14. Noise and vibration

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14.1 Introduction

14.1.1 Overview

This chapter presents the noise and vibration assessment undertaken for the Lower Fitzroy River Infrastructure Project (Project). The noise and vibration impacts from the Project are assessed and methods by which these impacts can be reduced are identified. The assessment addresses Part B, Sections 5.128 – 5.132 of the terms of reference (ToR) for the environmental impact statement. A table cross-referencing the ToR requirements is provided in Appendix B. Appropriate management measures relating to noise and vibration are used to inform the environmental management plan (EMP) contained in Chapter 23.

14.1.2 Approach and methodology

The methodology for the assessment of noise and vibration comprised:

- Desktop review (including aerial photography) to identify key environmental noise exposure areas and noise sensitive receptors. Sensitive receptors have been considered with regard to the weir sites and associated works areas such as access roads and river crossings.
- Undertaking a semi-quantitative assessment based on noise emissions of typical construction equipment to be used at the Eden Bann Weir and Rookwood Weir sites, including new access roads where applicable, as follows:

  Construction noise impacts associated with the Project were conservatively estimated using a distance attenuation relationship as described in Australian Standard (AS) 2436 – 2010 Guide to Noise Control on Construction, Maintenance and Demolition Sites

  Typical noise levels produced by construction plant anticipated to be used on site were sourced from AS 2436 – 2010 Guide to Noise Control on Construction, Maintenance and Demolition Sites, British Standard 5228-1:2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise and from GHD's internal database. Propagation calculations take into account sound intensity losses due to hemispherical spreading, with additional minor losses such as atmospheric absorption, directivity and ground absorption ignored in the calculations. As a result, predicted received noise levels are expected to overstate actual received levels and thus provide a measure of conservatism.

  Airblast overpressure and ground vibration were estimated in accordance with AS 2187.2 – 2006 Explosives – Storage and use Part 2: Use of explosives.

- Based on the findings of the assessment, outline in-principle construction noise management measures in order to mitigate potential noise impacts.

Given the remote and rural location of the sites and dominant land use practices being agriculturally based, specifically cattle grazing, it is expected that background noise and vibration levels during both daytime and night-time periods will be low. As such noise and/or vibration monitoring was not conducted and instead a review of background noise monitoring results in similar locations has been undertaken to determine likely existing ambient noise levels.

Potential noise and blasting impacts associated with extraction of materials from borrow and/or quarry areas are not included and they will be subject to separate environmental assessment and

approval permitting. Assessment of these sites, once their location is confirmed, will be undertaken in preparation for the approvals required for these extraction facilities.

14.1.3 Regulatory framework

14.1.3.1 Overview

The noise and vibration assessment has been informed by the following legislation, policies and/or guidelines:

- *Environmental Protection Act 1994* (Qld) (EP Act)
- Environmental Protection (Noise) Policy 2008 (EPP Noise)
- Noise Measurement Manual (EHP 2013)
- Planning for noise control guideline (EHP 2004)
- Assessment of low frequency noise guideline (DERM) 2006)
- Noise and vibration from blasting guideline (EPA 2006).

In addition, the following noise and vibration standards are applicable to the Project:

- AS 2436 – 2010 Guide to Noise Control on Construction, Maintenance and Demolition Sites
- AS 1055 – 1997 Acoustics – Description and Measurement of Environmental Noise
- AS 1055.3 – 1997: Description and measurement of environmental noise Part 3: Acquisition of data pertinent to land use
- AS 2187.2 – 2006 Explosives – Storage and use Part 2: Use of explosives.
- British Standard (BS) 5228.2 – 2009, Code of Practice Part 2 Vibration for noise and vibration on construction and open sites – Part 2: Vibration

14.1.3.2 Environmental Protection Act 1994

The EP Act provides for the protection of environmental values, including environmental values relating to maintenance of public amenity. The EP Act establishes a number of environmental protection policies. In relation to noise, the EP Act is supported by the EPP Noise. The EPP Noise (Section 7) outlines the key environmental values for the acoustic environment as follows:

The environmental values to be enhanced or protected under this policy are -

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

b) The qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to do any of the following –

(i) Sleep

(ii) Study or learn

(iii) Be involved in recreation, including relaxation and conversation, and

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

To further assist in determining noise levels consistent with the identified environmental values, the EPP Noise sets out acoustic quality objectives as shown in Table 14-1. The EPP Noise does not set limits on construction noise, however noise limits may be attached to approvals for environmentally relevant activities under the EP Act (Chapter 3 Legislation and approvals).

