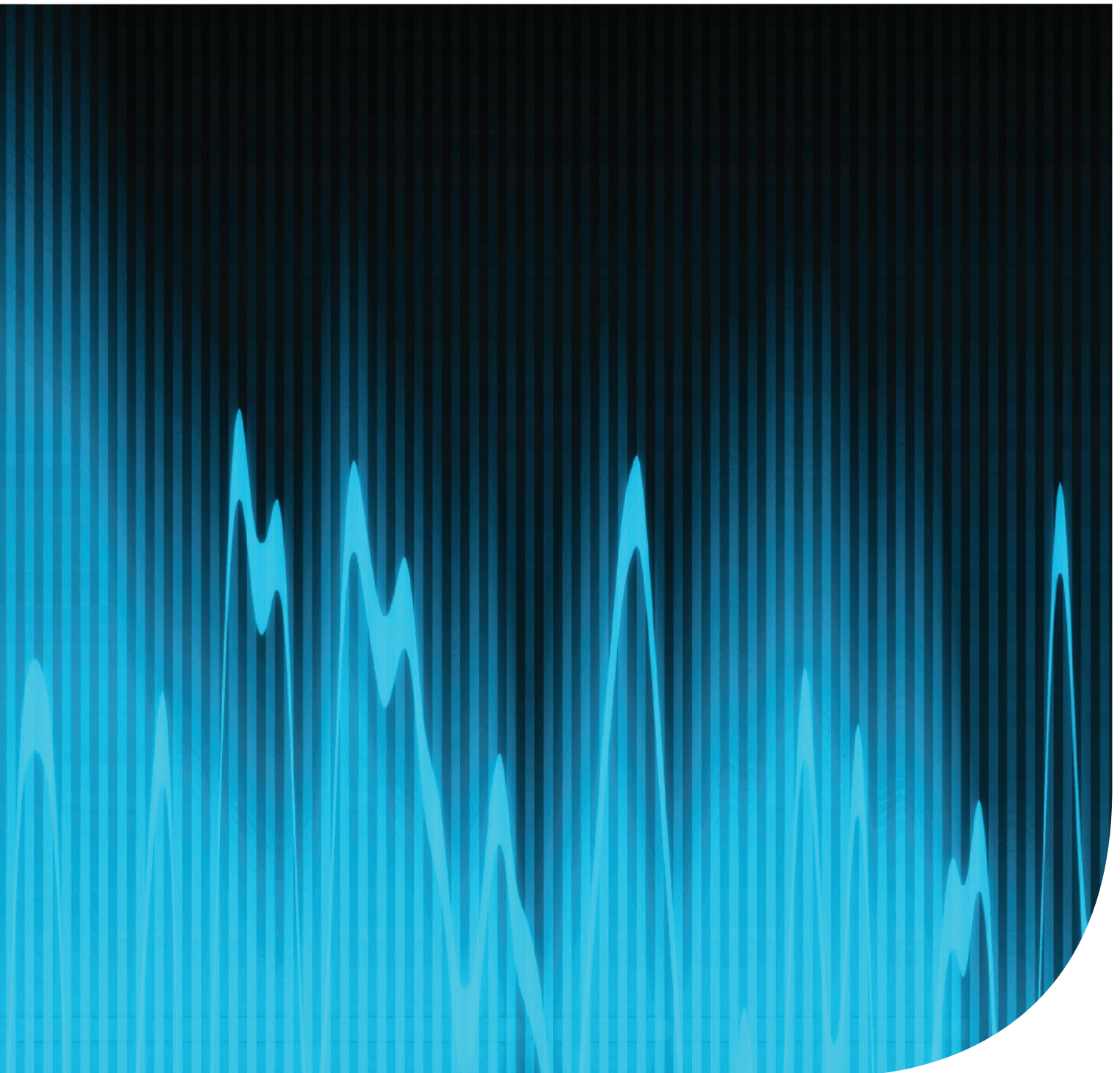


Construction noise management plan

Waukivory Pilot Project

Prepared for AGL Upstream Investments Pty Limited | 6 August 2014



Construction noise management plan

Waukivory Pilot Project

Prepared for AGL Upstream Investments Pty Limited | 6 August 2014

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Construction noise management plan

Final

Report J14098RP1 | Prepared for AGL Upstream Investments Pty Limited | 6 August 2014

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Approved by Duncan Peake

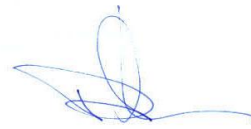
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Date 6 August 2014

Date 6 August 2014

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Document Control

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1 Introduction

1.1 Background

AGL Upstream Investments Pty Limited ('AGL') will be undertaking petroleum exploration activities for the proposed Waukivory pilot project (the 'project') within the Gloucester local government area (LGA) NSW. This document is a construction noise management plan (CNMP) and noise impact assessment (NIA) as required by the Environment Protection Licence (EPL) (licences – 20358) issued by the NSW Environment Protection Authority (EPA).

1.2 Purpose and scope

This CNMP has been prepared to specifically address condition G2.2 of EPL. Condition G2.2 is reproduced below:

The licensee must prepare and implement a detailed and site-specific CNMP, prior to commencement of construction activities, that apply to:

- a) site preparation activities including earthworks;
- b) construction of water storages and pipelines;
- c) hydraulic fracture stimulation; and
- d) well workover.

The EPL outlines the requirements of the CNMP and Table 1 below provides a reference where these requirements have been addressed in this plan.

