Construction Noise and Vibration Management Sub Plan

Nihon University Newcastle Campus Project

9 Church Street

Newcastle

NSW 2300

18&19 / 10 Kenrick Street
The Junction, NSW 2291
April 9, 2020

Benjamin Moss
Built
Suite 1, 155-157 Lambton Road
Broadmeadow NSW 2292

Nihon University – Construction Noise and Vibration Management Plan Requirements

Dear Ben,

Thank you for contacting me regarding assistance to review and endorse the Nihon University Construction Noise and Vibration Management Plan (CNVMP).

I can confirm I have over 25 years' experience in a wide range of Acoustics and Air Quality projects. I have previously been the Air and Noise Technical Service line leader and The Global Environmental Technical Sector Leader for international professional service firms and have the appropriate experience to undertake this review of your plan.

Approval Condition C7 Environment Management Plan requirements and C11 Construction Noise and Vibration Management Sub-Plan requirements for the proposal include:

	Environment Management Plan Requirements
C7	Management plans required under this consent must be prepared in accordance with relevant guidelines, and include: (a) detailed baseline data; (b) details of: (i) the relevant statutory requirements (including any relevant approval, licence or lease conditions); (ii) any relevant limits or performance measures and criteria; and (iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures; (c) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria; (d) a program to monitor and report on the: (i) impacts and environmental performance of the development; (ii) effectiveness of the management measures set out pursuant to paragraph (c) above; (e) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible; (f) a program to investigate and implement ways to improve the environmental performance of the development over time; (g) a protocol for managing and reporting any: (i) incident and any non-compliance (specifically including any exceedance of the impact assessment criteria and performance criteria); (ii) complaint; (iii) failure to comply with statutory requirements; and (h) a protocol for periodic review / update of the plan and any updates in response to incidents or matters of non-compliance. Note: The Planning Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans

C11	The Construction Noise and Vibration Management Sub-Plan must address, but not be limited to, the following: (a) be prepared by a suitably qualified and experienced noise expert; (b) describe procedures for achieving the noise management levels in EPA's Interim Construction Noise Guideline (DECC, 2009); (c) describe the measures to be implemented to manage high noise generating works such as piling, in close proximity to sensitive receivers; (d) include strategies that have been developed with the community for managing high noise generating works; (e) describe the community consultation undertaken to develop the strategies in condition C11(d); (f) include a complaints management system that would be implemented for the duration of the construction; and (g) include a program to monitor and report on the impacts and environmental performance of the development and the effectiveness of the management measures in accordance with condition C7(d). The program should be developed in accordance with the report titled Noise and Vibration Assessment – Operational and Construction report dated May 2019 and prepared by EMM Consulting, and included, but not limited: (i) alert triggers where project trigger noise levels are exceeded; and (ii) procedures for respite periods when sensitive receivers become 'highly noise affected' (i.e. noise levels exceed 75 dB(A).

I can confirm I have reviewed the CNVMP for the Nihon University Project and it satisfies the requirements for the CNVMP outlined above.

Should you have any further questions, please do not hesitate to contact Greg Collins on 0488512224 or greg@raptconsulting.com.au.

Thank you,

Greg Collins

Greg Collins, Director – RAPT Consulting

Revision History

Revision	Date	Description	Reviewed By
A	16/01/2020	For Approval	BM (BUILT NSW)
B	25/02/2020	Amendments to Appendix A – Construction Noise & Vibration Monitoring Programme due to initial results and changes in demolition / construction methodology to reduce noise and vibration levels	BM (BUILT NSW)
C	18/03/2020	Reviewed by RAPT Consulting. Amendments made to Section 5.5 Vibration Criteria.	GC (RAPT)
01	09/04/2020	Reviewed by RAPT Consulting. Amendments made in response to corrective actions arising from GHD Independent Environmental Audit Report 1 dated March 2020 Refer to attached Appendix A - Revision Change Register.	GC (RAPT)
02	21/06/2021	Section 7.1 updated to reflect EPA (COVID-19 Development – Construction Work Days) Order (No 2) 2021. A copy of the Order 2021 is now included in Appendix B.	BM (BUILT NSW)

Distribution

Revision	Organisation	Submission	Copies
A	Dwp Newcastle	For Submission to NSW DPIE	1
	Dix Gardner Group	For Information	
B	GHD Newcastle	For Review	1
	Dwp Newcastle	For Information	
C	Dwp Newcastle	For Submission to NSW DPIE	1
01	Dwp Newcastle	For Submission to NSW DPIE	1
	Dix Gardner Group	For Information	
02	Dwp Newcastle	For Submission to NSW DPIE	1
	Dix Gardner Group	For Information	

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1.0 Introduction

Built has prepared a Construction Noise and Vibration Management Sub-Plan (CNVMSP) in consultation with RAPT Consulting for major alterations and additions works of the Nihon University Newcastle Campus Project (the Project) located at 9 Church Street, Newcastle NSW 2290. The works involve the demolition of the existing Administration and Supreme Court Buildings and external areas, construction of two new four-story buildings, restoration and refurbishment to the heritage-listed Newcastle Courthouse, as well as external works within the site boundary and the public domain.

This sub-plan forms part of the Construction Environmental Management Plan, which is an appendix of the overarching Built Site Health, Safety and Environmental (HSE) Plan for the project. The CNVMSP has been prepared to address the construction noise and vibration requirements listed in the Development Consent, reference SSD 9787, issued by the NSW Department of Planning, Industry, and Environment (DPIE) and the Noise and Vibration Assessment (NVA) dated May 2019 prepared by EMM Consulting.

The purpose of this CNVMSP is to describe how Built proposes to manage potential noise and vibration impacts during construction of the Project.

The key objective of the CNVMSP is to ensure that project noise and vibration impacts on nearby sensitive receivers are minimised and within the scope permitted by the planning approval. This includes management procedures to appropriately respond to complaints from the community and stakeholders relating to noise and vibration.

To achieve this objective, Built will undertake the following:

- Ensure appropriate controls and procedures are implemented during construction activities to avoid or reduce noise and vibration impacts and potential adverse impacts on neighbouring sensitive receivers.
- Ensure reasonable and feasible mitigation measures are implemented with the aim of achieving the requirements in the Development Consent and the management levels detailed in this CNVMSP in accordance with the NSW EPA's *Interim Construction Noise Guideline*.
- Ensure complaints from the community and stakeholders are reduced.

2.0 Project Information

2.1 Description & Location

The Project is located at 9 Church Street, Newcastle and is situated on the site of the former Newcastle Courthouse. It is surrounded by buildings with Church Street and both commercial and residential receivers to the north, Newcastle Police Station to the east, and James Fletcher Hospital to the south and west.