Table 14-1 Acoustic quality objectives for dwellings

Sensitive receptor	Time of day*	Acoustic quality objectives (measured at receptor) dB(A)			Environmental value
		$L_{Aeq,adj,1hr}$	$L_{A10,adj,1hr}$	$L_{A1,adj,1hr}$	
Dwelling (for outdoors)	Daytime and evening	50	55	65	Health and wellbeing
Dwelling (for indoors)	Daytime and evening	35	40	45	Health and wellbeing
	Night-time	30	35	40	Health and wellbeing, in relation to the ability to sleep

* The EPP Noise defines: daytime as the period after 7 am on a day to 6 pm on the day; evening as the period after 6 pm on a day to 10 pm on the day; and night-time as the period after 10 pm on a day to 7 am on the next day.

For construction work occurring during normal daytime hours, provided all mechanical powered plant is fitted with appropriate mufflers, specific noise limits are not prescribed by the Department of Environment and Heritage Protection. It is generally accepted that construction activities should be undertaken in accordance with general building work hours as described in the EP Act under section 440R Building Work, specifically, no audible noise is permitted:

- Between 6.30 pm and 6.30 am – Monday to Saturday
- At any time on Sundays and public holidays.

Construction activity during these hours is not preferred but can usually occur provided construction noise is not audible or intrusive inside a dwelling. The time restrictions are designed to strike a balance between protecting noise amenity and the need to start construction activities early in the morning. Noise impacts during construction are therefore usually minimised by limiting the hours of operation and, in particular circumstances, scheduling the noisiest activities to occur at times when they would generate least disruption. As described in Chapter 2 Project description, normal daytime work hours for the Project's construction activities are between 6.30 am and 6.30 pm. Limited evening and night-time works are proposed (Section 14.3.1.5).

The Noise Measurement Manual (EHP 2013) provides direction to 'authorised persons', as defined in the EP Act, on how to measure environmental noise to a standard suitable for determining compliance with the EP Act, subordinate legislation and legal instruments issued under the authority of the legislation. It also aims to inform people other than 'authorised persons' on the measurement of environmental noise.

14.1.3.3 Planning for noise control guideline

The Planning for Noise Control guideline (EPA 2004) provides guidance on the assessment of operational noise impacts associated with industrial, commercial and mining operations and is intended for planning purposes. The guideline includes noise criteria designed to protect sensitive receptors from noise significantly louder than the background level, and to limit the total noise level from all sources near a receptor, hence protecting the amenity.

In line with this guideline, noise from continuous sources should be limited to 3 dB(A) above the rating background noise level determined for day, evening and night. Background noise levels relevant to each receptor are estimated in Section 0. The combined noise level, including ambient noise, should also not exceed the recommended ambient noise level under the guideline (Table 14-2).

Table 14-2 Recommended outdoor background noise planning levels

Receptor land use	Dominant land use* (description of neighbourhood)	Background noise level, min$L_{A90,\ 1hour}$ (dBA)		
		Day	Evening	Night
Purely residential	Very rural	35	30	25
	Rural residential, church, hospital	40	35	30

*The dominant land use is defined by a radius of 200 m from the receiver location under consideration

14.1.3.4 Assessment of low frequency noise guideline

The Assessment of Low Frequency Noise guideline (DERM 2006) addresses noise sources with inherent dominant infrasound or (very) low frequency noise characteristics (less than 200 Hz) emitted from industrial premises, commercial premises and mining operations (but excludes blasting). Items such as boilers, pumps, transformers, cooling fans, compressors, oil and gas burners, foundries, washing machines, electrical installations, diesel engines, asynchronous motors, ventilation and air-conditioning equipment, wind turbulence and large chimney resonances are sources of high level, low frequency noise having frequency content less than 200 Hz (Roberts 2004). This guideline is intended for planning purposes and the evaluation of existing problems relating to low frequency noise sources. The intent of the established criteria is to accurately assess annoyance and discomfort to persons at noise sensitive premises caused by low frequency noise with a frequency range from 10 Hz to 200 Hz (Roberts 2004).

14.1.3.5 Noise and vibration from blasting guideline

The Noise and Vibration from Blasting guideline (EPA 2006) sets out the following noise and vibration targets for blasting activities:

- Blasting activities must be carried out in such a manner that if blasting should propagate to a noise sensitive place:
  - The airblast overpressure must be not more than 115 dB (linear) peak[1] for nine out of any 10 consecutive blasts initiated, regardless of the interval between blasts
  - The airblast overpressure must not exceed 120 dB (linear) peak for any blast.
- Blasting operations must be carried out in such a manner that if ground vibration should propagate to a vibration sensitive place:
  - The ground-borne vibration must not exceed a peak particle velocity (PPV) of 5 mm/s for nine out of 10 consecutive blasts initiated, regardless of the interval between blasts
  - The ground-borne vibration must not exceed a PPV of 10 mm/s peak for any blast

[1] dB (linear) peak is the maximum reading in dB obtained using the "P" time weighting characteristic as specified in AS 1259.1-1990 with all frequency weighted networks inoperative.

