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Report

Noise Impact Assessment

Anna Bay Sand Mine

c/o Tattersall Lander Pty Ltd

8 August 2018
Rev 0 (Final)

Report Details

Noise Impact Assessment - Anna Bay Sand Mine

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Endorsements

Function	Signature	Name and Title	Date
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EXECUTIVE SUMMARY

Advitech Environmental was engaged to prepare an assessment of potential noise impacts associated with the construction and operation of a proposed Sand Quarry at Nelson Bay Road, Anna Bay. The construction period is anticipated to take approximately one to two months, with construction activities being undertaken during weekdays from 7:00am to 6:00pm. The development is proposed to operate between the hours of 7:00am and 6:00pm Monday to Friday, and 8:00am to 1:00pm Saturdays. The operation will produce up to 50,000 cubic metres of quarried material per annum.

Noise assessment criteria were established for adjacent sensitive receiving noise environments. Assessment of potential construction and operational phase noise impacts was made using a number of conservative assumptions as outlined in the report. The noise prediction indicates that exceedances of the noise goals may be expected under some construction and operational conditions.

During construction, exceedence of the NMLs at up to five residential receivers and one place of worship may be expected during internal haul road widening works and the works to improve the site access. It is expected that there would not be any exceedence of the *high affected* NMLs during any of the construction activities. Noise impacts would be minimised during the construction phase of the proposal by implementing the universal work practices provided within this report.

During operation, marginal exceedences of the PSNLs at up to three residential receives and one place of worship may be expected during general quarrying operations and vegetation mulching activities. In addition to universal work practices to minimise the site generated noise, the following noise control recommendations are provided to minimise noise emissions during the operational phase of the proposal:

- during quarrying operations, internal vehicle movements are restricted to four heavy vehicles in any one hour of the day;
- vegetation mulching is undertaken during periods of higher background noise levels, identified as the periods before 8:00am and after 3:00 pm.
- temporary barriers or local topography may be used to maximise the shielding of the nearby sensitive receivers from vegetation mulching activities.

It is anticipated that the maximum traffic volumes generated by the proposed development would be less than 0.5% of AADT, therefore, it is considered that no significant increase of road traffic noise is expected on Nelson Bay Road as a result of the proposal.

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APPENDICES

1. INTRODUCTION

Hay Enterprises proposes to extract sand within and adjacent to an AusGrid electricity easement, at the southern end of the property at 4226 Nelson Bay Road, Anna Bay. The sand extraction quarry proposes to extract up to a maximum of 50,000 cubic metres of sand per annum, and would assist AusGrid in the maintenance of the electricity easement.

Advitech Pty Limited (t/a Advitech Environmental) has been engaged by Hay Enterprises (c/o Tattersall Lander Pty Ltd) to prepare a Noise Impact Assessment as part of an Environmental Impact Statement (EIS), required under Section 78A(8) of the *Environmental Planning and Assessment Act* 1979 (EP&A Act).

It should be noted that this report was prepared by Advitech Pty Limited for Tattersall Lander Pty Ltd ("the customer") in accordance with the scope of work and specific requirements agreed between Advitech and the customer. This report was prepared with background information, terms of reference and assumptions agreed with the customer. The report is not intended for use by any other individual or organisation and as such, Advitech will not accept liability for use of the information contained in this report, other than that which was intended at the time of writing.

1.1 Objectives of the study

The objectives of this study are to undertake a quantitative assessment of the potential on-site construction and operational noise, and off-site transport noise impacts associated with the proposed development.

The Secretary's Environmental Assessment Requirements (SEARs) (EAR 1172), were issued in October 2017, and included the following requirements for the assessment of noise:

- a quantitative assessment of construction and operational noise, and off-site transport noise impacts of the development in accordance with the *Interim Construction Noise Guideline, NSW Industrial Noise Policy* and *NSW Road Noise Policy* respectively;
- reasonable and feasible mitigation measures to minimise noise emissions; and
- monitoring and management measures.

The assessment was performed with reference to the following guidelines, policies and standards:

- AS1055.1 *Acoustics – Description and measurement of environmental noise – Part1: General procedures.*
- AS 2436 *Guide to noise and vibration control on construction, demolition and maintenance sites.*
- *Interim Construction Noise* Guideline (ICNG), EPA. 2008.
- *Industrial Noise Policy* (INP). EPA, 2000.
- *INP Application Notes*. EPA 2006.
- *Road Noise Policy* (RNP). EPA, 2011.
- *Noise Policy for Industry* (NPfI). EPA, 2017.

On October 26, 2017, the New South Wales (NSW) *Industrial Noise Policy* (INP, 2000) was replaced by the *Noise Policy for Industry* (NPfI, 2017). The NSW Environment Protection Authority (EPA) has established transitional arrangements to allow industry and regulators to shift to the new assessment

framework. Under the transitional arrangements, where SEARs were issued before the release of the new policy, and have not been modified, the assessment requirements referenced in the SEARs will apply for a period of two (2) years from the date of issue of the SEARs consistent with the provisions if the *Environmental Planning and Assessment Regulation 20000*, Schedule 2, Part 2, 3(7). This assessment is therefore undertaken in accordance with the provisions of the INP.

2. PROJECT DESCRIPTION

2.1 Site Location and Surrounding Land Uses

The site, identified as Lot 591 DP 1191380, is located at 4226 Nelson Bay Road, Anna Bay, approximately 30 kilometres northeast of Newcastle (**Figure 1**). The site has an area of 13 hectares and is predominantly undeveloped. An existing shed is located at the northern end of the property, close to Nelson Bay Road, and an unsealed road extends north to south along the extent of the property. An electricity easement runs in an east to west direction through the southern portion of the property.

Figure 1: Site Location

The closest receivers to the site include the Baylife Church on the property immediately to the east of the proposal site and residential receivers adjacent to Nelson Bay Road. The Worimi National Park is located to the west of the proposal site, and the Birubi Beach foreshore is about 1 kilometre to the south of the proposal extent. There are commercial facilities, including a nursery and a service station about 700 metres to the east and the west of the proposal site respectively. A show ground and the Nelson Bay Pony Club are located east of the proposal site. There are three existing sand extraction quarries to the east of the proposal site also. **Figure 2** shows the surrounding land uses.