Table 1.1 G2.2 Construction Noise Management Plan requirements and document reference

Requirements ¹	CNMP reference
a) identification of each work area, site compound, access route (public and private);	Figure 1.1.
b) identification of specific activities to be carried out at premises and access routes;	Section 1.3
c) identification of all potentially affected sensitive receivers	Section 1.4 and Figure 1.1
d) noise objectives of the Department of Environment and Climate Change (DECC) Interim Construction Noise Guideline (ICNG) (DECC 2009) and the Environment Protection Authority (EPA) Industrial Noise Policy (INP) (EPA 2000)	Section 2
e) assessment against objectives of ICNG and INP	Section 3 (Tables 3.3 to 3.6)
f) analysis of reasonable and feasible referencing ICNG and Section 7 of INP	Sections 3 and 4
g) description of management methods	Section 4 (Table 4.1)
h) procedure for notifying residents	Section 4.2.3 and Table 4.1
i) measures to monitor performance.	Section 5.1

Notes: 1. G2.2 Construction Noise Management Plan requirements – EPL 20358.

1.3 Project description

The assessment documentation, including the Review of Environmental Factors (REF) (EMM 2013a) and Addendum to the REF (EMM 2013b) provide a description of several tasks and the location of ancillary infrastructure required for the project. The key components outlined in the REF are summarised below and form the basis of assessment scenarios adopted in this CNMP.

It is noted that several activities have previously been completed on site such as site establishment inclusive of significant earthworks activities to construct the pads for the wells and the drilling of the wells. Therefore, these will not be considered in this CNMP.

Further, a review of construction tasks for the project identifies that no significant sources of vibration (impact hammering, rolling or sheet piling) will be used as part of the construction works, therefore vibration impacts have not been considered further in this assessment.

1.3.1 Site preparation activities

Site preparation activities will predominantly involve the delivery of equipment to each of the four existing exploration wells (WK11, WK12, WK13 and WK14) given the pads have been previously established during the drilling phase in 2012. The deliveries will occur throughout the construction stage of the project. Products delivered will vary, however this scenario is representative of typical delivery scenarios encountered throughout the project (eg flare delivery, water storage tanks and general construction material deliveries).

1.3.2 Construction of water storages and pipelines

i Water transfer pipeline and gathering line

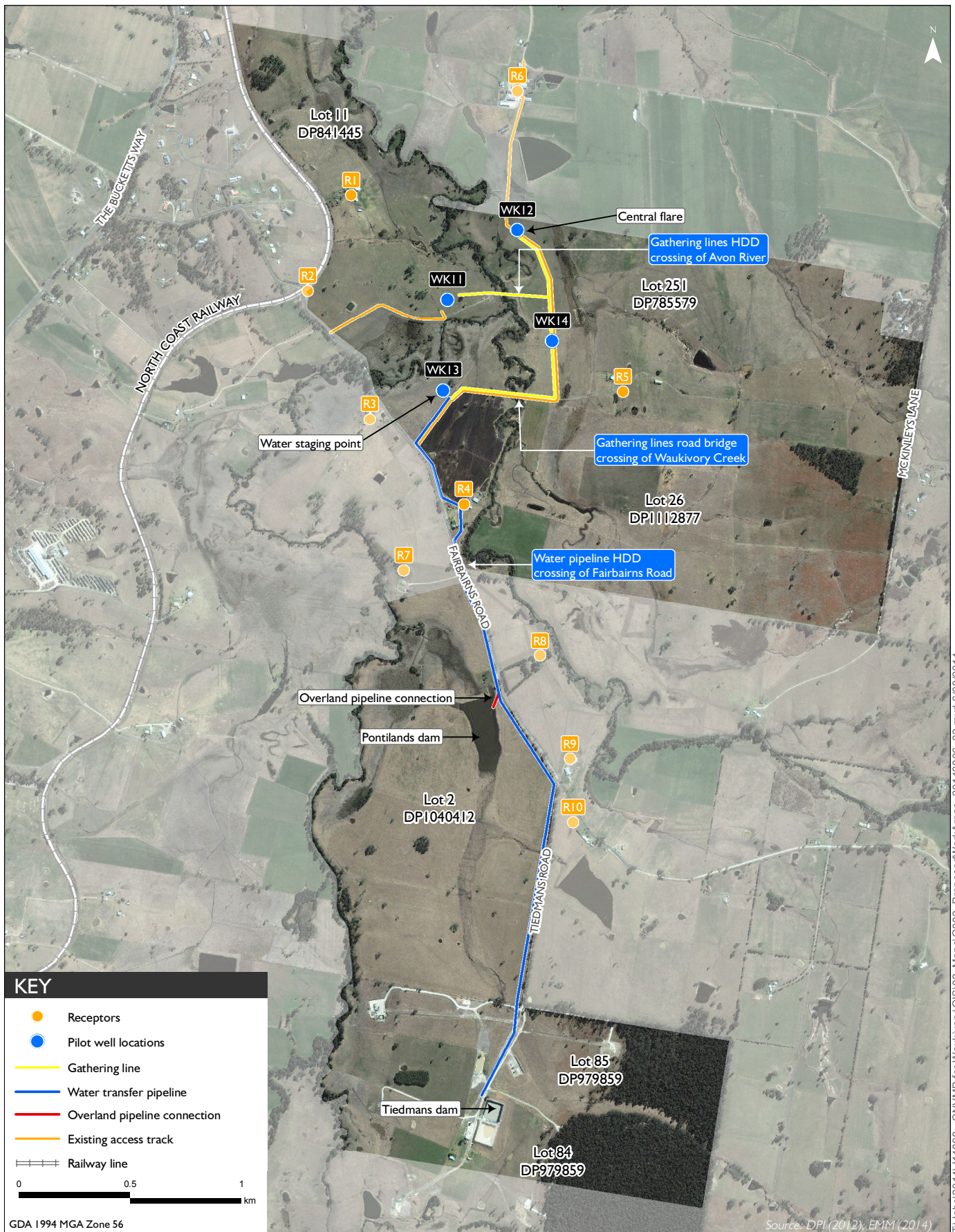
Construction of the proposed water pipeline will involve trenching and installing approximately 3.5 km of pipeline from the Tiedmans property, along Fairbairns Road. The water pipeline will include an overland section of pipeline connecting to Pontilands dam approximately 70 m in length (see Figure 1.1). This overland section of pipeline will connect into a tee-section in the water pipeline between Tiedmans dam and WK13 (see Figure 1.1). The pipeline to Pontilands dam will be able to be disconnected when not in use, which will prevent produced water from inadvertently being pumped into the dam.