– dB (linear) peak is the maximum reading in dB obtained using the "P" time – weighting characteristic as specified in AS 1259.1 – 1990 with all frequency weighted networks inoperative.

Further, the guideline recommends that blasting should generally only be permitted during the hours of 9:00 am to 3:00 pm, Monday to Friday, and from 9:00 am to 1:00 pm on Saturdays. Blasting should not generally take place on Sundays or public holidays.

14.1.3.6 Construction vibration

Typically, construction activities generate ground vibration of an intermittent nature. The degrees of perception for humans are suggested by the vibration level categories given in BS 5228.2 – 2009 as shown below in Table 14-3. Currently, there is no Australian Standard that sets criteria for the assessment of building damage caused by vibration.

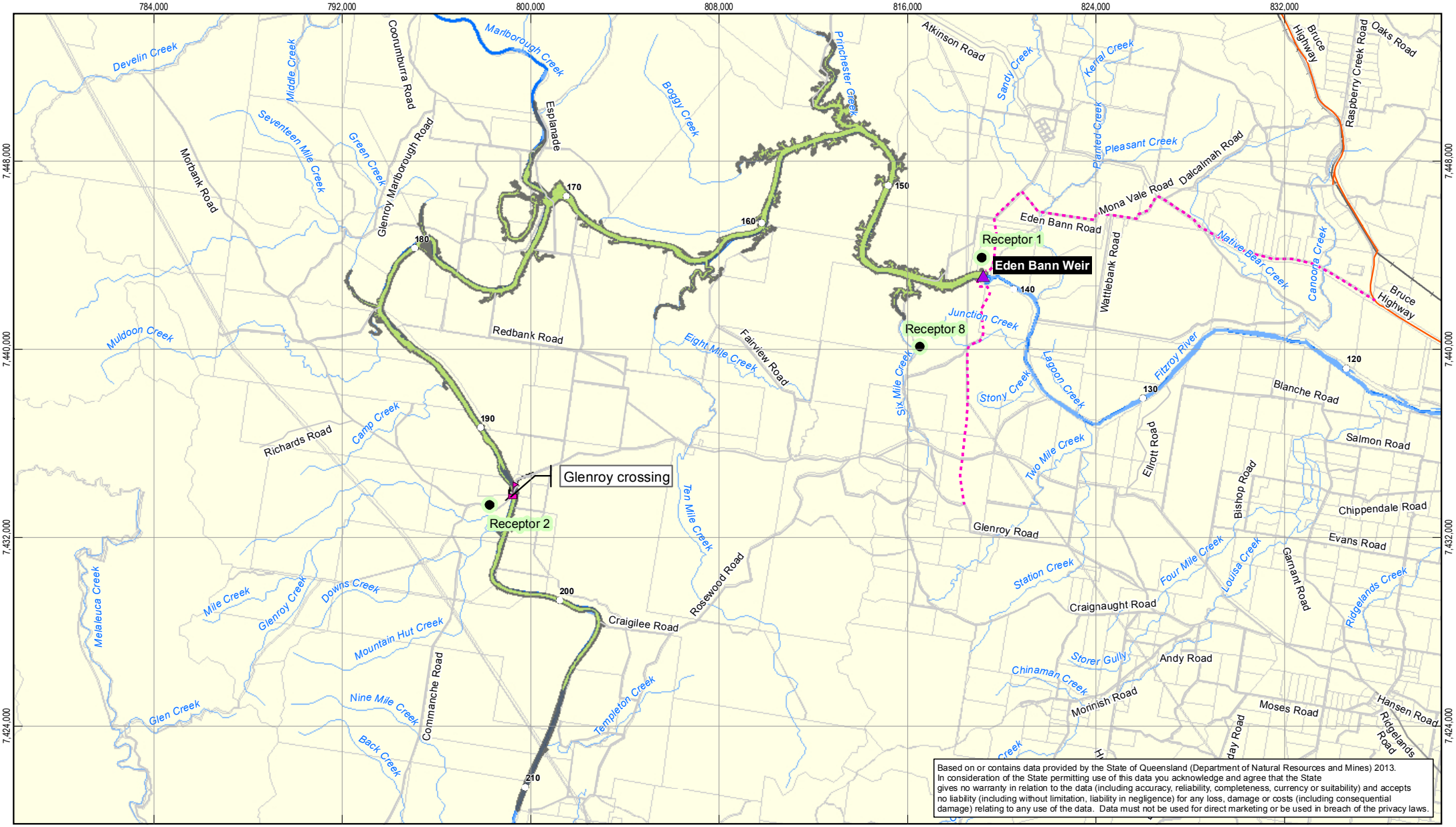
Table 14-3 Guidance on effects of vibration levels for human comfort (BS 5228.2 – 2009)

Vibration level	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction.
0.3 mm/s	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely that vibration at this level in residential environments will cause complaints, but can be tolerated if prior warning and explanation has been given to residents.
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure.

