

# The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park

Submissions and Preferred Infrastructure

Report Volume 2: Appendices

Roads and Maritime Services | December, 2017



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# Appendix A

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Noise and Vibration: additional information in response to submissions

# Noise and Vibration: additional information in response to submissions

## Attachment 1: Indicative duration of construction noise impacts

**Table 1: Indicative duration of construction noise impacts**

Activity	Indicative time of exposure to any one receiver (EIS)	Most noise intensive plant (EIS)	Indicative duration of most noise intensive plant use at any one receiver (worst case scenario)	Duration of worst case noise impact at any one receiver	Indicative nights/ hours any one receiver would be impacted by most intensive plant use
Road work and paving activities	2 – 10 weeks	Concrete saw 119dB(A)  Vibratory Roller  110dB(A)	A concrete saw would be in use about 10% of the time (about 1 week)  A vibratory roller would be in use about 50% of the time (about 5 weeks)	The CVNG outlines that where there are high noise and vibration generating activities near receivers, work should be carried out in continuous blocks that do not exceed 3 hours each, with a minimum respite period of one hour between each block. The actual duration of each block of work and respite should be flexible to accommodate the usage of and amenity at nearby receivers.	No more than three consecutive nights and no more than six evenings per month (unless duration respite is agreed to with the community). This equates to between about six to twelve nights for this activity at any one receiver
Earthworks	4-16 weeks	Bulldozer / grader 112dB(A)	Bulldozer / grader would be in use 100% of the time (12 weeks in total)	As above	n/a no work outside standard construction hours expected
Finishing work	2-8 weeks	Hydromulching equipment 116dB(A)	Hydromulching equipment would be in use 10% of the time (about 4 days in total)	As above	n/a no work outside standard working hours expected

Activity	Indicative time of exposure to any one receiver (EIS)	Most noise intensive plant (EIS)	Indicative duration of most noise intensive plant use at any one receiver (worst case scenario)	Duration of worst case noise impact at any one receiver	Indicative nights/ hours any one receiver would be impacted by most intensive plant use
Bridgeworks	12-26 weeks	Piling rig  121dB(A)	Piling equipment would be in use about 40% of the time (about 10 weeks)	As above	No impact piling is proposed to occur outside standard construction hours  The proposed night work for bridge construction would involve the delivery and lifting of large pre-cast elements of infrastructure (eg girders). This would not involve impact piling equipment  It is anticipated that the lifting of girders would be undertaken over three consecutive nights
Ancillary facilities	Each ancillary facility would be in use for about 3 years taking into account the staging of the project	Front end loader (all sites)  119dB(A)  Pugmill (ancillary facilities C5 and C8)  119dB(A))	Ancillary facilities would be in use 100% of the time	As above	No more than three consecutive nights and no more than six evenings per month (unless duration respite is agreed to with the community)

## Attachment 2: Indicative out of hours works and justification

**Table 1: Indicative out of hours works and justification\***

Activity	Proposed work	Locations	Justification
Paving	Intersection tie-ins	All intersections along the alignment.	Required to ensure safe traffic management during work and to meet any road occupancy licence requirements.
	Traffic switches	Points at which the existing Northern Road and the new alignment meet and/or at intersections.	
Bridge construction	Delivery and installation of large pre-cast bridge elements (e.g. girders)	Adams Road Bridge	Safe and efficient delivery and lifting of infrastructure equipment.
Ancillary facility	Work associated with out of hours activities including: <ul style="list-style-type: none"> <li>material and chemical storage and transport</li> <li>movement of equipment and plant</li> <li>light vehicle movements.</li> </ul>	Ancillary facilities required for out of hours work would depend on the location of work at the time. Out of hours bridge construction work at Adams Road would likely utilise ancillary facilities C8, C9 and C10.	Access to ancillary facilities for out of hours work would be required for: <ul style="list-style-type: none"> <li>storage and movement of materials, chemicals plant and equipment</li> <li>access to office facilities and amenities.</li> </ul>

\* The out of hours works activities and locations identified in Table 1 are indicative only. Further details regarding out of hours work activities, locations and justification would be identified in the Construction Environmental Management Plan (CEMP) to be developed by the contractor once engaged.