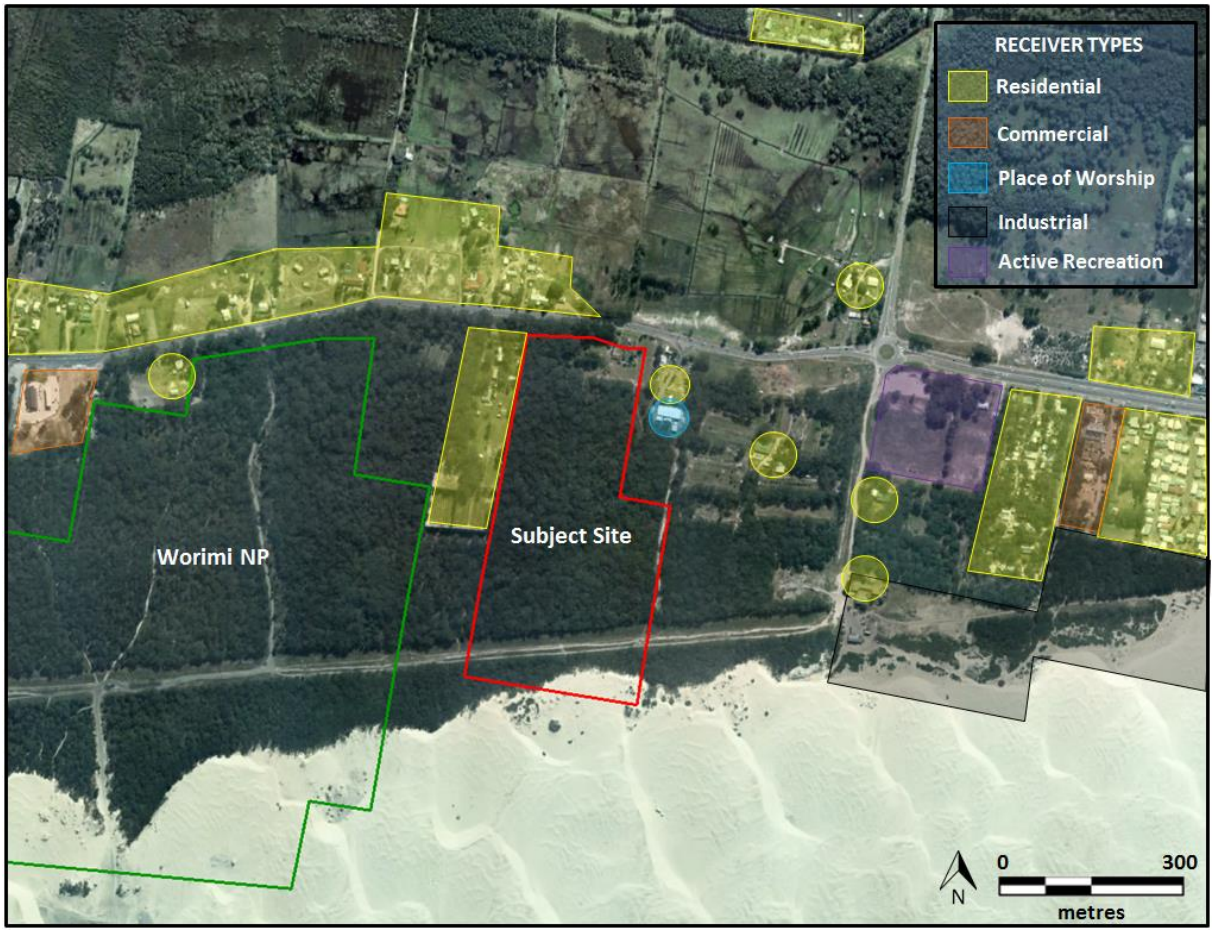

Figure 2: Sensitive land use types within study area

2.2 Project Overview

Approval is sought for the establishment and operation of a sand quarry, and ancillary facilities, at Anna Bay, approximately 30 kilometres northeast of Newcastle. The layout of the proposed facility is presented in **Figure 3**.

The proposed development would involve the extraction of sand from within and adjacent to an AusGrid electricity easement at the southern end of the property. At present, through the action of wind, sand accumulates within the electricity easement, under the 33kV electrical powerlines. AusGrid requires that the easement is kept clear to undertake legally required maintenance works. Hay Enterprises proposes to establish a sand quarry with a 30 year life span, and a maximum extraction rate of 50,000 cubic metres of sand annually. The proposal would assist AusGrid in their long term maintenance of the electricity easement.

The establishment of the sand quarry would involve minor vegetation clearing, widening and upgrading the existing unsealed internal road, the construction of a caretaker's residence, site office and machinery shed, and the improvement of the site access from Nelson Bay Road.

Figure 3: Layout of the proposed sand quarry facility

2.3 Proposed Operations

The proposed operation would involve the extraction of sand and direct removal off site on a per demand basis. A review of proposed site activities was undertaken in order to establish an inventory of significant noise generating plant and processes. These include:

- excavation of material using a front end loader;
- loading of sand to truck-and-dogs; and
- transport of material offsite;

The maximum extraction rate will be approximately 910 cubic metres of sand per day, with a maximum threshold of 50,000 cubic metres per annum. To achieve the maximum daily extraction rate, Advitech Environmental understands that there would be up to a maximum of 40 truck and dog movements per day (up to four per hour). It is anticipated that one additional vehicle movement (per hour) may occur in and out of the site, which would account for light vehicle movements, delivery of goods and removal of waste.

Heavy vehicles associated with the operation of the proposed facility will access the site from Nelson Bay Road. It is assumed that the majority of heavy vehicles (75%) will access the site from, and leave the site to, the south.

The proposed operating hours are 7:00am to 6:00pm Monday to Friday, and 8:00am to 2:00pm on Saturdays. The facility would be closed on Sundays.

The facility is proposed to be constructed over 1 to 2 months, across a number of stages. The construction is expected to involve vegetation removal and mulching, earthworks and site establishment, building assembly, and site access improvements. It is anticipated that the construction works would be undertaken during standard construction times (7:00 am to 6:00pm Monday to Friday).

3. THE EXISTING ENVIRONMENT

3.1 Sensitive Receiving Environments

Site inspection and review of aerial imagery indicate that the proposed development site is generally rural in nature; however, the site has frontage to Nelson Bay Road with characteristically heavy and continuous traffic flows during peak periods. Two distinct sensitive receiving environments adjacent to the proposed development site were identified, including:

1. receivers immediately adjacent to Nelson Bay Road (generally with frontage or shared boundary with the roadway); and
2. receivers setback from Nelson Bay Road (with or without frontage to Nelson Bay Road);

A combination of unattended background monitoring and short-term operator attended noise monitoring was undertaken in each of these receiving environments to characterise existing noise levels. These data were used to derive PSNL for the development. As heavy and continuous through traffic was observed to be a feature of the locality, all receiving environments were characterised as representative of the Urban Residential receiver type established in the INP.

3.2 Assessment of Existing Noise Levels

Environmental noise monitoring was undertaken at two locations to measure ambient and background noise levels in receiving environments adjacent to the proposed development site (**Figure 4**). The monitoring locations were selected such as to be representative of typical receiver locations in these receiving environments.

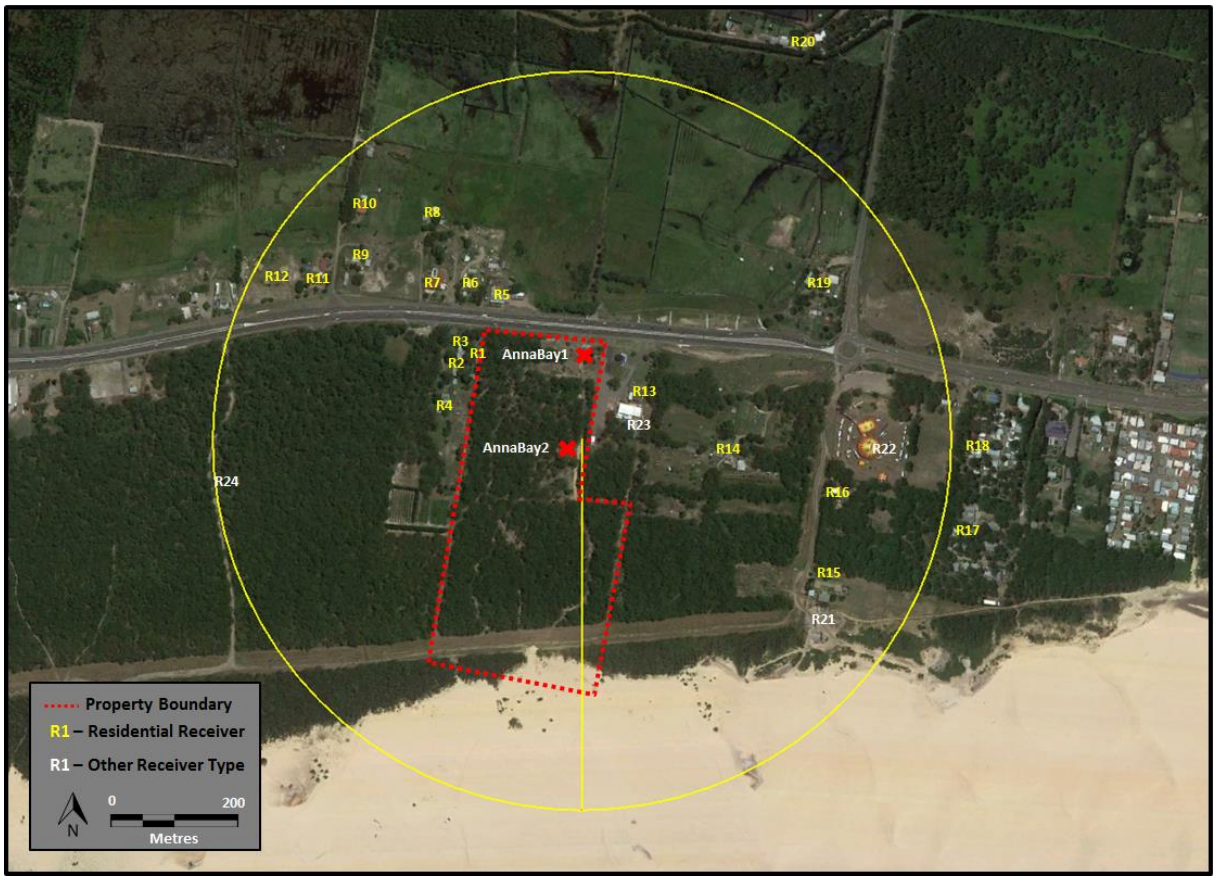

Figure 4: Sensitive receivers and noise monitoring locations

The noise monitoring was carried out using two ARL-EL-316 Type 1 Environmental Noise Loggers. The logger calibrations were checked before and after the measurement period, with no significant drift (±0.5 dB) noted. Details relevant to the background noise monitoring are provided in **Table 1**.