14.2 Existing environment

14.2.1 Noise and vibration sensitive receptors

The Project area is rural in nature and relatively isolated and, as a result, there are few noise sensitive receptors in proximity to the Project areas. The nearest sensitive receptors to construction activities are shown on Figure 14-1 and described in Table 14-4.



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Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA94)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- AMTD (km)
- Weir Location
- Highway
- Major Road
- Waterway
- Property Boundary
- Eden Bann Weir Stage 2 impoundment
- Eden Bann Weir Stage 3 impoundment
- Sensitive Receptor
- River Crossing
- Access Road

Gladstone Area Water Board, SunWater
Lower Fitzroy River Infrastructure Project

Job Number 41-20736
Revision A
Date 20 Dec 2013

Eden Bann Weir - Noise and Vibration Sensitive Receptors

Figure 14-1
Sheet 1 of 2

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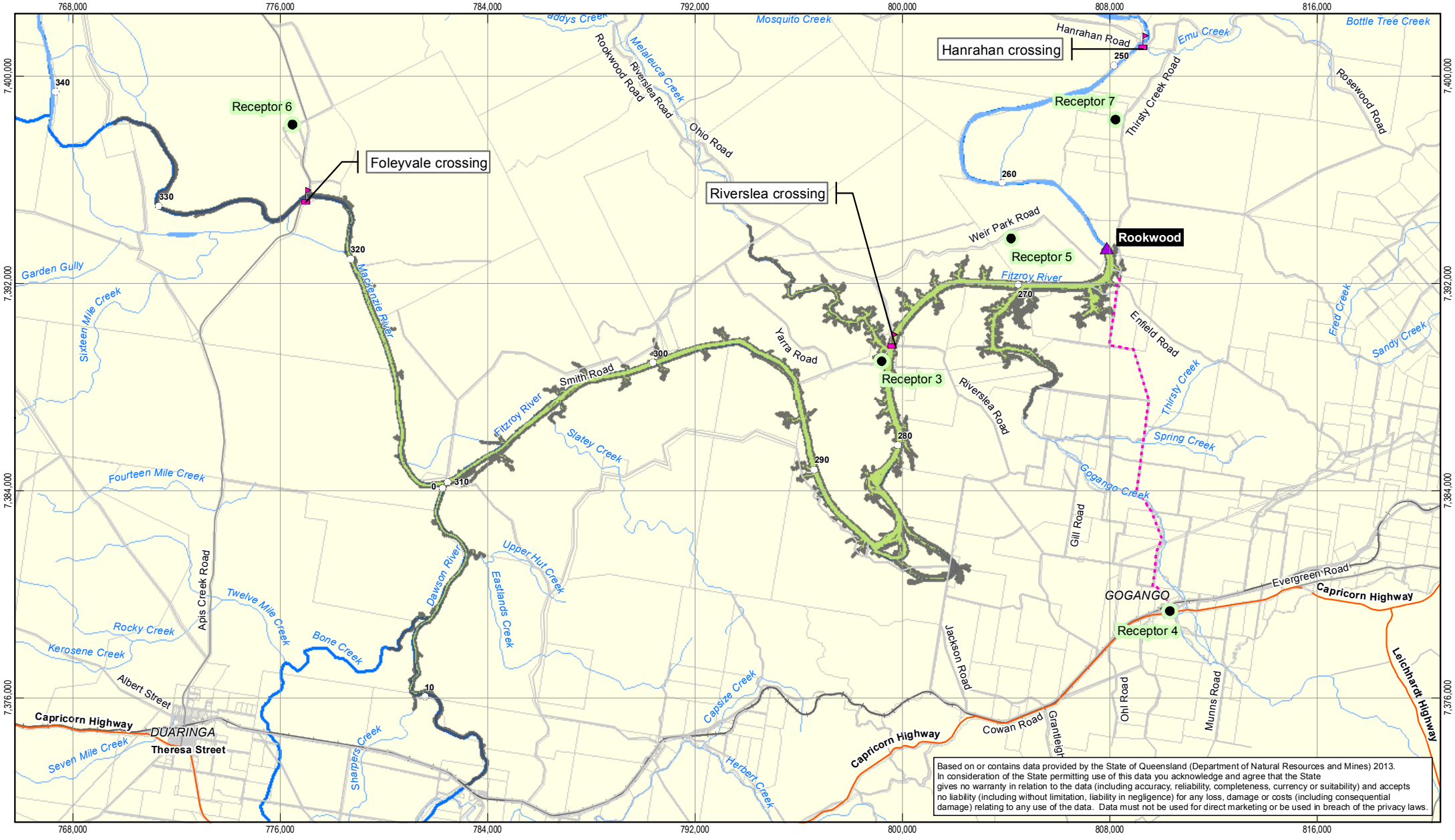
Level 9, 145 Ann Street Brisbane QLD 4000 Australia T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