Gas for flaring and water for hydraulic fracturing will be delivered from the water staging areas via buried gathering lines, from WK13. The gathering line will cross under the Avon River and Waukivory Creek through an under-bore as indicated in Figure 1.1.

It should be noted that no dam will be constructed for water storage. This is described in the Addendum to the REF (EMM 2013b).

ii Under-boring and horizontal directional drilling

Under-boring will be required for gathering lines (water and gas) to connect WK11 with the water staging point at WK13, and WK11 with the central flare at WK12. An under-bore at one location along the water transfer pipeline route and two locations along the gathering line route will be required. To enable the under-bore to occur, construction pads at the horizontal directional drilling (HDD) entry and exit points will be established on each side of Fairbairns Road, Avon River and Waukivory Creek.



KEY

- Receptors
- Pilot well locations
- Gathering line
- Water transfer pipeline
- Overland pipeline connection
- Existing access track
- Railway line

0 0.5 1 km

GDA 1994 MGA Zone 56

Source: DPI (2012); EMM (2014)

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Proposed work areas
 Construction Noise and Vibration Management Plan
 Waukivory Pilot Project

Figure 1.1

1.3.3 Hydraulic fracture stimulation

Hydraulic fracture stimulation will occur at four existing exploration wells (WK11, WK12, WK13 and WK14) using perforation and fracture stimulation techniques. Hydraulic fracture stimulation is a common method used in coal seam gas operations to increase the permeability of the coal seam. This method uses the hydraulic pressure of fluid pumped into gas wells to open coal seams and help increase gas production.

The fluid used in this process comprises approximately 99.5% water and sand, while 0.5% contains other additives. Fluids used during fracture stimulation are flushed from the coal seam and pumped to lined containment pits or tanks located on the surface and disposed of at appropriate off-site locations. Generally, only wells that intersect low permeability coal seams require fracture stimulation and these seams are usually very deep.

Coal seam gas wells are fully lined with steel casing, which is securely cemented in place to isolate aquifers overlying the coal seam. The well must be fully cased and is perforated at specific intervals where the fracture stimulation is to be undertaken. Thus, hydraulic fracture stimulation operations are controlled and designed so they are limited to coal seams and do not extend either above or below the targeted seam.

1.3.4 Well work-over

Immediately following hydraulic fractures stimulation and during flow testing from the pilot test wells, an occasional 'work-over' or other maintenance may be required. The work-over involves a rig to run or remove a pipe for clearing the hole of fill, obstructions, pumps or other issues. Work-over and maintenance activities are undertaken on a case-by-case basis as needed at individual holes; when an issue has been identified. Work-over activities may be required from time to time to perform maintenance activities on the wells.

i Sucker truck

It is noted that the work-over rig has an equivalent, albeit slightly higher sound power level of a sucker truck. A sucker truck may be required on occasion during fracture stimulating. For assessment purposes, the work-over scenario is considered representative of an operational sucker truck within each compound. Subsequently, sucker truck operations have not been assessed as a standalone activity for this assessment.

Furthermore, it is noted that a sucker truck may also be required during under-bore activities. The sucker truck in addition to the under-bore activities would result in negligible overall increases to noise emissions predicted for the under-bore scenarios presented in this assessment. Therefore, a standalone scenario assessing a sucker truck operating in isolation has not been considered in this assessment.

1.4 Sensitive receiver review

A review of potentially sensitive receivers has been completed in the vicinity of the proposed project. Table 1.2 provides a list of receptor types along with the Map Grid Coordinates (MGA) coordinates of each. Figure 1.1 provides a locality plan of the receivers.

Table 1.2 Noise sensitive receivers

Location	Receiver type	Address	Easting¹	Northing¹
R1	Residential	20 Grantham Road, Forbesdale, NSW 2422	402023	6453041
R2	Residential	Intersection of Fairbairns Lane and North Coast railway	401824	6452610
R3	Residential	176 Fairbairns Road, Forbesdale, NSW 2422	402095	6452080
R4 ²	Residential	237 Fairbairns Road, Forbesdale, NSW 2422	402510	6451653
R5 ²	Residential	197 Fairbairns Road, Forbesdale, NSW 2422	403184	6452184
R6	Residential	114 Maslens Lane, Gloucester, NSW 2422	402747	6453425
R7	Residential	304 Fairbairns Road, Forbesdale, NSW 2422	402282	6451332
R8	Residential	305 Fairbairns Road, Forbesdale, NSW 2422	402822	6450969
R9	Residential	Lot 881 Fairbairns Road, Forbesdale, NSW 2422	402942	6450475
R10	Residential	384 Fairbairns Road, Forbesdale, NSW 2422	403012	6450236

Note: 1. All coordinates are presented as Map Grid Australia, Zone 56.
2. These properties are owned by a neighbouring mining company.

2 Construction noise goals

2.1 Determining construction noise goals

This assessment was developed and guided by the following:

- Department of Environment, Climate Change NSW (DECC) Interim Construction Noise Guideline (ICNG), July 2009;
- DECCW - Industrial Noise Policy (INP), January 2000;
- Australian Standard AS 1055.1-1997: Acoustics - Description and measurement of environmental noise - General procedures; and
- Australian Standard AS 2436-2010: Guide to Noise Control on Construction, Maintenance and Demolition Sites.

2.1.1 Construction noise objectives

This section provides a summary of noise objectives that are applicable to the proposed works.

These noise objectives are used to derive a consistent set of criteria which will be used to assess and manage the project noise impacts.

i Interim construction noise guideline

The DECC (now EPA) provides the ICNG for the assessment and management of noise from construction works.

The ICNG provides two methods to assess construction noise emissions:

- quantitative, which is suited to major construction projects with typical durations of more than three weeks; and
- qualitative, which is suited to short-term infrastructure maintenance of less than three weeks.

