

Belmont Desalination Plant

Construction Noise and Vibration Monitoring Program

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Revisions and Distribution

Revisions

Draft issues of this document are identified as Revision A, B, C, etc. Upon initial issue (generally Contract Award) this will be changed to a sequential number commencing at Revision 0. Revision numbers will continue at Revision 1, 2, etc.

Rev	Date	Prepared By [Name]	[Signature]	Reviewed By [Name]	[Signature]	Approved By [Name]	[Signature]	Remarks
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Table of Contents

Revisions and Distribution	2
Revisions	2
Distribution List	2
Terms and Abbreviations	5
Plan Profile	8
1. Introduction	9
1.1. Context	9
1.2. Scope of the Monitoring Program	9
1.3. Purpose and Objectives	9
1.4. Environmental Management System Overview	9
1.5. Monitoring Program Preparation, Approval and Update	9
2. Environmental Requirements	10
2.1. Relevant Legislation, Guidelines and Standards	10
2.2. Conditions of Approval	11
2.3. Revised Environmental Management Measures	12
3. Existing Environment and sensitive receivers	13
3.1. Baseline Data	13
3.2. Noise and Vibration Sensitive Receivers	13
4. Monitoring procedures	15
4.1. Noise monitoring	15
4.1.1. Noise monitoring equipment	16
4.1.2. Real time noise monitoring	17
4.2. Vibration monitoring	17
4.2.1. Minimum working distances	18
4.2.2. Vibration monitoring equipment	18
4.3. Monitoring in response to complaints	18
4.4. Noise and vibration monitoring locations	18
5. Compliance Management	19
5.1. Roles, Responsibility and Training	19
5.2. Data analysis	19
5.3. Management of Exceedances	19
5.4. Reporting	20
6. Review and Improvement	21
6.1. Continuous Improvement	21
6.2. Monitoring Program Update and Amendment	21

Figures

Figure 3-1: Project Locality and Noise Monitoring Location 14

Tables

Table 2-1: Principal legislation and regulation relevant to noise and vibration..... 10

Table 2-2: Condition of Approval and Mitigation Measures relevant to this Monitoring Program 11

Table 2-3: REMMs relevant to this Monitoring Program..... 12

Table 3-1: Ambient noise monitoring results and derived RBL..... 13

Table 4-1: Noise monitoring procedure..... 15

Table 4-2: Vibration monitoring procedure 17

Table 5-1: Reporting requirements specific to noise and vibration management 20

Terms and Abbreviations

Term/Abbreviation	Definition/Expanded text
ABL	Assessment Background Level – A single-number figure used to characterise the background noise levels from a single day of a noise survey. ABL is derived from the measured noise levels for the day, evening, or night-time period of a single day of background measurements. The ABL is calculated to be the tenth percentile of the background LA90 noise levels, i.e. the measured background noise is above the ABL 90% of the time.
ABN	Airborne noise
Ambient Noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
AMS	Activity Method Statements
AQMP	Air Quality Management Sub-Plan
Attenuation	The reduction in the level of sound or vibration.
At-property acoustic treatment	Includes courtyard walls and building treatments. Building treatments may include but are not limited to ventilation, acoustic blinds/curtains, glazing, window and door seals, sealing of vents or underfloor areas, shutters and secondary glazing.
AVTG	Assessing Vibration – A Technical Guideline
CS	Communications Strategy
CEMP	Construction Environmental Management Plan
CMP	Construction Monitoring Program
CNVG	Construction Noise and Vibration Guideline (CNVG) (Transport for NSW 2016b)
CoA	Conditions of Approval
Construction	Includes all activities required to construct the SSI as defined in the Project Description described in the documents listed in Condition A1, including commissioning trials of equipment and temporary use of any part of the SSI but excludes Low Impact Work which is carried out or completed prior to approval of the CEMP and works approved under a Site Establishment Management Plan.
Consultation	To provide information and actively engage with and obtain and consider feedback from stakeholders during development of post approval documents. How the feedback has been considered and whether any changes have been made in response to this feedback is then documented and communicated back to stakeholders. Consultation should not be limited to one-way notification about the project.
Continuously	Includes any period during which there is less than one hour between ceasing and recommencing any of the work.
CNVMP	Construction Noise and Vibration Management Plan
D&C	Design and Construct
dB(A)	Decibels using the A-weighted scale which is accepted as being representative of the frequency response of the human ear.
DEC	Department of Environment and Conservation
DECC	Department of Environment and Climate Change
DECCW	Department of Environment and Climate Change and Water
DPHI	Former Department of Planning, Industry and Environment, now Department of Planning, Health and Infrastructure
EIS	Environmental Impact Statement
EMS	Environmental Management System
Environmental Assessment Documentation	Hunter Water Corporation Belmont Desalination Plant Environmental Impact Statement, prepared by GHD dated 2019. Hunter Water Corporation Belmont Desalination Plant Amendment Report and Submissions Report prepared by GHD dated 2020. Hunter Water Corporation Belmont Desalination Plant Modification Report Environmental Impact Statement prepared by Jacobs dated 2024.

