

**Appendix K**  
Terrestrial  
Noise Impact  
Assessment  
Report

# Terrestrial Noise Impact Assessment

Darwin Ship Lift Project

# Terrestrial Noise Impact Assessment

Darwin Ship Lift Project

Client: Northern Territory Government

ABN: 84 085 734 992

Prepared by

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## Quality Information

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## Executive Summary

The Northern Territory Government (NTG) is developing the Darwin Ship Lift Project ('the Project') which comprises construction and operation of a ship lift facility and an adjacent maintenance facility at East Arm.

The NTG has been developing land at East Arm for marine industries since 2004 and in 2014 proposed to include a ship lift as part of the development of its East Arm Marine Industry Park. The location of the Proposal at East Arm is consistent with long term master planning of the Darwin harbour which has been ongoing since the early 1980s.

The Project will enable maintenance and servicing of a broad range of industries, including Australian Defence Force (ADF) and Australian Border Force (ABF) vessels, as well as commercial and private vessels, including those servicing the oil, gas and marine industries.

The Project will support the continued economic growth of Darwin as a logistics and marine services hub of the Northern Territory, and Northern Australia.

This Terrestrial Noise and Vibration Impact Assessment is intended to describe and quantify the potential impacts of the proposed Project with reference to the policies, guidelines and standards that apply to the treatment and management of operational and construction noise and vibration in accordance with the requirements of the Term of Reference (ToR) as issued by the NT EPA in December 2019.

Noise from the operation of the Project has been assessed based on an indicative scenario of daily activities. Operational noise emission from the Project will need to be considered by each user and further assessment will be required if equipment differs from the indicative scenario presented in this report.

Noise and vibration impact from construction of the Project has been assessed at relevant receptors around the Project site.

The noise level criteria were derived in accordance with the Northern Territory Environment Protection Authority (NT EPA) *Northern Territory Noise Management Framework Guideline (NT Noise Guidelines)* (NTEPA, 2018) and the NT EPA *Guidelines to Prevent Pollution from Building Sites (NT Building Pollution Guidelines)* (NT EPA, 2015).

The noise level assessment indicates that the predicted operational noise levels will comply with the Project assigned noise levels at all noise sensitive receptors located in residential and commercial areas.

The noise level assessment indicates that the predicted construction noise levels will comply with the Project specific assigned construction noise levels at all noise sensitive receptors located in residential and commercial areas.

The nominated vibration criteria were derived from several Australian and international standards which were selected based on the type and nature of the vibration sources and the land use and sensitivity of the receptors.

## 1.0 Introduction

AECOM Australia Pty Ltd (AECOM) has been engaged by the Northern Territory Government (NTG) to provide a Terrestrial Noise and Vibration Impact Assessment for the Darwin Ship Lift Project.

This Terrestrial Noise and Vibration Impact Assessment includes an operational and indicative construction noise and vibration impact assessment. The assessment has been prepared in support of an Environmental Impact Statement (EIS), which has been prepared to assess the environmental impacts associated with the Project.

Operational noise management levels and vibration criteria have been established using:

- *Northern Territory Noise Management Framework Guideline (NT Noise Guideline)*, Northern Territory Environment Protection Authority (NT EPA), 2018
- *Assessing Vibration: A Technical Guideline (AVATG)*, Department of Environment and Conservation (DEC), 2006.

Construction noise management levels and vibration criteria have been established using:

- *Northern Territory Noise Management Framework Guideline (NT Noise Guideline)*, Northern Territory Environment Protection Authority (NT EPA), 2018
- *Guidelines to Prevent Pollution from Building Sites (NT Building Pollution Guideline)*, Northern Territory Environment Protection Authority (NT EPA), 2015
- *Assessing Vibration: A Technical Guideline (AVATG)*, Department of Environment and Conservation (DEC), 2006.

The operational and construction noise and vibration impact assessment is presented in this report along with noise and vibration mitigation treatments and strategies. The scope of the assessment includes:

- operational noise and vibration
  - major noise emitting plant
- construction noise and vibration
  - noise predictions for construction scenarios
  - noise impact assessment
  - recommendations for construction noise control measures to be incorporated into a construction noise management strategy.

### 1.1 Ship Lift Project description

The Northern Territory Government is developing the Darwin Ship Lift Project on the East Arm Peninsula within Darwin Harbour. Once constructed, the facility will be Northern Australia's largest common user ship lift. The facility is planned to be operational in 2024 and is proposed to include:

- ship lift of approximately 26 metres (m) width and 103 m length, capable of lifting vessels weighing up to 5,500 tonnes (t) including associated platform, trestles and vessel transfer system
- self-propelled modular transporter (SPMT) vessel transfer system
- approximately 13 hectares (ha) of hardstand area for ship repair and maintenance
- vessel wash area with separate contained drainage and treatment system
- stormwater system to capture and treat runoff water before discharge
- enclosed blast and paint facility with separate contained drainage system
- site services and utilities

- security infrastructure
- ancillary facilities including:
  - administration building
  - ship lift control room
  - SPMT garage.
- access channel and dredged manoeuvring areas
- six wet berths`
- heavy lift platforms suitable for a 100 t crane at each berth
- revetments and quay structures.

Once constructed, the Project will comprise:

- an NTG owned facility that will lease areas/berths on a common user basis under a principal operator (Darwin Ship Lift Facility), and
- a privately owned berthing and maintenance facility (Privately-owned Facility).

Multiple marine service providers will operate concurrently at the common user facility and provide vessel operators with a variety of maintenance services within a secure area.

## 1.2 Document purpose

This Terrestrial Noise and Vibration Impact Assessment is intended to describe and quantify the potential impacts of the proposed Project with reference to the policies, guidelines and standards that apply to the treatment and management of operational and construction noise and vibration in accordance with the requirements of the Term of Reference (ToR) as issued by the NT EPA in December 2019.

This Noise and Vibration Impact Assessment describes the assessment methodology, applicable criteria (listed above), and proposed standard noise and vibration mitigation measures, monitoring, reporting and complaint management requirements.



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**LEGEND**  
 Project footprint

Note:  
 The layout is indicative only

**Site location**

NORTHERN TERRITORY  
 GOVERNMENT OF AUSTRALIA  
 DARWIN SHIP LIFT PROJECT

Figure  
**1**

A4 size



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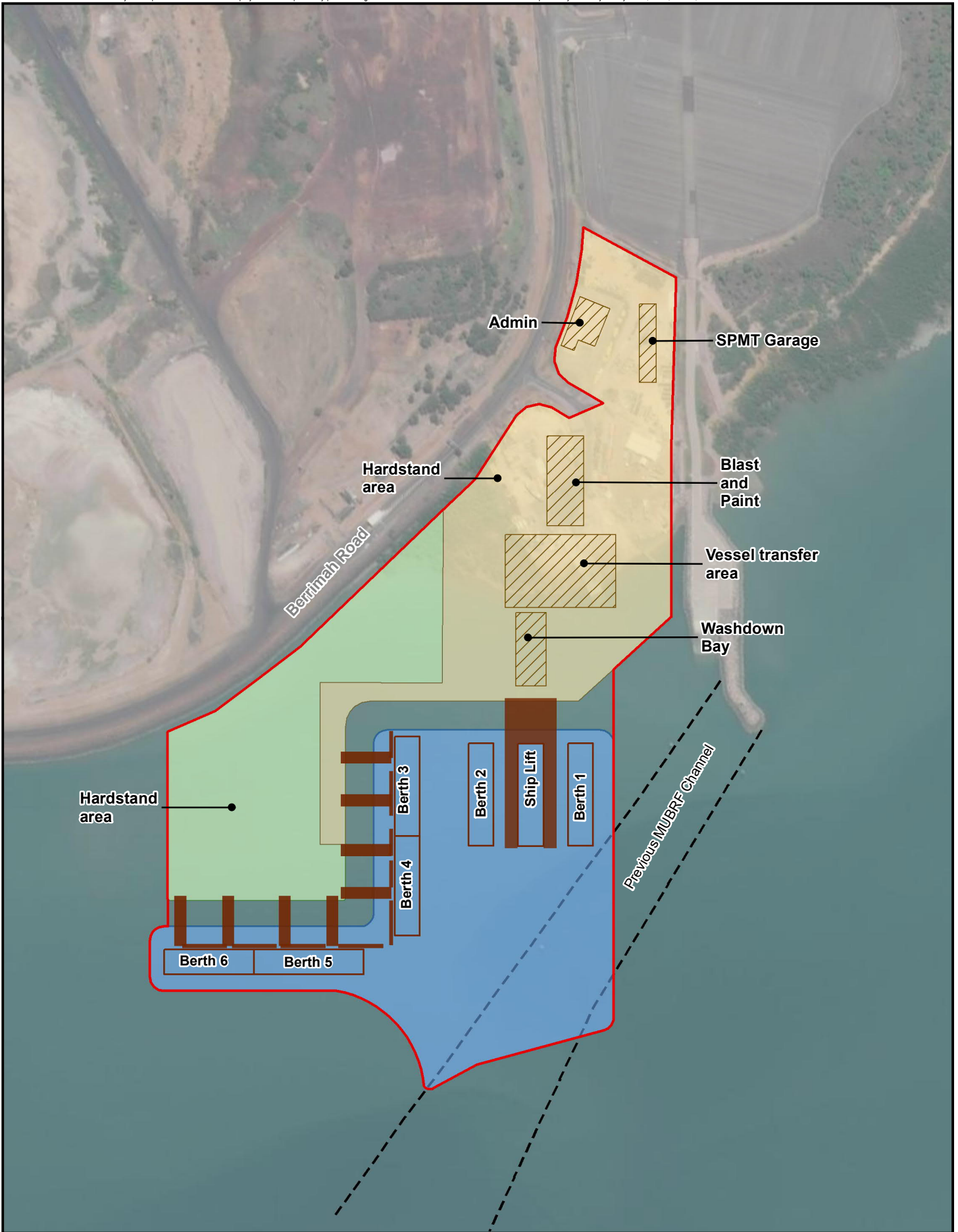
- Project footprint
- Cadastral boundary