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Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA94)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- AMTD (km)
- Weir Location
- Highway
- Major Road
- Railway
- Waterway
- Property Boundary
- Rookwood Weir Stage 1 impoundment
- Rookwood Weir Stage 2 impoundment
- Sensitive Receptor
- River Crossing
- Access Road

Gladstone Area Water Board, SunWater
Lower Fitzroy River Infrastructure Project

Job Number 41-20736
Revision A
Date 20 Dec 2013

Rookwood Weir - Noise and Vibration Sensitive Receptors

Figure 14-1 Sheet 2 of 2

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Data Source: © Copyright Commonwealth of Australia (Geoscience Australia): Places, Waterways, Homesteads (2007) © Copyright Commonwealth of Australia; Sunwater: Waterways, Weir Locations - 2008;
DNRM: Railways, Roads, DCDB; GHD: Sensitive Receptors (2013). Created by: MS *See Appendix for disclaimers and copyrights.

Table 14-4 Noise and vibration sensitive receptors

Receptor		Nearest construction area/activity	Distance from construction area/activity
No.	Type		
1	Homestead	Eden Bann Weir and access road	• 750 m from the existing Eden Bann Weir • 450 m from the existing (and proposed construction) left bank access road
2	Homestead	Glenroy Crossing (bridge)	700 m
3	Out buildings	Riverslea Crossing (bridge)	700 m
4	Gogango town	Road and intersection upgrade	<50 m
5	Homestead	Rookwood Weir	3,500 m
6	Homestead	Foleyvale Crossing (bridge)	2,200 m
7	Homestead	Hanrahan Crossing (culverts)	3,100 m
8	Homestead	Eden Bann Weir access road (right bank)	2,000 m

The majority of homesteads that occur along existing access roads to the weir sites and river crossings are set back from the road at distances greater than 200 m. Four homesteads are located adjacent to Riverslea Road which will be used as an access road for the upgrade of Riverslea Crossing.

Construction traffic for the proposed Rookwood Weir will exit the Capricorn Highway at Gogango (Receptor 4). The Gogango community comprises approximately ten residences and a school.

As a result of construction activities and workplace health and safety requirements, the camping and water reserve area immediately upstream of the proposed Rookwood Weir site will not be accessible during the construction period and is therefore not considered as a sensitive receptor during the construction stage. Temporary closure requirements, approvals and permits will be discussed and obtained through State Land Asset Management prior to construction.

No onsite accommodation (for example, temporary worker's camp) is proposed at either Eden Bann Weir or Rookwood Weir during construction. However, the effect of noise on the onsite construction workforce needs to be considered.

14.2.2 Typical background noise and vibration levels

Due to the generally rural nature of the receiving environment and the separation distance to receptors, no background noise and vibration monitoring was undertaken. It is expected that the existing environment will be typical of a rural area with low background noise levels and no perceivable ground vibration levels.

Indicatively, Table 14-5 presents typical background noise levels extracted from AS 1055.3 – 1997. These are representative of background levels in rural areas and are considered applicable to the Project areas.

Table 14-5 Estimated background noise levels

Noise area category	Description of neighbourhood	Average background A-weighted sound pressure level, $L_{A90,T}$					
		Monday to Saturday			Sunday and public holidays		
		7 am- 6 pm	6 pm- 10 pm	10 pm- 7 am	7 am- 6 pm	6 pm- 10 pm	10 pm- 7 am
R1	Area with negligible transportation (representative of the weir sites)	40	35	30	40	35	30
R2	Area with low density transportation (representative of the access roads and river crossings)	45	40	35	45	40	35
R3	Area with medium density transportation or some commerce of industry (representative of Gogango adjacent to the Capricorn Highway)	50	45	40	50	45	40

Source: AS 1055.3-1997: Description and measurement of environmental noise Part 3 - Acquisition of data pertinent to land use.

14.3 Potential impacts and mitigation measures

14.3.1 Construction phase impacts and mitigation measures

14.3.1.1 Predicted construction noise

Construction works will involve the following noise generating activities and/or use of the following noise generating plant and equipment:

- Excavators
- Trucks
- General earthworks
- Concrete batching plant and aggregate screening plant
- Blasting at Rookwood Weir
- Generators and dewatering pumps
- Pile driving at river crossings
- Truck movements along access roads.