Term/Abbreviation	Definition/Expanded text
	Hunter Water Corporation Belmont Desalination Plant Modification Report – Submissions Report prepared by Jacobs dated 2024
Environmental aspect	Defined by AS/NZS ISO 14001:2015 as an element of an organisation’s activities, products or services that can interact with the environment.
Environmental impact	Defined by AS/NZS ISO 14001:2015 as any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation’s environmental aspects.
Environmental incident	An unexpected event that has, or has the potential to, cause harm to the environment and requires some action to minimise the impact or restore the environment.
Environmental objective	Defined by AS/NZS ISO 14001:2015 as an overall environmental goal, consistent with the environmental policy, that an organisation sets itself to achieve.
Environmental target	Defined by AS/NZS ISO 14001:2015 as a detailed performance requirement, applicable to the organisation or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPA	Environment Protection Authority
EPL	Environment Protection Licence
ER	Environmental Representative
EWMS	Environmental Work Method Statement
Feasible and reasonable	Consideration of best practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. Feasible relates to engineering considerations and what is practical to build. Reasonable relates to the application of judgement in arriving at a decision, taking into account mitigation benefits and cost of mitigation versus benefits provided, community views and nature and extent of potential improvements.
GBN	Ground-borne noise
Highly Noise Affected	As defined in the Interim Construction Noise Guideline (DECC, 2009)
Highly noise intensive works/ particularly annoying	Work which is defined as annoying under the ICNG including: use of power saws, such as used for cutting timber, rail lines, masonry, road pavement or steel work (a) grinding metal, concrete or masonry; (b) rock drilling; (c) line drilling; (d) vibratory rolling; (e) bitumen milling or profiling; (f) jackhammering, rock hammering or rock breaking; and (g) impact piling Note: when modelled, these activities/plant and equipment will incur a 5dB(A) penalty.
HWC	Hunter Water Corporation
ICNG	Interim Construction Noise Guideline (DECC, 2009)
INP	Industrial Noise Policy
ISCA	Infrastructure Sustainability Council of Australia
JH	John Holland
L _{A(max)}	The A-weighted maximum noise level only from the construction works under consideration, measured using the fast time weighting on a sound level meter.
L _{Aeq(15min)}	The A-weighted equivalent continuous (energy average) A-weighted sound pressure level of the construction works under consideration over a 15-minute period and excludes other noise sources such as from industry, road, rail, and the community.
LA1	The A-weighted sound pressure level that is exceeded for 1 per cent of the time for which the given sound is measured.

Term/Abbreviation	Definition/Expanded text
LA90	The A-weighted sound pressure level that is exceeded for 10 per cent of the time for which the given sound is measured.
NCA	Noise Catchment Area
NCG	Noise Criteria Guideline
NMG	Noise Mitigation Guideline
NML	Noise Management Level as defined in the Interim Construction Noise Guideline (DECC, 2009)
NPfi	Noise Policy for Industry
NVA	Noise and Vibration Assessment
NVIS	Noise and Vibration Impact Statement
ONR	Operational Noise Review
OOHW	Out of Hours Works
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
PPV	Peak Particle Velocity – the highest velocity of a particle (such as part of a building structure) as it vibrates. Most sound level meters measure root mean squared (RMS) values; it is common to approximate the PPV based on an RMS measurement. PPV is commonly used as a vibration criterion, and is often interpreted as a PPV based on the L _{max} or L _{max,spec} index.
RBL	The Rating Background Level for each period is the medium value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period (day, evening and night).
REMM	Revised Environmental Management Measures
RMS	Root Mean Squared
RNP	Road Noise Policy
ROL	Road Occupancy Licence
Sensitive land use(s)	Includes residences, educational institutions (including preschools, schools, universities, TAFE colleges), health care facilities (including nursing homes, hospitals), religious facilities (including churches), childcare centres, passive recreation areas (including outdoor grounds used for teaching). Receivers that may be considered sensitive include commercial premises (including film and television studios, research facilities, entertainment spaces, temporary accommodation such as caravan parks and camping grounds, restaurants, office premises, and retail spaces), and industrial premises as identified by the Planning Secretary.
Submissions Report	The Proponent's response to issues raised in the submission received in relation to the application for approval of the SSI under the EP&A Act.
SPL	Sound Pressure Level
TfNSW	Transport for New South Wales, or TfNSW
VMS	Variable Message Signs
Work	Any physical activity for the purposes of the SSI including construction, Low Impact Work, enabling works, utility works and site establishment activities but not including operational maintenance works.
WRA	Work Risk Assessment

Noise and Vibration Monitoring Program

Plan Profile

Management System	The Project will use John Holland's Environmental Management System (EMS) and core Project plans to support Project delivery. Additional functional plans have been developed for the Project.
Name	Noise and Vibration Monitoring Program
Authorisation	All personnel employed on the Project will perform their duties in accordance with the requirements of this Plan and in compliance with Project system procedures and any specific Project instructions. This Plan is authorised by the Project Director.
Review and update	This Plan will be regularly reviewed, developed, and updated: <ul style="list-style-type: none"> • For changes in design or construction sequence, staging, methodology or resourcing • To consider progress of the Project Company's Work • For changes in access to the Project Site and Temporary Areas • To consider changes directed by HWC Representative

1. Introduction

1.1. Context

This Construction Noise and Vibration Monitoring Program (monitoring program) is an appendix of the Construction Noise and Vibration Management Sub Plan (CNVMP) which forms part of the Construction Environmental Management Plan (CEMP) for the Belmont desalination plant (the Project).