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**Site layout**

**NORTHERN TERRITORY  
 GOVERNMENT OF AUSTRALIA**  
 DARWIN SHIP LIFT PROJECT

Figure  
**2**



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**LEGEND**

- Project footprint
- Darwin Ship Lift Facility
- Privately-owned Facility
- Manoeuvring basin
- Multi-user Barge Ramp Facility (MUBRF)

Note:  
 The layout is indicative only

**Proposed infrastructure layout**

NORTHERN TERRITORY  
 GOVERNMENT OF AUSTRALIA  
 DARWIN SHIP LIFT PROJECT

Figure  
**3**

## 2.0 Methodology

The noise and vibration impact assessment has been undertaken to meet the requirements of the ToR for the Project issued by the Northern Territory EPA on 12 December 2019. The assessment has also been undertaken in accordance with:

- *NT Noise Guideline*
- *NT Building Pollution Guideline*
- AVATG.

Broadly the impact assessment:

- identifies the environmental values to be protected
- predicts the impacts that may occur as a result of the Project
- identifies mitigation measures that may be used to reduce impacts.

The environmental values to be protected depend on the sensitivity of existing receptors to noise and/or vibration, which depends on the type of occupancy and land use, and in the case of residential receptors part of the amenity of the receptor also depends on the existing background noise levels.

The impacts that may affect the sensitive receptors depend on the types of noise and/or vibration generation sources, their proposed duration and intensity of activity and their proximity to sensitive receptors.

The mitigation measures that can be implemented to reduce noise and vibration impact will depend on the type and nature of the operation and construction activities, their expected locations and durations and their proximity to the affected noise receptors. The noise mitigation and management strategies for each combination of noise source and receptor will need to be devised on a case-by case basis.

### 2.1 Existing noise and vibration environment

Identified receptors have been determined by considering nearby residential land uses (in all directions) and in particular land uses that may contain sleeping accommodation. The acoustic amenity of the existing noise environment at the identified receptors has been estimated by referring to the background noise levels from previous studies in the area and *Australian Standard 1055:1997 Acoustics – Description and measurement of environmental noise*. Based on these values, noise level criteria for operational and construction noise were developed for the identified sensitive receptors.

### 2.2 Prediction of noise and vibration impacts

Operation and each construction stage will have a different number of noise sources operating onshore and offshore and will have different combined overall sound power levels of noise emissions. The number of noise sources operating on site and the combined sound power levels of all noise emissions are shown in Table 13 and Table 14.

Noise predictions have been undertaken for the equipment and activities associated with operation and each construction stage.

All terrestrial construction noise sources were modelled with their sound emission energies distributed evenly above the surface of the development area, in order to represent an overall average location of all noise sources throughout the construction program. This assumption is an industry accepted practice and is regarded as valid since all receptors are located at distances greater than 10 times the physical size of the site and therefore predicted noise levels will be representative of the worst case noise levels experienced by each receiver. All offshore noise sources such as dredgers, piling rigs and barges were modelled at the relevant locations offshore.

## **2.3 Assessment of noise and vibration impacts**

### **2.3.1 Noise level predictions**

Noise levels from construction activities were predicted using the proprietary noise modelling software package SoundPLAN version 8.1.

Noise levels were predicted in SoundPLAN using the CONCAWE environmental noise level prediction algorithm.

### **2.3.2 Noise level assessment - Operation**

Assessment of the predicted noise levels has been undertaken by comparison against the criteria described in Section 4.0. These criteria have been developed from the *NT Noise Guideline*.

The *NT Noise Guideline* criteria are based on noise levels over a time period of 15 minutes.

Environmental noise emission predictions have been based on a worst case scenario of all operational equipment operating concurrently and constantly for a full 15 minute period..

### **2.3.3 Noise level assessment - Construction**

Assessment of the predicted noise levels has been undertaken by comparison against the criteria described in Section 5.0. These criteria have been developed from the *NT Noise Guideline* and the *NT Building Pollution Guidelines*.

The *NT Noise Guideline* criteria are based on noise levels over a time period of 15 minutes.

Environmental noise emission predictions have been based on a worst case scenario for each construction stage of all construction equipment, for that stage, operating concurrently and constantly for a full 15 minute period.

## 3.0 Existing Noise Environment

### 3.1 Locations of sensitive receptors

There are areas of residential receptors located to the west, north and east of the Project site. For the purposes of noise assessment, the closest residential receptors have been selected to be representative of residential areas, being the most exposed to Project site noise.

Most of the identified receptors are located in residential areas, however there are several receptors that are located in commercial land use zones as shown on the zoning map in Appendix D:

- the City of Darwin Central Business District (CBD) is currently zoned as Central Business (CB), which includes the Government House receptor and the Darwin Waterfront residential buildings
- temporary accommodation businesses located at Berrimah and Holtze are zoned as Tourist Commercial (TC).

The selected locations of representative residential noise receptors are given in Figure 4 and shown in Table 1.

**Table 1 Locations of residential noise receptors and approximate distance to Project site**

Land Use Type	Zone	Receptor	Direction from Project Site	Distance from Project Site
Commercial	Central Business	1 - Government House	WNW	6.5 km
Commercial	Central Business	2 - Darwin Waterfront Apartments	WNW	6 km
Residential	Residential	3 - Stuart Park	NW	6.8 km
Residential	Residential	4 - Bayview	NW	6.5 km
Residential- Caravan Park	Residential – Caravan Park	5 - Winnellie – Discovery Parks caravan park	NNE	6.2 km
Commonwealth	CA – Commonwealth Land – No Planning Scheme Controls	6 - Berrimah	N	5.4 km
Commercial (Educational)	Other – Community Purpose	7 – Haileybury Rendall School Accommodation	NNE	5.5 km
Residential	Residential	8 - Durack	E	7 km
Rural	Rural Residential	9 - Marlow Lagoon	ESE	6.1 km
Commercial	Tourist Commercial	10 - Hidden Valley Tourist Park	N	5.8 km
Commercial	Tourist Commercial	11 - Darwin Free Spirit Resort	ENE	8 km

N = North  
S = South  
E = East  
W = West



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**LEGEND**

- ▭ Project footprint
- Receptor

Note:  
 The layout is indicative only

**Noise sensitive receivers**

NORTHERN TERRITORY  
 GOVERNMENT OF AUSTRALIA  
 DARWIN SHIP LIFT PROJECT

Figure  
**4**

A4 size

### 3.2 Existing ambient noise levels

The existing ambient noise levels at the identified sensitive receptors have been estimated by a review of published data from other studies.

Measured background noise level data were obtained from the following document:

- AECOM Australia Pty Ltd. 2016. Marine Industry Park Environmental Impact Statement. Prepared for Land Development Corporation.

The noise levels in the above report were based on measured data from the following documents:

- SVT Engineering Consultants. 2009. Ichthys Gas Field Development Project, Onshore Airborne Noise Study. Prepared for INPEX Browse Ltd, Perth Western Australia
- SVT Engineering Consultants. 2004. Darwin Wharf Precinct Redevelopment, Noise Assessment. Prepared for URS Australia Pty Ltd
- GHD Consultants. 2006. Quarantine Waste Treatment Facility, Public Environmental Report
- Conoco Phillips. 2006. Annual Environmental Performance Report. Darwin Liquefied Natural Gas Plant, Environmental Protection Licence (EPL-LNG01).

Although these background noise levels are from measurements taken up to 17 years prior to this study it is expected that they remain a valid representation of the existing ambient environment because the majority of industrial development that has occurred in the Darwin region since the measurements were undertaken has occurred at industrial sites located remotely from the measurement locations. The noise levels were compared with those contained with AS 1055:1997 to confirm they are appropriate for the land usages and locations. Additionally, it is noted that Tiger Brennan Drive has been constructed since the measurements were conducted which will have resulted in increased noise levels at some receivers to the north of the Project site and therefore a conservative acoustic assessment at these receivers

Table 2 provides a summary of the adopted background ( $L_{A90}$ ) noise levels at representative locations to the identified noise sensitive receptors.

