B11

VOLUME B: AIRPORT AND SURROUNDS

Construction and Traffic Noise

Construction and Traffic Noise

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11.1 Introduction

This chapter examines the effect of ground-based noise on local adjacent areas to the airport as a result of the following:

- Construction noise;
- Ground-based aircraft noise; and
- Increased traffic noise as a result of the New Parallel Runway (NPR).

An assessment of noise from aircraft operations, including noise from aircraft in the air, and while moving on the airport site (for example while taxiing) is provided in Volume D. This chapter provides an assessment of other potential noise impacts, including impacts during the construction phase and also potential impacts from on-airport noise sources and changes to traffic conditions which would arise due to the project.

The assessment is based on measurements conducted during the study, relevant standards, and the proposed construction scenarios as outlined in Chapters A4 and A5.

The following information, relevant to assessment of noise from both construction and operational activities is presented:

- Existing ambient noise levels in potentially affected areas;
- Noise assessment criteria;
- Assessment methodologies and noise predictions; and
- Recommended controls to minimise noise impact.

None of the proposed activities has the potential to result in significant vibration at any relevant receiver location, and hence vibration is not specifically considered in this report. The potential for vibration from aircraft noise is addressed in Volume D.

11.2 Measurement of Ambient Noise Levels

Ambient noise levels were monitored at ten locations around the Airport, that were selected to cover the range of environments in the potentially affected area. The locations are shown in **Figure 11.2a** and described in **Table 11.2a**.

In all cases, monitoring was conducted between 4 or 5 November and 11 November 2005. The noise monitoring equipment used for these measurements consisted of environmental noise loggers set to A-weighted, fast response, continuously monitoring over 15 minute sampling periods. This equipment is capable of remotely monitoring and storing noise level descriptors for later detailed analysis. The equipment calibration was checked before and after the survey and no significant drift was noted.

The logger determines L_{A1}, L_{A10}, L_{A90} and L_{Aeq} levels of the ambient noise. L_{A1}, L_{A10} and L_{A90} are the noise levels exceeded for 1 percent, 10 percent and 90 percent of the sample time respectively (see **Appendix A** for descriptor definitions). The L_{A1} is indicative of maximum noise levels due to individual noise events such as the occasional pass-by of a heavy vehicle. The L_{A90} level is normally taken as the background noise level during the relevant period.

Detailed results for each monitoring location are shown in graphical form in **Appendix B**. The graphs show measured values of L_{Aeq}, L_{A90}, L_{A10} and L_{A1} for each 15 minute monitoring period.

Table 11.2b summarises the noise monitoring results, for 'Day', 'Evening' and 'Night' periods as defined in the Queensland Environmental Protection Agency's document 'Planning for Noise Control' (PNC). The summary values are:

- $L_{Aeq,Period}$ – the overall L_{Aeq} noise level measured over the assessment period; and
- $minL_{A90,1hr}$ – a measure of typical background noise levels which is used in determining noise criteria. Because data were measured in 15 minute periods, 1 hour values of L_{A90} were estimated on a conservative basis as the minimum of recorded $L_{A90,15min}$ values in the hour.

Figure 11.2a: *Noise Monitoring Locations Used to Establish Background Noise Levels.*

Table 11.2a Long Term Noise Monitoring Locations.

Site	Address	Relevant Noises Noted on-site Visits
A	1588 Nudgee Rd, Nudgee Beach (Nudgee Beach Environmental Education Centre)	Birds; Wind in trees; Ocean; Some traffic
B	Mercy Aged Care and Family Services Queens Rd, Nudgee	Distant traffic (Gateway Motorway); Birds; Occasional local traffic
C	St Pauls Theological College, Approach Road, Banyo	Distant traffic; Birds
D	33 Franklin Street, Nundah	Distant traffic; Insects, Birds; Occasional local traffic
E	29 Brassey Street, Ascot	Distant traffic; Insects; Birds
F	17 McBride Road, Pinkenba	Birds; Insects; Children; Animals; Aircraft at Airport
G	86 Brownlee St, Pinkenba (Williams Cranes and Rigging)	Distant traffic; Wind in trees; Industrial noise from adjacent premises; Occasional noise from workshop and crane movements
H	153 Palm Avenue, Shorncliffe	Insects; Birds; Traffic on Gateway Motorway; Noise from tree lopping one morning (excluded in analysis)
I	121 Towers Street, Ascot	Neighbours' pool pump; Children; Local traffic; Birds; Insects
J	127 Main Beach Road, Pinkenba	Insects; Frogs; Aircraft at airport; Neighbours; Industrial noise

Table 11.2b Summary of Measured Noise Levels.

Site	$minL_{A90,1hr}$ (dBA)			$L_{Aeq,Period}$ (dBA)		
	Daytime 7am–6pm	Evening 6–10pm	Night Time 10pm–7am	Daytime 7am–6pm	Evening 6–10pm	Night Time 10pm–7am
A	41	40	35	61	54	54
B	40	38	34	50	55	45
C	36	33	30	56	51	44
D	44	42	36	57	50	49
E	38	38	34	55	52	50
F	42	37	34	57	52	51
G	45	41	38	61	53	55
H	37	34	31	54	45	47
I	40	36	30	59	57	48
J	40	43	38	63	54	53

The values shown in **Table 11.2b** are considered typical for the relevant areas. The lowest background noise levels are at sites C, H and I, which are all in relatively quiet residential or quasi-residential areas. The highest night time background levels were recorded at sites G and J, in Pinkenba. Site inspections indicate that this is largely due to noise from insects and frogs, with some contribution from industrial noise. The effect of insect noise is noticeable in the high evening background level recorded at site J. The highest daytime background noise levels were recorded at site G, due to noise from the premises themselves.

11.3 Noise Significance Criteria

The degree to which the ground-based noise impacts on the acoustic amenity of the surrounding community is dealt with by the application of significance criteria. **Table 11.3a** describes the significance criteria to be applied in the assessment of noise impacts of the NPR project on sensitive receivers.

Table 11.3a: Noise Significance Criteria.

Significance	Criteria
Major Adverse	N/A
High Adverse	Construction noise levels are predicted to regularly exceed established noise criteria by more than 10 dBA. Mitigation measures may ameliorate some of the impacts on receivers, however mitigation of any form is unlikely to remove all adverse affects.
Moderate Adverse	Construction noise levels are predicted to exceed established noise criteria by between 5 to 10 dBA or occasionally by more than 10 dBA. Exceedences of this magnitude will require careful manageable by implementation of procedures included in the Operational Management Plan and, where practical, physical noise control. Mitigation measures may ameliorate some of the impacts on receivers.
Minor Adverse	Construction noise levels are predicted to exceed established noise criteria by up to 5 dBA. Exceedances of this magnitude may be manageable by implementation of procedures included in the Operational Management Plan.
Negligible	Construction noise levels are not predicted to exceed established criteria. Minimal impact on sensitive receivers.