Figure 1 shows the site location.

Figure 1 - Site Location

2.2 Sensitive Receivers

The Project area is located within a high-density area immediately adjacent to Newcastle Police Station, James Fletcher Hospital, The Grand Hotel, and residential receivers.

The NVA identified that the nearest noise-sensitive receptors potentially affected by noise from the subject site are residences on Church and Bolton Streets (located to the north of the project site) and adjacent commercial businesses. The nearest residences are located approximately 20 m from the northern boundary of the subject site while the nearest commercial properties are approximately 5-10 m from the eastern, southern and western boundaries of the site.

Figure 2 shows the site location with potentially affected receivers as identified within the NVA.

Figure 2 - Sensitive receiver locations

The sensitive land uses shown in Figure 2 are summarised in Table 1 alongside a description of the land use.

Table 1 Noise and vibration-sensitive land uses

Reference	Description
Residential Buildings	
R1 – 58 Bolton Street	Residential properties located opposite the site to the north. All properties are approximately 20-25m from the site boundary.
R3 – 30 Church Street	
Commercial	
R2 – The Grand Hotel, 32 Church Street	Commercial property/hotel located opposite the site to the north approximately 20-25m from the site boundary.
R4 – Newcastle Police Station, 1 Church Street	Commercial property located on the immediate eastern boundary of the site.
Hospital	
R5 – James Fletcher Hospital, 72 Watt Street	Health facility/hospital located on an elevated position opposite the site to the south approximately 5m from the site boundary
R6 – James Fletcher Hospital, 15 Church Street	Health facility/hospital located on an elevated position opposite the site to the west approximately 10-20m from the site boundary.

It is also noted that the NVA did not include additional neighbouring residential and commercial properties opposite the site boundary on Church Street during their assessment. Built has considered these properties within the preparation of the CNVMSP.

3.0 Regulatory Framework

The CNVMSP has been prepared to address the regulatory framework for the management of noise and vibration in accordance with the relevant legislation, policies, standards, guidelines, and SSD Development Consent, specifically Conditions C7, C11, D2, D4 to D7, D12 to D14 and D15 to D17.

Table 2 below outlines the relevant legislation, policies, standards and guidelines identified within the NVA by EMM Consulting while the specific SSD Consent Conditions are shown in Table 3.

Table 2 Legal Requirements

Legal Requirement	Relevance
Protection of the Environment Operations Act 1997 (POEO Act) (Sections 139, 140)	Relates to noise pollution / excessive noise due to the operation of plant and dealing (process, handle, move, store or dispose of) with materials.
Protection of the Environment Operations (Noise Control) Regulation 2008.	Relates to prescribed noise limits of motor vehicles, time limits for the use of tools and other articles, and the inspection and testing of certain articles
NSW Environment Protection Authority (EPA) 2017, Noise Policy for Industry (NPfI)	Sets out the requirements for the assessment and management of noise from industrial premises in NSW
State Environmental Planning Policy (Infrastructure) 2007.	Facilitates the effective delivery of infrastructure by identifying the environmental assessment category, matter to be considered in the assessment of development adjacent to particular types of infrastructure, and providing for consultation with relevant public authorities
NSW Department of Environment and Climate Change (DECC) 2009, Interim Construction Noise Guideline (ICNG)	Aimed at managing noise from construction works, specifically high noise levels that can adversely affect sleep, concentration, and mental and physical health
NSW Department of Environment and Conservation (DEC) 2006, Assessing Vibration: a technical guideline	The prescribed vibration criteria for human comfort on the project. Presents preferred and maximum vibration values for use in assessing human response (comfort) to vibration. Provides recommendations for measurement and evaluation techniques.
Standards Australia – AS 1055-2018 Acoustics - Description and measurement of environmental noise	Used in the evaluation of environmental noise in order to meet the needs of public bodies and persons interested in its management. It applies primarily to noise emitted from industrial, commercial and residential premises, and is intended for use in the evaluation of existing problems, as well as for planning purposes.
Australian Standard AS 2436-2010 Guide to Noise Control on Construction, Maintenance, and Demolition Sites	Provides guidance in noise and vibration control on construction, maintenance and demolition sites including guidance on investigation and identification of sources, measurement, assessment/planning for measures and monitoring their effectiveness
DIN 4150-3 (1992-02) Structural Vibration – Effects of vibration on structures (German Institute for Standardisation, 1999)	The relevant and prescribed vibration criteria for structural (cosmetic) damage on the project.
Australian Standard AS IEC 61672.1—2004 - Electroacoustics—Sound level meters, Part 1: Specifications (Standards Australia, 2004)	Provides electro-acoustical performance specifications of sound level meters.

Table 3 SSD-9787 Development Consent conditions for noise and vibration

Condition No.	Condition
C7	Management plans required under this consent must be prepared in accordance with relevant guidelines, and include:
(c)	A description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria
(d)	A program to monitor and report on the: (i) impacts and environmental performance of the development (ii) effectiveness of the management measures set out pursuant to paragraph (c)
C11	The Construction Noise and Vibration Management Sub-Plan must address, but not be limited to, the following:
(a)	be prepared by a suitably qualified and experienced noise expert;
(b)	describe procedures for achieving the noise management levels in EPA's Interim Construction Noise Guideline (DECC, 2009);
(c)	describe the measures to be implemented to manage high noise generating works such as piling, in close proximity to sensitive receivers
(d)	include strategies that have been developed with the community for managing high noise generating works;
(e)	describe the community consultation undertaken to develop the strategies in condition C11(d);
(f)	include a complaints management system that would be implemented for the duration of the construction; and
(g)	include a program to monitor and report on the impacts and environmental performance of the development and the effectiveness of the management measures in accordance with condition C7(d). The program should be developed in accordance with the report titled Noise and Vibration Assessment – Operational and Construction report dated May 2019 and prepared by EMM Consulting, and included, but not limited: (i) alert triggers where project trigger noise levels are exceeded; and (ii) procedures for respite periods when sensitive receivers become 'highly noise affected' (i.e. noise levels exceed 75 dB(A).
D2	All construction plant and equipment used on site must be maintained in a proper and efficient condition and operated in a proper and efficient manner.
D4	Construction, including the delivery of materials to and from the site, may only be carried out between the following hours:
(a)	between 7 am and 6 pm, Mondays to Fridays inclusive; and
(b)	between 8 am and 1 pm, Saturdays. No work may be carried out on Sundays or public holidays.