**Table 2 Summary of adopted existing  $L_{A90}$  background noise levels**

Location	Background Noise Level, $L_{A90}$ dB(A)		
	Day	Evening	Night
2 - Darwin (Waterfront Precinct)	45	45 <sup>1</sup>	40
3 - East Darwin, Stuart Park	35 <sup>3</sup>	32	32 <sup>2</sup>
4 - Bayview	35 <sup>3</sup>	32	32 <sup>2</sup>
6 - Berrimah Farm	45	45 <sup>1</sup>	39
7 – Haileybury Rendall School	45	45 <sup>1</sup>	39
Palmerston <sup>4</sup>	39	39	32

Notes:

Day is defined as 7 am to 6 pm Monday to Saturday and 8 am to 6 pm on Sundays and Public Holidays.

Evening is defined as 6 pm to 10 pm Monday to Sunday.

Night is defined as the remaining periods.

1. Where the evening background noise level has been reported as higher than daytime background noise level, the daytime level (the lower of the two reported levels) has been adopted for the purposes of this assessment.
2. Where the night-time background noise level has been reported as higher than evening background noise level, the evening level (the lower of the two reported levels) has been adopted for the purposes of this assessment.
3. The measured background noise level is below the minimum assumed rating background noise level. The minimum assumed level as per Table 3.4 of the NT Noise Guideline has been adopted.
4. Used to establish criteria for 8 – Durack and 9 – Marlow Lagoon.

## 4.0 Operational Noise Criteria

The *NT Noise Guideline* provides guidance in relation to acceptable Project specific assigned noise levels for industrial noise emission.

The *NT Noise Guideline* provides noise levels for assessing the potential impact of noise from industry. The *NT Noise Guideline* applies to all noise emission from permanent operations fixed facilities for the Project. The assessment procedure for industrial noise sources has two components that must be considered:

- controlling intrusiveness noise impacts in the short term for residences
- maintaining noise level amenity for residences and other land uses.

### 4.1.1 Intrusiveness noise impacts

The *NT Noise Guideline* states that the intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source ( $L_{Aeq}$  level), measured over a 15 minute period, does not exceed the background noise level measured by more than 5 dB. The Rating Background Levels (RBLs) and resultant Project intrusiveness noise levels are presented in Table 3.

**Table 3 Recommended  $L_{Aeq,15\text{ minute}}$  intrusiveness noise levels from industrial noise sources**

Receptor	Period	RBL ( $L_{A90}$ ) dB(A)	Project Intrusiveness Noise Level ( $L_{Aeq, 15min}$ ) dB(A)
2 - Darwin Waterfront Apartments	Day	45	50
	Evening	45	50
	Night	40	45
3 - Stuart Park	Day	35	40
	Evening	32	37
	Night	32	37
4 - Bayview	Day	35	40
	Evening	32	37
	Night	32	37
6 - Berrimah	Day	45	50
	Evening	45	50
	Night	39	44
7 – Haileybury Rendall School Accommodation	Day	45	50
	Evening	45	50
	Night	39	44
8 - Durack	Day	39	44
	Evening	39	44
	Night	32	37
9 - Marlow Lagoon (Palmerston)	Day	39	44
	Evening	39	44
	Night	32	37

As per the *NT Noise Guideline*, intrusiveness noise levels are only applied to residential receptors. For other receptors, only the amenity levels apply.

#### 4.1.2 Protecting noise amenity

To limit continuing increases in noise levels, the maximum ambient noise level resulting from all industrial noise sources in an area should not normally exceed the recommended amenity noise levels specified in Table 3.5 of the NT Noise Guideline. As per the definitions of receptor types within the *NT Noise Guidelines*, residences are classified as being in urban, suburban and rural areas.

**Table 4 Recommended  $L_{Aeq}$  amenity noise levels from industrial sources**

Type of Receptor	Noise Amenity Area	Time of Day	Recommended Assigned Noise Level ( $L_{Aeq}$ ), dB(A)
Residential	Urban	Day	60
		Evening	50
		Night	45
	Suburban	Day	55
		Evening	45
		Night	40
	Rural	Day	50
		Evening	45
		Night	40
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks	Urban	Day	65
		Evening	55
		Night	50
	Suburban	Day	60
		Evening	50
		Night	45
	Rural	Day	55
		Evening	50
		Night	45
Commercial Premises	All	When in Use	65
Industrial Premises	All	When in use	70

The Project specific amenity level applicable is equal to the recommended level minus 5 dB(A).

To convert the Project amenity noise level to an  $L_{Aeq,15 \text{ min}}$  3 dB is added.

### 4.1.3 Project specific assigned noise levels

Table 5 presents the applicable Project specific assigned noise levels.

**Table 5 Project specific assigned noise levels**

Receptor	Time of Day	Project Intrusiveness Noise Level (L <sub>Aeq, 15 min</sub> ), dB(A)	Project Amenity Level (L <sub>Aeq, 15 min</sub> ), dB(A)	Assigned Project Specific Assigned Noise Level (L <sub>Aeq, 15 min</sub> ), dB(A)
1 - Government House	When in Use	-	63	<b>63</b>
2 - Darwin Waterfront Apartments	Day	50	58	<b>50</b>
	Evening	50	48	<b>50</b>
	Night	45	43	<b>43</b>
3 - Stuart Park	Day	40	53	<b>40</b>
	Evening	37	43	<b>37</b>
	Night	37	38	<b>37</b>
4 - Bayview	Day	40	53	<b>40</b>
	Evening	37	43	<b>37</b>
	Night	37	38	<b>37</b>
5 - Winnellie – Discovery Parks caravan park	Day	-	58	<b>58</b>
	Evening	-	48	<b>48</b>
	Night	-	43	<b>43</b>
6 - Berrimah	Day	50	53	<b>50</b>
	Evening	50	43	<b>43</b>
	Night	44	38	<b>38</b>
7 – Haileybury Rendall School Accommodation	Day	50	53	<b>50</b>
	Evening	50	43	<b>43</b>
	Night	44	38	<b>38</b>
8 - Durack	Day	44	53	<b>44</b>
	Evening	44	43	<b>43</b>
	Night	37	38	<b>37</b>
9 - Marlow Lagoon	Day	44	53	<b>44</b>
	Evening	44	43	<b>44</b>
	Night	37	38	<b>37</b>
10 - Hidden Valley Tourist Park	Day	-	58	<b>58</b>
	Evening	-	48	<b>48</b>
	Night	-	43	<b>43</b>
11 - Darwin Free Spirit Resort	Day	-	58	<b>58</b>
	Evening	-	48	<b>48</b>
	Night	-	43	<b>43</b>

## 5.0 Construction Noise Criteria

Construction of the proposed development has the potential to temporarily contribute to the existing external noise environment. Noise is expected to be generated by construction works as well as construction traffic movements. This section will establish management levels in order to address the following acoustical issues:

- Construction noise and vibration impacts.

The NT EPA provides information on the management of construction noise in the following publications:

- *NT Noise Guideline*
- *NT Building Pollution Guideline*.

Where conflicting information is provided in the above two documents, the *NT Noise Guideline* is considered to take precedence.

### 5.1 Recommended standard hours for construction work

The *NT Noise Guideline* and the *NT Building Pollution Guideline* provide the following standard hours for construction work:

- normal Construction
  - Monday to Saturday: 7 am to 7 pm
  - Sundays and Public Holidays: 9 am to 6 pm.

Construction work conducted outside the standard hours may be considered for the following categories of works:

- delivery of oversized plant or structures
- emergency work
- maintenance and repair of public infrastructure
- public infrastructure works
- where the proponent demonstrates and justifies a need to operate outside the recommended standard hours such as concrete pours.

Works outside standard hours will only proceed if:

- a site-specific noise risk assessment is undertaken and appropriate management and mitigation measures are put in place
- justification is provided as to why works are required outside of the nominated hours
- consultation with the local community has been undertaken.

### 5.2 Assigned construction noise levels

The risk of adverse impact of construction noise on a community is determined by the extent of its emergence above the existing background noise level, the duration of the event and the characteristics of the noise.

#### 5.2.1 Assigned construction noise levels for airborne noise at residential premises

As the construction will exceed 3 weeks duration, a quantitative assessment has been completed in accordance with the *NT Noise Guideline*. Guidance for setting assigned construction noise levels for residential receptors is summarised in Table 6.

**Table 6 Recommended assigned construction noise levels for airborne noise at residential premises**

Time of Day	Recommended Assigned Construction Noise Level at Residences $L_{Aeq,15\text{ min}}$ , dB(A)	Notes
Monday to Saturday 7 am to 7 pm  Sundays and Public Holidays 9 am to 6 pm	Recommended assigned noise affected level:  RBL + 10 dB	The recommended assigned noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq,15\text{ min}}$ is greater than the recommended assigned noise affected level, proponents should apply all reasonable and feasible work practices to meet the recommended assigned noise affected level. Proponents should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
Outside recommended standard hours	Recommended assigned noise affected level:  RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. Proponents should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and the noise is more than 5 dB(A) above the recommended assigned noise affected level, proponents should negotiate with the community.