This monitoring program has been prepared to address the requirements of the ministers Conditions of Approval (CoA), the measures listed in the Environmental assessment documentation and all applicable legislation.

1.2. Scope of the Monitoring Program

The scope of the monitoring program is to describe how the environmental noise and vibration impacts from construction will be monitored during the delivery of the project. This monitoring program has been prepared under and consistent with the CNVMP, considering the relevant sensitive receivers and construction activities.

This monitoring program has been developed to describe how environmental noise and vibration will be monitored in the immediate vicinity of construction works. Operational monitoring measures do not fall within the scope of this monitoring program and therefore are not included. A copy of this monitoring program will be kept on the premises for the duration of construction.

1.3. Purpose and Objectives

The purpose of this monitoring program is to describe the methodology used for monitoring environmental noise and vibration during construction of the project. The key objective of this monitoring program is to ensure that noise and vibration impacts to sensitive receivers and the local community from construction off the project are minimised.

Section 2.2 and 2.3 of the CNVMP further detail objectives and specific targets for the management of noise and vibration impacts during the delivery of the project in relation to this monitoring program.

1.4. Environmental Management System Overview

The Environmental Management System (EMS) for the project is described in the CEMP. To achieve the intended environmental performance outcomes, JH have established, implemented, maintained and continually improved an EMS in accordance with the requirements of ISO 14001:2015. The JH EMS will be adopted as the guiding environmental management framework for the project.

1.5. Monitoring Program Preparation, Approval and Update

This Monitoring Program has been prepared to satisfy CoA C19(j) and has been prepared by a specialist noise and vibration consultant in accordance with CoA C19(a). This monitoring program will be reviewed by Hunter Water Corporation (HWC) and the Department of Planning, Housing and Infrastructure (DPHI) Environmental Representative (ER) to confirm it is consistent with, and incorporates, all relevant requirements prior to submission to the Planning Secretary for approval.

Construction of the project will not commence until the CNVMP, and this monitoring program are endorsed by the ER and approved by the Planning Secretary.

This monitoring program will be implemented for the duration of construction and for any longer periods set out in this monitoring program or specified by the Planning Secretary, whichever is greater. This monitoring program will be regularly reviewed by the Environmental Manager (or Delegate). If Planning agrees, minor amendments to this monitoring program will be approved by the ER.

Any amendments to the monitoring program will be documented in subsequent revisions of this monitoring program. A copy of the updated monitoring program and changes will be distributed to all relevant stakeholders in accordance with approved document control procedures outlined in the CEMP. Site personnel with responsibilities relevant to noise and vibration monitoring will be informed of any amendments and training provided, where required.

2. Environmental Requirements

2.1. Relevant Legislation, Guidelines and Standards

Table 2-1 lists the principal legislation, regulation, plans, policies, guidelines, specifications, and Australian Standards that apply to noise and vibration monitoring.

Table 2-1: Principal legislation and regulation relevant to noise and vibration

Legislation	<ul style="list-style-type: none"> • <i>Environmental Planning and Assessment Act 1979</i> • <i>Protection of the Environment Operations Act 1997 (POEO Act)</i> • Protection of the Environment Operations (Noise Control) Regulation 2008.
Standards	<ul style="list-style-type: none"> • British Standard BS6472-2008, Evaluation of human exposure to vibration in buildings (1-80Hz) • British Standard BS 7385: Part 2-1993 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground-borne vibration (BSI 1993) • German Standard DIN 4150-3 (2016) Vibration in buildings – Part 3: Effects on structures (DIN2016) • Australian Standard AS 1055: 2018 Acoustics – Description and Measurement of Environmental Noise • International Standard ISO5348:2021 Mechanical vibration and shock – Mechanical mounting of accelerometers. • AS/NZS IEC 61672.3:2019 Electroacoustics - Sound level meters, Part 3: Periodic tests • IEC 60942:2017 Electroacoustics - Sound calibrators • ISO 3744 Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure – Engineering methods for an essentially free field over a reflecting plane • ISO 3746 Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Survey method using an enveloping measurement surface over a reflecting plane • ISO 6393 Earth-moving machinery – Determination of sound power level – Stationary test conditions • ISO 6395 Earth-moving machinery – Determination of sound power level – Dynamic test conditions • NATA General Accreditation Guidance – General Equipment – Calibration and Checks, General Equipment Table 2018
Guidelines and Specifications	<ul style="list-style-type: none"> • Interim Construction Noise Guideline (ICNG) (DECC 2009a) • NSW EPA Assessing Vibration – a Technical Guideline (AVTG, 2006 – for human exposure) • NSW Road Noise Policy (RNP) (DECCW 2011) • Noise Policy for Industry (NSW EPA 2017). • NSW EPA Approved methods for measurements and analysis of environmental noise (NSW EPA 2022)

Relevant provisions of the above legislation are explained in the Register of Legal and Other Requirements included in Appendix A of the CEMP.