11.4 Construction Noise Criteria

The following sections detail derived construction noise criteria based on Commonwealth and State guidelines.

11.4.1 General Considerations

The Commonwealth Airports (Environment Protection) Regulations 1997 (the Regulations), contains specific noise criteria related to construction activities on-airport sites. However, as described in Schedule 4 of the Regulations, these criteria refer to "noise generated from construction, maintenance or demolition of a building or other structure at an airport". This description does not appear to include the 24 hour dredging and reclamation operations and the long term construction related activities associated with this project, which are arguably not related to 'construction, maintenance or demolition of a building or other structure'. The relevant criterion for construction of a structure is significantly less stringent than the more general criterion for 'operation of plant and machinery' at the Airport, and given the nature of construction activities associated with this project, the latter is considered more relevant for noise assessment.

For 'operation of plant and machinery', the Regulations indicate that noise from this source should not exceed the 'background' noise level:

(a) between the hours of 07:00 and 22:00 – by more than 5 dBA; and

(b) between 22:00 hours of a day and 07:00 hours of the next day – by more than 3 dBA.

at any sensitive receiver.

'Background' noise levels at potentially affected receivers can be determined with the measured min$L_{A90,1hour}$ values described in section 11.2.

In the case of surrounding commercial receivers the regulations state:

"For sites of commercial receptors, the indicators of noise that is excessive are the indicators mentioned for sites of sensitive receptors but the following considerations also apply in determining whether noise is excessive at a particular site:

- *the nature of the business conducted at the site;*
- *the time of day when the noise occurs;*
- *the duration of the noise;*
- *the nature and characteristics (if any) of the noise;*
- *the background noise level."*

Off-site operations, namely dredging activities, are subject to alternative noise criteria that can be derived from the Queensland Environmental Protection Agency's noise guideline Planning for Noise Control (PNC), which gives guidance on criteria for general industrial noise sources.

In the case of construction activities, noise criteria for assessment of this noise are again typically less stringent than for permanent sources, because of their temporary nature. Hence, noise criteria defined in the PNC document or general industrial noise sources will be considered for assessment of construction noise for the NPR.

In summary, noise from on-site construction activities has been assessed with respect to the Airports (Environment Protection) Regulations 1997 derived noise criteria. Noise from dredging activities has been assessed with respect to the PNC derived noise criteria.

11.4.2 Noise Criteria from Regulations

Table 11.4a shows L_{A10} construction noise criteria at the ten selected locations in the vicinity of the Airport, representing the range of locations which are potentially affected by construction noise and the relevant noise criteria at each location, as derived from the Regulations.

A review of the site indicates that surrounding commercial receivers that could be potentially affected by construction noise are generally those on-site along Airport Drive. Whilst noise measurements have not been conducted at this site it is considered that noise levels at Location F will be representative of those at Airport Drive. Therefore the criterion at Location F has been applied to these commercial receivers.

Other commercial receivers also surround the site, and these may be adequately represented by assessment Sites E,F,G and J.

11.4.3 Noise Criteria from PNC

The PNC criteria have been established for noise associated with off-site dredging activities. The PNC sets out three objectives to be considered in noise assessments:

1. Control and prevention of background noise creep;
2. Containment of variable noise levels and short term noise events;
3. Avoidance of sleep disturbance.

Noise during the operation of dredging near Morton Island and unloading at Luggage Point will be continuous in nature. Therefore criteria for 'control and prevention of background noise creep' are relevant in determining applicable PNC noise criteria.

These are intended to control noise from sources such as ship engines, which produce a relatively constant noise level for an extended period during operation.

The criterion requires that the total background noise level, min$L_{A90,1hour}$, should not exceed specified values which depend on the type of area and time of day. **Table 11.4b** shows total criteria for relevant measurement sites, existing measured min$L_{A90,1hour}$ noise levels, and the maximum allowed noise level from any new continuous noise source, under guidelines in PNC.

Sites F, G and J have been allocated criteria associated with 'industrial area – residential, church, hospital, school', and the remainder with 'residential area on a busy road or near an industrial area or commercial area – residential, church, hospital, school'. It is acknowledged that neither of these descriptions appears entirely adequate for the areas in question, but these are considered the most appropriate categories from those listed in PNC.

Table 11.4a: L_{A10} Noise Criteria for Plant and Machinery (dBA).

Site (Fig 2-1)	Daytime 7am–10pm		Night Time 10pm–7am	
	Background Noise ($minL_{A90,1hour}$)	Criterion L_{A10}	Background Noise ($minL_{A90,1hour}$)	Criterion L_{A10}
A	41	46	35	38
B	39	44	34	37
C	34	39	30	33
D	43	48	36	39
E	38	43	34	37
F	39	44	34	37
G	43	48	38	41
H	35	40	31	34
I	38	43	30	33
J	40	45	38	41

Table 11.4b PNC $minL_{A90,\ 1hour}$ Noise Criteria for New Continuous Noise Sources (dBA).

Site (Fig. 2-1)	Daytime			Evening			Night Time		
	Criterion	Existing	Allowed for New Source	Criterion	Existing	Allowed for New Source	Criterion	Existing	Allowed for New Source
A	45	41	43	40	40	30	35	35	25
B	45	40	43	40	38	35	35	34	26
C	45	36	41	40	33	38	35	30	33
D	45	44	36	40	42	32	35	36	26
E	45	38	43	40	38	35	35	34	26
F	50	42	47	45	37	42	40	34	39
G	50	45	48	45	41	43	40	38	35
H	45	37	42	40	34	39	35	31	33
I	45	40	43	40	36	38	35	30	33
J	50	40	45	45	43	40	40	38	35

11.4.3.1 Tangalooma Resort PNC Noise Criteria

Tangalooma Resort is located on Morteon Island. Whilst being remote from the airport, it is adjacent to some of the proposed dredging footprint. The dredge would not operate continuously throughout a night, and therefore would not result in background creep. Planning noise goals from Table 3 of the PNC have been adopted based on a Z1 area category (rural). The noise goals adopted are:

- Daytime (7am–6pm) 40 dBA
- Evening (6pm–10pm) 35 dBA
- Night time (10pm–7am) 30 dBA

11.4.4 Site Specific Noise Criteria from Regulations and PNC

Table 11.4c provides a summary of site specific noise criteria. For comparison and assessment purposes the criteria are presented in terms of the unit $L_{Aeq,1hour}$ as used in the PNC document, using the following translations which are typical for the type of equipment involved:

- Continuous sources (e.g. pumps, dredges): $minL_{A90,1hour} \sim L_{Aeg.\ 1hr}$
- Quasi-continuous sources (e.g. dozers): $L_{Aeq,1hr} \sim L_{A10} - 3$.

Table 11.4c indicates that in general the Regulations provide slightly more stringent criteria for construction noise than the PNC document, with the exception that the PNC document provides more stringent controls on noise from continuous sources in the evening and night periods. This is because the PNC criteria explicitly attempt to control background noise levels in addition to intrusive noise.