### 5.2.2 Assigned construction noise levels for airborne noise at other sensitive noise receptors

Assigned construction noise levels for sensitive non-residential receptors have been determined using the recommended levels in the *NT Noise Guideline* for other sensitive land uses. The assigned construction noise levels are presented in Table 7.

**Table 7 Construction noise at sensitive land uses (other than residences)**

Land Use	Assigned Construction Noise Levels, $L_{Aeq,15\text{ min}}$ (External)
Classrooms at schools and other educational institutions	55 dB(A) <sup>1</sup>
Hospital wards and operating theatres	55 dB(A) <sup>1</sup>
Places of worship	55 dB(A) <sup>1</sup>

Notes:

1. Assumes an external to internal noise level reduction through an open window of 10 dB(A)

### 5.2.3 Assigned construction noise levels for airborne noise at commercial and industrial premises

Assigned construction noise levels for commercial and industrial receptors located have been determined using the recommended levels in the *NT Noise Guideline* for other sensitive land uses. The assigned construction noise levels are presented in Table 8.

**Table 8 Construction noise at commercial and industrial land uses**

Land Use	Assigned Construction Noise Levels, L <sub>Aeq,15min</sub> (External)
Industrial premises	75 dB(A)
Offices and retail outlets	70 dB(A)
Other businesses that may be very sensitive to noise such as theatres and childcare centres	Refer AS 2107

#### 5.2.4 Project specific assigned construction noise levels

Table 5 presents the applicable Project specific assigned construction noise levels.

**Table 9 Project specific assigned noise levels**

Receptor	Recommended Standard Hours Assigned Construction Noise Level, L <sub>Aeq,15 min</sub> , dB(A)	Outside Recommended Standard Hours Assigned Construction Noise Level, L <sub>Aeq,15 min</sub> , dB(A)
1 - Government House	70	70
2 - Darwin Waterfront Apartments	55	45
3 - Stuart Park	45	37
4 - Bayview	45	37
5 - Winnellie – Discovery Parks caravan park <sup>1</sup>	55	44
6 - Berrimah	55	44
7 – Haileybury Rendall School Accommodation	55	44
8 - Durack	49	37
9 - Marlow Lagoon	49	37
10 - Hidden Valley Tourist Park <sup>1</sup>	55	44
11 - Darwin Free Spirit Resort <sup>2</sup>	49	37

Notes:

1. Based on background noise levels at Berrimah
2. Based on background noise levels at Palmerston.

## 6.0 Vibration Criteria

Vibration, at levels high enough, has the potential to cause damage to structures and disrupt human comfort. Vibration and its associated effects are usually classified as continuous, impulsive, or intermittent as follows:

- Continuous vibration continues uninterrupted for a defined period and includes sources such as machinery and continuous construction activities.
- Impulsive vibration is a rapid build up to a peak followed by a damped decay. It may consist of several cycles at around the same amplitude, with durations of typically less than two seconds and no more than three occurrences in an assessment period. This may include occasional dropping of heavy equipment or loading activities.
- Intermittent vibration occurs where there are interrupted periods of continuous vibration, repeated periods of impulsive vibration or continuous vibration that varies significantly in magnitude. This may include intermittent construction activity, impact pile driving, jack hammers.

The relevant standards and guidelines for the assessment of construction vibration are summarised in Table 10.

**Table 10 Standards/guidelines used for assessing construction vibration**

Item	Standard/guideline
Structural damage	Evaluation and Measurement for Vibration in Buildings Part 2, (British Standard (BS) 7385:Part 2-1993) (BS 7385)
Human comfort (tactile vibration)	Assessing Vibration: A Technical Guideline (AVATG) <sup>1</sup>

Notes:

1. *This document is based upon the guidelines contained in British Standard 6472:1992, "Evaluation of human exposure to vibration in buildings (1-80 Hz)". This British Standard was superseded in 2008 with BS 6472-1:2008 "Guide to evaluation of human exposure to vibration in buildings – Part 1: Vibration sources other than blasting" and the 1992 version of the Standard was withdrawn. However the Environment Protection Authority still requires vibration to be assessed in accordance with the 1992 version of the Standard at this point in time.*

### 6.1 Structural damage

At present, no Australian Standards exist for the assessment of building damage caused by vibration. The British Standard (BS 7385-2) provides recommended maximum levels of vibration that reduce the likelihood of building damage caused by vibration and are presented in Table 11. Buildings exposed to higher levels of vibration than recommended limits would not necessarily result in damage. In this assessment BS 7385-2 structural damage safe limits have been adopted for residential and non-residential structures.

**Table 11 Structural damage safe limits (DIN 4150) for building vibration (Vibration peak particle velocity)**

Group	Type of structure	At foundation – Less than 10 Hz	At foundation – 10 Hz to 50 Hz	At foundation – 50 Hz to 100 Hz <sup>1</sup>	Vibration at the horizontal plane of the highest floor for all frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20 mm/s	20 to 40 mm/s	40 to 50 mm/s	40 mm/s
2	Dwellings and buildings of similar design and/or use	5 mm/s	5 to 15 mm/s	15 to 20 mm/s	15 mm/s
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order/heritage listed)	3 mm/s	3 to 8 mm/s	8 to 10 mm/s	8 mm/s

Notes:

1. At frequencies above 100 Hz, the values given in this column may be used as minimum values.

## 6.2 Human comfort

The *NT Noise Guideline* refers to the NSW EPA document *AVTAG* for the assessment of vibration impacts in the Northern Territory. The assessment of intermittent vibration outlined in the *AVTAG* is based on Vibration Dose Values (VDVs). The VDV accumulates the vibration energy received over the daytime and night-time periods.

Maximum and preferred VDVs for intermittent vibration arising from construction activities are listed in Table 12. The VDV criteria are based on the likelihood that a person would comment adversely on the level of vibration over the entire assessment period.

**Table 12 Preferred and maximum vibration dose values for intermittent vibration (m/s<sup>1.75</sup>)**

Location	Daytime (7am – 10pm)		Night-time (10pm – 7am)	
	Preferred	Maximum	Preferred	Maximum
Critical areas <sup>1</sup>	0.1	0.2	0.1	0.2
Residences	0.2	0.4	0.13	0.26
Offices, schools, educational institutions and places of worship	0.4	0.8	0.4	0.8
Workshops <sup>2</sup>	0.8	1.6	0.8	1.6

Notes:

1. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. Places where sensitive equipment is stored or delicate tasks are undertaken require more stringent criteria than the residential criteria specified above.
2. Examples include automotive repair shops, manufacturing or recycling facilities. This includes places where manufacturing, recycling or repair activities are undertaken but do not require sensitive or delicate tasks.

## 7.0 Operational Noise Impact Assessment

The operational noise assessment, including assessment of noise emission and noise intrusion, is detailed in this section of the report with regard to the established criteria presented in Section 4.0.

The following operational inputs have been used for this assessment:

- operation will generally be Monday to Saturday 7 am to 7 pm
- some work may be required outside the above hours on occasion due to tidal conditions and individual vessel turnaround requirements.

The operational equipment and associated sound power levels for general operations are provided in Table 13.

**Table 13 Operational equipment and associated noise levels**

Operational Aspect	Equipment	Number	Size/Power Output	Sound Power Level, $L_{Aeq}$ , dB(A)
Ship Lift	Hydraulic Winch Pairs	12	-	100
Vessel Transfer	Self-propelled modular transporter	1	5,000 t capacity	116
Washdown	High Pressure Washers	4	-	109
Water Treatment Plant	Pumps	4	-	96
Dry Berth Maintenance	Elevated Work Platforms (EWPs)	4	-	98
	Grinders	4	-	105
	Welders	4	-	101
Loading / Unloading	Crawler Crane	1	500 t	103
	Mobile Crane	1	84 t	98
	Forklift Truck	1	40 t	108
	Forklift Truck	1	20 t	103
Generators		5	10 kV	96

It should be noted that the above scenario is indicative only and has been developed for the purposes of determining likely environmental noise emission from the facility. Equipment types, sizes and numbers may vary based upon the requirements of the end-user (which has yet to be determined).

Equipment numbers and noise levels should be checked against the table by the end-user and where exceedances occur, additional noise assessment may be required.

Based on the equipment outlined in Table 13 and a worst case scenario of all operational equipment operating concurrently and constantly for the full 15 minute period, noise emission from operational activities will comply with Project assigned noise level for day, evening and night periods.

Operational noise contours are presented in Appendix C.

## 8.0 Construction Noise Impact Assessment

A construction noise and vibration impact assessment has been completed for the Project construction phase. Whilst the Project is likely to be completed in multiple stages the assessment has considered a worst-case scenario by undertaking assessment of the most noise and vibration intensive stages.