2.2. Conditions of Approval

The CoA and Revised Environmental Mitigation Measures (REMMS) relevant to this Protocol are listed Table 2-2.

Table 2-2: Condition of Approval and Mitigation Measures relevant to this Monitoring Program

CoA	Condition Requirements	Document Reference
A23	<p>Any condition of this approval that requires the carrying out of monitoring or an environmental audit, whether directly or by way of a plan, strategy or program, is taken to be a condition requiring monitoring or an environmental audit under Division 9.4 of Part 9 of the EP&A Act. This includes conditions in respect of incident notification, reporting and response, non-compliance notification, Site audit report and independent auditing.</p> <p><i>Note: For the purposes of this condition, as set out in the EP&A Act, "monitoring" is monitoring of the development to provide data on compliance with the approval or on the environmental impact of the development, and an "environmental audit" is a periodic or particular documented evaluation of the development to provide information on compliance with the approval or the environmental management or impact of the development.</i></p>	CNVMP (Section 8)
A24	<p>At least 48 hours before the commencement of construction until the completion of all works under this approval, or such other time as agreed by the Planning Secretary, the Proponent must:</p> <p>a) make the following information and documents (as they are obtained or approved) publicly available on its website:</p> <ol style="list-style-type: none"> i. the documents referred to in condition A2 of this approval; ii. all current statutory approvals for the development; iii. all approved strategies, plans and programs required under the conditions of this approval; iv. regular reporting on the environmental performance of the development in accordance with the reporting arrangements in any plans or programs approved under the conditions of this approval; v. a comprehensive summary of the monitoring results of the development, reported in accordance with the specifications in any conditions of this approval, or any approved plans and programs; vi. a summary of the current stage and progress of the development; vii. contact details to enquire about the development or to make a complaint; viii. a complaints register, updated monthly; ix. audit reports prepared as part of any independent audit of the development and the Proponent's response to the recommendations in any audit report; x. any other matter required by the Planning Secretary; and <p>keep such information up to date, to the satisfaction of the Planning Secretary and publicly available for 12 months after the commencement of operations.</p>	CNVMP (Section 8.5)
C19 (j)	include a program to monitor and report on the impacts and environmental performance of the development and the effectiveness of the implemented management measures in accordance with the requirements of condition C11.	This monitoring program
D12	The development must be constructed to achieve the construction noise management levels detailed in the Interim Construction Noise Guideline (DECC, 2009). All feasible and reasonable noise mitigation measures must be implemented and any activities that could exceed the construction noise management levels must be identified and managed in accordance with the management and mitigation measures identified in the approved Construction Noise and Vibration Management Plan.	CNVMP (Section 7.1)
D14	The Proponent must implement, where practicable and without compromising the safety of construction staff or members of the public, the use of 'quackers' to ensure noise impacts on surrounding noise sensitive receivers are minimised.	CNVMP (Section 7.1)
D16	Vibratory compactors must not be used closer than 30 metres from residential buildings unless vibration monitoring confirms compliance with the vibration criteria specified in condition D15.	Section 4.2

2.3. Revised Environmental Management Measures

The REMMs relevant to this monitoring program are listed in Table 2-3. A cross reference is also included to indicate where the requirement is addressed in this monitoring program or other project management documents.

Table 2-3: REMMs relevant to this Monitoring Program

REMM	Condition Requirements	Document Reference
NV7	<ul style="list-style-type: none"> <u>Vibration monitoring</u> will be undertaken where equipment is being used within the safe working distances detailed in Table 7-41 of the EIS or when a complaint is received. Vibration monitoring will be conducted during these activities at the most susceptible buildings close to the construction sites. Any vibration measurement will be undertaken by a qualified professional and with consideration to the ICNG guidelines. 	Section 4.2
NV8	<p>Complaints will be managed in accordance with the CEMP and the procedure outlined below. Signage will clearly and visibly provide a contact number and name to receive complaints and enquiries about construction. Potential complaints specific to these works could include:</p> <ul style="list-style-type: none"> Vibration impacts from works that significantly affect structures or dwellings A cluster of noise and/or vibration complaints Works have the potential to cause noise complaints from nearby receivers. The response will be to: <ul style="list-style-type: none"> Verbally respond to complainant Provide a written response within seven calendar days if the complaint cannot be resolved verbally Log the complaint, and any actions taken with regards to the complaint within a complaints register Undertake <u>monitoring</u> at the complainant's residence(s) Investigate the nature and reasons of the impact and implement further mitigation measures to minimise the impact. 	Section 5
MB7	<p>Artificial noise emissions</p> <ul style="list-style-type: none"> here activities that generate underwater noise cannot be timed to occur outside of peak migration months the following mitigation measures and controls may be implemented. Where this is not possible, the need for Marine Fauna Observers will be determined on the basis of construction timeframes. Acoustic harassment/deterrent devices could be sounded prior to commencement of any underwater activity to provide opportunity for sensitive marine fauna to relocate temporarily. Vessel machinery will be maintained in accordance with the manufacturer specifications to reduce noise emissions. <p>The interaction of all vessels with cetaceans and whale sharks will be compliant with Part 8 of the Environment Protection and Biodiversity Conservation (EPBC) Regulations (2000). The Australian Guidelines for Whale and Dolphin Watching (Commonwealth of Australia, 2017) for sea-faring activities will be implemented across the entire Project. Including underwater within 300 metres of a cetacean.</p>	CNVMP (Table 7.7)