Condition No.	Condition
D5	Construction activities may be undertaken outside of the hours in condition D4 if required:
(a)	by the Police or public authority for the delivery of vehicles, plant or materials; or
(b)	in an emergency to avoid the loss of life, damage to property or to prevent environmental harm; or
(c)	where the works are inaudible at the nearest sensitive receivers; or
(d)	where a variation is approved in advance in writing by the Planning Secretary or his nominee if appropriate justification is provided for the works.
D6	Notification of such construction activities as referenced in condition D5 must be given to affected residents before undertaking the activities or as soon as it is practical afterwards.
D7	Rock breaking, rock hammering, sheet piling, pile driving, and similar activities may only be carried out between the following hours:
(a)	9am to 12pm, Monday to Friday;
(b)	2pm to 5pm Monday to Friday; and
(c)	9am to 12pm, Saturday.
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.
D13	The Applicant must ensure construction vehicles (including concrete agitator trucks) do not arrive at the site or surrounding residential precincts outside of the construction hours of work outlined under condition D4.
D14	The Applicant must implement, where practicable and without compromising the safety of the construction staff or members of the public, the use of 'quackers' to ensure noise impacts on surrounding noise sensitive receivers are minimised.
D15	Vibration caused by construction at any residence or structure outside the site must be limited to:
(a)	for structural damage, the latest version of DIN 4150-3 (1992-02) Structural vibration - Effects of vibration on structures (German Institute for Standardisation, 1999); and
(b)	for human exposure, the acceptable vibration values set out in the Environmental Noise Management Assessing Vibration: a technical guideline (DEC, 2006) (as may be updated or replaced from time to time).
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.

Condition No.	Condition
D17	The limits in conditions D15 and D16 apply unless otherwise outlined in a Construction Noise and Vibration Management Plan approved as part of the CEMP required by condition C11 of this consent.

4.0 Existing Noise Environment

4.1 Attended Noise Monitoring

In preparation for the NVA, attended noise monitoring was undertaken by EMM Consulting on 17/04/2019 to establish the existing ambient noise environment surrounding the proposed development site. The location of monitoring was selected to record background and ambient noise levels at locations representative of receptors potentially most affected by noise from the proposed development. The operator attended noise monitoring location (L1) is shown in Figure 2.

A summary of the noise monitoring results showing the Rated Background Level (RBL) and average ambient noise level (L_{Aeq}) is provided in Table 4 below.

Table 4 Attended noise monitoring summary

Location	Date	Start Time	Period[1]	L_{Aeq}	L_{A90} (RBL)	L_{Amax}	Comments
L1 Corner of Bolton & Church Streets	17/4/19	11:52	Day (7am – 6pm)	58	49	80	Urban hum (nearby fans, pumps, etc.) and distant traffic noise consistent. Car passbys frequent. Bird noise, aircraft noise, pedestrian noise and wind in trees occasionally.
	17/4/19	21:45	Evening (6pm – 10pm)	56	45	75	Urban hum (nearby fans, pumps, etc.) and insects consistent. Distant traffic, car passbys and nearby hotel noise frequent. Resident noise, pedestrian noise and dog barking occasionally.
	17/4/19	22:15	Night (10pm – 7am)	55	45	71	Urban hum (nearby fans, pumps, etc.) and insects consistent. Distant traffic and car passbys frequent. Pedestrian noise occasionally.

5.0 Construction Noise and Vibration Criteria

5.1 Construction Noise

Construction noise in New South Wales is assessed using the NSW EPA's *Interim Construction Noise Guideline* (ICNG, 2009). The ICNG is also defined as the relevant guideline for construction noise and vibration by the development consent issued by DPIE.

The ICNG aims to manage noise from construction works regulated by the EPA. It is also intended to provide guidance to other interested parties in the management of construction noise and has therefore been adopted for this construction noise assessment.

The ICNG prescribes L_{A}eq,15min Noise Management Levels (NML) for sensitive receivers as part of a quantitative construction noise assessment. Where the predicted or measured construction noise level exceeds these management levels, then all feasible and reasonable work practices should be implemented to reduce construction noise, and community consultation regarding construction noise is required to be undertaken.

5.1.1 Standard Hours of Construction

The ICNG recommended standard hours of construction are as follow:

- Monday to Friday: 7:00 am to 6:00 pm
- Saturday: 8:00 am to 1:00 pm
- No work on Sundays or Public Holidays

To encourage work during the Standard Hours of Construction, and to reflect the lower impact of work at these times, the ICNG prescribes less stringent Standard Hours NMLs. The construction hours described in Condition D4 of the development consent aligns with the ICNG Standard Hours.

It should be noted that the Standard Hours of Construction are only applicable to residential (or similar) land uses. At other land uses, the impact of construction noise is assessed based on the times that the land use operates.

5.1.2 Residential Land Uses

The daytime standard work hours NMLs prescribed for residential land use by the ICNG are presented in Table 5. The ICNG out of hours NMLs would not be applicable to this assessment as Condition D5 requires construction activities to be inaudible.

The levels apply at the most exposed property boundary of the noise-sensitive receiver at a height of 1.5 metres above ground level

Table 5 Noise management levels for residential land use

Time of day	NML, $L_{Aeq\ 15min}$	Notes
Recommended Standard Hours: Monday to Friday 7:00am to 6:00pm Saturday 8:00am to 1:00pm No work on Sundays or public holidays	Noise affected: RBL + 10 dB(A)	May be some community reaction to noise. • Where the predicted or measured construction noise level exceeds the noise affected level, all feasible and reasonable work practices should be applied to meet the noise affected level. • All residents potentially impacted by the works should be informed of the nature of the works,

Time of day	NML, $L_{Aeq\ 15min}$	Notes
		the expected noise levels, and duration, and provided with site contact details.
	Highly noise affected: 75 dB(A)	May be a strong community reaction to noise. • Where construction noise is predicted or measured to be above this level, the relevant authority may require respite periods that restrict the hours that the very noisy activities can occur. • Respite activities would be determined considering times identified by the community when they are less sensitive to noise, and if the community is prepared to accept a longer period of construction to accommodate respite periods.
Outside recommended Standard Hours	Noise affected: RBL - 10 dB(A)	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the affected noise level. • Where all feasible and reasonable practices have been applied and noise is more than RBL - 10 dB(A) above the affected noise level, the proponent should negotiate with the affected community.

5.1.3 Other Sensitive Land Uses

The ICNG also prescribes NMLs for other sensitive land uses, including educational buildings, offices, and hospital wards. The NMLs for other non-residential sensitive land uses are summarised in Table 6 and apply only when those land uses are in use.

Table 6 ICNG noise management levels for other sensitive land uses

Land use	NML $L_{Aeq,15min}$
Industrial premises	External noise level 75 dB (when in use)
Offices, retail outlets	External noise level 70 dB (when in use)
Classrooms at schools and other educational institutions	Internal noise level 45 dB (when in use)
Hospital wards and operating theatres	Internal noise level 45 dB (when in use)
Places of worship	Internal noise level 45 dB (when in use)
Active recreation areas	External noise level 65 dB (when in use)
Passive recreation areas	External noise level 60 dB (when in use)

5.1.4 Project Specific Noise Management Levels

The adopted Project Construction NMLs for each identified receiver location has been determined based on the measured noise levels in Section 4.1 and are in accordance with ICNG. These are listed in Table 7, and more specifically in Table 8 below.