For assessment of construction noise associated with the NPR project, the following guidelines are adopted:

- Noise criteria for "operation of plant and machinery" in the Commonwealth Airports (Environment Protection) Regulations 1997 for on-airport activities; and
- For operation of continuous dredging, criteria derived from the Queensland EPA's 'Planning for Noise Control' document.

Based on the above, the following $L_{Aeq,1hr}$ construction noise criteria have been established for all construction activities.

Note that the Daytime period 7am-10pm as defined in the Regulations has been broken into day and evening periods to allow consideration of varying meteorological conditions in these two periods. This also allows for consistency with periods defined in the PNC.

11.5 Construction Procedures

11.5.1 Construction Methodology

The construction of the NPR is proposed to be carried out over several years. A description of likely construction processes, activities and equipment to be used is presented in Chapter A5. The construction procedures and equipment detailed in that chapter represent the likely works to be conducted to meet the construction works and timing requirements and program. The exact details of each construction stage will be established by the successful construction contractor. A summary of the proposed construction works is presented in **Table 11.5a.**

Table 11.4c Site Specific Criteria for Construction Noise (dBA).

Site (Fig 2-1)	Construction Noise Criteria –$L_{Aeq,1hour}$					
	Day (0700–1800)		Evening (1800–2200)		Night (2200–0700)	
	Regs	PNC*	Regs	PNC*	Regs	PNC*
A	43	43	43	30	35	25
B	41	43	41	35	34	26
C	36	41	36	38	30	33
D	45	36	45	32	36	26
E	40	43	40	35	34	26
F	41	47	41	42	34	39
G	45	48	45	43	38	35
H	37	42	37	39	31	33
I	40	43	40	38	30	33
J	42	45	42	40	38	35

** Applicable to dredging associated noise.*

Table 11.5a: Proposed Construction Works.

Phase	Works	Proposed Hours	Commencement	Completion
1	14/32 runway upgrade	6 days per week, 7am–7pm	May 2008	Dec 2009
2	Early works (site clearing)	6 days per week, 7am–7pm	June 2008	July 2009
3 *	Reclamation works and ground treatment	7 days per week, 24 hours per day	July 2008	early 2013
4	Pavements and civil works	6 days per week, 7am–7pm	March 2013	July 2015

* *The reclamation works consist of 12 to 18 months of sand distribution across the site followed by a number of years where ground consolidation occurs. Minimal construction equipment is expected to be operating on the site during ground consolidation.*

11.5.2 Construction Noise Sources

Typical Sound Power Levels (SWL) of the plant likely to be used at various stages of the works are identified in **Table 11.5b**. These SWLs have recently been measured at other similar construction sites at source.

Table 11.5b Typical Construction Plant Sound Power Levels (SWL).

Plant	SWL (dBA)
Excavator	107
Front End – Low Loader	112
Dump Trucks	112
Tower Crane or Mobile Crane	105
Generators	95
Smooth Drum Roller	107
Scrapers	119
Graders	109
Dozer	119
Vacuum (Diesel Engines)	110
Concrete Trucks	109
Concrete Paver Roller	121
Hydro – mulching	114
Water Truck	110
Vibratory Rollers	110
Skid Steer loader	112
Chain Saws	114
Small Excavators	90
Tub grinder	116
Swamp Dozer	119
Rotary Hoes	107
Pug Mills	100
Concrete Plant	103
Asphalt Plant	114
Paving machine Asphalt	109
Paving machine Concrete	109
Saw Cutter	115
Dredge*	105

* *Noise levels of the dredge are based on measurements conducted for the Melbourne Ports Authority 'Trial Dredging Program'. Measurements are based on noise emissions from the dredge 'Queen of the Netherlands'.*

11.6 Construction Noise Predictions

Noise levels at potentially affected receivers were calculated for three separate stages during the construction process, and under a range of meteorological conditions, for comparison with the criteria outlined in section 11.4.

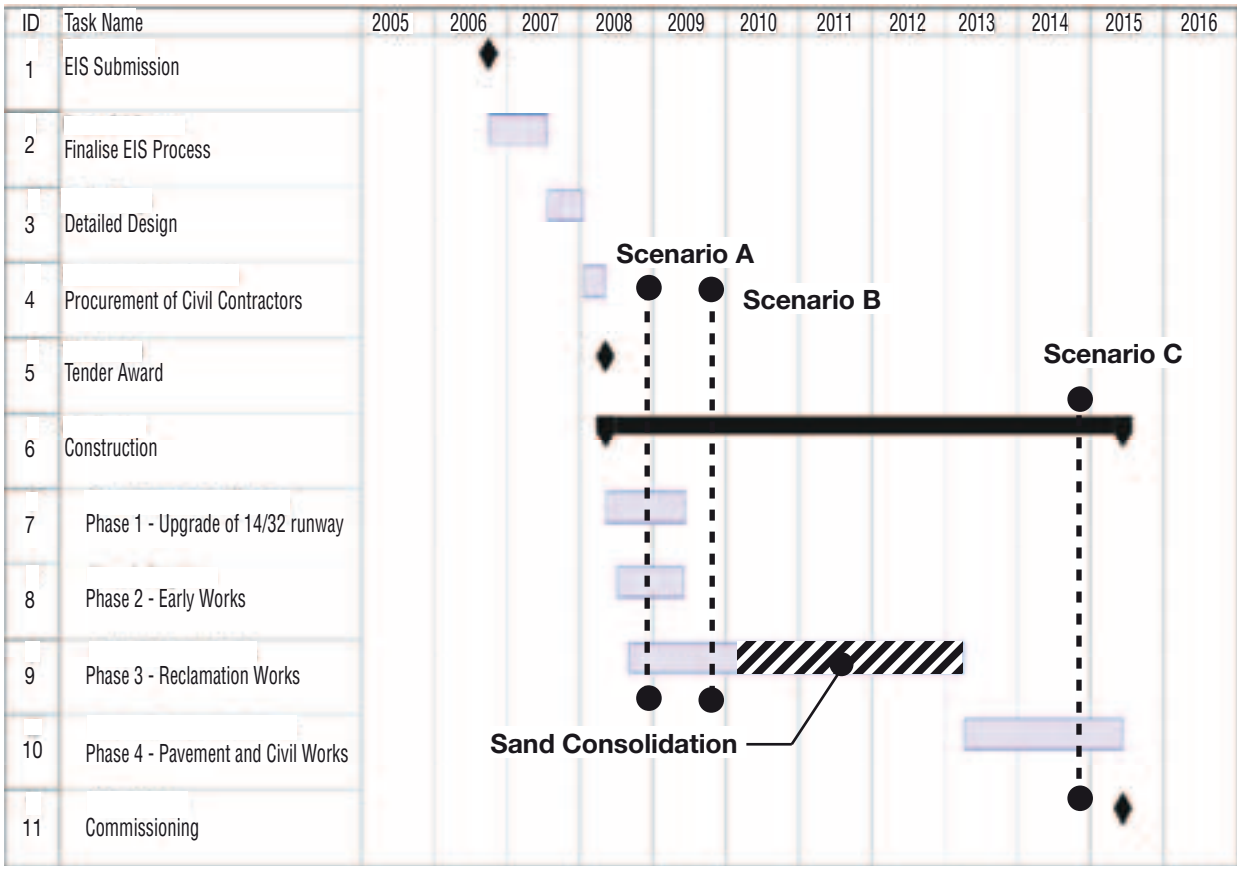
11.6.1 Construction Scenarios

Following a review of the proposed construction phases, and the various stages within each phase, three scenarios have been selected for noise modelling. **Figure 11.6a** presents the scenarios with respect to the construction program.