3. Existing Environment and sensitive receivers

The noise environment within the suburban areas are generally influenced by road traffic from the Pacific Highway particularly during the day-time period. Natural white noise from Tasman Sea and Belmont Bay are also audible during quieter periods when traffic volumes drop. During the evening and night-time periods, ambient noise levels typically decrease due to a reduction in the volume of road traffic.

The existing Belmont Waste Water Treatment Works (WWTW) is located at the northern extent of the project area, suburban residential receivers including Active and passive recreational areas and motels and educational facilities are located to the west of the Project area. The suburban residential areas in Belmont are located to the south west of the Project.

3.1. Baseline Data

A summary of the background noise and vibration levels is provided in Section 4 of the CNVMP. The ambient noise environment is dominated by a combination of road traffic noise in the vicinity of the Pacific Highway at Belmont, local transport activities and natural white noise from South Pacific Ocean and Belmont Bay.

Baseline unattended noise monitoring was conducted in accordance with the procedures in the Noise Policy for Industry (NPI, 2017) guideline at one location. The noise logger was deployed at 24 Beach Street, South Belmont. This location was selected to capture noise characteristics considered representative of the project. Selection considerations included location of sensitive receivers, land topography and contribution from other noise activities, such as road noise. An attended noise measurement was also conducted for a 15-minute duration to identify ambient noise sources and validate unattended logger data. The locations in which the noise monitoring surveys were carried out are shown on Figure 3-1.

Unattended monitoring was carried out between 23 September 2019 and 30 September 2019 at 1 location (LO1). The derived Rating Background Levels (RBL) were re-established in the Modification Report from the levels presented in the EIS. The RBLs are presented in Table 3-1 and have been utilised to determine the Noise Management Levels (NML) applicable to the site component of the completed Construction Noise Assessment.

Table 3-1: Ambient noise monitoring results and derived RBL

ID	Address	RBL, dB (A) ¹			Ambient Noise dB (A)		
		Day	Evening	Night	Day	Evening	Night
L01	24 Beach Street, Belmont	38	37	33	55	50	47

Notes: Day time: 7:00AM to 6:00PM Monday to Saturday; or 8:00AM to 6:00PM on Sundays and Public Holidays. Evening: 6:00PM to 10:00PM. Night time: remaining period (NSW Noise Policy for Industry (EPA, 2017)).

3.2. Noise and Vibration Sensitive Receivers

The noise and vibration assessment in the EIS and submissions report identified and considered potential construction noise and vibration impacts for Nearby suburban and commercial areas.

Receivers potentially sensitive to noise and vibration were categorised as residential dwellings, commercial/industrial buildings (including small businesses), or 'other' sensitive land uses which includes educational institutions, childcare centres, medical facilities and places of worship.

There are sensitive receivers near the Project area, which may be impacted by noise from the construction works and operation of the proposed plant. The nearby sensitive receivers identified, are categorised as:

- Residential
- Commercial/Retail
- Hotel/Motel (Belmont Executive Apartments, Lakeview Motor Inn, Squid's Ink Motel, Gunyah Hotel)
- Active recreation (Belmont Golf Club, Nine Mile Beach, Belmont South Playground)
- Passive recreation (Belmont Cemetery)
- Education (Creative Kids Preschool)

Sensitive receiver locations are shown on Figure 3-1. Sensitive receivers will be reviewed during each revision of this Plan to determine whether any additional measures are required to minimise potential noise and vibration impacts.



Figure 3-1: Project Locality and Noise Monitoring Location

4. Monitoring procedures

4.1. Noise monitoring

The noise monitoring procedure to be adopted for the Project is provided in Table 4-1.

All noise monitoring will be undertaken in accordance with the ICNG and, where additional guidance is required, the NSW Environment Protection Authority Approved methods for the measurement and analysis of environment noise in NSW (Environment Protection Authority, 2022). Any person measuring and analysing environmental noise must be appropriately qualified and experienced in acoustics to a standard sufficient to enable that person to accurately interpret and apply the advice set out in acoustics standards, guidelines and policies (competent person).

Subject to property owner approval, noise monitoring will be conducted at representative residential and other locations (including at the worst-affected residences) to confirm construction noise levels. The ICNG states that noise levels are to be assessed at the property boundary that is most exposed to construction noise, and at a height of 1.5 metres above ground level. If the property boundary is more than 30 metres from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 metres of the residence. The monitoring location will be selected with regard to this guidance in the ICNG, as well as factors including but not limited to:

- Safety of the competent person undertaking the measurement,
- Security of the noise monitoring equipment,
- The purpose of the noise monitoring (such as investigating a noise complaint occurring at a particular façade of a residence), and
- Other site-specific constraints as they may arise.