Table 7 Construction Noise Management Levels

Receiver	Period	Representative RBL, dB(A)	NML[1] $L_{Aeq,\ 15\text{-}minute}$, dB(A)
Residential - west (nearest potentially affected)	Recommended standard hours	49	Noise affected: 59 Highly noise affected: 75
Offices, retail outlets	When in use	N/A	70
Neighbouring industrial premises	When in use	N/A	75
Classrooms	When in use	N/A	45 (Internal) / 55 (External)
Hospital wards and operating theatres	When in use	N/A	45 (Internal) / 55 (External)
Places of worship	When in use	N/A	45 (Internal) / 55 (External)

Table 8 Specific construction noise management levels

Receiver	No. of Buildings	Land Use	NML[1] $L_{Aeq,\ 15\text{-}minute}$, dB(A)
James Fletcher Hospital	2	Hospital	45 (Internal) / 55 (External)
Newcastle Grammar School	1	Education	45 (Internal) / 55 (External)
Christ Church Cathedral	1	Place of Worship	45 (Internal) / 55 (External)
30 Church Street[1]	1	Residential	59 (Noise affected) / 75 (Highly noise affected)
58 Bolton Street[2]	1	Residential	59 (Noise affected) / 75 (Highly noise affected)
The Grand Hotel	1	Commercial	70
Newcastle Police Station	1	Offices	70
Commonwealth Law Courts	2	Offices	70
WSP Australia	1	Offices	70
Braye Cragg Solicitors	1	Offices	70
Newcastle Chambers	1	Offices	70
Bolton Street Pantry	1	Offices	70

Note 1: Neighbouring residential properties to 30 Church Street are also considered

Note 2: Neighbouring residential properties to 58 Bolton Street on Church Street are also considered

5.2 Construction Vibration

Ground vibration generated by construction can have a range of effects on buildings and building occupants. The main effects are generally classified as:

- human disturbance – disturbance to building occupants: vibration which inconveniences or interferes with the activities of the occupants or users of the building
- effects on building structures – vibration which may compromise the condition of the building structure itself.

In general, vibration criteria for human disturbance are more stringent than vibration criteria for effects on buildings. Building occupants will normally feel vibration readily at levels well below those which may cause a risk of cosmetic or structural damage to a structure. However, it may not always be practical to achieve human comfort criteria.

Furthermore, unnecessary restriction of construction activities can prolong construction works longer than necessary, potentially resulting in other undesirable effects for the local community.

Construction vibration criteria have been adopted from the following sources:

- Cosmetic and structural damage to buildings: German Standard DIN 4150-3:1992-02 Structural Vibration – Effects of vibration on structures (German Institute for Standardisation, 1999)
- Human comfort: Environmental Noise Management Assessing Vibration – A Technical Guideline (DEC, 2006) (the Guideline)

5.2.1 Cosmetic and Structural Damage

SSD Condition D15 (a) states that potential structure damage caused by construction vibration at any residence or structure outside the site must be limited to the levels specified in the latest version of DIN 4150-3. DIN 4150-3 summarises the structural and cosmetic damage assessment criteria for different types of buildings, which are presented in Table 9, and are widely used for the assessment of construction vibration effects on buildings in Australia. The criteria are specified as Peak Particle Velocity (PPV) levels measured in any direction at or adjacent to the building foundation.

Table 9 DIN 4150-3 vibration cosmetic and structural damage criteria

Structure type	Peak Particle Velocity (PPV), mm/s			
	Foundation of Structure			Vibration at horizontal plane of the highest floor at all frequencies
	<10 Hz	10-50 Hz	50-100 Hz	
Buildings used for commercial, industrial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
Dwelling and buildings of a similar design and/or use	5	5 to 15	15 to 20	15
Structures that, because of their particular sensitivity to vibration, do not correspond to those listed in rows 1 and 2, and are of great intrinsic value (e.g. heritage-listed buildings)	3	3 to 8	8 to 10	8

DIN 4150-3 states that exposing buildings to vibration levels higher than that recommended would not necessarily result in damage. Rather, it recommends these values as maximum levels of short-term construction vibration at which experience has shown damage reducing the serviceability of structures will not occur due to vibration effects.

Special consideration is required to comply with SSD Condition D16, ensuring that 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.

The limits in Conditions D15 and D16 apply unless otherwise outlined in a Construction Noise and Vibration Management Plan, approved as part of the CEMP required by condition C11 of this consent.

5.2.2 Human Exposure and Comfort

The ICNG recommends that vibration from construction works be assessed under *Environmental Noise Management Assessing Vibration – a technical guideline* (DEC, 2006) (the Guideline), consistent with Condition D15 (b) of the development consent.

The vibration assessment criteria defined in the Guideline are for human comfort and represent goals that, where predicted or measured to be exceeded, require the application of all feasible and reasonable mitigation measures. At vibration values below the preferred values, there is a low probability of adverse comment or disturbance to building occupants. Where all feasible and reasonable mitigation measures have been applied and vibration values are still beyond the maximum value, it is recommended the operator negotiate directly with the affected community.

The Guideline defines vibration assessment criteria for continuous, impulsive and intermittent vibration. Vibration can be classified according to the following definitions:

- **Continuous vibration:** continues uninterrupted for a defined period. Applies to continuous construction activity such as tunnel boring machinery.
- **Impulsive vibration:** Infrequent: Activities that create up to 3 distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading, and unloading.
- **Intermittent vibration:** interrupted periods of continuous vibration (such as drilling) or repeated periods of impulsive vibration (such as a jackhammer).

The majority of construction activities as part of the proposed works would be expected to be continuous and intermittent in nature, however, some impulsive vibration activity is expected during the demolition and early works stages.

Table 10 presents the management levels for continuous and impulsive vibration at different land uses. The management levels specified are as overall unweighted RMS vibration velocity levels. The Guideline specifies the management levels as suitable for vibration sources predominantly in the frequency range 8-80 Hz as would be expected for construction vibration.