### 8.1 Construction noise

This construction noise and vibration assessment is based on typical construction scenario for this type of development.

The construction scenarios that have been assessed are detailed below:

1. Land preparation
2. Dredging
3. Land Reclamation
4. Revetments
5. Piling
6. Laydown and Hardstand
7. Concrete Pour.

The equipment and associated sound powers for the scenarios are shown in Table 14. This table shows the Sound Power Levels (SWL) for proposed equipment and activities. The SWL is measured in 'A' weighted decibels [dB(A)]. The 'A' weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds (refer Appendix A: Glossary).

SWLs were obtained from published datasets in AS2436:2010 "Guide to noise and vibration control on construction, demolition and maintenance sites", BS5228: Part 1 2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 1: Noise and AECOM's database.

Dredging and concrete pours may occur outside of standard construction hours. Other construction works are scheduled to be undertaken during recommended standard hours only.

**Table 14 Construction phases and equipment**

Phase	Equipment / Activity	'A' Weighted SWL dB(A)
Land Clearing	Excavator	107
	Bulldozer	108
	Scraper	114
	<b>Overall</b>	<b>116</b>
Dredging	Backhoe Dredger	110
	Cutter Suction Dredger	110
	Pumps	106
	Barges	105
	<b>Overall</b>	<b>114</b>
Land Reclamation	Swamp Bulldozer (x2)	108 each
	Excavator	107
	Articulated Truck (x2)	104 each
	Bulldozer	108
	Roller	109

Phase	Equipment / Activity	'A' Weighted SWL dB(A)
	Bobcat	98
	<b>Overall</b>	<b>116</b>
Revetments	Excavator (x2)	107 each
	Articulated Truck (x2)	104 each
	Crane (x2)	104 each
	<b>Overall</b>	<b>113</b>
Piling	Land-based Rig (x2)	115 each
	Barge-based rig	115
	Cranes (x4)	109 each
	Barges	105
	<b>Overall</b>	<b>126<sup>1</sup></b>
Laydown and Hardstand	Grader	114
	Roller (x2)	109 each
	Water Truck (x3)	108 each
	Tipper (x4)	105 each
	Backhoe (x2)	98 each
	Skidsteer (x2)	98 each
	Loader (x2)	104 each
	Excavator (x4)	107 each
<b>Overall</b>	<b>120</b>	
Concrete Pour	Concrete Batching Plant	116
	Concrete Truck and Pump	106
	<b>Overall</b>	<b>116</b>

## Notes:

1. A +5 dB penalty has been applied to noise emission from the piling stage to account for annoying characteristics of piling noise

### 8.1.1 Modelling and conditions

Modelling of the proposed construction scenarios has been performed using SoundPLAN 8.0. Neutral weather conditions were applied.

It can be expected that there may be differences between predicted and measured noise levels due to variations in instantaneous operating conditions, plant in operation during the measurement and also the location of the plant equipment. The acoustic shielding calculated in the model due to localised fixed building structures will also vary as the construction equipment moves around the site.

### 8.1.2 Results

Construction noise from all construction phases meet the Project specific assigned construction noise levels at all noise sensitive receptors for standard hours works.

Additionally, noise emission from the dredging and concrete pour stages is predicted to comply with the outside of standard hours Project specific assigned construction noise levels at all noise sensitive receptors.

Construction noise contours are presented in Appendix B.

## 8.2 Construction vibration

Vibration-intensive works may include the use of the following items of equipment:

- vibratory rollers
- piling rigs.

The minimum working distances of these items of equipment to nearby receptors are shown in Table 15 which is based on recommendations of the Transport for New South Wales (TfNSW) *Construction Noise and Vibration Strategy* (CNVS) (2018) and AECOM's previous project experience.

If these minimum working distances are complied with no adverse impacts from vibration intensive works are likely in terms of human response or cosmetic damage.

Based on the indicative construction activities assessed for the proposed development, works are unlikely to occur within the minimum working distances.

**Table 15 Recommended minimum working distances for vibration intensive plant**

Plant	Rating/Description	Minimum Working Distance	
		Cosmetic Damage	Human Response
Vibratory Roller	<300 kN (Typically 7-13 tonnes)	15 m	100 m
Piling Rig (Bored)	≤800 mm	2 m nominal	4 m
Piling Rig (Hammer)	12 t downforce	15 m	50 m

## 9.0 Construction Noise and Vibration Mitigation

Though the Project specific assigned construction noise levels are expected to be met, it is recommended that a construction noise and vibration management plan (CNVMP) be prepared and the recommended noise mitigation measures presented in Table 16 be considered to minimise noise impacts on surrounding land uses.

Details of noise and vibration mitigation measures and management practices which should be considered for the CNVMP are detailed below.

### 9.1 Construction Noise and Vibration Management Plan

The CNVMP would include the following:

- identification of nearby residences and other sensitive land uses
- description of approved hours of work and requirements for site specific noise risk assessments for proposed activities outside standard work hours
- description and identification of all construction activities, including work areas, equipment and duration
- description of what work practices (generic and specific) would be applied to minimise noise and vibrations
- a complaint handling process
- noise and vibration monitoring procedures
- overview of community consultation required for identified high impact works.

Noise and vibration mitigation measures which should be considered in the CNVMP are detailed below in Table 16. Details of a complaints handling procedure are provided in Section 9.2.

**Table 16 Recommended noise mitigation measures**

Action required	Safeguard detail considerations
<b>Management measures</b>	
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction.
Attended vibration measurements	Vibration intensive work should not proceed within the minimum working distances unless a permanent vibration monitoring system is installed approximately a metre from the building footprint, to warn operators (via flashing light, audible alarm, SMS etc.) when vibration levels are approaching the peak particle velocity objective. It is noted that assessments indicate that vibration intensive work is unlikely to occur within minimum working distances.
Communication	Nearby residences and sensitive receptors will be notified about the timing of planned works generating high noise and/or vibration levels.
<b>Source controls</b>	
Construction hours and scheduling	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Equipment selection and maintenance	Consider noise and vibration emissions when selecting construction methods where feasible and reasonable. Equipment would be regularly inspected and maintained to ensure it is in good working order.
Maximum noise levels	The noise levels of plant and equipment must have operating sound power or sound pressure levels that would meet the predicted noise levels (refer to Table 14).

Action required	Safeguard detail considerations
Rental plant and equipment	Noise and vibration emissions should be considered as part of the selection process.
Use and siting of plant	Avoid simultaneous operation of noisy plant within discernible range of a sensitive receptor. The offset distance between noisy plant and adjacent sensitive receptors is to be maximised. Plant used intermittently to be throttled down or shut down. Plant and vehicles to be turned off when not in use.
Plan works site and activities to minimise noise and vibration	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site.
Non-tonal reversing alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Minimise disturbance arising from delivery of goods to construction sites	Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receptors. Select site access points and roads as far as possible away from sensitive receptors.
Construction related traffic	Schedule and route vehicle movements away from sensitive receptors and during less sensitive times. Limit the speed of vehicles and avoid the use of engine compression brakes. Maximise on-site storage capacity to reduce the need for truck movements during sensitive times.
Silencers on Mobile Plant	Where possible reduce noise from mobile plant through additional fittings including: <ul style="list-style-type: none"> <li>Residential grade mufflers</li> <li>Damped hammers such as "City" Model Rammer Hammers</li> <li>Air parking brake engagement is silenced</li> </ul>
Site specific minimum working distances	Attended vibration measurements are undertaken when work commences, to determine site-specific minimum working distances. Vibration intensive work should not proceed within the minimum working distances unless a permanent vibration monitoring system is installed around one metre from the building footprint, to warn operators (e.g. via flashing light, audible alarm, SMS) when vibration levels are approaching the peak particle velocity objective. It is noted that assessments indicate that vibration intensive work is unlikely to occur within minimum working distances.
Path controls	
Shield stationary noise sources such as pumps, compressors, fans etc.	Where practical, stationary noise sources should be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained.
Shield sensitive receptors from noisy activities	Use structures to shield sensitive receptors from noise, where practical, such as site shed placement, fencing, and consideration of site topography when siting plant.

## 9.2 Complaints handling procedure

A complaint handling procedure should be developed and documented within each CNVMP. The following section outlines items to be considered for inclusion in the procedure.

If complaints are received, an Environmental Incident Report Form should be completed to record details of the occurrence and actions taken. Where applicable, completed forms should detail the following:

- the date and time of the complaint
- the method by which the complaint was made
- any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect
- the nature of the complaint
- description of noise source that is the subject of complaint, duration of event
- location of complainant during time of incident, and general area in which the noise source was located
- identification of Project related noise activities and locations that could have or are known to have contributed to the incident
- if known, identification of non-Project related noise emission activities and location at time of incident
- meteorological conditions at the time of the incident
- the action taken in relation to the complaint
- any follow-up contact with the complainant
- if no action was taken, the reason why no action was taken.