The construction noise impact for the anticipated construction equipment are shown in Table 14-6 for a variety of distances to a typical receptor and is based on no natural landform noise barriers or acoustic shielding in place and with each plant item operating at full power. Other construction noise sources such as concrete batching and screening plants are expected to have noise impacts within the same range as the noise sources presented in Table 14-6.

Table 14-6 Predicted construction plant noise levels

Plant	Estimated sound power level dB(A)*	Estimated sound pressure level dB(A) at distance (m)						
		50	100	200	500	750	850	1000
Crane	105	63	57	51	43	40	38	37
Bulldozer	108	66	60	54	46	43	41	40
Excavator	107	65	59	53	45	42	40	39
Back hoe	104	62	56	50	42	39	37	36
Compactor	113	71	65	59	51	48	46	45
Generator	99	57	51	45	37	34	32	31
Compressor	101	59	53	47	39	36	34	33
Jackhammer	121	79	73	67	59	56	54	53
Water pump	99	57	51	45	37	34	32	31
Concrete pump	108	66	60	54	46	43	41	40
Concrete batching plant	115	73	67	61	53	50	48	47
Paver	108	66	60	54	46	43	41	40
Breaker	118	76	70	64	56	53	51	50
Piling	137	95	89	83	75	72	70	69
Truck	107	65	59	53	45	42	40	39

* Based on the AS 2436 – 2010 Guide to Noise Control on Construction, Maintenance and Demolition Sites

With regards to truck (and vehicle) movements on access roads Class 6, Class 4 and Class 9 Austroad type vehicles are proposed (Chapter 16 Transport), along with buses and 4WD utility vehicles.

The magnitude of off-site noise impact associated with construction would be dependent upon a number of factors:

- The intensity of construction activities
- The location of construction activities on site
- The type of equipment used
- The timing of construction activities
- Intervening terrain
- The prevailing weather conditions.

Plant and equipment would only operate at maximum sound power levels for brief periods whilst the remainder of the time machinery would operate below full power, producing lower sound levels. It is highly unlikely that all construction equipment would operate at maximum sound power levels at any one time and certain types of construction machinery would be present in the construction area for only brief periods.

Therefore, the predicted noise levels in Table 14-6 represent a worst-case scenario and in reality noise levels at these distances from equipment are likely to be much lower.

The predicted construction noise for combined plant operation has been calculated at increasing distances from the Project areas as shown in Table 14-7. Conservatively overall sound power level has been calculated based on all construction activities, excluding piling, occurring at all locations. Concrete batching will only occur at the weir sites. Noise generated by construction plant dissipates over distance. Piling activities are predicted to generate the highest sound pressure levels at distance.

Table 14-7 Predicted construction noise over distance

Activity	Overall sound power level dB(A)	Estimated sound pressure level dB(A) at distance (m)								
		50	100	200	500	750	850	1000	2000	3000
Construction activities	124	82	76	70	62	59	57	56	50	47
Piling	137	95	89	83	75	71	70	69	63	59

14.3.1.2 Impacts at sensitive receptors

Predicted construction noise levels at sensitive receptors are provided in Table 14-8. Based on these conservative predictions, construction works noise levels will be audible at times at sensitive receptors. Noise from piling activities at river crossings will be intermittent and occur over short durations and will be restricted to daytime hours. The Project construction is not expected to generate low frequency noise emissions.

Table 14-8 Predicted construction noise at nearest sensitive receptors

Receptor		Nearest construction area/activity	Distance from construction area/activity (m)	Construction activities (dB(A))	Piling (dB(A))
No.	Type				
1	Homestead	Eden Bann Weir and (left bank) access road	750	59	Not applicable
2	Homestead	Glenroy Crossing	700	59	72
3	Out buildings	Riverslea Crossing	700	59	72
5	Homestead	Rookwood Weir	3500	45	Not applicable
6	Homestead	Foleyvale Crossing	2200	49	62
7	Homestead	Hanrahan Crossing	3100	46	Not applicable
8	Homestead	Eden Bann Weir access road (right bank)	2000	50	Not applicable

Construction traffic will pass through the town of Gogango (Receptor 4) en route to the Rookwood Weir site. Gogango is bounded by the Capricorn Highway immediately to the south and Aurizon's Blackwater rail line to the north. Ambient background noise and vibration levels at Gogango are

influenced by this ongoing existing infrastructure activity. The school at Gogango is located at over 200 m from the access road (and is an equal distance to the Capricorn Highway). Peak construction traffic through Gogango is estimated at approximately 61 vehicles daily (Chapter 16 Transport). It is predicted that noise levels from truck movements will be audible during the daytime intermittently and for short durations (Table 14-7). Night-time haulage of materials and plant will be restricted. Traffic related noise impacts are considered to be localised and of short duration.