Table 4-1: Noise monitoring procedure

Monitoring details	Frequency	Test procedure
Attended OOHW noise monitoring at sensitive receivers during evening, night and other OOH periods (weekends/public holidays)	On the first occasion of activities for which an assessment has been prepared	<p>The testing method includes:</p> <ul style="list-style-type: none"> • Sound level meter configured for “Fast” time weighting and “A” frequency weighting • Outdoor (free-field) measurements should be undertaken at least 3.5m from any reflecting structure (other than the ground) and at a height of 1.2–1.5m above ground level or the floor of interest if pertinent to a building, unless good acoustic practice means that a different position is more appropriate. • Tests will not be carried out during rain or when the wind speed at the test site exceeds 5 m/s at the monitoring location. • Conditions such as wind velocity, wind direction, temperature, relative humidity and cloud cover will be recorded. These may be obtained from the nearest Bureau of Meteorology monitoring station or on-site weather station/observations • The monitoring period should be sufficient such that the measured noise levels are representative of the noise over a 15-minute period • Selected monitoring periods should vary to cover the range of activities being undertaken, including the worst-case construction scenario • Where there is no requirement specified, you must measure at least the following descriptors: <ul style="list-style-type: none"> – equivalent A-weighted continuous sound level ($L_{Aeq,T}$) – maximum A-weighted sound pressure level ($L_{AFmax, T}$) – A-weighted sound pressure level that is exceeded for 90% of the measurement time ($L_{AF90, T}$)
Attended monitoring where a complaint is received and monitoring is considered an appropriate response to determine if noise levels exceed predicted ‘worst case’.	Related to noise complaint	

Monitoring details	Frequency	Test procedure
		<ul style="list-style-type: none"> – A-weighted sound pressure level that is exceeded for 10% of the measurement time ($L_{AF10,T}$). • The attended noise monitoring data will be compared to the relevant NML and/or predicted noise levels. • Observations will also be reported including audibility of construction noise, other noise in the environment and any discernible construction activities contributing to the noise at the receiver. If 'particularly annoying' activities (as listed in the ICNG) are the dominant noise source during the measurement, then the noise from that activity will be increased by 5 dB(A) before comparison to the relevant NML and/or predicted noise levels.
Where required for the purposes of refining construction methods or techniques to reduce noise levels (e.g. noise monitoring as a result of a consistency assessment)	Reviewed monthly following monitoring	<ul style="list-style-type: none"> • Sound level meter configured for “Fast” time weighting and “A” frequency weighting • The test environment will be free from reflecting objects • Tests will not be carried out during rain or when the wind speed at the test site exceeds 5 m/s at the monitoring location. • Duration will depend on the noise source being monitored. Sources generating continuous noise (e.g. generators) may be measured for 1-2 minutes, dynamic plant (e.g. front-end loaders) will be measured during a representative activity (e.g. a load cycle). • If verifiable data confirming the sound power level of the item is not available, attended measurements shall be conducted before the item is used on-site to verify the sound power level and confirm that the sound power level does not exceed the maximum levels in the assessment. • Where the sound power level of a particular plant/equipment item is believed to have changed since the initial measurement, or is inconsistent with provided data, a subsequent measurement shall be conducted to verify its sound power level.
Real time (unattended) monitoring	ongoing	Refer to Section 4.1.2
Monitoring requested by the EPA	As required	To be determined based on the monitoring request

Where actual noise levels exceed the predicted worst-case levels, the source of excessive noise generation will be identified, and any additional feasible and reasonable measures available will be implemented to either reduce noise emissions or reduce the impacts on receivers.

Details of site activity and equipment usage will be noted during construction noise monitoring.

4.1.1. Noise monitoring equipment

All monitoring will be undertaken by competent personnel, suitability trained and experienced in undertaking noise measurements. Noise monitoring equipment used will be at least Class 1 instruments and calibrated in accordance with manufacturer specifications or relevant Australian Standards. The calibration of the monitoring equipment will be checked in the field before the noise measurement period.

Acoustic instrumentation employed in the noise monitoring surveys will carry current manufacturer conformance certificates and comply with the guidelines identified in Section 2.

4.1.2. Real time noise monitoring

Real-time (unattended) noise monitoring will be undertaken to provide useful indications of noise exceedances. Real-time noise monitoring would only be used as a backup for attended noise monitoring and will not be used alone.

Subject to property owner approval, real time noise monitoring will be conducted at one private property location to be determined in consultation with HWC and the ER.

4.2. Vibration monitoring

The vibration monitoring procedure to be adopted for Project is provided in Table 4-2. All vibration monitoring will be undertaken in accordance with the technical guidance as identified below:

- For cosmetic damage to heritage structures (structurally unsound), the German Standard DIN 4150-3: Structural Vibration – effects of vibration on structures
- For cosmetic damage to buildings and/or structures (structurally sound), the British Standard BS 7385-2:1993 – Evaluation and measurement for vibration in buildings – Part 2
- For human exposure, Assessing Vibration: A Technical Guideline
- Specific monitoring requirements from utility asset owners.