The following sections describe the scenarios, together with indicative plant numbers.

Locations where this equipment was placed for modelling purposes are shown in **Appendix C**. These represent typical locations during the relevant construction period. Although exact equipment locations would vary from day to day and month to month, this variation would not have a significant impact on noise levels at relevant receivers.

Figure 11.6a: *Construction Noise Modelling Scenarios.*



11.6.1.1 Scenario A

This scenario consists of simultaneous works during construction Phases 1, 2 and 3 which are expected to overlap in the latter part of 2008. Works included in this scenario are presented in **Table 11.6a**.

Hours of operation for this scenario are 7am–7pm with the exception of the vacuum ground consolidation of the northern end of runway 14/32 where the pumps will operate on a 24 hour basis.

11.6.1.2 Scenario B

This scenario consists of works during Phase 3. Works included in this scenario are presented in **Table 11.6b.**

In this scenario, both the dredging and the sand distribution on-site will occur on a 24 hour basis. Dredging will consist of two hours dredging, followed by two hours transit from the dredging area to the Luggage Point unloading site where the sand will be unloaded for approximately two hours. This cycle will continue on a 24 hour basis but with acivities at night limited to the dredge and two swamp dozers.

11.6.1.3 Scenario C

This scenario consists of works during Phase 4. Works included in this scenario are presented in **Table 11.6c**

Table 11.6a: Construction Noise Scenario A Operations.

Phase	Description	Equipment	
1	Ground Treatment, Drainage Works and 14/32 upgrade (Drawing 10100906-SK103)	Diesel Engines for Pumps Excavators Dump Trucks Water Trucks Dozers Scrapers, graders, Loaders	16 4 6 (35T), 5 (25T) 2 2 6
2	Mangrove and Casuarina Stripping (Drawing 10100906-SK203)	Excavator Dump Trucks Chain Saws Tub grinder Swamp Dozer with winch Loader	3 3 (35T), 2 (LGP trucks) 6 1 2 1
3	Reclamation Works Stage 1 (Drawing 10100906-SK301)	Excavator Graders Loaders Water truck	1 1 11 1

Table 11.6b: Construction Noise Scenario B Operations.

Phase	Description	Equipment	
3	Reclamation Works Stage 5 (Drawing 10100906-SK305)	Dredge Excavator Dump Trucks Graders Swamp Dozer Loaders Water truck	1 1 3(25T) 1 6 5 1

Table 11.6c Construction Noise Scenario C Operations

Phase	Description	Equipment	
4	Pavement and Civil Works Pavement Construction (Drawing 10100906-SK403)	Paving machine Asphalt Paving machine Concrete Saw Cutter Dump Trucks Pug Mills Concrete Plant Asphalt Plant Rollers Dozer Loaders Excavators Water Trucks Concrete /asphalt trucks Graders	2 1 2 13(25t), 24 (tipper) 2 1 1 4 7 10 6 7 11 8

11.6.2 Noise Modelling

Noise level calculations were performed using the ENM computer noise model, which has been shown to produce reliable predictions of noise levels from construction and similar developments. The model takes account of the topography of the area, as well as prevailing wind and temperature inversion conditions. Each of the scenarios detailed in the preceding section was modelled separately for day, evening and night time conditions.

At relatively large distances from a source, the received noise levels will be influenced by meteorological conditions, particularly wind and temperature gradients, and hence can vary from hour to hour and night to night. The Commonwealth Airports (Environment Protection) Regulations 1997 do not discuss this issue, or how it should be addressed in determining noise levels for comparison with the criteria in section 11.4.

The EPA's PNC specifies that where meteorological effects are significant, noise criteria should be achieved under adverse meteorological conditions, which are defined in terms of specific parameters to be used in the assessment. Separate procedures are defined for assessment of temperature inversions and gradient wind effects.

The procedures described in the PNC are directed toward finding a single set of meteorological conditions, representing generally adverse conditions for noise propagation, which should be used in noise assessment. Whilst this is considered adequate for some types of assessment, in more complex cases, such as this project, it is considered that it is more appropriate to assess noise impacts under the entire range of meteorological conditions applying at the location. This is important, for example, where meteorological conditions which result in enhanced noise levels at one receiver may result in reduced noise levels at another.

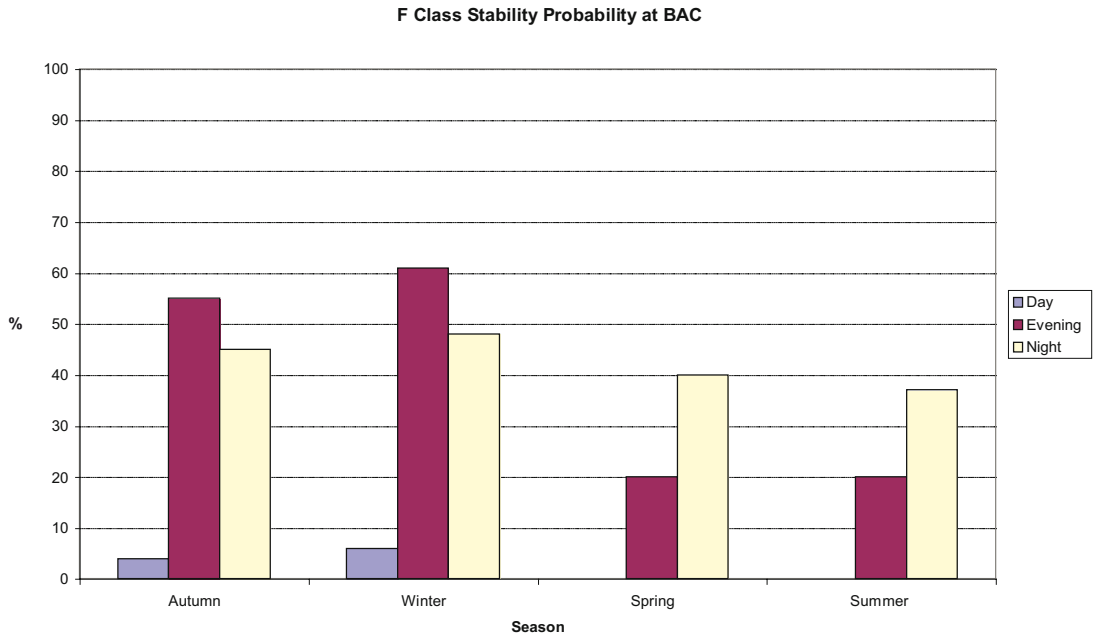
In the present assessment, meteorological effects on noise propagation are taken into account generally in accordance with the procedures of the PNC. However, the noise level used in comparison with the stated criteria (whether derived from the PNC or the Regulations) is defined more precisely as the level which is exceeded for 10 percent of the time during the relevant periods (day, evening and night), under the range of meteorological conditions prevailing at the site. This interpretation is believed to be consistent with the intent of both the PNC and the Regulations.