Table 1: Details of background monitoring

Location	Adjacent to Nelson Bay Road (RecEnv1)	Setback Receivers (RecEnv2)
Logger Serial Number	ARL316 (s/n:16-203-513)	ARL316 (s/n:16-299-450)
Measurement Title	AnnaBay1	AnnaBay2
Run Started	1/02/18 14:00	1/02/18 14:00
Run Stopped	14/02/18 13:30	14/02/18 13:30
Frequency Weighting	A	A
Time Response	Fast	Fast
Engineering Units	dB SPL	dB SPL

The noise levels obtained from the continuous noise logging (presented graphically in **Appendix I**) are expressed in terms of, $L_{A90,15minute}$ and $L_{Aeq,15minute}$.

- $L_{A90,15minute}$ is the A-weighted noise level that is exceeded for 90% of the monitoring time period (15 minutes).
- The $L_{Aeq,15minute}$ is the 15 minute equivalent continuous noise level containing the same acoustic energy as the actual fluctuating noise level.

The $L_{A90,15minute}$ descriptor is commonly referred to as the background noise level and the lowest 10th percentile $L_{A90,15minute}$ over a period (day, evening, night) is referred to as the period assessment background level (ABL). The Rating Background Level (RBL) for each assessment period of the monitoring occurrence is then calculated by taking the median of the ABLs.

Supplementary local meteorological monitoring (rain, wind speed and direction) was undertaken using a Davis Vantage Vue Precision Weather Station at the monitoring location set back from Nelson Bay Road (AnnaBay2). This data is used to validate noise monitoring results in accordance with provisions established in Section 5 of the INP.

3.2.1 Noise Monitoring Results

The Rating Background Level (RBL) and associated Intrusiveness Criteria were determined for the receiving environments adjacent to the proposed development in accordance with provisions established in the INP. The results of this analysis are presented in **Table 2**.

Table 2: Details of background monitoring (Day period 7:00 to 6:00pm)

	Adjacent to NBR (AnnaBay1)	Setback Receivers (AnnaBay2)
Date	Day	Day
1/02/2018	-	-
2/02/2018	51	46
3/02/2018	50	47
4/02/2018	49	45
5/02/2018	-	-
6/02/2018	48	43
7/02/2018	50	43
8/02/2018	49	44
9/02/2018	51	43
10/02/2018	47	41
11/02/2018	43	39
12/02/2018	49	42
13/02/2018	49	44
14/02/2018	47	40
Rating Background Level (RBL)	49	43
Mean L_{Aeq}	60	54

Assessment of monitoring results is presented for the day period (7:00 to 6:00pm) only, as the development is not proposed to operate during the evening or night periods. Periods for which Assessment Background Levels (ABL) are not presented were omitted from the analysis based on the data exclusion rules outlined in Appendix B of the INP.

Short term attended monitoring was also undertaken at each of the monitoring locations on 1 February, 2018 during the day period, as a means of characterising the ambient noise sources within the receiving environments. The attended monitoring was undertaken using a Svantek (SVAN) 958, Type 1 sound level meter (SLM) (S/N:20777), with the results of the monitoring detailed in **Table 3**.

Table 3: Attended Monitoring Results, dB(A)

Location	Date	Time	L_{A10}	L_{Aeq}	L_{A90}	Comments
AnnaBay1 (Adjacent to NBR)	1/02/18	12:57	58	55	51	Bird Chatter up to 73 dB(A) Road Noise up to 60 dB(A)
AnnaBay2 (Setback Receivers)	1/02/18	12:23	57	54	50	Bird Chatter up to 65 dB(A) Road Noise up to 69 dB(A)

Existing industrial facilities within the locality of the study site, including other sand mining operations, were not audible at any time during the attended noise monitoring events.

3.3 Assessment of Prevailing Meteorology

The INP identifies that meteorological conditions such as wind gradients and temperature inversions may enhance noise propagation from industrial sites to distant sensitive receivers. The guide provides two options for the assessment of these impacts:

- a simple method, which adopts worst case noise enhancing conditions;
- a more detailed analysis of prevailing meteorology, to identify whether enhancing conditions occur with sufficient frequency to be considered a feature of the local environment:
  - where enhancing conditions occur with sufficient frequency, noise enhancing meteorological parameters should be adopted by the noise modelling;
  - where enhancing conditions are not a feature of the environment, modelling should adopt the standard meteorological parameters.

The INP sets the threshold of significance at 30% of the time during any assessment period, assessed seasonally.

The nearest Bureau of Meteorology (BoM) Automatic Weather Station (AWS) is located at Nelson Bay, approximately 11km northeast of the proposed development site. Monthly climate statistics between 1968 and 2010 were analysed to identify whether any prevailing wind patterns may be considered a feature of this environment. Wind is considered to be a feature of the environment where source to receiver wind speeds (at 10 m height) of 3 m/s or below occur for 30 percent of the time of more in any assessment period, in any season.

The results of the analysis of monthly climate statistics indicated that prevailing winds were not observed for more than 30% of the time during any season. Prevailing winds are therefore not considered a significant feature of this environment, and neutral meteorological conditions were applied to the assessment of noise propagation.

As temperature inversions are usually only prominent during sunset and sunrise, there is no need to consider their effect for a development that does not operate at night. Therefore, temperature inversions have not been considered within this assessment.

4. NOISE ASSESSMENT CRITERIA

4.1 Construction Noise

The NSW *Interim Construction Noise Guideline* (ICNG) (2009) provides guidance on managing construction works to minimise noise, with an emphasis on communication with, and cooperation from all stakeholders affected by construction noise. The framework identifies the following steps for managing construction noise impacts:

- identify any sensitive land uses that may be affected;
- identify the operating hours and duration of the proposed construction works;
- determine the noise impacts at sensitive receivers; and
- select and apply the best work practices to minimise noise impacts.

The quantitative noise assessment approach is applied to larger construction projects, anticipated to extend for a period greater than three weeks. This approach involves predicting noise levels from construction activities, and comparing them to Noise Management Levels (NML), as per Table 2 of the ICNG, reproduced as **Table 4** below.

Table 4: Noise at Residences (Quantitative Assessment) from ICNG (DECC, 2009)

Time of Day	Management Level, $L_{Aeq\ (15\ min)}$*	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8am to 1 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 LAeq (15 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: 3. 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 4. if the community is prepared to accept a longer period of construction in place of restrictions on construction times.

A summary of the construction noise management levels (NMLs) specific to this project are provided in **Table 5**. The NMLs for residential receivers are based on the unattended background noise levels summarised in **Table 2**. It should be noted that the ICNG recognises that the potential long term benefits of some construction works may offset short term amenity losses. On this basis, the NML are not statutory criteria above which impacts are deemed to be non-compliant, but the level at which reasonable and feasible management measures would be required.

Table 5: Construction Noise Management Levels ($L_{Aeq, (15\ min)}$)

Receiver Type	Recommended Standard Hours	Management Level ($L_{Aeq, (15\ min)}$)	
Residential Receivers	Monday to Friday: 7am to 6pm Saturday : 8am to 1pm	Noise Affected NML (RBL + 10)	53 - 59
		Highly Noise Affected NML	75
Places of Worship	Applies when property is being used	Internal NML	45
Areas of Active Recreation		External NML	65
Areas of Passive Recreation		External NML	60
Industrial Receivers		External NML	75

4.2 Operational Noise Criteria

The INP presents two criteria for the assessment of industrial noise sources, intrusive noise impacts and amenity noise levels. In assessing the noise impact of industrial sources, both components are considered for sensitive receivers. Typically, the more stringent of these criteria would be applied as the Project Specific Noise Level (PSNL) for the development as a means of managing intrusive noise impacts and preserving the amenity of the receiving environment.

4.2.1 Intrusive Noise Impacts

The intrusiveness of an industrial noise source is generally considered acceptable if the predicted $L_{Aeq,15minute}$ impact does not exceed the background noise level by more than 5 dB when measured in the absence of the source. The background noise level, or Rating Background Level (RBL), is determined in accordance with Section 3 of the INP and is the median value of the Assessment Background Levels (ABL) determined for the monitoring period. The use of the median accounts for noise level variations over time. The intrusiveness criterion is equal to the RBL + 5dB.

4.2.2 Amenity Noise Level

To limit continuing increases in noise levels, the EPA has identified recommended maximum ambient noise levels for typical receiver areas and land uses. The relevant section of *Table 2.1* of the INP has been reproduced as **Table 6**. The locality of the study area is described as rural in nature; however, as heavy and continuous through traffic was observed to be a feature of the locality, all receiving environments were characterised as representative of the Urban Residential receiver type established in the INP.

Where the existing noise level from industrial sources is close to the acceptable noise level (ANL), the noise level from any new source(s) must be controlled to preserve the amenity of the area. If the total noise level from industrial sources already exceeds the ANL for the area in question, the L_{Aeq} noise level from any new source should not be greater than 10 dB below the acceptable noise level if there is reasonable expectation that existing levels may be reduced in the future; or 10 dB below the existing level if there is no such reasonable expectation that existing levels will fall. *Table 2.2* of the INP (reproduced as **Table 7**) sets out implications and adjustment requirements for noise from industrial sources.