## Attachment 3: Triggers for additional mitigation measures

The following tables are replicated from Appendix C of Roads and Maritime Construction Noise and Vibration Guideline (CNVG) 2016

**Table C.1: Triggers for Additional Mitigation Measures - Airborne Noise**

Predicted airborne $L_{Aeq}(15min)$ noise level at receiver			Additional mitigation measures	
Perception	dB(A) above RBL	dB(A) above NML	type <sup>1</sup>	Mitigation Levels <sup>2</sup>
<b>All hours</b>				
75dBA or greater			N, V, PC, RO	HA
<b>Standard Hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)</b>				
Noticeable	5 to 10	0	-	NML
Clearly Audible	10 to 20	< 10	-	NML
Moderately intrusive	20 to 30	10 to 20	N, V	NML+10
Highly intrusive	> 30	> 20	N, V	NML+20
<b>OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am &amp; 1pm – 10pm), Sun/Pub Hol (8am – 6pm)</b>				
Noticeable	5 to 10	< 5	-	NML
Clearly Audible	10 to 20	5 to 15	N, R1, DR	NML+5
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR	NML+15
Highly intrusive	> 30	> 25	V, IB, N, R1, DR, PC, SN	NML+25
<b>OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)</b>				
Noticeable	5 to 10	< 5	N	NML
Clearly Audible	10 to 20	5 to 15	V, N, R2, DR	NML+5
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR	NML+15
Highly intrusive	> 30	> 25	AA, V, IB, N, PC, SN, R2, DR	NML+25

Notes (refer to detailed descriptions):

- 1 AA = Alternative Accommodation  
V = Verification  
IB = Individual briefings  
N = Notification  
R2 = Respite Period 2  
DR = Duration Respite
- 2 NML = Noise Management Level (see Appendix D)
- R1 = Respite Period 1  
PC = Phone calls  
SN = Specific notifications  
Perception = relates to level above RBL
- HA = Highly Affected (> 75 dB(A) - applies to residences only)



## C.2 Ground-borne noise

**Table C.2: Triggers for Additional Mitigation Measures - Ground-borne Noise**

Predicted ground-borne $L_{Aeq(15min)}$ noise level at receiver perception	dB(A) above GB NML	Additional mitigation measures type <sup>1</sup> :	apply to <sup>2</sup> :
Standard Hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
N/A	Vibration only applicable during standard hours		
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Clearly Audible	< 10	N	All
Moderately intrusive	10 to 20	V, N, R1, DR SN	All
Highly intrusive	> 20	V, IB, N, PC, SN, R1, DR	All
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Clearly Audible	< 10	V, N, SN	All
Moderately intrusive	10 to 20	AA, V, IB, N, PC, RP, SN, R2, DR	All
Highly intrusive	> 20	AA, V, IB, N, PC, RP, SN, R2, DR	All
Notes:			
1	AA = Alternative accommodation V = Validation of predicted noise levels IB = Individual briefings N = Notification box drops R2 = Respite Period 2 DR = Duration Respite	R1 =Respite Period 1 PC = Phone calls SN = Specific notifications	
2	All affected receivers		



## Attachment 4: Overview of Additional mitigation measures

The following information provides more detail on each of the *additional* mitigation measures (Roads and Maritime CNVG, 2016)

### **Notification**

Notification detailing work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and a contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works.

### **Verification**

A verification program is to be carried out for the duration of the works in accordance with the Construction Noise and Vibration Management Plan and any approval and licence conditions.

The measurements would need to be carried out by an appropriately trained person in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures.

The attended measurements shall include evaluation of both construction noise and background noise levels compared with the predicted and estimated levels used in the assessment. The results of the attended noise measurements shall be used to update the Construction Noise and Vibration Management Plan and other relevant environmental management documents.

### **Specific notifications**

Specific notifications are letterbox dropped (or equivalent) to identified stakeholders no later than seven calendar days ahead of construction activities that are likely to exceed the noise objectives. The specific notification provides additional information when relevant and informative to more highly affected receivers than covered in general letterbox drops.

### **Phone calls**

Phone calls detailing relevant information made to identified/affected stakeholders within seven calendar days of proposed work. Phone calls provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and specific needs. Where the resident cannot be telephoned then an alternative form of engagement should be used.

### **Individual briefings**

Individual briefings are used to inform stakeholders about the impacts of high noise activities and mitigation measures that will be implemented. Project representatives would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the project. Where the resident cannot be met with individually then an alternative form of engagement should be used

### **Respite Offers**

Respite Offers should be considered made where there are high noise and vibration generating activities near receivers. As a guide work should be carried out in continuous blocks that do not exceed 3 hours each, with a minimum respite period of one hour between each block. The actual duration of each block of work and respite should be flexible to accommodate the usage of and amenity at nearby receivers.

The purpose of such an offer is to provide residents with respite from an ongoing impact. This measure is evaluated on a project-by-project basis, and may not be applicable to all projects.