Subject to property owner approval, vibration monitoring will be conducted at representative receivers/structures and other relevant locations (including at utility assets if relevant) to confirm construction vibration levels.

Table 4-2: Vibration monitoring procedure

Monitoring details	Frequency	Test procedure
At the commencement of vibratory compaction work within 30 m of residential buildings (CoA D16)	As required	Attended vibration monitoring will be undertaken when checking the minimum working distances from construction plant or in response to a complaint. The testing method includes:
Where a complaint is received in relation to human exposure to vibration levels and monitoring is considered an appropriate response	As required	<ul style="list-style-type: none"> • Transducer to be affixed to ground or building in general accordance with ISO5348:2021 • The testing will be conducted at each location to obtain a suitable representation of the range of vibration levels that would occur from the tested plant • The plant will be tested in the settings in which it is expected to operate. For vibratory rollers this may include both “High” and “Low” settings • PPV with sufficient temporal resolution to determine vibration impacts and the dominant frequency of the vibration will be recorded for assessment against the cosmetic damage criteria and against human comfort (screening criteria). In situations in which human comfort is the main concern then a metric which is appropriate for estimating the vibration dose values should be considered.
Where an activity may occur within minimum working distances for cosmetic damage	As required	
Where required for the purposes of refining construction methods to reduce vibration levels (e.g. in the case of a consistency assessment)	As required	
Where an activity may occur within minimum working distances for cosmetic damage (for Belmont WWTW structures)	As required	Continuous vibration monitoring will be undertaken in situations where there is a high risk that vibration from a particular construction activity may exceed the cosmetic damage criteria at a sensitive structure. This will be where activities may occur within the site specific minimum working distances for cosmetic damage. The testing method includes: <ul style="list-style-type: none"> • Transducer to be affixed to ground or building in general accordance with ISO5348:2021 • Vibration logger to continuously measure vibration levels while the relevant works are occurring within the site-specific minimum working distance for cosmetic damage • Measurement to be conducted as close as possible to the sensitive structure • A warning system will be implemented with the monitoring system (e.g. SMS and/or email alerts to site personnel)

Monitoring details	Frequency	Test procedure
		<ul style="list-style-type: none"> • PPV with sufficient temporal resolution to determine vibration impacts and the dominant frequency of the vibration will be recorded for assessment against the cosmetic damage criteria.
Vibration testing for vibration generating activities that have the potential to impact on heritage items	As required	Identify minimum working distances to prevent cosmetic damage. When conducting monitoring on a heritage item, the advice of a suitably qualified and experienced heritage specialist will be obtained and implemented to ensure the monitoring installation does not have an adverse impact on the heritage significance of the item.
Monitoring requested by the EPA	As required	To be determined based on the monitoring request

Where vibration is found to exceed the relevant vibration criteria, impacts will be reduced by changing work methods and/or equipment. Details of site activity and equipment usage will be noted during monitoring.

4.2.1. Minimum working distances

The minimum working distances presented in Section 7.2 of the CNVMP are indicative and will vary depending on the item of plant (particularly its power rating), local geotechnical conditions and the dominant frequency of the construction vibration levels. The cosmetic damage thresholds apply to typical light-framed residential buildings and heritage buildings and assume that construction vibration could include low frequency content with associated increased risk of cosmetic damage.

4.2.2. Vibration monitoring equipment

John Holland will identify the vibration monitoring equipment to be used and a relevant maintenance/ calibration program with respect to the manufacturer's specifications and relevant standards. Monitoring methods and instrumentation employed in the vibration monitoring surveys will comply with the relevant vibration measurement requirements in the reference standards and documents in Section 2.1.

Advice from a heritage specialist will be sought on methods and locations for installing equipment used for vibration monitoring at heritage-listed structures.

4.3. Monitoring in response to complaints

John Holland will offer attended noise or vibration monitoring to noise complainants at their premises if:

- Any investigation referred to in this condition identifies works or activities as the likely source of the complaint, and
- JH is not in possession of noise monitoring data representative of the complainant's location and of the subject works and activities being undertaken on the site.

John Holland will, in respect of each complaint made, advise each complainant of the results of its investigation of their complaint and any proposed reasonable and relevant remedial action within a reasonable period of time.

4.4. Noise and vibration monitoring locations

Noise and vibration monitoring locations may vary throughout construction of the Project. Final monitoring locations will be determined on a case-by-case basis in a noise and vibration assessment.

Noise monitoring locations will include representative sensitive receivers relevant to the Project.

Vibration monitoring will be undertaken at vibration sensitive locations within the 'minimum working distances'.

Attended noise and vibration monitoring locations will include locations identified as a result of a noise complaint or known noise related incident.

5. Compliance Management

5.1. Roles, Responsibility and Training

The organisational structure for the project and overall roles and responsibilities are outlined in the CEMP. Specific responsibilities for the implementation of environmental controls for noise and vibration are detailed in the CNVMP.