Table 6: Recommended L_{Aeq} noise levels from industrial noise sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended Acceptable Level dB(A)	Recommended Maximum dB(A)
Residential	Urban	Day Evening Night	60 50 45	65 55 50
Place of worship - internal	All	When in use	40	45
Passive recreation			50	55
Active recreation			55	60
Industrial Premises			70	75

Source: Environment Protection Authority INP Table 2.1 (2000)

Table 7: Modification to acceptable noise levels (ANL) to account for existing level of industrial noise

Total existing LAeq noise level from industrial sources, dB(A)	Maximum LAeq noise level for noise from new sources alone, dB(A)
≥ Acceptable noise level plus 2	If existing noise level is *likely to decrease* in the future: Acceptable noise level minus 10. If existing noise level is *unlikely to decrease* in the future: Existing noise level minus 10
Acceptable noise level plus 1	Acceptable noise level minus 8
Acceptable noise level	Acceptable noise level minus 8
Acceptable noise level minus 1	Acceptable noise level minus 6
Acceptable noise level minus 2	Acceptable noise level minus 4
Acceptable noise level minus 3	Acceptable noise level minus 3
Acceptable noise level minus 4	Acceptable noise level minus 2
Acceptable noise level minus 5	Acceptable noise level minus 2
Acceptable noise level minus 6	Acceptable noise level minus 1
< Acceptable noise level minus 6	Acceptable noise level

4.2.3 Modifying Factor Adjustments

Where a noise source contains certain characteristics, such as tonality, impulsiveness, intermittency, or dominant low frequency content, the "unusual" noise may cause greater annoyance than other noise at the same level. One the other hand, noise levels from a single event of a short duration, may cause less annoyance to nearby sensitive receivers. In such circumstances, a modifying factor should be applied to the acceptable noise level at the nearby sensitive receivers.

It is considered that normal operational activities would not generate unusual noise characteristics. Furthermore, Advitech Environmental understands that tonal reverse alarms would not be used in mechanical plant on the proposal site. Therefore, no modification factors have been applied for tonality, impulsive noise or low frequency noise.

4.2.4 Project Specific Noise Levels

Project specific noise levels (PSNLs) for the development are assigned after determining the relevant noise levels from the intrusiveness and amenity criteria, and set the benchmark against which noise impacts and the need for noise mitigation are assessed. **Table 8** provides an assessment of the acceptable noise levels, and establishes the PSNLs relevant to the project.

Table 8: Assessment of PSNL in adjacent receiving environment

Receiver Type	Period	Amenity		Intrusiveness	
		Recommended Acceptable ANL $L_{Aeq,period}$	RBL	Intrusiveness Criteria $L_{Aeq,15min}$	PSNL dB(A)
Residential (RecEnv1)	Day	60	49	54	54 ($L_{Aeq,15min}$)
Residential (RecEnv2)	Day	60	43	48	48 ($L_{Aeq,15min}$)
Place of Worship[1]	When in use	40	-	-	40 ($L_{Aeq,period}$)
Passive Recreation		50	-	-	50 ($L_{Aeq,period}$)
Active Recreation		55	-	-	55 ($L_{Aeq,period}$)
Industrial		70	-	-	70 ($L_{Aeq,period}$)

Note 1: Existing industrial noise sources not audible during attended monitoring. Therefore, no modification to ANL

4.2.5 Road Traffic Noise Criteria

The NSW RNP (2011) provides a framework for the management of noise issues associated with road traffic from existing roads, new road projects, road redevelopment projects and new traffic-generating developments. The primary aim of the RNP is to provide assessment criteria for road traffic noise based on protecting amenity and wellbeing.

The criterion adopted for this assessment is provided in **Table 9**. This is based on review of existing receiving environments, and description of road types established in the RNP. Calculated contributions from road traffic generated by the proposed development may be compared against management levels (or existing traffic noise levels) to assist with evaluation of potential project related impacts.

Table 9: Road traffic noise assessment criteria for residential land uses

Road Category	Type of Project / Land Use	Assessment Criteria - dB(A) Day 7:00am - 10:00pm
Freeway / arterial / sub-arterial roads	Existing residences affected by additional traffic on existing freeways / arterial / sub-arterial roads generated by land use developments	$L_{Aeq,\ (15hour)}$ 60 (external)

5. NOISE LEVEL ASSESSMENT

5.1 Methodology

A model of the construction phase and operational noise impacts was constructed using the ISO9613 calculation methodology in the *Predictor* environmental noise modelling software, with consideration to the CONCAWE sub-method to evaluate meteorological influences. Predictor is an environmental noise mapping package that facilitates calculation of noise impacts, accounting for source receiver relationships, terrain and meteorological affects. To assess the potential noise impacts, predictions derived through the noise modelling are presented against the relevant noise criteria.

The modelled impact of the proposed activities is based on the Sound Power Level (SWL) and location of noise sources within the proposed works area. Third-octave (1/3 octave) SWL data representative of the proposed works were used as model inputs. These data were sourced from:

- the UK Department of Environment, Food and Rural Affairs (DEFRA, 2005);
- AS 2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites; and
- the Advitech Environmental noise source library, including SWL measurements of processes at similar operations.

Sensitive receiver locations were selected to be indicative of the potentially worst affected receivers within the noise environments. A review of receivers in the locality found that the dwelling types were typically single storey residences. The receiver heights were therefore modelled at 1.5 metres. Residential and industrial receivers were assessed at the potentially most affected location on the site boundary, while the internal noise levels of a nearby church were assessed using a conservative attenuation of 10 dB as per the INP.

5.2 Construction Phase Scenarios

The construction phase of the proposal is expected to last between 1 to 2 months, and be completed over multiple stages. The construction works are expected to occur during standard hours 7:00am to 6:00pm Monday to Friday, with no works to be undertaken on weekends.

A summary of SWL for plant utilised during site construction phase activities are shown in **Table 10.** The specific work phases during the construction period would include:

- Vegetation removal and mulching;
- Improvement and widening works to the existing haul road;
- Site preparation including the placement and spreading of base material for the construction of the site shed;
- Installation of formwork and the pouring of the concrete slab; and
- Construction of the caretaker's residence, site office and machinery site shed.

In addition to the site construction activities, upgrade works would be required to the site access to provide safe ingress and egress. These upgrade works would involve the widening Nelson Bay Road to allow for the construction of a turning lane. Specific construction works would include formation widening works and asphalt paving works.

Table 10: Construction Noise Sources

Construction Phase	Plant Description	A-wt Level
Site Construction Activities		
Vegetation Removal	Chainsaw	114
	Mulcher	116
	Excavator	105
Haul Road Improvements	Truck & Dog	106
	Excavator	105
	Grader	112
Site Preparation	Excavator	105
	Truck & Dog	106
Concrete Foundations	Hand Tools	102
	Concrete Truck	108
	Concrete Pump	103
	Concrete Screen	91
Construction of site structures	Delivery Truck	101
	Franna	103
	Hand Tools	102
Site Access Construction Activities		
Formation Widening	Truck & Dog	106
	Excavator	105
	Grader	112
	Compactor	109
	Roller	107
	Water Cart	107
Paving Works	Asphalt Paver	114
	Asphalt Sprayer	104
	Smooth Drum Roller	107
	Truck & Dog	107

5.3 Operational Phase Scenarios

A summary of SWL for plant utilised during operational phase activities are shown in **Table 11.** Multiple operational phase modelling scenarios were constructed to evaluate the potential noise impacts, including:

- premises based operational noise associated with:
  - combined operation of the quarry and movement of heavy vehicles within the boundary of the development site; and
  - mulching of vegetation removed during quarrying processes; and
- road traffic noise associated with the movement of heavy vehicles along the public access roads to the site.

Table 11: Operational stage noise sources

Plant Description	Description of Utilisation	A-wt Level
Front End Loader	Loading material into heavy vehicles	107 dB
Truck & Dog	Transport of material from site	106 dB
Mulcher	Occasional mulching of vegetation	116 dB

5.4 Model Assumptions

Modelling scenarios were established to provide a conservative assessment for operations at the facility over a 15 minute period. The predicted results for each scenario represent the upper limit of expected noise levels from the proposed facility.

Key assumptions of the model include:

- all ground surfaces were modelled considering a ground factor of 0.5. It is noted that the land surface between the proposal site and the sensitive receiver locations is generally forested, therefore the modelled ground factor is considered to be conservative;
- the land surface was modelled as a flat surface. It is noted that the natural dune system would provide natural shielding to some sensitive receivers;
- all residential receivers were modelled at 1.5 metres above the ground surface;
- all noise sources were considered to operate at their maximum assumed noise levels for the duration of the assessment period;
- all noise sources were considered to operate simultaneously;
- all noise sources were modelled as point sources except for truck and dogs, and delivery trucks, which were modelled as a moving source at a speed of 20 km/hr;
- a peak number of trucks moving on site of 4 per hour (8 vehicle movements) for removal of sand off site, and 1 additional truck per hour (2 vehicle movements) for removal of waste or delivery of equipment, at a speed of 20 km/hr;
- no modifying factors have been applied to noise source sound power levels (SWLs) as tonal influences are not considered to be a feature of the operational noise environment.