Table 10 RMS vibration velocity management levels for continuous and impulsive vibration

Land use	Continuous vibration – RMS vibration velocity, mm/s		Impulsive vibration – RMS vibration velocity, mm/s	
	Preferred	Maximum	Preferred	Maximum
Critical areas[1]	0.1	0.2	0.1	0.2
Residences and hospital wards – daytime[2]	0.2	0.4	6.0	12.0
Residences and hospital wards – night time[3]	0.14	0.28	2.0	4.0

Land use	Continuous vibration – RMS vibration velocity, mm/s		Impulsive vibration – RMS vibration velocity, mm/s	
	Preferred	Maximum	Preferred	Maximum
Offices, schools	0.4	0.8	13.0	26.0
Workshops	0.8	1.6	13.0	26.0

(1) Critical operating areas include hospital operating theatres and precision laboratories where sensitive operations are occurring.

(2) Daytime is defined by the Vibration Guideline to be 7 am to 10 pm.

(3) Night time is defined by the Vibration Guideline to be 10 pm to 7 am.

For intermittent vibration, the Vibration Dose Value (VDV) is used as the metric for assessment as it accounts for the duration of the source, which will occur intermittently over the assessment period. The VDV management levels at different land uses for intermittent vibration sources are presented in Table 11.

Table 11 VDV management levels for intermittent vibration

Land use	VDV – Intermittent vibration, mm/s	
	Preferred	Maximum
Critical areas[1]	0.1	0.2
Residences and hospital wards – daytime[2]	0.2	0.4
Residences and hospital wards – night time[3]	0.13	0.26
Offices, schools	0.4	0.8
Workshops	0.8	1.6

(1) Critical operating areas include hospital operating theatres and precision laboratories where sensitive operations are occurring.

(2) Daytime is defined by the Vibration Guideline to be 7 am to 10 pm.

(3) Night time is defined by the Vibration Guideline to be 10 pm to 7 am.

6.0 Construction Noise and Vibration Assessment

6.1 Construction Activities

The planned sequence of construction works for the Nihon University project are broadly identified as follows:

- Demolition, earthworks & piling
- Structural works
- Internal fit-out and civil (external) works

6.2 Construction Noise Assessment

6.2.1 Construction Noise Sources

The construction noise impact assessment has adopted equipment noise emission values obtained from the EMM noise database for plant used on similar projects and the UK Department for Environment, Food and Rural Affairs (DEFRA) *Update of noise database for prediction of noise on construction and open sites*. Table 12 summarises typical equipment items, sound power level and quantities adopted in the noise modelling for each proposed phase of works.

Table 12 Construction noise source power levels

Equipment	Quantity (worst case per 15-min period)	Sound power level per item, $L_{Aeq,\ 15\ minute}$ (dB)[1]
Demolition, earthworks & piling		
Piling rig	1	116
Excavator including rock-hammer	1	120
Excavator	2	105
Compactor	1	106
Dozer	1	108
Roller (up to 20T)	1	107
Truck & Dog	2	104
Structural works		
Concrete trucks	3	108
Concrete pump	1	110
Crane	1	99
Delivery truck	1	106
Power tools	4	105
Hand tools	Numerous	102
Internal fit-out and civil works		
Concrete trucks	3	108
Crane	1	99
Delivery truck	1	106
Hand tools	Numerous	102
Generator	1	99

6.2.2 Predicted Construction Noise Levels

Typical worst-case predicted noise levels are shown in Table 13 for each receiver location and each stage of works. Predicted noise levels were calculated using distance attenuation.

Construction equipment has been modelled at possible locations nearest to and furthest away from the nearest residence to represent the range of noise levels that may be experienced over the relevant periods.

Based on the predictions, construction noise from the site is likely to exceed the project-specific NMLs at all locations.

It is important to note that these predictions are typical worst-case predictions as they assume that:

- The receiver is located at the boundary of each receiver property.
- All plant/equipment within each stage is operating concurrently.
- The noisiest construction sources are operating continuously for the entire 15-minute period. This will always not occur as equipment will regularly be stood down or idled while other activities are undertaken.

Regardless of worst-case predictions, Built will actively manage construction noise from the site.

Table 13 Construction noise predictions

Representative Receiver	Distance	Indicative predicted noise level $L_{Aeq, 15\ minute}$	Construction noise goal $L_{Aeq, 15\ minute}$
Nearest residences (to north)	20-105m	Demolition and earthworks 74-88 dB Structural works 66-81 dB Internal fit-out and civil works 66-80 dB	Noise affected: 59 dB (Recommended standard hours) Highly noise affected: 75 dB
Commercial / Offices	5-105m	Demolition and earthworks 74-100 dB Structural works 66-93 dB Internal fit-out and civil works 66-92 dB	70 dB (when in use)
Hospitals	5-105m	Demolition and earthworks 74-100 dB Structural works 66-93 dB Internal fit-out and civil works 66-92 dB	55 dB (when in use)

6.3 Construction Vibration

The safe working distances listed in Table 14 have been sourced from *Transport Infrastructure Development Corporation Construction's Construction Noise Strategy (Rail Projects), November 2007* and provide guidance on safe working distances for typical vibration intensive plant. The safe working distances are quoted for both "Cosmetic Damage" (refer British Standard BS 7385) and "Human Comfort" (refer British Standard BS 6472-1).

Table 14 presents the recommended safe working distances for vibratory rollers, hydraulic hammers, pile boring and jackhammers that may be used for the construction of the project.

Table 14 Recommended safe working distances for vibration intensive plant

Plant item	Rating / Description	Safe working distance	
		Cosmetic Damage (BS 7385)	Human Response (BS 6472)
Vibratory Roller	< 50 kN (Typically 1-2 tonnes)	5m	15 to 20m
	< 100 kN (Typically 2-4 tonnes)	6m	20m
	< 200 kN (Typically 4-6 tonnes)	12m	40m
	< 300 kN (Typically 7-13 tonnes)	15m	100m
	> 300 kN (Typically 13-18 tonnes)	20m	100m
	> 300 kN (> 18 tonnes)	25m	100m
Small hydraulic hammer	(300 kg - 5 to 12t excavator)	2m	7m
Medium hydraulic hammer	(900 kg - 12 to 18t excavator)	7m	23m
Large hydraulic hammer	(1600 kg - 18 to 34t excavator)	22m	73m
Pile boring	≤ 800 mm	2m (nominal)	N/A
Jackhammer	Handheld	1m (nominal)	Avoid contact with the structure

The minimum working distances are indicative and will vary depending on the particular item of plant and local geotechnical conditions. They apply to cosmetic damage of typical buildings under typical geotechnical conditions. Vibration monitoring is recommended to confirm the minimum working distances at specific sites and once plant selection has been confirmed for each stage of works.

Vibration intensive equipment/plant, i.e. vibratory roller, hydraulic hammers, jackhammers and pile boring are anticipated to be used in Stage 1 and Stage 3 works. Where feasible and reasonable, all vibration intensive works would be undertaken outside the cosmetic damage safe working distances to avoid structural vibration impact.