A quantitative assessment requires noise emission predictions from construction activities at the nearest receptors, while the qualitative assessment is a simplified approach that relies more on noise management strategies.

This study has adopted a quantitative assessment approach. The qualitative aspects of the assessment include identification of receptors, description of works involved and proposed management measures that include a complaints handling procedure.

ii Noise management level

Table 2.1 is an extract from the ICNG and reproduces the noise management levels for residential receivers for day and out of hours (OOH) periods. Section 2.2 of the ICNG recommends the following standard hours for construction where noise from these activities is audible at residential premises:

- Monday to Friday 7am - 6pm;
- Saturday 8am - 1pm; and
- no construction work is to take place on Sundays or public holidays.

Table 2.1 ICNG residential criteria

Time of day	Management level $L_{eq(15\text{ min})}$ *	How to apply
Recommended standard hours: Monday to Friday 7:00 am to 6:00 pm Saturday 8:00 am to 1:00 pm. No work on Sundays or public holidays.	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{eq(15\text{ min})}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent 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.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: <ul style="list-style-type: none"> • times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences. • if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours.	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2.

Source: ICNG (DECC, 2009).

Table 2.2 is an extract from the ICNG and reproduces the noise management levels for sensitive land uses (non-residential receptors) for standard and OOH periods.

Table 2.2 Noise at sensitive land uses (other than residences) using quantitative assessment

Land use	Management level, $L_{eq(15-min)}$ (applies when properties are being used)
Classrooms at schools and other educational institutions.	Internal noise level 45dB(A)
Hospital wards and operating theatres.	Internal noise level 45dB(A)
Places of worship.	Internal noise level 45dB(A)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion).	External noise level 65dB(A)
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation).	External noise level 60dB(A)
Community centres.	Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS2107 for specific uses.

Source: ICNG (DECC, 2009).

Table 2.3 is an extract from the ICNG and provides noise management levels for commercial and industrial land uses for standard and OOH periods.

Table 2.3 Noise at commercial and industrial land uses using quantitative assessment

Land use	Management level, $L_{eq(15-min)}$
Industrial premises	External noise level 75dB(A) (when in use)
Offices, retail outlets	External noise level 70dB(A) (when in use)

Source: ICNG (DECC, 2009).

2.2 Construction noise goals

Prior to the drilling of the wells in 2012, background noise monitoring was undertaken to verify the existing noise levels in the area. The monitoring was undertaken at representative sensitive receiver locations surrounding the project. At each monitoring location, the existing noise levels were measured at or below 30 dB(A). This monitoring confirmed the assessment approach of setting a background noise levels to be consistent to that of a rural environment in accordance with the INP. The residential construction noise criteria for the proposal are provided in Table 2.4.

Table 2.4 Residential construction noise criteria

Location	Adopted RBL, dB(A)	$L_{eq(15-min)}$ noise criteria, dB(A)
All receptors	30	40 (ie RBL + 10dB - during recommended hours)
	30	35 (ie RBL + 5dB - out of hours)

3 Predicted construction noise levels

3.1 Construction activities

Construction works associated with the project are expected to be divided into several activities as discussed in Section 1. A summary of each activity, plant and duration/occurrence are presented in Table 3.1.

Table 3.1 Construction activities

Task	Plant	Duration/occurrence
A – Site preparation activities	Franna crane, flat bed truck, Manitou, semi trailer and service vehicles	Ongoing throughout project, short term duration. WK13 pad install 2 weeks max.
B1 – Water transfer pipeline and gathering line	Excavator, trencher, flatbed truck, service vehicles, backhoe	14 days for water transfer 7 weeks for gathering lines
B2 – Under-boring (HDD)	Semi trailers, HDD rigs, service vehicles, sucker truck	3 weeks - one week Avon River and Fairbairns Road and two weeks at Waukivory Creek.
C – Hydraulic fracture stimulation	Generator, reticulating pumps, mountain mover and V12 pump	5-7 days per well
D – Well work-over	Pipe cleaning rig	-

Table 3.2 summarises the noise emission data and anticipated plant items to be used during each construction task. It has been assumed that all equipment will be in operation concurrently which provides a worst-case scenario for assessment purposes.

Table 3.2 Construction equipment sound power

Plant and equipment	Quantity	Sound power level dB(A), L_{eq} . (re 10^{-12} Watts)
Task A - Site preparation activities		
Franna crane	1	106
Flat bed truck	1	96
Manitou	1	96
Semi trailer	1	102
Service vehicles	2	76
Task A - total fleet sound power		108
Task B1¹ – Water transfer pipeline and gathering line		
Excavator	1	105
Trencher	1	104
Flatbed truck	2	96
Service vehicles	2	76
Backhoe	1	104
Task B2 - total fleet sound power		110

Table 3.2 Construction equipment sound power

Plant and equipment	Quantity	Sound power level dB(A), L_{eq} (re 10^{-12} Watts)
Task B2 – Under-boring (HDD)		
Semi trailer	3	102
HHD rig (small and medium)	2	115
Service vehicle	2	76
Sucker truck	1	112
Task B2 - total fleet sound power		119
Task C¹ – Hydraulic fracture stimulation		
Generator	1	103
Reticulating pump	4	124
Mountain mover	1	123
V12 pump	4	117
Task C - total fleet sound power		131
Task D – Well work-over		
Pipe cleaning rig	1	113

Note: 1. Sourced from Appendix O of REF (EMM 2013).

3.2 Noise impact results

Noise impact calculations quantify noise levels for acoustically significant tasks for the project. The criteria provided in Table 2.4 should be used as a guide for screening potential noise impacts and also used as a reference for providing adequate and suitable noise management and mitigation.

3.2.1 Task A - Site preparation activities

Table 3.3 presents the predicted noise levels associated with Task A. The results indicate that noise emissions generated during deliveries would generally satisfy the relevant daytime noise criteria at the majority of receptors. The exception is deliveries at WK13 and WK14 where marginal noise exceedances are predicted at R3 and R5 respectively. It is noted that R5 is owned by a neighbouring mining company.