***Respite Period 1***

Out of hours construction noise in out of hours period 1 shall be limited to no more than three consecutive evenings per week except where there is a Duration Respite. For night work these periods of work should be separated by not less than one week and no more than 6 evenings per month.

***Respite Period 2***

Night time construction noise in out of hours period 2 shall be limited to two consecutive nights except for where there is a Duration Respite. For night work these periods of work should be separated by not less than one week and 6 nights per month. Where possible, high noise generating works shall be completed before 11pm.

***Duration Respite***

Respite offers and respite periods 1 and 2 may be counterproductive in reducing the impact on the community for longer duration projects. In this instance and where it can be strongly justified it may be beneficial to increase the work duration, number of evenings or nights worked through Duration Respite so that the project can be completed more quickly.

The project team should engage with the community where noise levels are expected to exceed the NML to demonstrate support for Duration Respite. Where there are few receivers above the NML each of these receivers should be visited to discuss the project to gain support for Duration Respite.

***Alternative Accommodation***

Alternative accommodation options may be offered to residents living in close proximity to construction works that are likely to experience highly intrusive noise levels. The specifics of the offer will be identified on a project-by-project basis. Additional aspects for consideration shall include whether the highly intrusive activities occur throughout the night or before midnight.

## Attachment 5: Indicative application of mitigation measures during construction of the project

**Table 1: Indicative application of mitigation measures for activities during standard construction hours**

Activity	dB(A)	Mitigation measures*
Road work and paving Earthworks Finishing works Bridgework	0-10 dB(A) above NML	<b>Standard mitigation measures:</b> <ul style="list-style-type: none"> <li>• Behavioural practices on site</li> <li>• Maintaining and monitoring plant</li> <li>• Use and siting of plant and hoardings</li> <li>• Site inductions</li> <li>• Selection of quieter plant and equipment</li> <li>• Use of non-tonal reversing alarms</li> <li>• Scheduling of work during standard hours where reasonable and feasible and outside of sensitive periods e.g. HSC exams.</li> </ul>
	10-20 dB(A) above NML	<b>Standard mitigation measures:</b> <ul style="list-style-type: none"> <li>• Standard measures as above.</li> </ul> <b>Additional mitigation measures:</b> <ul style="list-style-type: none"> <li>• Notification</li> <li>• Verification.</li> </ul>
	20 + dB(A) above NML	<b>Standard mitigation measures:</b> <ul style="list-style-type: none"> <li>• Standard measures as above.</li> </ul> <b>Additional mitigation measures:</b> <ul style="list-style-type: none"> <li>• Notification</li> <li>• Verification.</li> </ul>
	>75d (B)A	<b>Standard mitigation measures:</b> <ul style="list-style-type: none"> <li>• Standard measures as above.</li> </ul> <b>Additional mitigation measures:</b> <ul style="list-style-type: none"> <li>• Notification</li> <li>• Verification</li> <li>• Phone calls</li> <li>• Respite offers.</li> </ul>

Activity	dB(A)	Mitigation measures*
Ancillary facilities	0-10 dB(A) above NML	<p><b>Standard mitigation measures:</b></p> <ul style="list-style-type: none"> <li>• Behavioural practices on site</li> <li>• Maintaining and monitoring plant</li> <li>• Use and siting of plant and hoardings</li> <li>• Site inductions</li> <li>• Selection of quieter plant and equipment</li> <li>• Use of non-tonal reversing alarms</li> <li>• Scheduling of work during standard hours where reasonable and feasible and outside of sensitive periods eg HSC exams.</li> </ul> <p><b>Project-specific measures:</b></p> <ul style="list-style-type: none"> <li>• Hoarding (2.4 metres) to be installed at the perimeter of all ancillary facilities. An exception exists where it can be strongly justified that the acoustic benefit of the hoarding is not warranted</li> <li>• Haulage routes will be located as far away as possible from residential receivers, where this is reasonable and feasible</li> <li>• Where it has been identified as necessary (eg in response to community complaints), noise monitoring will be undertaken to check that the noise mitigation measures are effective</li> <li>• Static noise sources, such as generators, pumps and lighting towers, will be located as far as possible from sensitive receivers</li> <li>• Loading and unloading will be carried out away from sensitive receivers, where practicable</li> <li>• Ensure all deliveries occur during standard construction hours where reasonable and feasible.</li> </ul>
	10-20 dB(A) above NML	<p><b>Standard mitigation measures:</b></p> <ul style="list-style-type: none"> <li>• Standard measures as above.</li> </ul> <p><b>Additional mitigation measures:</b></p> <ul style="list-style-type: none"> <li>• Notification</li> <li>• Verification.</li> </ul>