The joint probability distribution of wind speed, wind direction and stability class for the site was obtained from Holmes Air Sciences assessment work (Chapter B12), and is the same data on which their modelling of air emissions is based. Wind roses for the airport, based on these data, are presented in **Appendix D**.

A temperature inversion is generally assumed to exist when the atmospheric Pasquill Stability Class is F. **Figure 11.6b** presents the frequency of F class stability by season and time period, based on the above data. An inversion strength of 3ºC per 100 m was assumed where F class stability is present.

For the assessment, construction noise levels at each receiver location were calculated under 33 different wind conditions and two temperature inversion conditions (zero gradient and 3ºC per 100 m), and the noise level exceeded for 10 percent of the day, evening and night period was established from these results, using the probability of occurrence for each of these conditions.

Figure 11.6b *Probability of Temperature Inversion.*



11.6.3 Predicted Noise Levels

Table 11.6d, **Table 11.6e** and **Table 11.6f** summarise predicted construction noise levels with respect to relevant criteria.

Table 11.6d: Scenario A – Predicted Construction Noise Levels exceeded for 10 Percent of Time – dBA.

Receiver Location	Daytime			Evening*			Night Time**		
	Criterion	Predicted	Exceedence	Criterion	Predicted	Exceedence	Criterion	Predicted	Exceedence
A	43	29	0	43	32	0	35	26	0
B	41	37	0	41	45	4	34	37	3
C	36	35	0	36	42	6	30	33	3
D	45	13	0	45	19	0	36	8	0
E	40	12	0	40	13	0	34	4	0
F	41	17	0	41	18	0	34	8	0
G	45	32	0	45	36	0	38	17	0
H	37	17	0	37	19	0	31	12	0
I	40	10	0	40	17	0	30	8	0
J	42	34	0	42	40	0	38	20	0

* *Levels shown refer to the period 6pm–7pm, when all construction equipment would be operating.*

** *Vacuum pumps operating only.*

Table 11.6e : Scenario B – Predicted Construction Noise Levels Exceeded for 10 Percent of Time – dBA.

Receiver Location	Daytime			Evening			Night Time		
	Criterion	Predicted	Exceedence	Criterion	Predicted	Exceedence	Criterion	Predicted	Exceedence
A	43	29	0	43	35	0	35	30	0
B	41	35	0	41	44	3	34	42	8
C	36	33	0	36	39	3	30	39	9
D	45	9	0	45	15	0	36	15	0
E	40	6	0	40	11	0	34	11	0
F	41	12	0	41	17	0	34	17	0
G	45	26	0	45	27	0	38	26	0
H	37	10	0	37	16	0	31	15	0
I	40	8	0	40	13	0	30	10	0
J	42	27	0	42	29	0	38	29	0

Table 11.6f: Scenario C – Predicted Construction Noise Levels Exceeded for 10 Percent of Time – dBA.

Receiver Location	Day			Evening*			Night		
	Criterion	Predicted	Exceedence	Criterion	Predicted	Exceedence	Criterion	Predicted	Exceedence
A	43	29	0	43	32	0	35	-	-
B	41	36	0	41	48	7	34	-	-
C	36	39	3	36	47	11	30	-	-
D	45	16	0	45	23	0	36	-	-
E	40	14	0	40	17	0	34	-	-
F	41	20	0	41	21	0	34	-	-
G	45	29	0	45	31	0	38	-	-
H	37	15	0	37	20	0	31	-	-
I	40	12	0	40	19	0	30	-	-
J	42	25	0	42	31	0	38	-	-

* *Levels shown refer to the period 6pm–7pm.*

11.6.4 Assessment of Noise Impacts

Construction noise is predicted to comply with daytime noise goals for all modelled scenarios. However, occasional exceedances are indicated during the evening and night periods.

Noise associated with construction activities has the potential to impact at the elevated residential facilities that overlook the site at Nudgee and Banyo (i.e. locations B and C).

The following sections review possible noise mitigation measures that can be implemented to manage construction noise.

11.6.4.1 Scenario A

In the night period (10pm–7am) an exceedance of the Regulations noise criteria by up to 3 dBA on occasion is predicted due to the operation of the vacuum consolidation pumps. These pumps have been assumed to be operated by diesel motors (two pumps per motor) without sound proofing.

This equipment will operate at night on a continuous basis and therefore the noise associated with this equipment is more likely to be perceived at the elevated residential premises at locations B and C. Further, if reviewed with respect to PNC derived continuous noise criteria an even greater level of impact is indicated. Therefore the following noise control measures will need to be considered at the detailed design stage.

1. Enclose ALL diesel motors in acoustic housings/ sheds.
2. Use alternative quieter electric motors powered by the existing power grid.

In the case of the evening period, exceedences of up to 6 dBA are predicted, related largely to works undertaken in the period 6pm–7pm. Further modelling indicates that, due to the elevated nature of the residential receivers there are no practical physical noise barriers that can be implemented on-site that will effectively reduce these noise levels at the identified receivers.

Monitoring of noise levels during this phase, would determine whether the predicted evening exceedences occur in practice.

11.6.4.2 Scenario B

In the night period, exceedences of established noise criteria by up to 9 dBA are predicted on occasion at locations B and C. In this case the major contribution to the calculated noise level is from trucks and dozers associated with reclamation activities.

The listed activities are, in fact, likely to overestimate the extent of operations in the night period, and in particular the number of swamp dozers used at night is likely to be lower than shown in **Table 11.6.b**.

Again, further modelling predicted that, due to the elevated nature of the residential receivers, there are no practical physical noise barriers that can be implemented on-site that will effectively reduce noise levels at the identified receivers.

Exceedances at night due to the 24 hour reclamation activities modelled in this scenario are predicted to occur over the 18 month construction period. In conjunction with the other activities modelled in Scenario A, exceedences in the first hour of the evening period are also predicted to occur over the two year construction period.