Personnel working on site will undergo a site induction and targeted training relating to noise and vibration management issues, as detailed in the CNVMP. All personnel involved in the implementation of this monitoring programme will receive training in the correct use of equipment, including field maintenance, use, storage and data analysis. The environmental manager (or delegate) is responsible for training and keeping records of trained staff.

5.2. Data analysis

Noise and vibration monitoring results obtained during the monitoring programme will be compared against the performance criteria described in Section 5 of the CNVMP and/or predicted levels. The results will be tabulated in a monitoring spreadsheet and provided as part of the reporting requirements detailed in Section 5.4. below.

5.3. Management of Exceedances

In the event that exceedances are identified during monitoring, the Environment Manager (or Delegate) will coordinate a management review and the appropriate responses that are triggered. The review will include:

- Investigation of the construction activities occurring at the time, including specific equipment, plant and vehicles in comparison to that assessed as part of the noise and vibration assessment and/or relevant approvals.
- Identification of other (non-project) activities that may influence monitoring results (unrelated works or events such as meteorological conditions etc).
- Identification of the possible causes for the exceedance.
- Effectiveness of mitigation measures (Section 7 of the CNVMP) already in place at the time of the exceedance.
- Identification of additional reasonable and feasible mitigation measures.
- Inclusion of learnings from the above into the noise and vibration modelling process for fine-tuning.

The EIS and subsequent modification outlines noise and vibration goals for this project. An exceedance of those goals may not be a non-compliance, if, when investigated, finds that the Project has implemented the management process within this section (Section 5.3), all environmental control measures in section 7.1 of the Noise and Vibration Management Plan and all other reasonable and feasible mitigation measures.

Section 4.10 of the CEMP defines non-compliance and non-conformance and their associated reporting requirements. Generally, a non-compliance refers to a breach of the CoA or a failure to implement the CEMP and CEMP sub-plans, requiring a notification to the Planning Secretary, while a non-conformance is a failure to comply with standards and procedure established by the Project EMS in addition to the CoA.

Mitigation measures and preventative/corrective actions will be developed in accordance with the environmental management measures outlined in the CEMP. The Environmental Manager (or delegate) will verify and document the effectiveness of any management measures or preventative/corrective actions implemented to avoid further exceedances. The timing for any improvement in relation to a non-compliance (or non-conformance where appropriate) will be agreed in consultation with HWC based on the level of risk or re occurrence of the exceedance (e.g. A significant risk will require immediate action).

5.4. Reporting

All monitoring results are to be provided to HWC, the ER, DPFI upon request. Reporting requirements relevant to the management of noise and vibration are identified in Table 5-1:

Table 5-1: Reporting requirements specific to noise and vibration management

Item	Frequency	Standards	External Reporting	Responsibility
Non conformance	At each occurrence	Environmental Incident Classification and Reporting Procedure.	Depending on nature of non-conformance; ER and HWC in monthly reports or audit reports	Project Environment Manager (or delegate)
Incident and non-compliance reports	At each occurrence	Reporting of incidents and non-compliances in accordance with CoA, EPL (and associated PIRMP), Environmental Incident Classification and Reporting Procedure.	Appropriate authority dependant on nature of the incident (e.g. EPA, DPFI) HWC	Project Environment Manager (or delegate) / HWC in accordance with the CEMP
Complaint register	Daily (ER, EPA) as received DPFI as requested	Reporting of complaints, in accordance with the CoA, EPL and CCS, through the complaints register, to the ER and EPA for any complaints received (on the day they are received). Communication, notification and complaints handling requirements regarding Noise matters will be managed through the Complaints Management System and the CCS.	ER EPA (in accordance with EPL conditions) DPFI (as requested by the Secretary) HWC	Project Environment Manager (or delegate)
Weekly environmental inspection	Weekly	Inspection of the environmental controls and implementation all relevant mitigation measures relating to noise and vibration.	N/A	Project Environment Manager (or delegate)
Noise Monitoring Report	Monthly	Noise monitoring results	ER / HWC	Project Environment Manager (or delegate)

6. Review and Improvement

6.1. Continuous Improvement

Continuous improvement of the Construction Noise and Vibration Monitoring Program will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance
- Identify environmental risks not already included in the risk register
- Determine the cause or causes of non-conformances and deficiencies
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies
- Respond quickly to nonconformities
- Verify the effectiveness of the corrective and preventative actions
- Document any changes in procedures resulting from process improvement
- Make comparisons with objectives and targets.

The Environment Manager (or delegate) is responsible for ensuring stage-specific environmental risks are identified and included in the Project risk register and appropriate mitigation measures implemented throughout the construction, as part of the continuous improvement process. The process for ongoing risk identification and management during construction is outlined in the CEMP.

6.2. Monitoring Program Update and Amendment

The processes described in the CEMP may result in the need to update or revise this monitoring program. Only the Environment Manager (or delegate) has the authority to approve changes to the requirements of this Plan. Minor amendments to the program may be approved by the ER in accordance with the CEMP and are to be implemented for the duration of construction and for any longer period set out in the monitoring programs or specified by the Planning Secretary, whichever is the greater. Amendments not considered minor by the ER need to be approved by the Planning Secretary.

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure detailed in the CEMP.