Therefore, management of noise emissions should be considered when deliveries occur to WK13 and WK14. Section 4 provides further discussion on reasonable and feasible noise management measures to be considered and implemented consistent with Chapter 7 of the INP.

Furthermore, construction activities relating to the project will be undertaken over a short duration and only during construction hours, with most activities taking approximately two weeks at any one location. Additionally, where practicable, plant and equipment will be strategically placed on site to provide shielding to receptors; an indicative scenario incorporating attenuation due to shielding has been provided in Table 3.3. Affected receptors will be consulted with about proposed construction activities and provided with a 24 hour contact phone number.

Table 3.3 Construction emissions summary, Task A - Site preparation activities

Receptor	ICNG $L_{eq(15-min)}$ criteria, dB(A)	Predicted received $L_{eq(15-min)}$ noise level, dB(A) – without mitigation	Exceedance above criteria, dB(A)	Predicted received $L_{eq(15-min)}$ noise level, dB(A) – with shielding	Exceedance above criteria, dB(A)
R1 – WK11	40	35	nil	<30	nil
R1 – WK12	40	32	nil	<30	nil
R1 – WK13	40	<30	nil	<30	nil
R1 – WK14	40	<30	nil	<30	nil
R2 – WK11	40	37	nil	<30	nil
R2 – WK12	40	32	nil	<30	nil
R2 – WK13	40	37	nil	<30	nil
R2 – WK14	40	31	nil	<30	nil
R3 – WK11	40	38	nil	<30	nil
R3 – WK12	40	<30	nil	<30	nil
R3 – WK13	40	43	3	33	nil
R3 – WK14	40	30	nil	<30	nil
R4 ¹ – WK11	40	<30	nil	<30	nil
R4 ¹ – WK12	40	<30	nil	<30	nil
R4 ¹ – WK13	40	37	nil	<30	nil
R4 ¹ – WK14	40	31	nil	<30	nil
R5 ¹ – WK11	40	35	nil	<30	nil
R5 ¹ – WK12	40	37	nil	<30	nil
R5 ¹ – WK13	40	37	nil	<30	nil
R5 ¹ – WK14	40	46	6	36	nil
R6 – WK11	40	<30	nil	<30	nil
R6 – WK12	40	33	nil	<30	nil
R6 – WK13	40	<30	nil	<30	nil
R6 – WK14	40	<30	nil	<30	nil

Table 3.3 Construction emissions summary, Task A - Site preparation activities

Receptor	ICNG $L_{eq(15-min)}$ criteria, dB(A)	Predicted received $L_{eq(15-min)}$ noise level, dB(A) – without mitigation	Exceedance above criteria, dB(A)	Predicted received $L_{eq(15-min)}$ noise level, dB(A) – with shielding	Exceedance above criteria, dB(A)
R7 – WK11	40	<30	nil	<30	nil
R7 – WK12	40	<30	nil	<30	nil
R7 – WK13	40	<30	nil	<30	nil
R7 – WK14	40	<30	nil	<30	nil
R8 – WK11	40	<30	nil	<30	nil
R8 – WK12	40	<30	nil	<30	nil
R8 – WK13	40	<30	nil	<30	nil
R8 – WK14	40	<30	nil	<30	nil
R9 – WK11	40	<30	nil	<30	nil
R9 – WK11	40	<30	nil	<30	nil
R9 – WK12	40	<30	nil	<30	nil
R9 – WK13	40	<30	nil	<30	nil
R10 – WK14	40	<30	nil	<30	nil
R10 – WK11	40	<30	nil	<30	nil
R10 – WK12	40	<30	nil	<30	nil
R10 – WK13	40	<30	nil	<30	nil

Note: 1. These properties are owned by a neighbouring mining company.

3.2.2 Task B1 - Water transfer pipeline and gathering line

Table 3.4 presents the predicted noise levels associated with Task B1 activities at adjacent receptors. Exceedances of ICNG criteria are anticipated at several assessment locations. However, predicted to remain below the highly noise affected criteria.

Noise levels resulting from the pipeline installation were modelled (unmitigated and mitigated) at the residential assessment locations. The results show that predicted daytime trenching noise would not meet criteria at all assessment locations as works pass the near point of residences. However, predicted noise levels are below the OEH highly affected level of 75 dB(A). It is anticipated that the 40 dB(A) $L_{eq(15-min)}$ criteria would be met at a distance of 900m from trenching works. Therefore, given the anticipated trenching duration of 14 days, each receiver would be exposed to noise above the criteria for approximately four days in total.

Notwithstanding, the noise levels presented in Table 3.4 are maximum levels (at constructions closest point to each receiver) and it is anticipated that each receiver would experience levels of this amplitude for no more than one day throughout the period of the work. Section 4 provides further discussion on reasonable and feasible noise management measures to be considered and implemented consistent with Chapter 7 of the INP. Trenching would be undertaken during the daytime shift only.

Table 3.4 Construction emissions summary, Task B1 – Water transfer pipeline and gathering line

Receptor	ICNG $L_{eq(15-min)}$ criteria, dB(A)	Predicted received $L_{eq(15-min)}$ noise level, dB(A) – without mitigation	Exceedance above criteria, dB(A)	Predicted received $L_{eq(15-min)}$ noise level, dB(A) – with shielding	Exceedance above criteria, dB(A)
R1	40	48	8	38	nil
R2	40	49	9	38	nil
R3	40	52	12	42	2
R4 ¹	40	71	31	61	21
R5 ¹	40	52	12	42	2
R6	40	45	5	40	nil
R7	40	52	12	42	2
R8	40	59	19	49	9
R9	40	58	18	48	8
R10	40	58	18	48	8

Note: 1. These properties are owned by a neighbouring mining company.

3.2.3 Task B2 - Under-boring (HDD)

Under-boring will utilise the HDD method for crossing the Avon River, Waukivory Creek and Fairbairns Road.