\*Note: additional information on each mitigation measure is provided in Attachment 4 of this appendix

**Table 2: Indicative application of mitigation measures for activities outside of standard construction hours (ie out of hours works)**

Activity	OOHW period	dB(A)	Mitigation measures*
Road work and paving Bridgework Ancillary facilities	<b>OOHW work period 1</b> <ul style="list-style-type: none"> <li>Mon – Fri (6pm – 10pm)</li> <li>Sat (7am-8am &amp; 1pm – 10pm)</li> <li>Sun /Pub Hol (8am – 6pm)</li> </ul>	0-5 dB(A) above NML	<b>Standard mitigation measures:</b> <ul style="list-style-type: none"> <li>Behavioural practices on site</li> <li>Equipment selection / Maintaining and monitoring plant</li> <li>Use and siting of plant and hoardings</li> <li>Site inductions</li> <li>Use of non-tonal reversing alarms</li> <li>Notification</li> <li>Planning noisier work to be carried out earlier in the period</li> </ul>
		5 - 15 dB(A) above NML	<b>Standard mitigation measures:</b> <ul style="list-style-type: none"> <li>Standard measures as above.</li> </ul> <b>Additional mitigation measures:</b> <ul style="list-style-type: none"> <li>Notification</li> <li>Respite offer period 1</li> <li>Duration respite.</li> </ul>
		15 - 25 dB(A) above NML	<b>Standard mitigation measures:</b> <ul style="list-style-type: none"> <li>Standard measures as above.</li> </ul> <b>Additional mitigation measures:</b> <ul style="list-style-type: none"> <li>Notification</li> <li>Verification</li> <li>Respite offer period 1</li> <li>Duration respite.</li> </ul>
		>25 dB(A) above NML	<b>Standard mitigation measures:</b> <ul style="list-style-type: none"> <li>Standard measures as above.</li> </ul> <b>Additional mitigation measures:</b> <ul style="list-style-type: none"> <li>Notification</li> <li>Verification</li> <li>Individual briefing</li> <li>Respite offer period 1</li> <li>Duration respite</li> <li>Phone calls</li> <li>Specific notifications.</li> </ul>

Activity	OOHW period	dB(A)	Mitigation measures*
	<b>OOHW work period 2</b> <ul style="list-style-type: none"> <li>Mon – Fri (10pm – 7am)</li> <li>Sat (10pm-8am)</li> <li>Sun /Pub Hol (6pm – 7am)</li> </ul>	0-5 dB(A) above NML	<b>Standard mitigation measures:</b> <ul style="list-style-type: none"> <li>Behavioural practices on site</li> <li>Equipment selection / maintaining and monitoring plant</li> <li>Use and siting of plant and hoardings</li> <li>Site inductions</li> <li>Use of non-tonal reversing alarms</li> <li>Notification</li> <li>Planning noisier work to be carried out earlier in the period</li> </ul>
		5 - 15 dB(A) above NML	<b>Standard mitigation measures:</b> <ul style="list-style-type: none"> <li>Standard measures as above.</li> </ul> <b>Additional mitigation measures:</b> <ul style="list-style-type: none"> <li>Notification</li> <li>Verification</li> <li>Respite offer period 2</li> <li>Duration respite.</li> </ul>
		15 - 25 dB(A) above NML	<b>Standard mitigation measures:</b> <ul style="list-style-type: none"> <li>Standard measures as above</li> </ul> <b>Additional mitigation measures:</b> <ul style="list-style-type: none"> <li>Notification</li> <li>Verification</li> <li>Individual briefing</li> <li>Respite offer period 2</li> <li>Duration respite</li> <li>Phone calls</li> <li>Specific notifications.</li> </ul>
		>25 dB(A) above NML	<b>Standard mitigation measures:</b> <ul style="list-style-type: none"> <li>Standard measures as above.</li> </ul> <b>Additional mitigation measures:</b> <ul style="list-style-type: none"> <li>Notification</li> <li>Verification</li> <li>Individual briefing</li> <li>Respite offer period 2</li> </ul>



Activity	OOHW period	dB(A)	Mitigation measures*
			<ul style="list-style-type: none"> <li>• Duration respite</li> <li>• Phone calls</li> <li>• Specific notifications</li> <li>• Alternate accommodation.</li> </ul>

\*Note: additional information on each mitigation measure is provided in Attachment 4 of this appendix



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