In this case, it is understood that the nature of the work undertaken in this phase means that it must be conducted on a 24 hour basis, and hence there would be no possibility of restricting hours of operation. Residents would need to be made aware of the potential for noise impacts during this period, and the proposed duration of the impacts, and kept informed of progress on the site and any other information relevant to noise exposure. Methods for achieving this should be described in a Noise Management Plan for the project.

11.6.4.3 Scenario C

In the early evening (6pm–7pm), exceedences of construction noise criteria by up to 11 dBA on occasion are predicted at location C. Again, further modelling indicated that, due to the elevated nature of the residential receivers there are no practical physical noise barriers that can be implemented on-site that will effectively reduce noise levels at the identified receivers.

Residents at location C (St Paul's Theological College) would need to be made aware of the potential for noise impacts during this period, and the proposed duration of the impacts, and kept informed of progress on the site and any other information relevant to noise exposure. Methods for achieving this will be described in a Noise Management Plan for the project.

11.6.4.4 Dredging Noise

The scenario calculations include noise from the dredge unloading at Luggage Point (which represents the worst case for the residences considered there). A review of noise levels at Location J (the nearest residential receiver) is presented in **Table 11.6e** and reveals compliance with PNC noise criteria of 45, 40 and 35 dBA for the day, evening and night periods respectively.

When the dredge is operating in dredging mode, the only potentially affected receiver is Tangalooma Resort on Moreton Island. At its nearest point, the dredge would be approximately 3 km from the resort, and the calculated noise level at this point is 27 dBA. This is below the established night time planning goal of 30 dBA, indicating that dredging activities can occur across the entire dredging footprint.

Based on the above findings, it has been determined that 24 hour operation of dredging activities will be acceptable from the point of view of noise impact.

11.6.4.5 Noise at Commercial Receivers

Commercial receivers located on Airport Drive are located approximately half way between receiver locations D and F. A review of predicted daytime construction noise levels for each scenario at these locations indicates that resultant noise levels will be well below established noise criteria. Based on this finding it has been determined that construction noise is not likely to adversely impact these commercial receivers.

At surrounding commercial premises off-airport, that are represented by Site G, and commercial premises in the vicinity C, D and E, compliance with established residential criteria during the day is indicated, and therefore, commercial criteria, which are less stringent, will also not be exceeded.

11.7 Proposed Construction Noise Management Measures

11.7.1 Construction Noise Mitigation Measures

Without mitigation, noise levels from some construction activities have been predicted to exceed the nominated guideline goals at some residential receivers. Therefore, at a number of sites, noise control measures will be adopted to ensure that acceptable levels are achieved at affected receivers.

A range of approaches to reducing the impact of construction noise are described below. It is proposed that these strategies be applied to areas of exceedence identified in the preceding section.

- *Noise Monitoring Programme* – A well-planned noise monitoring programme will be implemented to assist in identifying the site-specific potential for disturbance at particularly sensitive localities as the works progress.

  Monitoring of overall noise emission from critical work sites will be carried out in order to check compliance with the established construction noise emission guidelines, which have been adopted for this project. This will also provide feedback to guide improvements in procedures or equipment selections to minimise noise.

- *Noise Sensitive Sites* – The quietest available plant and equipment that can economically undertake the work required will be selected. Mobile plant such as excavators, front-end loaders and other diesel-engined equipment should be fitted with residential class mufflers and other silencing equipment, as applicable.

- *Plant Noise Audit* – Noise emission levels of all critical items of mobile plant and equipment would be checked for compliance with noise limits appropriate to those items prior to the equipment going into regular service. Periodic noise monitoring would be conducted to ensure that items of plant continue to be well maintained in compliance with the noise emission limits for that class of equipment.

  To this end, a regular testing programme should be established with the contractor.

- *Operator Instruction* – Operators are to be trained in order to raise their awareness of potential noise problems and to increase their use of techniques to minimise noise emission.

- *Equipment Selection* – All fixed plant at the work sites will be appropriately selected, and where necessary, fitted with silencers, acoustical enclosures and other noise attenuation measures. It is possible that the vacuum pump engines will need to be enclosed within a building or acoustic enclosure.

- *Site Noise Planning* – Where practical, the layout and positioning of noise-producing plant and activities on each work site will be optimised to minimise noise emission levels to surrounding residential communities.

- *Permissible Times of Work* – Normal hours of operation will occur, with extensions linked to type of activity.

11.7.2 Community Liaison and General Approaches to Mitigation

The existing BAC community relations programme is to be utilised to keep the community, that has been identified as being potentially affected, appraised of progress of the works, and to forewarn potentially affected groups (e.g. by letterbox drop, meetings with community groups, etc) of any anticipated changes in noise emissions prior to critical stages of the works, and to explain complaint procedures and response mechanisms.

Close liaison is to be maintained between the communities overlooking work sites and the parties associated with the construction works to provide effective feedback in regard to perceived emissions. In this manner, equipment selections and work activities can be coordinated where necessary to minimise disturbance to neighbouring communities, and to ensure prompt response to complaints, should they occur.

11.7.3 Noise Management Plan

A comprehensive Noise Management Plan is to be included in the Environmental Management Plan for the project. The plan will be prepared during the final project planning process, including components relating to noise. This plan will detail the mitigation, monitoring and community liaison measures outlined in the previous section. The plan will be updated to incorporate any additional measures that emerge as the project design evolves and work methodologies become better defined.

A key element of the Noise Management Plan will be the need to conduct progressive noise impact assessments prior to each stage of the works. In this manner, the work activities having particular potential for noise and vibration impact can be identified (as proposed work methodologies become clearer).

Further control and monitoring methodologies can be refined to suit those activities, and assurance can be given that emissions will be minimised wherever practical.

11.8 Noise from Ground Running, Aircraft At Terminals and General Mechanical Plant

11.8.1 Introduction

Noise resulting from ground testing of aircraft engines, aircraft which are stationary at terminals, and general mechanical plant on the airport site, has a different character from construction noise discussed previous sections, in that it is long term and relatively constant in nature.

11.8.2 Policies and Guidelines

Noise from the above sources comes within the scope of the Commonwealth Airports (Environment Protection) Regulations 1997 (the Regulations). These regulations explicitly do not apply to *"noise generated by an aircraft in flight or when landing, taking off or taxiing at an airport"*, but do apply to the noise sources considered in this Chapter.

The Regulations describe 'offensive noise' which may emanate from an airport, and indicate that the operator of an 'undertaking' at an airport must:

"take all reasonable and practicable measures:

(a) to prevent the generation of offensive noise from the undertaking; or

(b) if prevention is not reasonable or practicable – to minimise the generation of offensive noise from the undertaking."

Section 2 of the Regulations describes 'offensive noise' as:

"noise [that] is generated at a volume, or in a way, or under a circumstance, that, in the opinion of an airport environment officer, offensively intrudes on individual, community or commercial amenity."