14.3.1.3 Impacts to native fauna

Current research indicates that there are no government policies or widely accepted guidelines with regard to noise criteria for animals. The effect of noise on wildlife can be similar to the effects observed in humans. Noise can adversely affect wildlife by interfering with communication, masking the sounds of predators and prey, cause "stress" or avoidance reactions and (in the extreme) result in temporary or permanent hearing damage.

It is likely that animal responses depend on the intensity of the perceived threat rather than the intensity of noise (Barber et al. 2011). Behavioural responses by animals fall into three categories described by Bejder et al. 2009 as follows:

- Habituation is a process involving a reduction in response over time as individuals learn that there are neither adverse nor beneficial consequences
- Sensitisation refers to increased behavioural responsiveness over time when animals learn that repeated or ongoing stimulus has significant consequences for the animal (Richardson et al. 1995)
- Tolerance is the intensity of disturbance that an individual tolerates without responding in a defined way (Nisbet 2000).

Habituation and sensitisation are ongoing behavioural processes while tolerance is a behavioural state (Bejder et al. 2009).

It is unlikely that adverse impacts on native fauna will arise as a result of the Project. Construction noise and vibration impacts will be localised, intermittent and/or of short duration, likely to move within the construction areas and as far as practicable confined to daytime hours. Noise impacts during operation will be limited to maintenance activities and vehicle access and are expected to be negligible.

14.3.1.4 Impacts to livestock

The noise objectives provided are based on human response and annoyance factors and, as such, are not applicable to livestock or other non-human receivers. However, it is recognised that sudden noise has the potential to startle or upset domestic livestock and pets.

It is unlikely that blasting at the Rookwood Weir site would have an adverse effect on livestock in the vicinity of the development given that stock would tend to keep some distance away from construction activities. Regardless, prior to blasting landholders will be notified and provided the opportunity to move cattle away from the area.

14.3.1.5 Night-time works

Construction activities will as far as practicable be restricted to daytime work hours. However, on occasion it may be necessary to undertake activities during night-time periods, for example, concrete pour operations at the weir sites or to avoid peak traffic periods for upgrading the

Capricorn Highway intersection. During these periods there is potential for noise impacts on sensitive receptors at Eden Bann Weir and Gogango and to disrupt nocturnal fauna behaviour, including turtle nesting (Chapter 7 Aquatic fauna).

During operations, scheduled maintenance will be undertaken during daytime hours as far as practicable. Night works during operations may be required in emergency situations.

14.3.1.6 Vibration impacts

The use of construction plant and equipment and activities such as piling (for bridge construction at river crossings) has the potential to cause vibration impacts. Table 14-9 provides predicted ground vibrations at various distances for typical construction equipment. Table 14-9 shows that predicted ground vibration levels dissipate rapidly away from the source and are generally expected to be below accepted criteria within 100 m of the source. All sensitive receptors are located at distances of 700 m or more from piling activities and are not expected to be adversely impacted as a result of the vibration levels from these activities/equipment.

Table 14-9 Predicted construction plant vibration levels

Plant	Predicted ground vibration levels (mm/s PPV) at distance (m)				
	10	30	50	100	300
Pile driving (impulse)	21.0	4.0	1.9	0.7	0.1
Roller (15 t)	7.5	1.4	0.7	0.2	<0.1
Dozer	3.3	0.6	0.3	0.1	<0.1
Compactor (7 t)	6.0	1.2	0.5	0.2	<0.1
Rock breaking	7.0	1.3	0.6	0.2	<0.1
Backhoe	1.0	0.2	0.1	<0.1	<0.1

14.3.1.7 Blasting impacts

It is anticipated that blasting will be required at the Rookwood Weir site. Potential adverse impacts (dependent on charge mass of explosive per delay, the distance from the blast, ground type and terrain conditions, meteorological conditions and blast control measures used) associated with blasting may include:

- Disturbance of native fauna and livestock (Sections 0 and 14.3.1.4)
- Annoyance and discomfort to sensitive receptors as a result of airblast overpressure and ground vibration
- Damage to property and infrastructure as a result of ground vibration.

The nearest sensitive receptor is in the order of 3 km west of the Rookwood Weir site and on the opposite bank from which blasting is intended. Airblast overpressure estimated at this location is within the adopted guideline levels, ranging between 90 and 110 dB (linear) (under average and adverse conditions, respectively), assuming a charge mass of 50 kg. Ground vibration estimated at this location is also within the adopted guideline levels at <0.1 mm/s.

With regard to Eden Bann Weir, the need for blasting is not expected and will be confirmed during detailed design. In the event that blasting is required, potential impacts, management and mitigation as for basting at the proposed Rookwood Weir will apply.