It must be noted that these represent conservative assumptions, and the modelling results represent the upper limit of expected noise levels.

5.5 Noise Level Predictions

5.5.1 Construction Phase

A summary of predicted $L_{Aeq,15minute}$ noise levels at the nearest sensitive receivers associated with each of the construction phase scenarios are provided in **Table 12**. The predicted results are summarised by receiver type. Noise level contours for each of the construction phase scenarios are provided in **Appendix II.**

Table 12: Worst case noise impact predictions ($L_{Aeq,15minute}$ dB(A))

Scenario	Receiver Type	ID of most Affected Receiver	Prediction $L_{Aeq,15minute}$	NML $L_{Aeq,15minute}$	Count Receivers > NML
Vegetation Removal Including Mulching	Residential	R13	52	53-59	0
	Church	R23	42[1]	45 (internal)	0
	Recreation	R22	47	60-65	0
	Industrial	R21	52	75	0
Haul Road Widening and Improvements	Residential	R13	67	53-59	2 (R13, R14)
	Church	R23	55[1]	45 (internal)	1 (R23)
	Recreation	R22	48	60-65	0
	Industrial	R21	46	75	0
Site Preparation	Residential	R13	46	53-59	0
	Church	R23	36[1]	45 (internal)	0
	Recreation	R22/R24	39	60-65	0
	Industrial	R21	42	75	0
Concrete Foundations	Residential	R13	46	53-59	0
	Church	R23	36[1]	45 (internal)	0
	Recreation	R22/R24	37	60-65	0
	Industrial	R21	40	75	0
Shed Construction	Residential	R14	42	53-59	0
	Church	R23	32[1]	45 (internal)	0
	Recreation	R22/R24	37	60-65	0
	Industrial	R21	41	75	0
Formation Widening	Residential	R13	64	53-59	3 (R5, R13, R14)
	Church	R23	51[1]	45 (internal)	1 (R23)
	Recreation	R22	50	60-65	0
	Industrial	R21	46	75	0
Paving Works	Residential	R13	64	53-59	5 (R1, R5, R8, R13, R14)
	Church	R23	51[1]	45 (internal)	1 (R23)
	Recreation	R22	51	60-65	0
	Industrial	R21	48	75	0

Note 1: Denotes predicted internal noise level

The results of noise modelling for site preparation and construction works indicate that:

- during haul road widening works, exceedences of the day period NML may be expected for:
  - two residential receivers, including R13 (14 dB) and R14 (2 dB);
  - one place of worship (R23) with predicted internal noise levels 10 dB above the NML;
- there were no receivers predicted to experience noise levels above the highly affected NML of 75 dB(A); and
- emissions associated with vegetation removal, site preparation, foundation works and shed construction are expected to be below the relevant NMLs at all receiver locations.

During site access construction works, involving the widening of Nelson Bay Road to allow a left turn lane into the proposed facility, and road paving works, the results of the modelling indicate that:

- three residential receivers would potentially experience noise levels, during formation widening works, that exceed the day period NMLs by up to 11 dB at R13, and up to 2 dB at R5 and R14;
- five residential receivers would potentially experience noise levels, during paving works, that exceed the day period NMLs by up to:
  - 11 dB at R13;
  - 3 dB at R5 and R14; and,
  - 1 dB at R1 and R8;
- an exceedences of the internal NML, for a place of worship, was predicted of up to 7 dB at R23 (Baylife Church);
- there were no predicted exceedences of the NML for recreation or industrial receivers.

The predicted noise levels represent conservative assumptions, based on all plant operating at maximum capacity, and at locations most exposed to the nearby sensitive receivers. Where plant do not work simultaneously and are not at their closest point, lower noise levels would be expected. It is therefore considered that these modelled predictions represent the upper limit of expected noise levels.

It should be noted that many of the items of plant proposed for the construction phase activities have the potential to generate tonal influences, particularly in the case of reverse alarms. Where tonal reverse alarms are used in lieu of broadband reverse alarms, the predicted noise levels are expected to be up to 5 dB higher than those modelled.

In light of the predicted exceedances at nearby residential receivers and the Baylife Church under specific construction scenarios, noise mitigation and management measures will be implemented. Some practical methods for managing the potential impacts will include:

- early and ongoing communication with potentially affected receivers to inform of the proposed works, duration and potential for noise;
- training workers to minimise noise by avoiding shouting; minimising slamming vehicle doors; avoiding the use of radios or stereos outdoors where neighbours can be affected;
- keeping truck drivers informed of designated vehicle routes, parking locations, acceptable delivery hours or other relevant practices;

- avoiding operating equipment simultaneously, where possible. This has the potential to substantially reduce noise emissions;
- designing of the site to avoid the use of reverse alarms or employ the use of broadband alarms to reduce the occurrence of any annoying characteristics;
- regular inspection and maintenance of equipment to ensure it is good working order;
- placing as much distance between plant or equipment and other sensitive land uses; and
- scheduling works to occur when neighbours are not present, or during times of high background noise to provide masking or reduce the amount that the construction noise intrudes above the background.

Although noise exceedences may be expected under haul road widening and turning lane improvement works, the activity will occur only for a relatively short term, and impacts will be minimised through the implementation of the above measures. Where noise complaints are received during the construction period, noise monitoring may be undertaken to confirm the nature of the complaint, and where required, confirm the need for any additional specific mitigation measures.

5.5.2 Operational Phase

A summary of predicted $L_{Aeq,15minute}$ noise levels at the nearest sensitive receivers associated with each of the operational scenarios are provided in **Table 13**. The predicted results are summarised by receiver type. Noise level contours for each of the operational stage scenarios are provided in **Appendix II.**

Table 13: Worst case noise impact predictions ($L_{Aeq,15minute}$ dB(A))

Scenario	Receiving Environment	ID	Prediction $L_{Aeq,15minute}$	PSNL $L_{Aeq,15minute}$	Count Receivers > PSNL
Quarry Operations (Front End Loader and Truck & Dogs)	Residential	R13	49	48-53	1 (R13)
	Church	R23	39[1]	40 (internal)	0
	Recreation	R22	40	50-55	0
	Industrial	R21	43	70	0
Quarry Operations including Vegetation Mulching	Residential	R13	51	48-53	3 (R4, R13, R14)
	Church	R23	42	40 (internal)	1 (R23)
	Recreation	R22	45	50-55	0
	Industrial	R21	49	70	0

The results of noise modelling indicate that:

- a marginal exceedence of up to 1 dB above the day period criterion may be expected at residential receiver location R13 during general quarry operations;
- exceedences of 1 to 3 dB above the day period criterion may be expected at the residential receivers during vegetation mulching activities, where they occur concurrently with general quarry operations; and
- an exceedance of up to 2 dB above the day period criterion for internal noise at a place of worship may be expected at the Baylife Church (R23), where vegetation mulching and general quarry operations are occurring concurrently.

The results of the noise modelling indicate that the movement of vehicles on the internal haul road is the predominant activity contributing to the marginal exceedence of the day period criterion at residential receiver location R13 during general quarrying operations. In the absence of truck movements along the haul road, sand extraction activities were predicted to comply with the noise goals at each of the sensitive receiver locations.

During vegetation mulching activities, noise levels are predicted to increase at each of the receiver locations, with exceedences expected at three residential receivers (R4, R13 and R14), and the Baylife Church. It is noted that vegetation mulching activities would be an occasional practice at the site, occurring only when vegetation is uncovered from within the sand resource during quarrying operations.

In light of the predicted exceedances at nearby sensitive receivers under general quarrying operations and occasional vegetation mulching scenarios, noise mitigation and management measures will be implemented where reasonable and feasible. Advitech makes the following recommendations to manage noise levels from site activities:

- during quarrying operations, internal vehicle movements are restricted to four heavy vehicles in any one hour of the day; and
- additional analysis shown in **Figure 5** indicates that background noise levels generally fall to their lowest between 11:00am and 3:00pm. High noise generating activities such as mulching should be scheduled for periods of higher background noise levels, during which masking of noise is more likely to occur.