However, Schedule 4 to the Regulations also provides more detail on relevant noise criteria for ground based aircraft operations, and various other activities carried out on the airport premises including the general category 'operation of plant and machinery'. The Regulations provide the framework for assessment of noise from these sources, although as described below other criteria may also be relevant.

For the purposes of the Regulations, 'ground-based aircraft operations' covers noise from ground testing of engines, and noise from aircraft while stationary at a terminal. No explicit indicators of 'excessive' noise are provided, and any relevant criteria are to be derived from provisions in the airport's approved Airport Environment Strategy (AES).

11.8.3 Ground Running Noise

In the case of ground engine testing, Brisbane Airport's current AES refers to Ground Running Procedures developed by the Airport which limit the times and types of testing which may be carried out. Approval of the AES by the Australian Government can be taken to indicate approval of these procedures as being acceptable. No change is proposed to the location or type of ground running conducted at the Airport as a result of the NPR project, and proposed changes to the ground conditions between the existing ground running locations and relevant noise-sensitive receivers

would result in negligible change to the resulting noise levels. Hence, proposed future ground running operations would currently be considered acceptable under the Regulations.

The number and type of ground running operations which are considered acceptable to the community may, of course, change from time to time. However, the Airport's AES is revised every five years as part of the Master Planning process, and it is at this time that any such revised assessment procedures are appropriately considered.

For these reasons, noise from ground testing of aircraft engines is not considered further in this report.

There is no change to the current terminal layout due to this project and therefore will not result in any changes to current noise due to aircraft whilst stationed at a terminal.

11.8.4 Noise from General Mechanical Plant

Schedule 4, section 2.06 of the Regulations indicates that noise from a number of sources including 'plant and machinery' should not exceed the 'background' noise level:

(a) between the hours of 07:00 and 22:00 – by more than 5 dBA; and

(b) between 22:00 hours of a day and 07:00 hours of the next day – by more than 3 dBA at any sensitive receiver.

Background' noise levels at potentially affected receivers can be identified with the measured min$L_{A90,1hour}$ values described in section 11.2.

It is not anticipated that the NPR project would involve the introduction of any new items of permanent mechanical plant with the potential to significantly impact noise-sensitive receivers. Approximate calculations indicate that any such new items, even if located at the closest point on the airport site, would require a total sound power level of approximately 108 dBA before the above criteria would be exceeded at any residence. If any new items of permanent mechanical plant with a sound power level approaching this value were to be required as a result of detailed design considerations, then detailed assessment and possibly noise control measures would be required to ensure that the above criteria are met.

It is considered that in the unlikely event that such equipment is required, noise mitigation measures including local shielding and engineering noise control methods would be available to achieve the required criterion noise levels. Any such requirements should be detailed in the equipment specification.

11.9 Noise from Road Traffic

11.9.1 Noise Level Criteria

The proposed development will facilitate additional aircraft movements in the longer term which in turn will create additional traffic on roads surrounding the Airport, due to the additional passenger traffic generated. This in turn has the potential to result in additional noise impacts at residences adjacent to those roads. Accordingly, an assessment has been conducted with respect to Queensland Department of Main Roads criteria.

The Queensland Department of Main Roads sets out criteria for assessment of traffic noise in a number of circumstances. The most relevant of these is assessment of noise from 'Existing Roads – No Roadworks'. These criteria define noise levels at which 'measures for noise attenuation will be considered within the road reserve'. They are:

- $L_{10(18hr)}$ noise level 10 years after the date of the assessment of 68 dBA or greater; AND
- $L_{10(18hr)}$ noise level 10 years after the date of assessment to be at least 3 dBA above the existing level at the time of assessment.

These criteria can be used to assess the impact of growth in traffic noise associated with the Airport as a whole, as well as the additional impact due to the NPR project.

11.9.2 Calculated Noise Levels

Chapter B10 (Surface Transport) discusses the likely total road traffic volumes generated by Brisbane Airport for the 2015, 2035 and 2035 'No Build' scenarios. These traffic volumes, sourced from Chapter B10, are shown in **Table 11.9a**.

The analysis in Chapter B10 report also provides predicted total traffic volumes on relevant roads close to the Airport in the above three scenarios, taking account of both growth in Airport-related traffic and other factors likely to influence future traffic growth. Of the 14 road sections considered, seven have residences close enough to require consideration for noise impacts. These are listed in **Table 11.9b**, together with the predicted annual average daily traffic volumes and other relevant parameters. The mean vehicle speed and percentage heavy vehicles were estimated based on available data.

For each road section, the $L_{A10,18hr}$ noise level was calculated at the nearest residence using the standard CoRTN methodology, with the following standard assumptions:

- Traffic volumes in the period 6am-midnight are 95 percent of the average daily volume;
- Ground between road and residence is 50 percent acoustically soft;
- A façade correction of 2.5 dBA is included; and
- Noise barriers on the Gateway Motorway and the Eastern Arterial are conservatively assumed to provide attenuations of 8 dBA and 5 dBA respectively.

Table 11.9b shows traffic noise levels at the nearest residence, calculated in this way.

Table 11.9a: Total Traffic Volumes Generated by Brisbane Airport (movements per day).

Traffic Source	Time Period	Scenario		
		2015	2035 'No Build'	2035 NPR
Domestic Terminal	Average Daily Traffic	67,800	101,800	133,900
	AM Peak (7–9am)	5,400	8,300	9,700
	PM Peak (4–6pm)	5,700	9,400	12,600
International Terminal	Average Daily Traffic	27,700	40,100	52,400
	AM Peak (7–9am)	2,900	4,200	4,300
	PM Peak (4–6pm)	900	1,400	1,800

Table 11.9b: Traffic Parameters Used in Noise Calculations.

Road Section	Direction	Annual Average Daily Traffic			Set-Back to Nearest Residence (m)	Mean Traffic Speed (km/h)	Percentage Heavy Vehicles
		2015	2035 'No Build'	2035 NPR			
Kingsford Smith Drive West of Nudgee Road	Westbound	28,000	39,300	41,000	25	60	10
	Eastbound	31,900	41,200	43,600	13	60	10
Nudgee Road North of Kingsford Smith Drive	Northbound	3,200	6,400	7,100	16	60	10
	Southbound	8,100	7,900	9,800	11	60	10
Nudgee Road, North of East-West Arterial	Northbound	3,600	5,800	6,500	9	60	10
	Southbound	5,400	5,500	7,400	13	60	10
Gateway Motorway, Between Kingsford Smith Drive and East-West Arterial	Northbound	38,300	5,200	52,500	34	90	10
	Southbound	33,700	47,900	48,200	44	90	10
East-West Arterial, West of Nudgee Road	Westbound	39,900	46,800	48,100	10	50	10
	Eastbound	42,300	48,800	48,600	21	50	10
Sandgate Road, South of East-West Arterial	Northbound	15,700	2,400	26,400	18	60	10
	Southbound	21,400	25,600	31,000	12	60	10
South of Airport Drive	Northbound	7,000	9,400	9,900	167	80	10
	Southbound	6,500	9,000	8,600	171	80	10

Table 11.9c: Calculated $L_{A10,18hr}$ Noise Levels.

