Protection Policy (Noise) specifies that the environmental values to be enhanced or protected under the policy are:

(a) the qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems; and

(b) the qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to do any of the following—
(i) sleep;
(ii) study or learn;
(iii) be involved in recreation, including relaxation and conversation; and

(c) the qualities of the acoustic environment that are conducive to protecting the amenity of the community.

Schedule 1 of the Environmental Protection Policy (Noise) details specific acoustic quality objectives to be met for various types of sensitive receptors. This includes the noise goals for receptors used in this assessment and is summarised in Table 4.

Table 4 EPP (Noise) 2008 acoustic quality objectives at dwelling

Sensitive receptor	Time of day	Acoustic quality objectives (measured at the receptor) dB(A)		
		$L_{Aeq, adj, 1hr}$	$L_{A10, adj, 1hr}$	$L_{A1, adj, 1hr}$
Dwelling (outdoors)	Daytime and evening	50	55	65
Dwelling (indoors)	Daytime and evening	35	40	45
	Night	30	35	40
Commercial and retail (indoors)	When the activity is open for business	45	-	-

It is noted that the limits presented in Table 4 above are objectives designed as maximum long-term noise limits and are not designed for assessment of any individual project or enterprise.

Planning For Noise Control

In 2004 the Environmental Protection Agency produced a noise guideline entitled "Planning for Noise Control". The methods and procedures described in the guideline are applicable for setting conditions relating to noise emitted from industrial premises, commercial premises and mining operations. The nominated noise goal is the lower of the Specific Noise Level and the Maximum Planning Noise Level. These noise levels are discussed in the following sections (EPA, 2004).

As the noise guidelines provided by the Planning for Noise Control document are applicable to external noise levels, and the Environmental Protection Policy provides an internal guideline noise value for commercial activities, no Specific Noise Level targets are set for the Townsville Marine Precinct (EPA, 2004).

Specific Noise Level

The specific noise level for the residences in the vicinity of the port is based on the Rating Background Levels provided in Table 2. These specific noise levels have been determined by the following equation: $L_{Aeq, 1hr}$ = Rating Background Level + 3.

The specific noise levels for each measurement location and a summary of the measured Rating Background Levels are provided in Table 5.

Table 5 Specific noise levels

Location	Measured Rating Background Level ($minL_{A90, 1hr}$) dB(A)			Specific noise levels ($L_{Aeq, 1hr}$) dB(A)		
	Day	Evening	Night	Day	Evening	Night
29 Hubert Street, South Townsville	38	39	38	41	42	41
55 Macrossan Street, South Townsville	41	35	32	44	38	35
5 Breakwater Quays, Sir Leslie Thiess Drive, Townsville	42	43	41	45	46	44
The Ville Resort - Casino, Townsville	45	44	44	48	47	47

Noise measurements were not conducted at Magnetic Island, and therefore environmental noise goals for this location cannot be calculated from actual background noise data.

For Magnetic Island, the background noise levels are anticipated to be low, akin to rural noise levels, and so the lowest threshold background noise level of 28 dB(A) has been assumed for this location (Table 6).

Table 6 Summary of applied noise criteria

Location	Specific noise levels ($L_{Aeq, 1hr}$) dB(A)		
	Day	Evening	Night
1 Esplanade, Picnic Bay, Magnetic Island	28	28	28

Maximum Planning Noise Levels

The Planning for Noise Control guideline defines maximum planning noise levels for the setting of long-term noise goals. The category which currently best defines the sensitive receptors surrounding the Port of Townsville would best be defined as Z4, while the receptors on Magnetic Island are best defined by Category Z2. Table 7 provides a description of the Z2 and Z4 categories, as defined in the Planning for Noise Control guideline (EPA 2004, Table 3).

Table 7 Planning for Noise Control Z2 and Z4 noise area categories

Noise area category	Description of neighbourhood	Maximum hourly sound pressure level $L_{Aeq, 1hr}$ (Planning Noise Level)		
		Day	Evening	Night
Z2	Negligible transportation (less than 80 vehicles an hour).	50	45	40
Z4	Medium density transportation (less than 600 vehicles an hour) or some commerce or industry	60	55	50

The Planning for Noise Control guideline states that:

> *Table 3 must only be used as a guideline. Whenever possible, values of the background min$L_{A90\ 1hr}$ and residual $L_{Aeq\ 1hr}$ in the appropriate time period must be measured prior to development.* (EPA, 2004)

The measured maximum hourly sound pressure levels are found in Table 8. No adjustments for tonality or impulsiveness were applied to the specific noise levels as none were detected during the measurements.