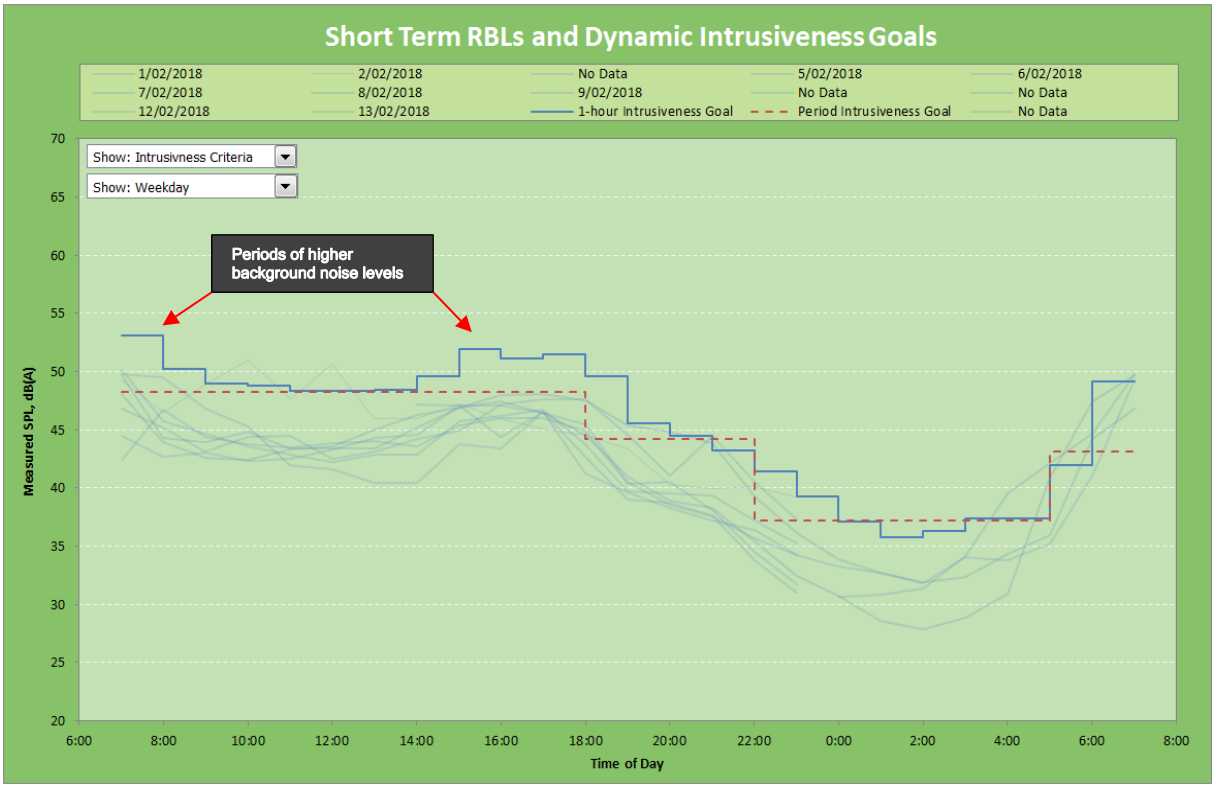

Figure 5: Analysis of short term (hourly) RBLs and Dynamic Intrusiveness Goals

Upon implementation of the noise mitigation and management measures, noise monitoring is to be carried out to establish the noise emission level of the facility at sensitive receivers and determine compliance. It is recommended that noise monitoring is undertaken on a quarterly basis for the facility's first year of operation, with the frequency of noise monitoring reviewed each year afterwards.

Monitoring should also be carried out in response to a complaint and should be completed as soon as practically possible after the complaint. Where applicable, following any corrective action, monitoring should be repeated to confirm the effectiveness of any control measure implemented.

5.6 Road Traffic Noise Assessment

Project generated traffic has the potential to increase noise levels on existing public roads. For sensitive land uses affected by additional traffic on existing roads, generated by land use developments, any increase in the total traffic noise levels should be limited to 2 dB above that of the corresponding 'no build option'.

Vehicle movements would be determined by product demand and the availability of the resource. At present, the existing sand resource is approximately 37,100 cubic metres, therefore the annual volume to be extracted would be significantly less than the maximum threshold extraction rate of 50,000 cubic metres per year. Notwithstanding this, the road traffic assessment has assumed a maximum number of vehicle movements based on the threshold production rate. The road traffic noise assessment was based on the following parameters:

- an assumed maximum of 4 heavy vehicles accessing and exiting the site per hour;
  - this figure was established by dividing the maximum number of production vehicles per day (40) by the operating hours in each day (10 hours);
- it is anticipated that there would be a 75% / 25% split of vehicles accessing and departing the site via Nelson Bay Road from the west / east respectively; and
- the sign posted speed limit on Nelson Bay Road is 90km/h.

It is anticipated that one additional vehicle movement would occur per hour in and out of the site, which would account for light vehicle movements, delivery of goods and removal of waste.

Nelson Bay Road is the main arterial link connecting Newcastle to Williamtown and the Tomaree Peninsula. It carries a large volume of local and tourist traffic visiting the Nelson Bay area. It is the only route servicing the Tomaree Peninsula and the various townships between Newcastle and Nelson Bay. Based on a traffic survey undertaken by Trans Traffic Survey between 6 February 2018 and 13 February 2018, the existing traffic volumes on Nelson Bay Road are approximately 19,100 vehicles per day, with approximately 6% heavy vehicles.

As Nelson Bay Road is the main arterial road servicing the Tomaree Peninsula, carrying a high volume of existing traffic including heavy vehicles, it is expected that the maximum traffic generated by the proposed development would be less than 0.5% of AADT.

Typically an increase in traffic noise level above the 2 dB increase criteria is expected where traffic volumes increase by 20% or more. Since the project is expected to increase traffic by a much lower amount than this, it is considered to comply with the RNP relative increase criteria.

6. CONCLUSION

Advitech Environmental was engaged to prepare an assessment of potential noise impacts associated with the construction and operation of a proposed Sand Quarry at Nelson Bay Road, Anna Bay. The construction period is anticipated to take approximately one to two months, with construction activities being undertaken during weekdays from 7:00am to 6:00pm. The development is proposed to operate between the hours of 7:00am and 6:00pm Monday to Friday, and 8:00am to 1:00pm Saturdays. The operation will produce up to 50,000 cubic metres of quarried material per annum.

Noise assessment criteria were established for adjacent sensitive receiving noise environments. Assessment of potential construction and operational phase noise impacts was made using a number of conservative assumptions as outlined in the report. The noise prediction indicates that exceedances of the noise goals may be expected under some construction and operational conditions.

During construction, exceedence of the NMLs at up to five residential receivers and one place of worship may be expected during internal haul road widening works and the works to improve the site access. It is expected that there would not be any exceedence of the *high affected* NMLs during any of the construction activities. Noise impacts would be minimised during the construction phase of the proposal by implementing the recommended work practices provided within this report. Supplementary monitoring may be undertaken in response to, and to assist with the management of specific noise complaints.

During operation, marginal exceedences of the PSNLs at up to three residential receivers and one place of worship may be expected during general quarrying operations and vegetation mulching activities. In addition to universal work practices to minimise the site generated noise, the following noise control recommendations are provided to minimise noise emissions during the operational phase of the proposal:

- during quarrying operations, internal vehicle movements are restricted to four heavy vehicles in any one hour of the day;
- noise levels generally fall to their lowest between 11:00am and 3:00pm. High noise generating activities such as mulching should be scheduled for periods of higher background noise levels, during which masking of noise is more likely to occur.
- temporary barriers or local topography may be used to maximise the shielding of the nearby sensitive receivers from vegetation mulching activities.

It is anticipated that the maximum traffic volumes generated by the proposed development would be less than 0.5% of AADT, therefore, it is considered that no significant increase of road traffic noise is expected on Nelson Bay Road as a result of the proposal.

7. REFERENCES

The following information was used in the preparation of this report:

1. AS 2436-2010: *Guide to noise and vibration control on construction, demolition and maintenance sites.*
2. AS 2706-1984: *Numerical Values: Rounding and interpretation of limiting values;*
3. Bies, DA & Hansen, CH (2009). Engineering Noise Control: Theory and Practice (4th Edition), Spon Press;
4. NSW Department of Environment and Climate Change (2009), *Interim Construction Noise Guideline,* Department of Environment and Climate Change, Sydney.
5. NSW Department of Environment, Climate Change and Water (2011), *NSW Road Noise Policy,* Department of Environment, Climate Change and Water, Sydney.
6. NSW Environment Protection Authority (2000). *NSW Industrial Noise Policy*, NSW Environment Protection Authority, Sydney;
7. UK Department of Environment, Food and Rural Affairs (2005), *Update of noise database for prediction of noise on construction and open sites,* UK Department of Environment, Food and Rural Affairs, Norwich.