Road Section	Calculated $L_{A10,18hr}$ Noise Level at Nearest Residence (dBA)			Difference in $L_{A10,18hr}$ (dBA)	
	2015	2035 'No Build'	2035 NPR	2035 NPR – 2015	2035 NPR – 'No Build'
Kingsford Smith Drive West of Nudgee Road	77.1	78.4	78.6	1.5	0.2
Nudgee Road, North of Kingsford Smith Drive	71.1	71.9	72.7	1.6	0.8
Nudgee Road, North of East-West Arterial	70.4	71.5	72.3	2.0	0.8
Gateway Motorway, Between Kingsford Smith Drive and East-West Arterial	69.3	70.7	70.8	1.4	0.0
East-West Arterial West of Nudgee Road	73.4	74.1	74.2	0.7	0.1
Sandgate Road South of East-West Arterial	75.7	76.9	77.6	1.8	0.7
Lomandra Drive South of Airport Drive	63.0	64.3	64.4	1.4	0.0

From **Table 11.9c,** the following points are clear:

- At all locations except Lomandra Drive, calculated $L_{A10,18hr}$ noise levels exceed the level of 68 dBA. Both in 2015 and for both scenarios in 2035.
- At all locations, the projected increase in traffic noise due to all causes, between 2015 and 2035 is less than 3 dBA. For locations with $L_{A10,18hr}$ exceeding 68 dBA, the highest projected increase is 2.0 dBA. This is an increase over a 20 year period, compared with the criterion of a 3 dBA increase over a 10 year period.
- The difference between traffic noise levels in the 2035 'NPR' and 'No Build' scenarios is in all cases negligible.

It can be concluded that at locations close to the Airport, increases in traffic noise over the 20 year assessment period for this project will be acceptable, and the NPR project itself will result in imperceptible differences in level of road traffic noise.

11.10 Conclusions

An assessment of construction noise levels from the NPR project has been conducted, using design noise goals established from the Commonwealth Airports (Environment Protection) Regulations 1997 and the Queensland EPA's PNC guidelines, and using results of on-site noise monitoring. This assessment has been based on the preliminary construction methodology as described in Chapter A5.

Noise modelling of three construction scenarios indicates the potential for occasional exceedence of noise criteria during the night and evening periods at residences to the west that overlook the site.

In initial stage of the project (Phase 1), it has been identified that noise from the vacuum consolidation pumps can be adequately controlled during the night period by enclosing the pump engines, or alternatively using electric motors to power this equipment.

In both the early stage of the project, lasting approximately one year, and in a later stage lasting approximately two years, on-site operations are proposed in the period 6pm–7pm. Noise levels in this period are predicted to exceed the relevant

evening criteria at the two nearest residential locations, the St Pauls Theological College and the Mercy Aged Care facility. Accordingly noise management of these activities will be required, and modifications to the construction methodology would need to be implemented, where possible, should actual noise levels, through the community consultation and monitoring program, be deemed unacceptable.

During the reclamation period of proposed operations (Phase 3), lasting approximately 18 months, 24 hour operation of equipment is required on the site. During this time occasional exceedences of relevant criteria are predicted in both the evening and night periods, at the same two nearest residential locations. The nature of the work undertaken means that it must be conducted on a 24 hour basis, and hence there would be no possibility of restricting hours of operation. The predicted exceedences were for a worse case operating scenario, however, at night there will only be limited equipment (two dozers) operating, so the night time levels are likely to be less than that predicted most of the time.

However, any unacceptable noise will need to be managed through operational controls where possible. In addition residents will be made aware of the potential for noise impacts during this period, and the proposed duration of the impacts, and kept informed of progress on the site and any other information relevant to noise exposure.

Noise from 24 hour dredging operation has been predicted to comply with all established criteria at all residential receivers including Tangalooma Resort on Moreton Island.

A Noise Management Plan, which specifically address these areas and nominates the physical and operational measures to minimise both the noise emission and any resultant impact, will be developed for this project as follows:

- Noise monitoring procedures to validate noise level predictions, and better identify the extent of any criterion exceedences;
- On-site noise controls, including physical and operational controls which can feasibly be implemented to reduce or eliminate identified exceedences; and
- A community consultation process to ensure that residents are fully informed of the works being undertaken, their potential noise impacts, and the measures being taken to control them.

In the case of ground engine testing proposed future ground running operations would currently be considered acceptable under the Regulations. There is no change to the current terminal layout due to this project and therefore will not result in any changes to current noise due to aircraft whilst stationed at a terminal.

It is not anticipated that the NPR project would involve the introduction of any new items of permanent mechanical plant with the potential to impact noise-sensitive receivers. It is considered that in the unlikely event that such equipment is required, noise mitigation measures including local shielding and engineering noise control methods would be available to achieve the required criterion noise levels.

With respect to noise from road traffic, it can be concluded that at locations close to the Airport, increases in traffic noise over the 20 year assessment period for this project will be acceptable. The NPR project itself will result in imperceptible differences in the level of road traffic noise compared with the 'No Build' case.

Table 11.10 presents an assessment summary matrix of all construction and on-site noise impacts associated with the NBR.

Table 11.10: Noise Assessment Summary Matrix.

EIS Area: Noise Feature/ Description	Current Value + Substitutable Y:N	Description of Impact			Additional Compensation (Beyond Standard Practice)
		Impact	Mitigation Inherent in Design/ Standard Practice Amelioration	Significance Criteria	
Construction Scenario A	All sites identified located on and off-site.	Vacuum Consolidation Pump Operation	Enclosure or substitution	Minor Adverse to Negligible, -ve, T, ST, D	Nil
Construction Scenario B	All sites identified located on and off-site.	General Night Construction Noise	Limited plant operating and best practice noise management,	Minor Adverse to Negligible, -ve, T ,ST, D	Nil
Construction Scenario C	All sites identified located on and off-site.	Evening Construction Noise	Best Practice and Noise Management	Moderate Adverse to Negligible, -ve, T,ST, D	Nil
Dredging	All sites identified located on and off-site.	None	n/a	Negligible, +ve, , T, ST, D	Nil
Ground Running	All sites identified located on and off-site.	None	n/a	Negligible, +ve,P, LT, D	Nil
General Mechanical Plant	All sites identified located on and off-site.	None	n/a	Negligible, +ve, P, LT, D	Nil
Road Traffic	All sites identified located off-site.	None	n/a	Negligible, +ve, P,LT, D	Nil

Key: Significance Criteria: Major, High, Moderate, Minor, Negligible, +ve positive; -ve negative, D – direct; I – indirect, C – cumulative; P – permanent; T – temporary, ST – short term; MT – medium term; LT long term