The nearest receivers that would potentially be impacted by the vibration of the project's construction activities are the residential properties opposite the site's northern boundary and other adjoining properties including Newcastle Police Station (receiver R4) to the east, and James Fletcher Hospital (receiver R5 and R6) to the south and west of the site.

The nearest residential receivers are approximately 30 metres or more from the site where vibration intensive plant will be used, vibration impacts have been assessed to be:

- negligible and deemed to comply with the cosmetic damage vibration management levels when vibratory roller, hydraulic hammer, pile boring or jackhammer is used
- negligible and deemed to comply with the human comfort vibration management levels when vibratory roller < 7 tonnes, small to medium hydraulic hammers, pile boring or jackhammers are used

- in exceedance of the human comfort vibration management levels when vibratory roller > 4 tonnes or a large hydraulic hammer is used

7.0 Construction Hours

7.1 Standard Construction Hours

The approved project standard construction hours, as outlined in Condition D4, are as follows.

Construction, including the delivery of materials to and from the site, may only be carried out between the following hours:

(a) between 7 am and 6 pm, Mondays to Fridays inclusive; and

(b) between 8 am and 1 pm, Saturdays

(c) No work may be carried out on Sundays or public holidays

Special Conditions

On 10th June 2021, the NSW Minister for Planning and Public Spaces introduced the Environmental Planning and Assessment (COVID-19 Development - Construction Working Days) Order (No 2) 2021 to support the construction industry during the COVID-19 pandemic.

A copy of the Order 2021 is included in **Appendix B**.

In response to previous consultation with the community, Built has established the following construction hours (pending Government advice and/or project requirements):

Monday to Friday: Normal approved working days 7:00am to 6:00pm

Saturdays: 7:00 am to 5:00 pm as permitted under the Order 2021

Sunday's & Public Holidays: No works (advanced notice will be given to the community if extended hours are planned between 9:00 am to 5:00 pm)

7.2 Out of Hours Work

The approved out of hours work, as outlined in Conditions D5 and D6, are as follows.

Activities may be undertaken outside of the hours in condition D4 if required:

(a) by the Police or a public authority for the delivery of vehicles, plant or materials; or

(b) in an emergency to avoid the loss of life, damage to property or to prevent environmental harm; or

(c) where the works are inaudible at the nearest sensitive receivers; or

(d) where a variation is approved in advance in writing by the Planning Secretary or his nominee if appropriate justification is provided for the works.

Notification of such activities must be given to affected residents before undertaking the activities or as soon as practical afterwards.

7.3 High Impact Work Hours

The approved work hours for high impact activities, as outlined in Condition D7, are as follows.

Rock breaking, rock hammering, sheet piling, pile driving, and similar activities may only be carried out between the following hours:

(a) 9 am to 12 pm, Monday to Friday

(b) 2 pm to 5 pm, Monday to Friday; and

(c) 9 am to 12 pm, Saturday

8.0 Noise and Vibration Management Measures

This section outlines noise and vibration management measures that will be implemented as part of the construction works, including consultation and complaint handling procedures.

It may always not be feasible to adopt all management measures during construction, and identification of all practicable and reasonable mitigation methods will be conducted by the site supervisor and/or environmental representative on a regular basis during noisy works near sensitive land uses.

In relation to the implementation of mitigation measures, practicability addresses engineering considerations regarding what is practical to build. Reasonableness relates to the application of judgment in arriving at a decision, considering the following factors:

- work hours
- noise reduction achieved
- number of people or other uses benefited
- cost of the measure
- delay to schedule and whether the measure will prolong exposure to noise
- community views
- pre-construction noise levels at receivers

While the management measures presented will always not necessarily result in mitigating all noise and vibration impacts, they are expected to reduce impacts to levels most stakeholders should find acceptable considering the anticipated benefits of the completed project.

8.1 Implementation of Management Measures

Table 15 outlines the noise management measures provided within the NVA by EMM, including recommendations, set out in AS 2436-2010 "*Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites",* will be implemented throughout the construction of the project where reasonable and feasible in accordance with Conditions D12 to D14 and D15 to D17:

Table 15 Noise and vibration management measures

Reference	Details of management measure	Implementation		Responsibility
Implemented throughout external works		**PC[1]**	**C[2]**	
NVMM01	Construction hours will be restricted to the approved construction hours in accordance with Condition D4 to D7	✓	✓	Construction/Project Manager
NVMM02	In accordance with Condition D12, ensure construction vehicles (including concrete agitator trucks) do not arrive at the site or surrounding residential precincts outside of the construction hours of work outlined under Condition D4.		✓	Site Manager

Reference	Details of management measure	Implementation		Responsibility
Implemented throughout external works		**PC[1]**	**C[2]**	
NVMM03	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 in accordance with Condition D14	✓	✓	Site Manager
NVMM04	All construction plant and equipment used on site must be maintained in a proper and efficient condition and operated in a proper and efficient manner in accordance with Condition D2	✓	✓	Site Manager Foreman
NVMM05	Built personnel and subcontractors will always be issued a copy of the current CNVMP and instructed to comply.	✓	✓	Construction/Project Manager
NVMM06	Regular review of work methodologies to identify potential noise and vibration effects and minimise where possible.	✓	✓	Construction/Project Manager Site Manager
NVMM07	Provide regular information to neighbours before and during construction through media such as letterbox drops, meetings or individual contact.	✓	✓	Project Manager Community Liaison Officers
NVMM08	The induction of site staff will include a reference to potential noise impacts and the identification of noise-sensitive land uses.	✓		Construction/Project Manager
NVMM09	Implement a complaint management system	✓	✓	Construction/Project Manager
NVMM10	The use of a site information board at the front of the site, with the name of the organisation responsible for the site and their contact details, hours of operation and regular information updates. This signage will be clearly visible from the outside and include after-hours emergency contact details.		✓	Site Manager
NVMM11	Erection of 2.4m high plywood hoarding to Church Street boundary to minimise noise to receivers	✓		Site Manager
NVMM12	The use of existing structures, temporary site buildings and materials stockpiles as noise barriers, where practicable.		✓	Foreman
NVMM13	Where practicable, place as much distance as possible between noisy plant or equipment and residences and other sensitive land uses.		✓	Site Manager Foreman
NVMM14	Minimise the number of plant items operating concurrently when near surrounding		✓	Site Manager