All records are to be kept in a legible form, or in a form that can readily be reduced to a legible form and kept for at least 4 years after the complaint or event to which they relate took place.

The Site Environmental Officer will make available a report on complaints received to the relevant Government Agencies upon request. A summary will be included in the Annual Environmental Report.

A response should be provided to the complainant within 24 hours. Corrective actions may involve supplementary monitoring to identify any non-compliances, and/or may involve modification of construction or operational techniques to avoid any recurrence or minimise impacts.

## 10.0 Conclusion

This report presents the results of a Terrestrial Noise and Vibration Impact Assessment of the proposed Project located on the East Arm Peninsula within Darwin Harbour.

Operational noise emission from the development has been assessed with consideration to the Project assigned noise levels established in accordance with the *NT Noise Guideline* and measured noise levels at the development site. The impact of noise emission from new developments can be widespread when noise issues are not correctly considered, however, this assessment indicates that noise emission from an representative operational scenario will meet the established Project assigned noise levels and therefore acoustic impacts on neighbouring areas will be minimal.

Construction noise has been assessed in accordance with the *NT Noise Guideline* and the *NT Building Pollution Guidelines*. Worst case construction scenarios have been considered. Construction works will generally be undertaken during standard hours with dredging and concrete pours occurring outside standard hours, where required. Predicted noise emission from the various construction stages complies with the Project specific assigned construction noise levels.

Based upon the assessment documented above, all environmental noise and vibration impacts can be appropriate managed in accordance with the relevant guidelines and standards.

## 11.0 References

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# Appendix A

## Glossary of Acoustic Terminology

## Appendix A Glossary of Acoustic Terminology

The following is a brief description of acoustic terminology used in this report.

<i>Sound power level (SWL)</i>	The total sound emitted by a source.																						
<i>Sound pressure level (SPL)</i>	The amount of sound at a specified point.																						
<i>Decibel [dB]</i>	The measurement unit of sound.																						
<i>A Weighted decibels [dB(A)]</i>	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).																						
<i>Decibel scale</i>	<p>The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:</p> <table> <tr> <td>0dB(A)</td> <td>Threshold of human hearing</td> </tr> <tr> <td>30dB(A)</td> <td>A quiet country park</td> </tr> <tr> <td>40dB(A)</td> <td>Whisper in a library</td> </tr> <tr> <td>50dB(A)</td> <td>Open office space</td> </tr> <tr> <td>70dB(A)</td> <td>Inside a car on a freeway</td> </tr> <tr> <td>80dB(A)</td> <td>Outboard motor</td> </tr> <tr> <td>90dB(A)</td> <td>Heavy truck pass-by</td> </tr> <tr> <td>100dB(A)</td> <td>Jackhammer/Subway train</td> </tr> <tr> <td>110 dB(A)</td> <td>Rock Concert</td> </tr> <tr> <td>115dB(A)</td> <td>Limit of sound permitted in industry</td> </tr> <tr> <td>120dB(A)</td> <td>747 take off at 250 metres.</td> </tr> </table>	0dB(A)	Threshold of human hearing	30dB(A)	A quiet country park	40dB(A)	Whisper in a library	50dB(A)	Open office space	70dB(A)	Inside a car on a freeway	80dB(A)	Outboard motor	90dB(A)	Heavy truck pass-by	100dB(A)	Jackhammer/Subway train	110 dB(A)	Rock Concert	115dB(A)	Limit of sound permitted in industry	120dB(A)	747 take off at 250 metres.
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110 dB(A)	Rock Concert																						
115dB(A)	Limit of sound permitted in industry																						
120dB(A)	747 take off at 250 metres.																						
<i>Frequency [f]</i>	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.																						
<i>Equivalent continuous sound level [L<sub>eq</sub>]</i>	The constant sound level which, when occurring over the same period of time, would result in the receptor experiencing the same amount of sound energy.																						
<i>L<sub>max</sub></i>	The maximum sound pressure level measured over the measurement period.																						
<i>L<sub>min</sub></i>	The minimum sound pressure level measured over the measurement period.																						
<i>L<sub>10</sub></i>	The sound pressure level exceeded for 10% of the measurement period. For 10% of the measurement period it was louder than the L <sub>10</sub> .																						

<i>L<sub>90</sub></i>	The sound pressure level exceeded for 90% of the measurement period. For 90% of the measurement period it was louder than the L <sub>90</sub> .
<i>Ambient noise</i>	The all-encompassing noise at a point composed of sound from all sources near and far.
<i>Background noise</i>	The underlying level of noise present in the ambient noise when extraneous noise (such as transient traffic and dogs barking) is removed. The L <sub>90</sub> sound pressure level is used to quantify background noise.
<i>Traffic noise</i>	The total noise resulting from road traffic. The L <sub>eq</sub> sound pressure level is used to quantify traffic noise.
<i>Day</i>	The period from 0700 to 1800 h Monday to Saturday and 0800 to 1800 h Sundays and Public Holidays.
<i>Evening</i>	The period from 1800 to 2200 h Monday to Sunday and Public Holidays.
<i>Night</i>	The period from 2200 to 0700 h Monday to Saturday and 2200 to 0800 h Sundays and Public Holidays.
<i>Assessment background level [ABL]</i>	The overall background level for each day, evening and night period for <b>each day</b> of the noise monitoring.
<i>Rating background level [RBL]</i>	The overall background level for each day, evening and night period for the <b>entire length</b> of noise monitoring.

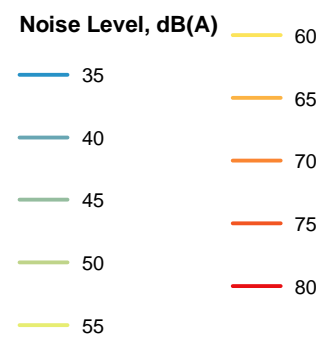
\*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 “Acoustics – Glossary of terms and related symbols”, the NT EPA’s Noise Management Framework Guideline and the NSW EPA’s Noise Policy for Industry and Road Noise Policy.

# Appendix B

## Construction Noise Contours



CONSTRUCTION NOISE CONTOURS - LAND CLEARING



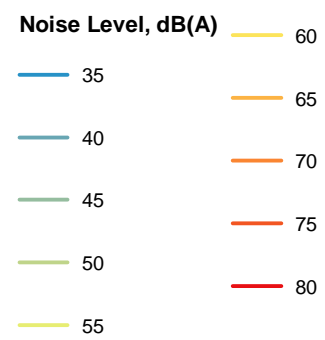
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CONSTRUCTION NOISE CONTOURS - DREDGING