Table 3.5 presents the predicted noise levels associated with these activities at adjacent receptors. Exceedances of ICNG criteria are anticipated at several assessment locations. However, predicted to remain below the highly noise affected criteria.

Notwithstanding, where feasible and consistent with Chapter 7 of the INP, attenuation associated with localised barriers or screens adjacent to the HDD would significantly reduce noise emissions from this activity. Furthermore, construction activities relating to the project will be undertaken over a short duration and only during construction hours, with most activities taking approximately two weeks at any one location. Additionally, where practicable, plant and equipment will be strategically placed on site to provide shielding to receptors; an indicative scenario incorporating attenuation due to shielding has been provided in Table 3.5. Affected receptors will be consulted with about proposed construction activities and provided with a 24 hour contact phone number.

Section 4 provides further discussion on reasonable and feasible noise management measures to be considered and implemented.

Table 3.5 Construction emissions summary, Task B2 – Under-bore (HDD)

	Receiver										$L_{eq(15-min)}$ criteria
	R1	R2	R3	R4 ¹	R5 ¹	R6	R7	R8	R9	R10	
Under-bore activities (unmitigated)											
Avon River	40	40	41	37	47	37	32	<30	<30	<30	40
Waukivory River	36	41	42	45	51	32	37	33	<30	<30	40
Fairbairns Road	<30	37	34	55	41	<30	56	46	34	32	40
Under-bore activities (shielding)											
Avon River	30	30	31	<30	37	<30	<30	<30	<30	<30	40
Waukivory River	<30	31	32	35	41	<30	<30	<30	<30	<30	40
Fairbairns Road	<30	<30	<30	45	31	<30	46	36	<30	<30	40

Note: 1. These properties are owned by a neighbouring mining company.

3.2.4 Task C – Hydraulic fracture stimulation

Table 3.6 presents the predicted noise levels associated with hydraulic fracture stimulation. Given the location of the activities, six assessment locations were considered. Exceedances of ICNG criteria are anticipated at some receptors. However, are predicted to remain below the highly noise affected criteria.

Results also include indicative noise attenuation associated with localised barriers or screens adjacent to reticulation pumps and the mountain mover. Section 4 provides further discussion on reasonable and feasible noise management measures to be considered and implemented consistent with Chapter 7 of the INP. Barriers are recommended where feasible, to reduce noise emissions to adjoining assessment locations and could be in the form of large plant, shipping containers or purpose-build mobile screens.

Table 3.6 Construction emissions summary, Task C - Hydraulic fracture stimulation

	Receiver						$L_{eq(15-min)}$ criteria
	R1	R2	R3	R4 ¹	R5 ¹	R6	Day
Fracture stimulation activities (unmitigated)							
WK11	62	62	62	58	58	52	40
WK12	60	57	57	56	61	63	40
WK13	58	60	69	66	62	54	40
WK14	56	56	59	60	68	57	40
Fracture stimulation activities (mitigated)							
WK11	52	52	52	48	48	42	40
WK12	50	47	47	46	51	53	40
WK13	48	50	59	56	52	44	40
WK14	46	46	49	50	58	47	40

Note: 1. These properties are owned by a neighbouring mining company.

3.2.5 Task D – Well work-over

Well work-over activities will involve the use of a work-over rig required to run or remove a pipe for clearing the hole of fill, obstructions, pumps or other issues. Table 3.7 presents the predicted noise levels associated with Task D. Exceedances of highly noise affected criteria (refer to Table 2.1) are not anticipated for this activity.

Furthermore, construction activities relating to the project will be undertaken over a short duration and only during construction hours, with most activities taking approximately two weeks at any one location. Additionally, where practicable, plant and equipment will be strategically placed on site to provide shielding to receptors, an indicative scenario incorporating attenuation due to shielding has been provided in Table 3.7. Affected receptors will be consulted with about proposed construction activities and provided with a 24 hour contact phone number. Section 4 provides further discussion on reasonable and feasible noise management measures to be considered and implemented consistent with Chapter 7 of the INP.

Table 3.7 Construction emissions summary, Task D – Well work-over

Receptor	ICNG $L_{eq(15-min)}$ criteria, dB(A)	Predicted received $L_{eq(15-min)}$ noise level, dB(A) – without mitigation	Exceedance above criteria, dB(A)	Predicted received $L_{eq(15-min)}$ noise level, dB(A) – with shielding	Exceedance above criteria, dB(A)
R1 – WK11	40	39	nil	<30	nil
R1 – WK12	40	36	nil	<30	nil
R1 – WK13	40	33	nil	<30	nil
R1 – WK14	40	32	nil	<30	nil
R2 – WK11	40	41	1	31	nil
R2 – WK12	40	36	nil	<30	nil
R2 – WK13	40	41	1	31	nil
R2 – WK14	40	35	nil	<30	nil
R3 – WK11	40	42	2	32	nil
R3 – WK12	40	32	nil	<30	nil
R3 – WK13	40	47	7	37	nil
R3 – WK14	40	34	nil	<30	nil
R4 – WK11	40	33	nil	<30	nil
R4 – WK12	40	<30	nil	<30	nil
R4 – WK13	40	41	1	31	nil
R4 – WK14	40	35	nil	<30	nil
R5 – WK11	40	39	nil	<30	nil
R5 – WK12	40	41	1	31	nil
R5 – WK13	40	41	1	31	nil
R5 – WK14	40	50	10	40	nil