Appendix I

Background Noise Monitoring

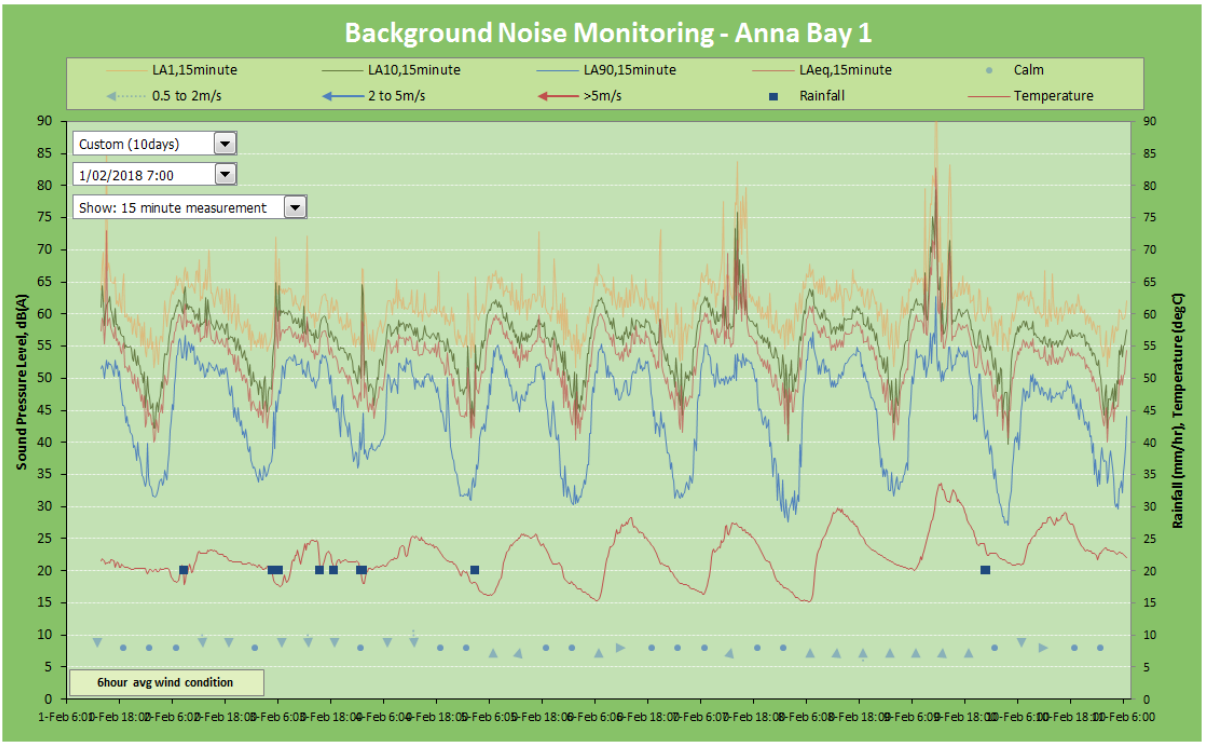

Figure I-1: Background noise monitoring at location Anna Bay 1, adjacent to Nelson Bay Road

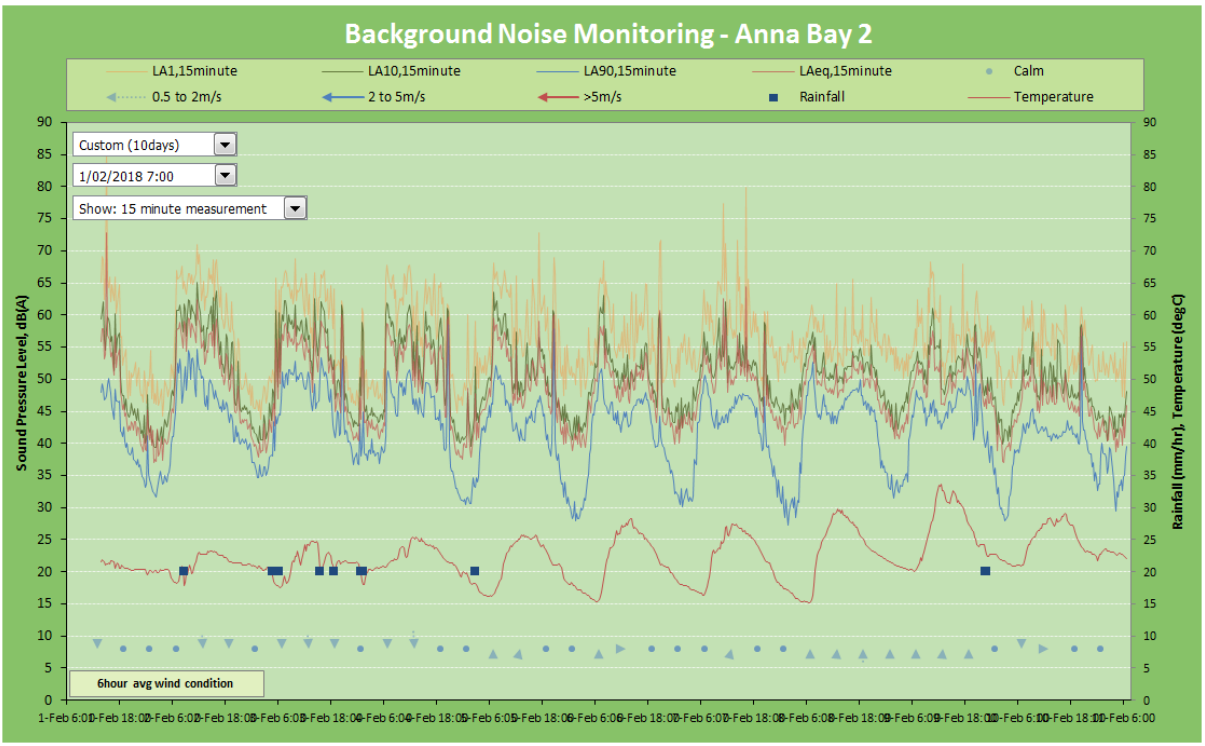

Figure I-2: Background noise monitoring at location Anna Bay 2, setback from Nelson Bay Road