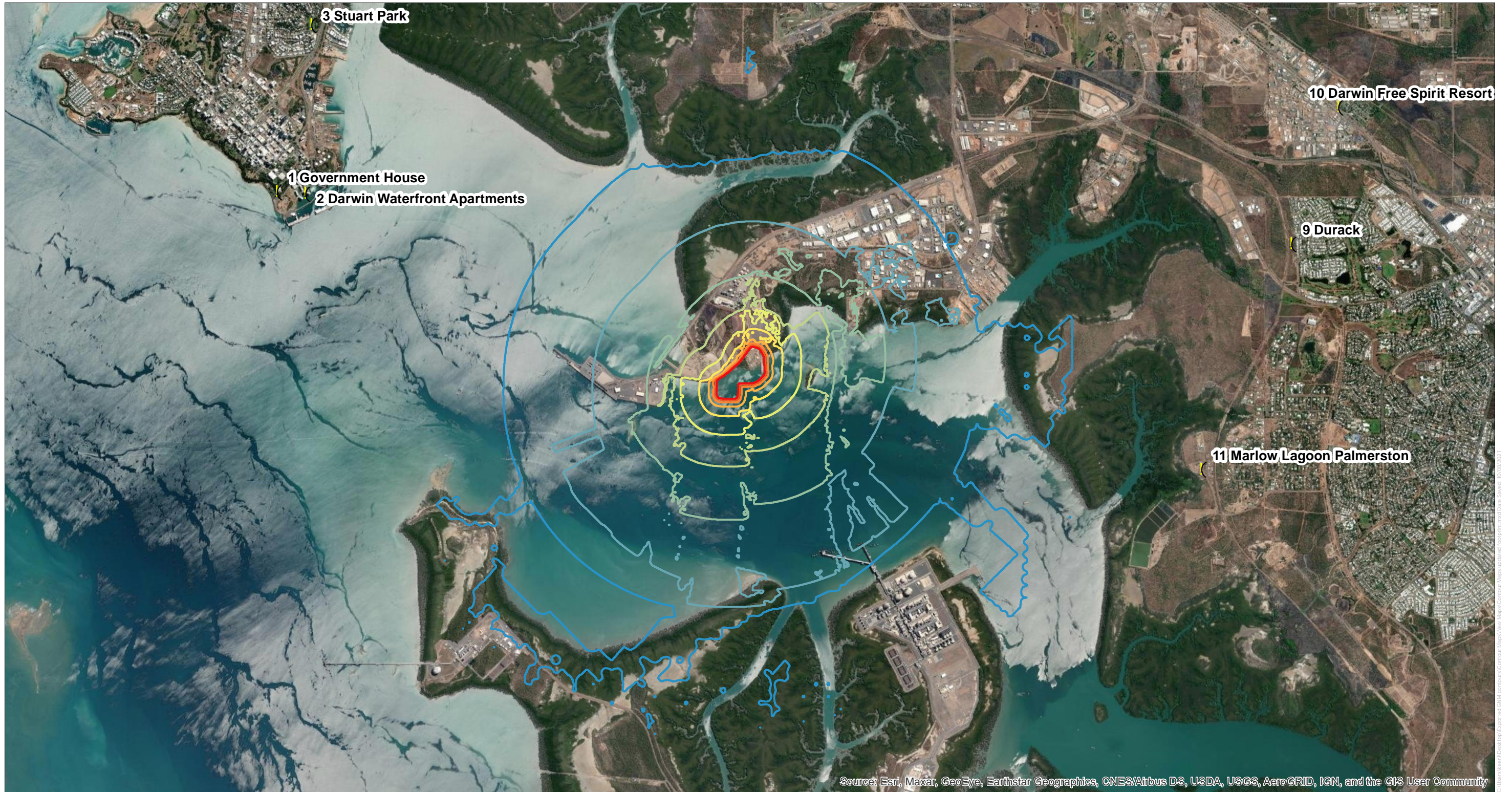


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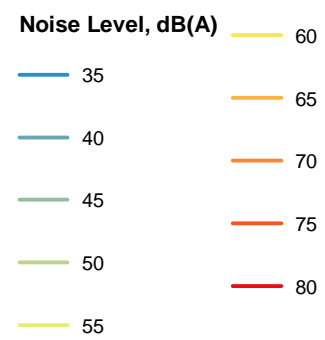
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Source:



CONSTRUCTION NOISE CONTOURS - LAND RECLAMATION

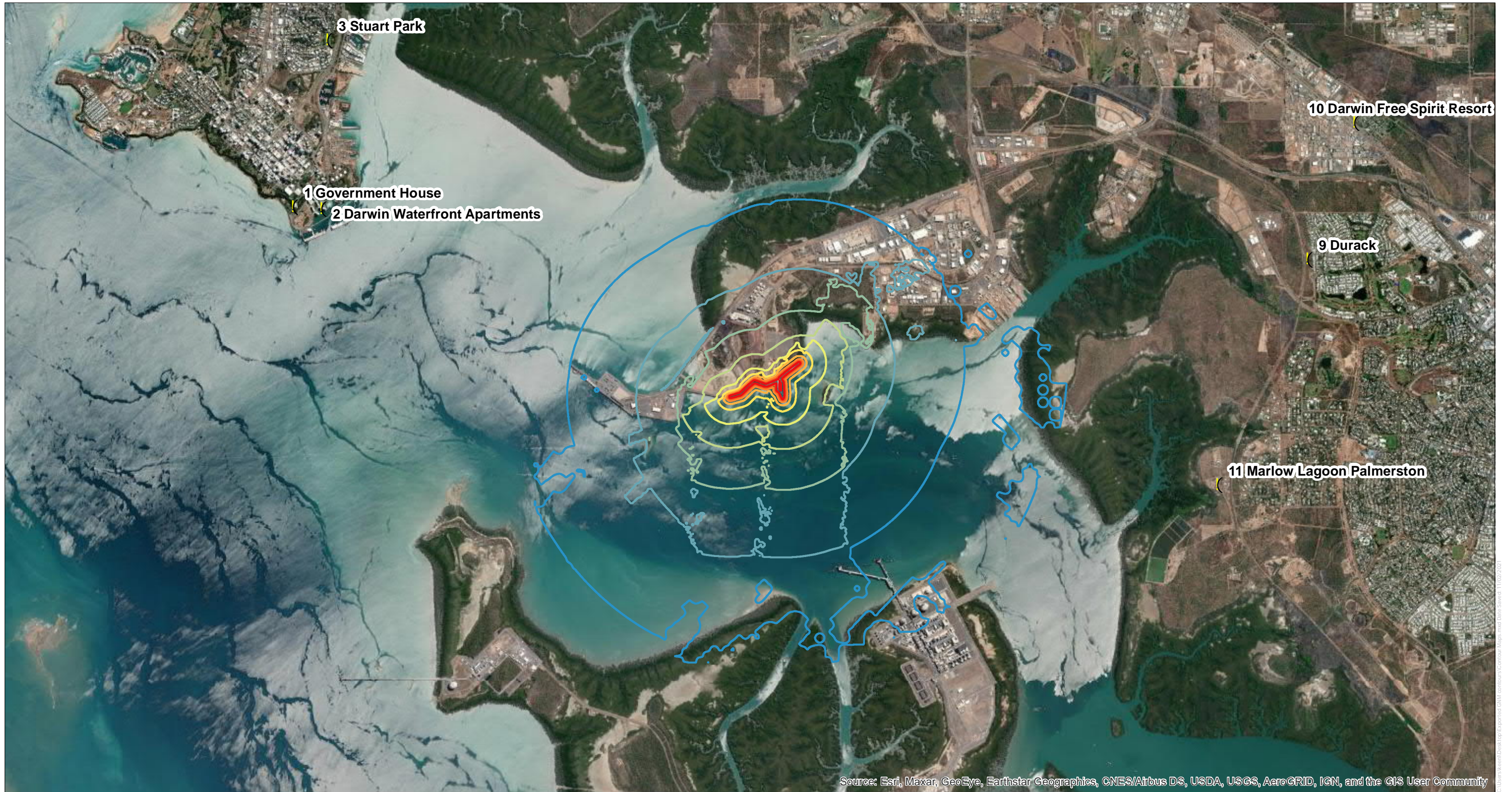


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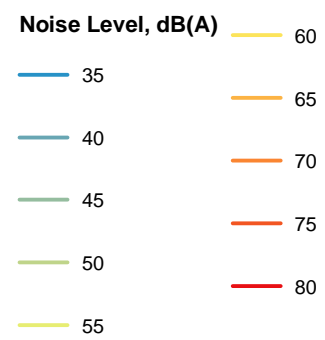
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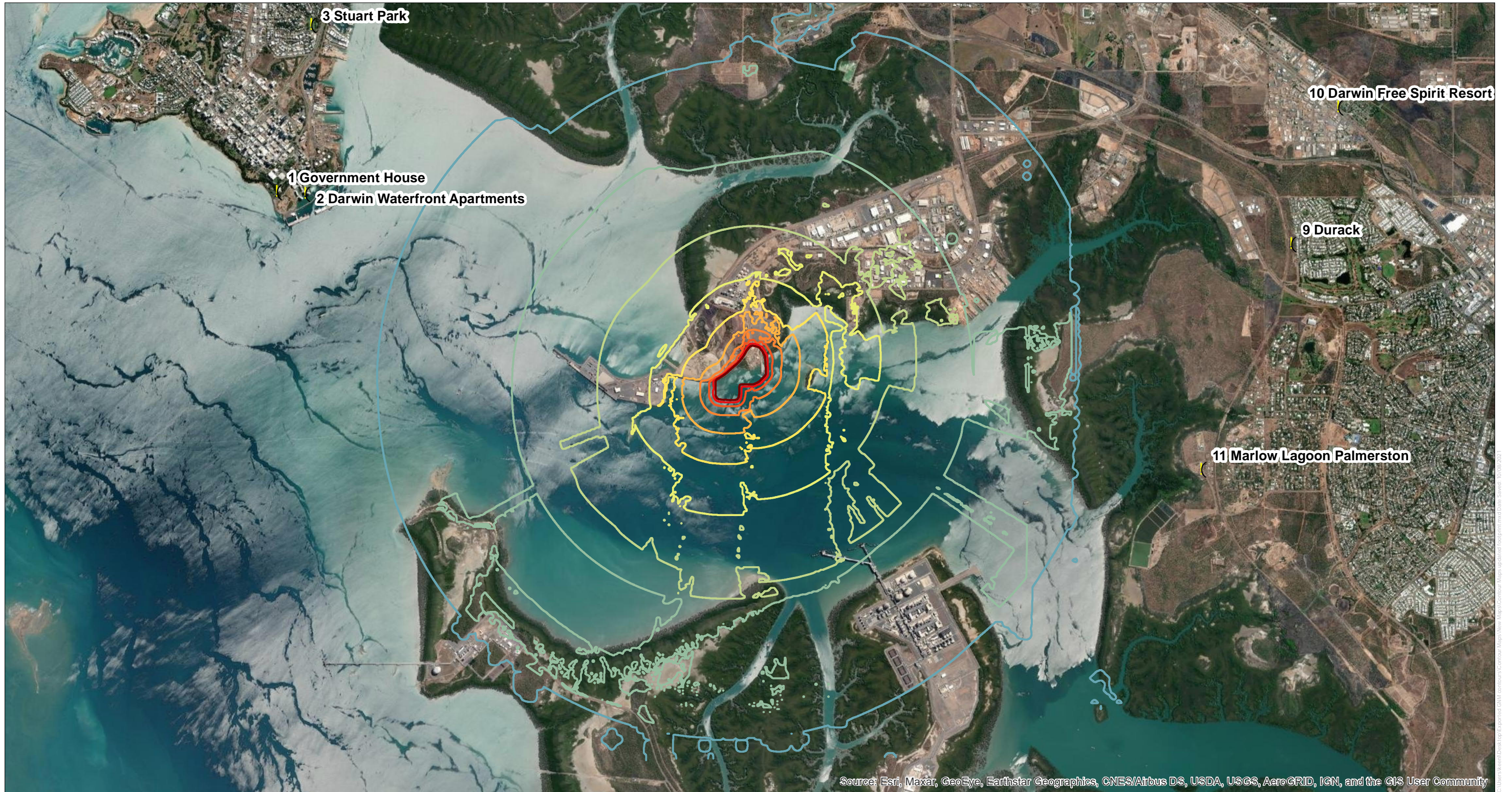
CONSTRUCTION NOISE CONTOURS - REVETMENTS