Table 3.7 Construction emissions summary, Task D – Well work-over

Receptor	ICNG $L_{eq(15-min)}$ criteria, dB(A)	Predicted received $L_{eq(15-min)}$ noise level, dB(A) – without mitigation	Exceedance above criteria, dB(A)	Predicted received $L_{eq(15-min)}$ noise level, dB(A) – with shielding	Exceedance above criteria, dB(A)
R6 – WK11	40	32	nil	<30	nil
R6 – WK12	40	37	nil	<30	nil
R6 – WK13	40	<30	nil	<30	nil
R6 – WK14	40	30	nil	<30	nil
R7 – WK11	40	<30	nil	<30	nil
R7 – WK12	40	<30	nil	<30	nil
R7 – WK13	40	33	nil	<30	nil
R7 – WK14	40	<30	nil	<30	nil
R8 – WK11	40	<30	nil	<30	nil
R8 – WK12	40	<30	nil	<30	nil
R8 – WK13	40	30	nil	<30	nil
R8 – WK14	40	<30	nil	<30	nil
R9 – WK11	40	<30	nil	<30	nil
R9 – WK11	40	<30	nil	<30	nil
R9 – WK12	40	<30	nil	<30	nil
R9 – WK13	40	<30	nil	<30	nil
R10 – WK14	40	<30	nil	<30	nil
R10 – WK11	40	<30	nil	<30	nil
R10 – WK12	40	<30	nil	<30	nil
R10 – WK13	40	<30	nil	<30	nil

4 Noise management strategy

4.1 Overall approach

The primary objective of the noise management strategy is to minimise noise impacts on the surrounding community in accordance with Chapter 7 of the INP. The Project Manager may adopt the following hierarchical strategy to achieve this objective:

- ensure that construction activities meet construction noise goals within the allowable hours of operation as far as practicable;
- where noise levels are above relevant goals, implement reasonable and feasible controls to minimise noise emissions and/or exposure duration at affected receivers; and
- where the use of best practice noise controls do not adequately address exceedance of noise goals, adopt alternative measures to minimise impacts on the community.

4.2 Construction noise management and mitigation

Australian Standard AS 2436-2010 '*Guide to Noise Control on Construction, Maintenance and Demolition Sites*' sets out numerous practical recommendations to assist in mitigating construction noise emissions. Recommendations provided in this standard include operational strategies, source noise control strategies, noise barrier controls, and community consultation.

It is estimated that adopting strategies contained in this standard may result in the following noise attenuation:

- up to 10 dB(A) where space requirements place limitations on the attenuation options available; and
- up to 20 dB(A) in situations where noise source noise mitigation measures (silencers, mufflers, etc.) can be combined with noise barriers and other management techniques.

Further descriptions of management measures and mitigation options are provided for specific construction activities and work areas in the following sections. General noise mitigation and management measures are included in Table 4.1.

4.2.1 Standard construction activities

During construction activities, the following noise management and mitigation strategies should be adopted where feasible:

- plant, where possible, to be strategically positioned to provide shielding where noise generation at a site is predicted to be above criteria at surrounding receptors;
- limitation of use of acoustically significant plant (reticulation pumps) to minimise exposure to nearby residences (where possible);
- undertake regular maintenance of machinery to minimise noise emissions. Maintenance will be confined to standard daytime construction hours and where possible, away from noise sensitive receivers; and

- hydraulic fracture stimulation to use localised screens to block line of site from construction plant to adjacent receivers, screens may include other not operational plant, shipping containers, site sheds etc.

4.2.2 Trucking operations

Mitigation strategies to manage noise from on site truck operations include:

- trucks will be well-maintained; and
- trucks will adhere to the designated speed limits in and around local streets.

4.2.3 Community awareness

Special consideration is required for the residences where construction works are expected to generate noise level exceedances. In addition to the above management and mitigation options, the following strategies will be considered:

- consultation with residences immediately adjacent to proposed works will include letter box drops and verbal communication prior to works;
- noise monitoring during activities predicted to generate maximum impacts; and
- all contractors and staff will undergo noise awareness training.

4.3 Complaint response

AGL will maintain a 24 hour community complaints line 1300 886 170 for the Waukivory pilot that will be available throughout the construction activities. Records of all community complaints will be maintained on an up-to-date complaints register. The records will include:

- date and time of the complaint;
- the means by which the complaint was made (telephone, mail or email);
- any personal details of the complainant that were provided, or if no details are provided, a note to that effect;
- the nature of the complaint;
- any actions taken by AGL/construction contractor in relation to the complaint, including any follow up contact with the complainant and the timing for implementing action; and
- if no action was taken by AGL/construction contractor in relation to the complaint, the reason why no action was taken.

Community complaints will be allocated to a responsible AGL person immediately to facilitate the implementation of corrective actions. The details of the complaint will also be circulated to the applicable construction personnel for action, where required.

4.4 Construction noise management and mitigation

Several mitigation measures have been considered for the assessment of the project and are summarised below in Table 4.1.

Table 4.1 Noise management and mitigation measures

Management measures	Responsibility	Timing
Community and stakeholder liaison		
Communities and stakeholders who are likely to be directly impacted by construction will be provided with detailed information on the nature and timing of the proposed works.	Project Manager	At least 1 week prior to construction
Noise complaints will be received, recorded and investigated in accordance with the CEMP. Complaints will be responded to within timeframes specified within the CEMP.	Contractor/Subcontractor	At all times
Where appropriate, negotiated agreements will be entered into with receivers when exceedances of noise criteria are predicted, and after all reasonable and feasible noise mitigation measures have been considered and implemented. Negotiated noise agreements will be implemented in accordance with the ICNG and INP.	Project Manager	Pre-construction
Construction activities		
Where possible, machinery will be located / orientated to direct noise away from any sensitive receivers.	Contractor / Subcontractor	As required
Limitation of use of acoustically significant plant (reticulation pumps) to minimise exposure to nearby residences.	Contractor / Subcontractor	Where possible
Where practicable, plant and equipment will be strategically placed on site to provide shielding to receptors	Contractor / Subcontractor	At all times/ Where possible
Undertake regular maintenance of machinery to minimise noise emissions. Maintenance will be confined to standard daytime construction hours and where possible, away from noise sensitive receivers.	Contractor / Subcontractor	At all times/ Where possible
Trucking operations		
Trucks will have well-maintained mufflers.	Contractor / Subcontractor	At all times
Trucks will adhere to the designated speed limits in and around site.	Contractor / Subcontractor	At all times
Impacts on community		
Consultation with residences immediately adjacent to proposed works will include letter box drops and verbal communication at least 1 week prior to works.	Contractor	1 week prior to works
Consultation with the community will be ongoing and a 24hr community hotline established.	Contractor	As required / Ongoing
Monitoring and reporting		
Noise monitoring during activities predicted to generate greatest impacts.	Acoustic Specialist or Suitably Qualified and trained Environment Officer	As required / Ongoing
Training		
All contractors and staff will undergo noise awareness training as part of the Project induction.	Project Manager / Foremen	Pre-Construction

5 Noise performance

To ensure that management strategies provided to minimise noise emissions are carried out, a noise monitoring program has been developed to guide, manage, quantify and control emissions from construction activities. Where noise monitoring indicates exceedances, additional mitigation measures and controls may be considered to minimise impacts to nearby sensitive receptors.