Appendix II

Noise Level Contours

Figure II-1: Construction noise contours - Vegetation removal

Figure II-2: Construction noise contours - Haul road widening

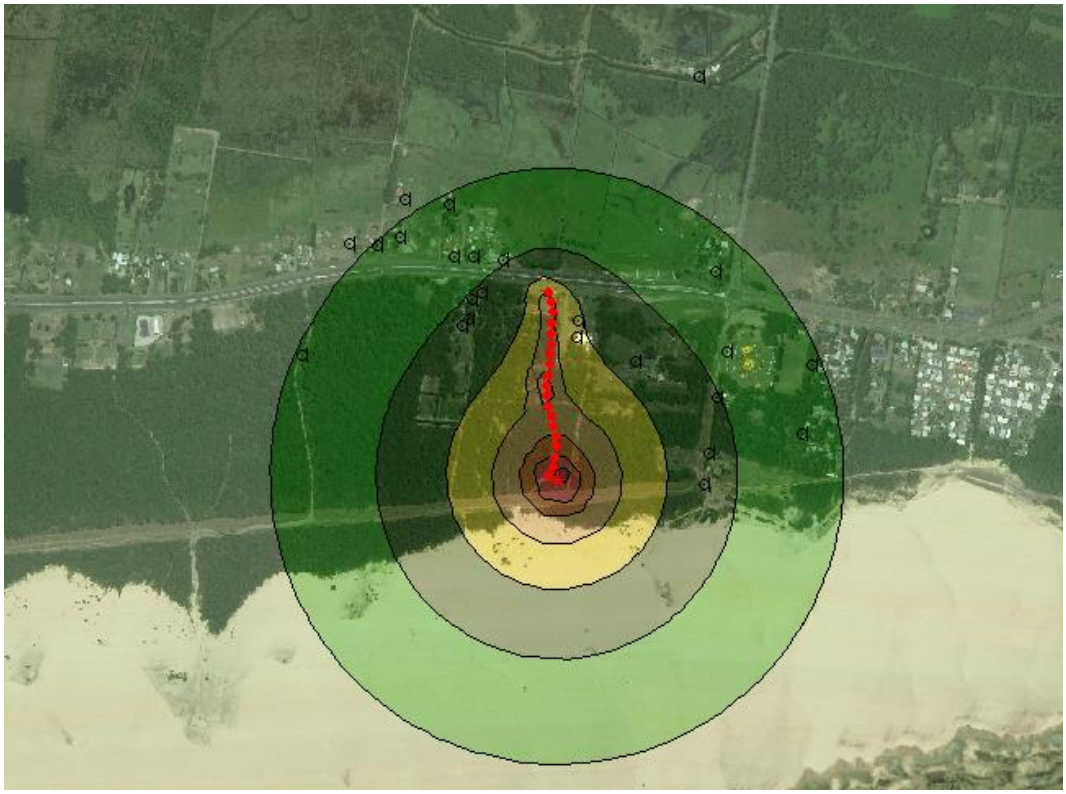

Figure II-3: Construction noise contours – Site preparation

Figure II-4: Construction noise contours – Concrete pouring

Figure II-5: Construction noise contours – Shed construction

Figure II-6: Construction noise contours – Formation widening

Figure II-7: Construction noise contours – Paving works

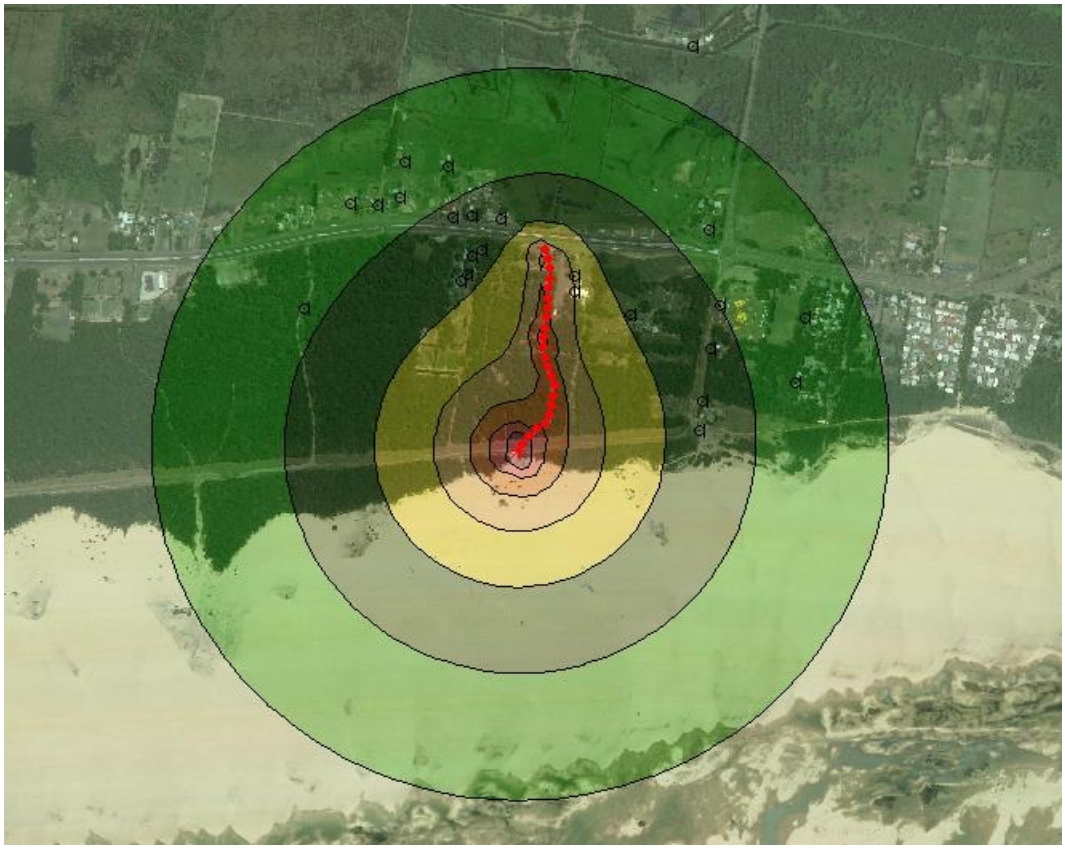

Figure II-8: Operation noise contours – Quarry operations

Figure II-9: Operation noise contours – Quarry operations including mulching

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15 January, 2020

Tattersall Lander
2 Bourke Street / PO Box 580
Raymond Terrace NSW 2324
AUSTRALIA

Attention: **Julie Wells**

Subject: **Anna Bay: Request for Clarification/Further Information**

Dear Julie,

I have reviewed the EPA's request for clarification relating to the noise impact assessment associated with Anna Bay. This report, while conservatively stating that both the project specific noise levels (PSNL) and noise management levels (NML) for the operational and construction phases of this development may be exceeded under certain circumstances, has provided the proponent with feasible and reasonable recommendations to assist in the mitigation and management of potential residual impacts in the receiving environment. When reviewing the mitigation recommendations stated in this report, it is important to consider the following aspects pertaining to predicted exceedances.

Noise exceedances during the construction phase

During the construction phase of the project, it has been indicated that the activities likely to cause adverse noise levels above the NML are:

- site preparation works including haul road widening, which is predicted to impact:
  - residential receivers R13 and R14 in addition to R23 (place of worship); and
- site access works including formation widening, and paving works on Nelson Bay Road, which is predicted to impact:
  - residential receivers R1, R5, R8, R13 and R14 in addition to R23 (place of worship).

Although noise exceedences may be expected under haul road widening and turning lane improvement works, the activity will occur only for a relatively short term (1 to 2 months of the proposed 30-year lifespan), and impacts will be minimised through the implementation of the measures outlined in Section 5.5.2 of the Anna Bay NIA. Where noise complaints are received during the construction period, noise monitoring may be undertaken to confirm the nature of the complaint, and where required, confirm the need for any additional specific mitigation measures.

It is important to note that the predicted noise levels for these activities represent conservative assumptions, based on all plant operating at maximum capacity, and at locations most exposed to the nearby sensitive receivers. Where plant do not work simultaneously and are not at their closest point, lower noise levels would be expected. Therefore, while construction noise is likely to impact the nearest sensitive receivers, the circumstances in which the NML is exceeded would be experienced at intermittent periods and not for the entire duration of the activity.

Noise exceedances during the operational phase

During the operational phase of the project, it has been indicated that the activities likely to cause adverse noise levels above the PSNL are:

- quarry operations conducted simultaneously with mulching operations, which is predicted to impact:
  - residential receivers R4, R13 and R14 in addition to R23 (place of worship);and
- quarry operations conducted in isolation, which is predicted to impact:
  - residential receiver R13 (up to 1dB(A) above the PSNL).

Modelling results indicate that exceedances of 1 to 3dB(A) may be experienced at residential receivers R4, R13 and R14 when quarry operations are occurring concurrently with mulching operations (Table 13 of report). Additionally, an exceedance of 1dB(A) is also expected at receiver R13 when quarry operations are conducted (in isolation from other activities).

Long term unattended noise monitoring results indicate that the hourly intrusiveness criteria increases by at least 3dB(A) at both unattended monitoring locations (identified as AnnaBay1 and AnnaBay2 in report) between the hours of 8 to 9am and 4 to 6pm during weekdays. Further analysis indicates that the hourly intrusiveness criteria is also above the predicted worst-case noise level for this activity between 10am to 1pm on weekends. During these windows, the noise levels experienced at the affected sensitive receivers would be considered compliant with the PSNL criteria.

Modelling results also indicate that exceedances of up to 2dB(A) are expected at the nearby Baylife church (R23) if mulching and quarry operations are to occur simultaneously. This receiver is assessed under a recommended acceptable amenity noise criterion as a place of worship and has a PSNL of 40dB(A). The worst case predicted internal noise level for this activity is 42dB(A). To avoid any exceedances at this receiver, mulching in conjunction with quarry operations should be conducted outside the opening hours of the Baylife church. Information pertaining to the opening hours of Baylife church are presented below:

- closed Monday;
- open Tuesday to Friday from 10am to 4pm;
- closed Saturday; and
- open Sunday at 10am to 11:30am and 5pm to 6pm.

It therefore stands that receivers R4, R13, R14 and R23 are expected to be compliant with the PSNL if mulching operations (when conducted simultaneously with quarry operations) is restricted to the following periods:

- 8am to 9am and 4pm to 6pm weekdays; and
- 10am to 1pm on Saturdays.

No operations are proposed on Sundays or Public Holidays.

Further to this, ongoing mitigation measures have been recommended to ensure that if adverse noise impacts are experienced as a result of the project, active investigation into the nature of the complaint and additional controls are conducted.

These measures are listed below:

- noise monitoring is to be carried out to establish the noise emission level of the facility at sensitive receivers and determine compliance; and
- it is recommended that noise monitoring is undertaken on a quarterly basis for the first year of operation of the facility, with the frequency of noise monitoring reviewed each year afterwards.

In conclusion, it is predicted that mitigation measures will adequately address modelled exceedances of PSNL during all operational activities. Although noise exceedences may be expected under haul road widening and turning lane improvement works during construction, the short duration of these activities and practical mitigation measures provided in the report should be considered when assessing what is reasonable and feasible regarding the effective controls for site noise management. It is recommended that this project has adequately considered and addressed potential noise impacts associated with the construction and operational phases of the project.

Yours faithfully,

Louis Abell

Environmental Scientist
Advitech Pty Limited

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