Reference	Details of management measure	Implementation		Responsibility
Implemented throughout external works		**PC[1]**	**C[2]**	
	receivers.			Foreman
NVMM15	Minimise the need for vehicle reversing for example, by arranging for one-way site traffic routes where practicable	✓	✓	Project Manager Site Manager
NVMM16	Noise and vibration monitoring will be adopted as a management strategy throughout the construction works. The purpose of monitoring would be to validate background noise levels, the construction noise predictions and to confirm that the noise and vibration levels from individual items of equipment are not excessive. Ideally, monitoring will be undertaken at the commencement of works and during (or soon after) any significant change in activities		✓	Project Manager HSE Officer
NVMM17	regular reinforcement (such as at toolbox talks) of the need to minimise noise and vibration		✓	Site Manager Foreman
NVMM18	regular identification of noisy activities and adoption of improvement techniques as practicable and reasonable	✓	✓	Project Manager Site Manager
NVMM19	avoiding the use of shouting, portable radios, public address systems or other methods of site communication that may unnecessarily impact upon nearby residents		✓	Foreman Operators / Workers
NVMM20	developing routes for the delivery of materials and parking of vehicles to minimise noise	✓	✓	Construction/Project Manager
NVMM21	where possible, avoiding the use of equipment that generates impulsive noise	✓	✓	Project Manager Site Manager
NVMM22	minimising the movement of materials and plant and unnecessary metal-on-metal contact		✓	Foreman
NVMM23	minimising truck movements where practicable		✓	Site Manager Foreman
NVMM24	scheduling respite periods for intensive works as determined through consultation with potentially affected neighbours (e.g. a daily respite period for a minimum of one hour at midday).		✓	Project Manager
NVMM25	choosing quieter plant and equipment based on the optimal power and size to most efficiently perform the required tasks	✓	✓	Project Manager Site Manager

Reference	Details of management measure	Implementation		Responsibility
Implemented throughout external works		**PC[1]**	**C[2]**	
NVMM26	using temporary noise barriers (in the form of plywood hoarding or similar) to shield intensive construction noise activities from residences where practicable and reasonable	✓	✓	Site Manager Foreman
NVMM27	operating plant and equipment in the quietest and most efficient manner as is practicable and reasonable		✓	Foreman Operators
NVMM28	regularly inspecting and maintaining plant and equipment to minimise noise and vibration level increases, to ensure that all noise and vibration reduction devices are operating effectively.		✓	Foreman HSE Officer
NVMM29	scheduling activities to minimise impacts by undertaking all possible work during hours that will least adversely affect sensitive receivers and by avoiding conflicts with other scheduled events	✓	✓	Project Manager Site Manager
NVMM30	scheduling work to coincide with non-sensitive periods where it is reasonable and practicable to do so	✓	✓	Project Manager Site Manager
NVMM31	scheduling noisy activities to coincide with high levels of neighbourhood noise so that noise from the activities is partially masked and not as intrusive	✓	✓	Project Manager Site Manager
NVMM32	planning deliveries and access to the site to occur quietly and efficiently and organising parking only within designated areas located away from the sensitive receivers		✓	Site Manager Foreman
NVMM33	optimising the number of deliveries to the site by amalgamating loads where possible and scheduling arrivals within designated hours		✓	Site Manager Foreman
NVMM34	designating, designing and maintaining access routes to the site to minimise impacts	✓	✓	Project Manager Site Manager
NVMM35	include contract conditions that include penalties for non-compliance with reasonable instructions by the principal to minimise noise or arrange suitable scheduling	✓		Construction / Project Manager
NVMM36	high vibration generating activities should only be carried out in continuous blocks, with appropriate respite periods as determined through consultation with potentially affected neighbours.	✓	✓	Project Manager Site Manager

Reference	Details of management measure	Implementation		Responsibility
Implemented throughout external works		**PC[1]**	**C[2]**	
NVMM37	Plant used intermittently will be shut down or throttled down to a minimum in between use.		✓	Foreman Operators
NVMM38	Vibratory compactors must not be used closer than 30 metres from residential buildings unless vibration monitoring confirms compliance with the vibration criteria specified in Section 5.2 (as per Condition D16)	✓	✓	Project Manager Site Manager
NVMM39	Limitations to vibration intensive plant identified in Section 6.3 are to be considered and avoided where is practicable and reasonable when planning works regarding structural damage and human comfort.	✓	✓	Project Manager Site Manager
NVMM40	Stopping works if reasonable to do so when noise and/or vibration levels exceed limits and re-assess to identify additional mitigation measures		✓	Project Manager Site Manager

(1) Pre-construction – note that this may refer to prior to commencement of specific activities rather than prior to the commencement of all construction works.
(2) Construction

9.0 Compliance Management

9.1 Roles and Responsibilities

The Project Team's organisational structure and overall roles and responsibilities are outlined in the Environmental Site Management Plan. Specific responsibilities for the implementation of noise and vibration management measures are detailed in Section 8.1.

9.2 Training

All employees, sub-contractors and utility staff working on-site will undergo site induction training relating to noise and vibration management issues, including:

- Existence and requirements of this CNVMSP.
- Approved Working Hours.
- Location of noise-sensitive areas and receivers.
- General noise and vibration management measures, including monitoring and inspection procedures.
- Complaints reporting.
- Non-compliances

The project's site induction documentation will be updated to adopt all changes to noise and vibration related requirements.

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

9.3 Monitoring and Inspections

To maximise the effectiveness of management strategies to minimise construction noise and vibration emissions, a monitoring program will be developed to guide, manage, quantify and control emissions from construction activities. Where monitoring results indicate exceedances of the relevant noise and vibration goals, additional practicable and reasonable mitigation measures and controls would be considered to minimise impacts to nearby sensitive receivers.

The objectives of the monitoring program are to:

- assess construction noise and vibration levels against relevant goals, with consideration given to non-site related ambient and background noise and vibration at the time of measurements;
- identify potential noise and vibratory sources and their relative contribution to impacts from construction activity;
- specify appropriate intervals for monitoring to evaluate, assess and report the relative contribution due to construction activity;

- outline the methodologies to be adopted for monitoring construction noise and vibration, including justification for monitoring intervals or triggers, weather conditions, monitoring location selection and
- timing; and
- incorporate noise and vibration management and mitigation strategies outlined in this plan.

Regular inspections will be completed by the Built project team or a suitably qualified representative throughout construction.

Noise and vibration monitoring will also occur routinely during the works as detailed in Table 16.