Planning for Noise Control states that:

> *Where the existing noise level from specific noise sources is close to the maximum planning level, the noise level from any new source(s) must be controlled to preserve the amenity of an area.* (EPA, 2004)

The Planning for Noise Control guideline are outlines (in Table 4), these modifications to the planning noise level to account for existing levels of specific noise (EPA, 2004). The PEP, is for new industrial development near a suburban area for which existing ambient noise levels are controlled by existing industry (Port) and traffic noise. Hence, the methodology outlined in example C2 in Appendix C of the Planning for Noise Control guideline is the most relevant to this development for residential receivers other than Magnetic Island, for which the example in C4 is considered to be more appropriate.

The existing noise level in the surrounding area is unlikely to decrease in the future.

Accordingly, Table 4 of the Planning for Noise Control guideline recommends that the $L_{Aeq, 1hr}$ noise level from any new source should be equal to the relevant Planning Noise Level. This is shown in Table 8.

Table 8 Recommended Planning Noise Level levels $L_{Aeq, 1hr}$

Location	Planning Noise Levels $L_{Aeq, 1hr}$ dB(A)		
	Day	Evening	Night
29 Hubert Street, South Townsville	(60+0) 60	(55-1) 54	(50-2) 48
55 Macrossan Street, South Townsville	(60-3) 57	(55-2) 53	(50-6) 44
5 Breakwater Quays, Sir Leslie Thiess Drive, Townsville	(60+0) 60	(55-4) 51	(50-4) 46
The Ville Resort - Casino, Townsville	(60-6) 54	(55-2) 53	(50-10) 40
1 Esplanade, Picnic Bay, Magnetic Island	(50-8) 42	(45-8) 37	(40-8) 32

Summary of Planning for Noise Control Noise Goals

The Planning for Noise Control noise goals are summarised in Table 9. The noise goal applied to the proposed PEP for each time period is the lowest value of the Specific Noise Level and the maximum Planning Noise Level.

Table 9 Summary of Planning for Noise Control Noise Goals

Location	Specific Noise Levels			Planning Noise Levels $L_{Aeq, 1hr}$			Planning For Noise Control noise goal (minimum) $L_{Aeq, 1hr}$		
	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
29 Hubert Street, South Townsville	41	42	41	60	54	48	41	42	41
55 Macrossan Street, South Townsville	44	38	35	57	53	44	44	38	35
5 Breakwater Quays, Sir Leslie Thiess Drive, Townsville	45	46	44	60	51	46	45	46	44
The Ville Resort - Casino, Townsville	48	47	47	54	53	40	48	48	42
1 Esplanade, Picnic Bay, Magnetic Island	28	28	28	42	37	32	28	28	28

World Health Organisation

The World Health Organisation issued its "Guidelines for Community Noise" in April 1999. The following sections are applicable to the current Project:

Section 4.2.1 Interference with Communication

a. Speech in relaxed conversation is 100% intelligible in background noise levels of about 35 dB(A), and can be understood fairly well in background levels of 45 dB(A).

Section 4.2.3 Sleep Disturbance Effects

…Where noise is continuous, the equivalent sound pressure level should not exceed 30 dB(A) indoors, if negative effects on sleep are to be avoided... (WHO, 1999)

A summary of the World Health Organisation Guidelines is provided in Table 10.

Table 10 Summary of World Health Organization Night-time Noise Goals (WHO, 1999)

Descriptor	Indoor noise goal	Outdoor noise goal
Residential		
Communication Interference	L_{eq} 35 dB(A)	40-45 dB(A)*
Sleep Disturbance	L_{eq} 30 dB(A)	35-40 dB(A)*
Annoyance – night time	L_{eq} 35 dB(A)	40-45 dB(A)*
Commercial		
Hearing impairment	L_{eq} 70 dB(A)	L_{eq} 70 dB(A)

Note: * Based on an outdoor-to-indoor noise reduction of 5 to 10 dB(A) through open windows.

ECOACCESS Guideline for the Assessment of Low Frequency Noise

The Environmental Protection Agency has produced a draft guideline for the assessment of low frequency noise in the proceedings of the Annual Conference of the Australian Acoustical Society 2004. The following sections are applicable to the current proposal:

Low frequency noise above 20Hz

Initial assessment.

The following two requirements are specified as part of the initial screening test for audibility of low frequency noise.

- The overall sound pressure level does not exceed 50 dB(Lin) within dwellings
- The overall dB(Lin) level does not exceed the dB(A) level by more than 15 dB, within dwellings.

Where these conditions are not met, there is an increased likelihood that low frequency noise may be audible and that additional assessment by way of measurement is recommended. It is noted that this initial screening test only identifies the risk of increased audibility and does not verify whether this is likely to cause annoyance.