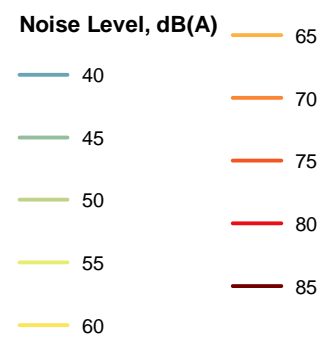
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CONSTRUCTION NOISE CONTOURS - PILING (+5 dB modification applied for annoyance characteristics)



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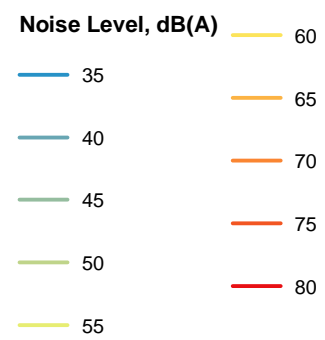
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CONSTRUCTION NOISE CONTOURS - LAYDOWN & HARDSTAND



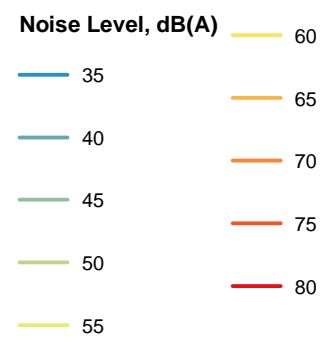
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CONSTRUCTION NOISE CONTOURS - CONCRETE POUR



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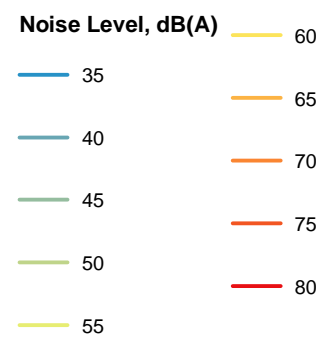
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# Appendix C

## Operational Noise Contours



**OPERATIONAL CONTOURS**



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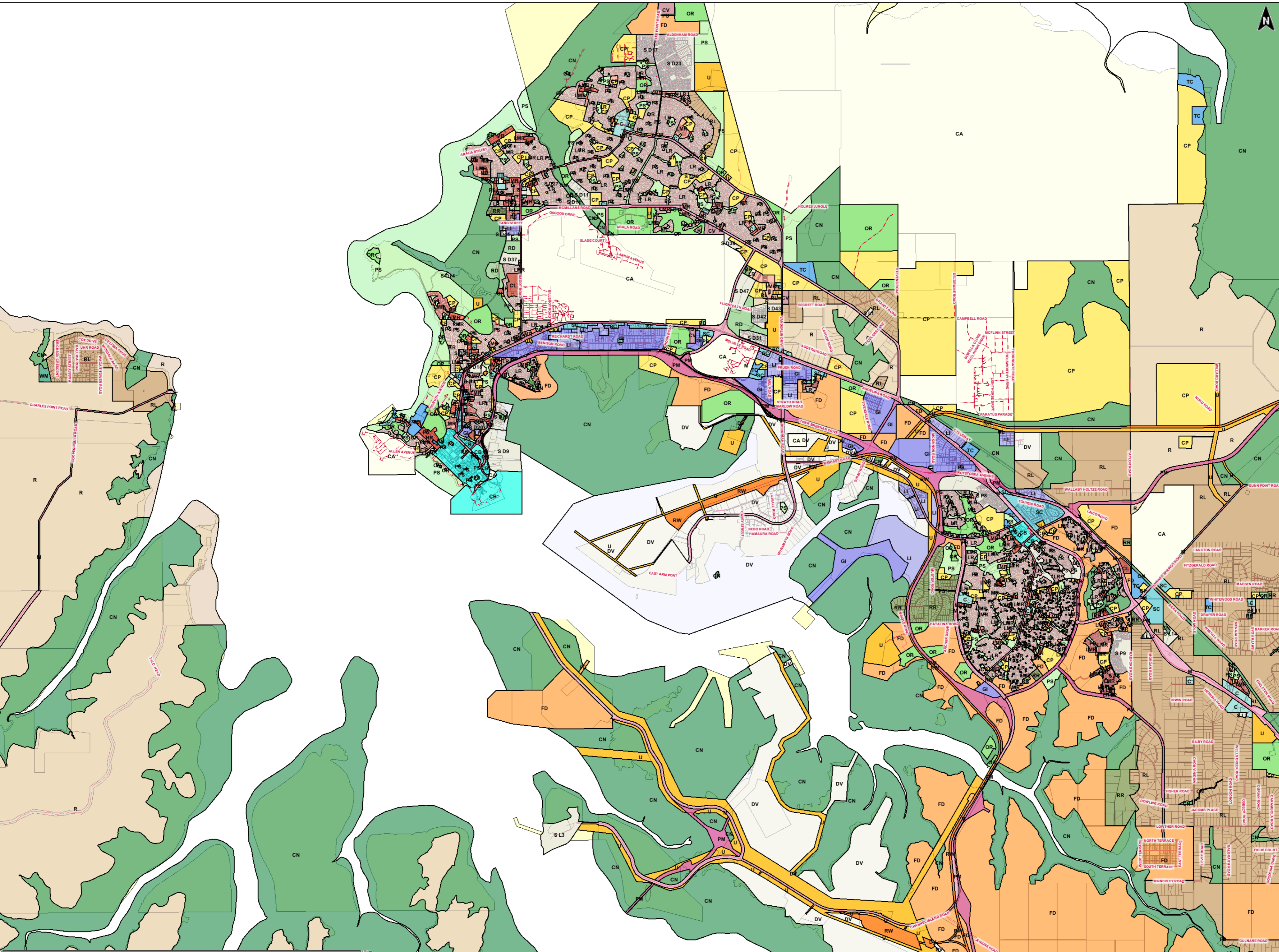
# Appendix D

Current Zone Plan -  
Darwin and Surrounds

# Darwin and Surrounds Land Zoning

## Legend

- General Lines
- Town Planning Zones
- A - Agriculture
- CV - Caravan Park
- CB - Central Business
- C - Commercial
- CL - Community Living
- CP - Community Purpose
- CN - Conservation
- DV - Development
- RR - Rural Residential
- GI - General Industry
- HT - Heritage
- HR - High Density
- H - Horticulture
- LI - Light Industry
- M - Main Road
- MR - Medium Density
- MD - Multiple Dwelling
- LMR - Medium Density Residential
- CA - No Planning Scheme Controls
- OR - Organised Recreation
- PM - Proposed Main Road
- PS - Public Open Space
- RW - Railway
- RD - Restricted Development
- R - Rural
- RL - Rural Living
- SC - Service Commercial
- SD - Single Dwelling
- LR - Low Density Residential
- S - Specific Use
- TC - Tourist Commercial
- U - Utilities
- WM - Water Management
- FD - Future Development
- RJ - Residential Jabiru
- PSJ - Public Open Space Jabiru
- ORJ - Organised Recreation Jabiru
- CJ - Commercial Jabiru
- SCJ - Service Commercial Jabiru
- TCJ - Tourist Commercial Jabiru
- CPJ - Community Purpose Jabiru
- FDJ - Future Development Jabiru
- IJ - Industrial Jabiru
- MJ - Main Road Jabiru
- UJ - Utilities Jabiru
- Road Labels
- Road Centrelines
- Highway
- Other Road
- Cadastre



Created by Public User

Bottom Left: 130° 44' 10", -12° 35' 21"  
 Top Right: 131° 02' 15", -12° 20' 33"  
 Approximate Scale: 1:69,000  
 Datum: GDA 1994  
 Data for information purposes only  
 - accuracy not guaranteed  
 N.T. Land Information System  
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Map Center: 130° 53' 13" E, 12° 27' 58" S