14.3.1.8 Mitigation and management measures

Construction related noise and vibration generating activities with potential to adversely impact on sensitive receptors will be managed and mitigated through the implementation of the following:

- Works will as far as is practicable be undertaken with consideration to the time restrictions defined in the EP Act. Where practicable, all typically noisy construction activities will be undertaken within the daytime working hours
- Night works will be restricted as far as practicable. In particular, night-works will be avoided adjacent to or within sensitive areas such as remnant vegetation and within the river bed, during turtle nesting periods
- Night time works will be restricted to on site activities within designated construction areas; haulage and delivery of materials will be restricted to daytime work hours
- The Construction Site Manager (or representative) will establish contact with local residents and communicate the construction program and progress on a regular basis, particularly when noisy or vibration-generating (such as blasting) activities are planned. Potentially affected receptors will be notified of the intended work, its duration and times of occurrence
- For any work that would take place outside of normal construction hours or for high noise activities, residents potentially affected by such activities will be notified at least seven days before hand through individual briefings or specific notifications delivered via letterbox drop or hand distribution
- All site workers (including subcontractors and temporary personnel) will be informed of the potential for noise impacts upon local residents and encouraged to take all practical and reasonable measures to minimise noise during the course of their activities
- Work methods will be reviewed with a preference for quieter methods wherever possible. This is particularly important for any out-of-hours and night-time activities
- In-stream earthworks and blasting will be undertaken in the drier periods when fish movement is naturally inhibited thereby minimising the potential to disrupt up- and down-stream movement
- Prior to construction commencing work areas will be surveyed and fauna relocated if necessary
- Work areas will be inspected daily for the presence of fauna and if found fauna will be relocated away from work areas
- Speed limits on site and along access roads will be restricted
- Material dumps will be located as far as practicable from sensitive receptors, and whenever possible, loading and unloading areas will be located as far as practicable from sensitive receptors
- As far as practicable, materials dropped from heights into or out of trucks will be minimised
- All construction plant, vehicles, machinery and pneumatic tools will be fitted with manufacturer supplied noise suppression devices (as applicable) and maintained in accordance with manufacturers' guidelines
- Fixed equipment (pumps, generators, compressors, concrete batching plants) will be located as far as practicable from sensitive receptors

- Upon receipt of a noise and/or vibration complaint in relation to ongoing construction activities, the complainant will be contacted within 24 hours and monitoring will be undertaken within five days. Corrective actions will be implemented as necessary, included in the response to the complainant and recorded. Any noise and vibration monitoring will be undertaken by a qualified professional and with consideration to the relevant standards and guidelines
- Blasting activities at the Rookwood Weir site (and at Eden Bann Weir if determined to be required) will be undertaken by a qualified blasting contractor and subject to a blast control plan, including an assessment of overpressure and ground-vibration impacts at the nearest receiver and notification to landholders to facilitate movement of livestock away from the area. Blast design will include measures to control impacts and achieve guideline levels (Section 14.1.3.5) at the nearest sensitive receptor
- Fauna spotter catchers will be present prior to and during clearing activities associated with construction, including assisting wildlife to disperse into adjacent habitat.

A construction noise and vibration management plan has been developed and incorporated into the EMP (Chapter 23) which will form the basis of the construction EMP.

14.3.2 Operational phase impacts

Noise emissions during operations will be largely associated with falling/running water over the weir crest during high flow conditions. Such levels would be negligible given the distance to the nearest sensitive receptors. Noise emissions from maintenance activities are likely to be negligible. Vehicle movements on access roads are not anticipated to be more than a few times a week and largely comprise a 4WD utility. Fishways and gates are hydraulically operated by motor drives housed within a control room and are therefore acoustically screened. A standby diesel generator may be used during operations in emergency situations. Emergency situations during operations are predicted to be rare and of short-duration.

14.4 Summary

Construction noise and vibration impacts are localised, intermittent and/or of short duration, likely to move within the construction areas and as far as practicable will be confined to daytime hours. Eight sensitive receptors in proximity to construction noise sources have been considered, in additional to native fauna and livestock.

It is conservatively predicted that construction noise will be audible at sensitive receptors. Piling activities are predicted to have the greatest impact, however noise from piling activities will be intermittent, occur over short durations and will be restricted to daytime hours. The Project construction is not expected to generate low frequency noise emissions.

Sensitive receptors are not expected to be adversely impacted as a result of the vibration levels from construction activities. Where blasting is required, estimated airblast overpressure and ground vibration is expected to be within the guideline levels at the nearest sensitive receptor.

It is unlikely that adverse impacts on native fauna and livestock will arise as a result of noise or vibration due to the Project.

Management and mitigation measures are proposed and incorporated into the Project EMP (Chapter 23) (and subsequent construction EMP) to minimise these impact. Potential operational noise impacts associated with the Project will be negligible.