5.1 Complaint response

Where complaints from receptors are received, noise monitoring should be conducted to quantify construction noise levels and to verify the noise contribution within the community.

The objectives of the noise monitoring program are as follows:

- assess construction noise levels against derived construction noise criteria presented in Section 2 of this report, with consideration given to non-site related ambient and background noise at the time of measurements;
- identify potential noise sources and their relative contribution to noise impacts from construction; and
- incorporate noise management and mitigation strategies outlined in this plan.

5.1.1 General noise measurement procedures

The noise measurement procedures adopted for the Project shall be in accordance with AS 1055-1997 '*Acoustics - Description and Measurement of Environmental Noise*' and be guided by the ICNG.

i Monitoring equipment

All acoustic instrumentation used in the monitoring of construction should comply with the requirements of IEC 61672.1-2004 and carries current NATA or manufacturer calibration certificates. All instrumentation shall be programmed to record statistical noise level indices in 15 minute or lower intervals which may include the L_{Amax} , $LA1$, $LA10$, $LA90$, L_{Amin} and the L_{Aeq} .

The statistical noise exceedance levels (L_{An}) are the levels exceeded for n% of the 15 minute or other interval. The $LA90$ represents the level exceeded for 90% of the interval period and is referred to as the average minimum or background noise level. The $LA10$ is the level exceeded for 10% of the time and is usually referred to as the average maximum noise level. The L_{Aeq} is the equivalent continuous sound pressure level and represents the steady sound level which is equal in energy to the fluctuating level over the interval period. The L_{Amax} is the maximum noise level recorded over the interval.

Instrument calibration shall be checked before and after each measurement survey, ensuring a valid variation in calibrated levels not exceeding ± 0.5 dBA.

5.1.2 Noise monitoring

Noise monitoring will be undertaken by a suitably qualified acoustic specialist or suitably qualified and trained environment officer.

Noise monitoring will be carried out in response to construction noise related complaints and during each component of construction activity.

Where ambient noise is a significant feature of the noise environment at the monitoring location, and the relative construction noise contribution cannot be quantified, interim monitoring locations may be selected so that the construction noise is clearly audible above the background noise level. Using this methodology, $L_{Aeq,15min}$ noise levels can be estimated back to the receiver using distance attenuation calculations, and compared with construction criteria.

i Operator attended noise surveys

One operator attended noise monitoring event will be conducted at a representative location(s) for each of the activities outlined in Table 3.1. Operator attended noise monitoring will also be conducted in response to a construction noise complaint (see Chapter 4.3). Monitoring would be undertaken at representative locations relating to the complaint.

Attended noise measurements will quantify noise emissions and estimate the $L_{Aeq,15min}$ noise contribution from construction activities with respect to the overall level of ambient noise. Importantly, the background and ambient noise levels at that time and in the absence of site contribution must also be quantified. These measurements will be conducted by suitably qualified acoustic specialist.

The operator shall quantify and characterise the maximum (L_{Amax}) and equivalent (L_{Aeq}) noise levels from both extraneous (non-site) and construction noise sources over a period of 15 minutes for representative potentially affected receivers.

A site layout, summarising the locations of construction equipment, is to be included in noise monitoring reports.

5.2 Training

All personnel involved in monitoring noise levels will be adequately trained and up to date with relevant measurement standards, methodologies and product technology with respect to noise measurements.

6 Conclusion

This CNMP has been prepared in accordance with the requirements of EPL 20358 for the project situated within the Gloucester LGA, NSW.

The results of the CNMP indicate that noise emissions from project have potential to generate noise levels above relevant ICNG noise criteria, however would remain below the highly affected criteria of 75 dB(A) $L_{eq(15-min)}$. The noise management recommendations provided in this CNMP will be adopted where feasible to minimise the noise impacts on the surrounding community.

Appendix A

Glossary of acoustic terms

Table A1 **Glossary of acoustic terms**

Term	Description
	The assessment background level (ABL) is defined in the INP as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L_{90} statistical noise levels.
dB(A)	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
ICNG	Interim Construction Noise Guideline
INP	Industrial Noise Policy
L_1	The noise level exceeded for 1% of the time.
L_{10}	The noise level which is exceeded 10% of the time. It is roughly equivalent to the average of maximum noise level.
L_{90}	The noise level that is exceeded 90% of the time. Commonly referred to as the background noise level.
L_{eq}	The energy average noise from a source. This is the equivalent continuous sound pressure level over a given period. The $L_{eq(15min)}$ descriptor refers to an L_{eq} noise level measured over a 15-minute period.
L_{max}	The maximum root mean squared sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single value background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (L_w)	A measure of the total power radiated by a source. The sound power of a source is a fundamental property of the source and is independent of the surrounding environment.

It is useful also to have some appreciation of the scale of decibels, the unit of noise measurement. The following gives some practical indication as to what an average person perceives about changes in noise levels:

- differences of less than approximately 2dB are imperceptible in general, ie, most people would find it difficult to discern which is the louder of two noise sources having levels within 2dB of each other; and
- a difference in noise levels of around 10dB appears as either doubling or halving of loudness.



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