Table 16 Noise and vibration monitoring program

Activity	Monitoring Requirements	Frequency, reporting, and responsibility
Noise monitoring		
Operator attended noise survey Where a complaint is received, and monitoring is considered an appropriate response to determine if noise levels exceed predicted construction noise levels documented in this CNVSMP	Noise monitoring will be carried out at the complainant and/or nearest sensitive receiver/s relevant to the construction activities at the time of monitoring. The testing method includes: • Sound level meter configured for "Fast" time weighting and "A" frequency weighting. • Test environment free from reflecting objects where possible. Where noise monitoring is conducted within 3.5 metres of large walls or a building facade, then a reflection correction of up to -2.5 dB(A) will be applied to remove increased noise due to sound reflections. • Tests will not be carried out during rain or when wind speed exceeds 5m/s. • Conditions such as wind velocity and direction, temperature, relative humidity, and cloud cover will be recorded from the nearest Bureau of Meteorology station or on-site weather station/observations. • The monitoring period must be sufficient such that measured noise levels are representative of noise over a 15-minute period. • measurements in one-third octave bands from 10 Hz to 8 kHz inclusive (or a broader range of bands) for the 15-minute interval • At a minimum L_{Aeq}, L_{Amin}, L_{A90}, L_{A10}, L_{A1}, and L_{Amax} levels will be measured and reported. The observations of the person undertaking the measurements will be reported including the audibility of construction noise, other noise in the environment and any discernible construction activities contributing to the noise at the receiver.	**Frequency:** Minimum three (3) monthly basis for attended monitoring or as required by significant activity and/or a new stage of works. As required for complaints where a spot check confirms exceedance. **Reporting:** Reports will be submitted to Built and contain the results of monitoring and how exceedances were managed. A site layout outlining locations of equipment and monitoring locations are also to be included. Records will be maintained on-site and made available to key stakeholders upon request. **Responsibility:** Monitoring to be undertaken by a suitably qualified acoustic specialist or suitably qualified and experienced environmental officer.

Activity	Monitoring Requirements	Frequency, reporting, and responsibility
Vibration monitoring		
Pre-Construction Dilapidation Inspections	In accordance with Condition B4: • a dilapidation inspection was completed to assess the condition of existing public infrastructure in the vicinity of the project (including roads, gutters, and footpaths). In accordance with Condition B5: • dilapidation inspections were completed for adjoining private properties, heritage items and council assets likely to be affected by the development. Built issued an invitation for a dilapidation inspection to all properties likely to be affected by the development. Inspections were completed on those properties where the owner/occupier accepted the invitation. Dilapidation inspections assessed the existing condition of the properties for reference in the event of any damage potentially occurring due to construction activities. Inspection requirements include: - Unrestricted access to the property - Inspection of all internal and external areas (apart from those covered by furniture, wall paintings/ornaments and the like - Photographic records of areas inspected and any visible existing damage (cracks and the like). - Notes of the existing condition of areas inspected and any visible damage identified.	**Frequency:** Prior to the commencement of construction activities on site. **Reporting:** Dilapidation reports containing general comments on key findings and a photographic summary were prepared and submitted to property owners, City of Newcastle, NSW Heritage Division and the Certifying Authority. Reports maintained by Built for future reference in the instance of receiving complaints. **Responsibility:** Qualified Structural/Civil Engineer & Built
Vibration monitoring prior to or at the commencement of significant vibration causing activities/stage of works/works occurring within safe working distances to buildings.	Continuous vibration monitoring will be conducted on relevant activities as follows: • Geophone installed at the ground adjacent to building foundations or equivalent (or nearer) location if access not provided to the outside of the building. • Monitor to continuously record PPV and/or VDV vibration levels generated by the activity. • Measured levels to be compared to human disturbance vibration goals and/or building damage limits as appropriate. • An audio and/or visual warning alarm system will be implemented with the monitoring system • If the alarm is triggered, work will STOP and necessary measures such as modified work practices will be implemented. • Note that if the frequency of the vibration event is such that 75% of the DIN 4150-3 limit was not exceeded, then works will proceed with caution, and the alert level adjusted as appropriate.	**Frequency:** As required throughout each stage of construction where significant vibration is expected **Reporting:** A report detailing measurement results and any vibration management measures to be provided to Built. Records will be maintained onsite. **Responsibility:** Vibration monitoring will be undertaken by a suitably qualified specialist.
Continuous vibration monitoring if trial/initial monitoring results determine exceedance		**Frequency:** As required throughout construction where trial/initial tests found that vibration levels

Activity	Monitoring Requirements	Frequency, reporting, and responsibility
of levels for damage or annoyance.	Where testing for vibration caused by plant & equipment, the plant/equipment will be tested in the settings in which it is expected to operate.	exceeded the criteria in Section 5.2 **Reporting:** Report detailing measurement results and any vibration management measures to be provided to Built. Records will be maintained onsite. **Responsibility:** Vibration monitoring will be undertaken by a suitably qualified specialist.
Vibration monitoring in response to a complaint	Attended vibration monitoring will be conducted on the relevant activities as follows: • Geophone installed at the ground adjacent to building foundations or equivalent (or nearer) location if access not provided to the outside of the building. • Monitor to continuously record PPV and/or VDV vibration levels generated by the activity. • Measured levels to be compared to human disturbance vibration goals and/or building damage limits as appropriate. If necessary, following the vibration measurements: • Appropriate vibration management measures will be implemented. Continuous vibration monitoring will be considered if this is considered of benefit to address the complaint.	**Frequency:** As required for complaints where this is considered an appropriate response. **Reporting:** Report detailing measurement results and any corrective actions to be provided to the complainant and relevant stakeholders. **Responsibility:** Vibration monitoring will be undertaken by a suitably qualified specialist.
Structural Inspection / Assessment in response to a complaint regarding damage potentially caused by construction damage	In the event of being notified and/or receiving a complaint of property damage by a stakeholder who received a Pre-Construction Dilapidation Inspection, Built will arrange for an inspection at the location as soon as reasonably practicable by all parties (complainant, Built, Engineer). The inspection will assess the alleged damage against the pre-construction dilapidation report. A report will be prepared to note the findings of the inspection and issued to the complainant. In the instance that the property owner did not accept the offer for a pre-construction dilapidation inspection, Built will	**Frequency:** As required/seen as an appropriate response to a complaint **Reporting:** Dilapidation reports containing general comments on key findings and a photographic summary were prepared and submitted to property owners.

Activity	Monitoring Requirements	Frequency, reporting, and responsibility
	review the details of the complaint and conduct a preliminary investigation. If deemed appropriate, Built will arrange a detailed inspection of the building.	Reports maintained by Built for future reference in the instance of receiving complaints. **Responsibility:** Qualified Structural/Civil Engineer & Built
Post-Construction Dilapidation Report	In accordance with Condition E4: • At the completion of the development, a dilapidation inspection of adjoining buildings and infrastructure will be completed to assess against the pre-construction dilapidation reports to ascertain whether any structural damage occurred as a result of construction works.	**Frequency:** At the completion of construction works / the development **Reporting:** To be submitted the Certifier and City of Newcastle **Responsibility:** Qualified Structural/Civil Engineer & Built

9.4 Compliance Reporting

All noise and vibration monitoring results will be assessed against the nominated management levels. Noise and vibration monitoring data, and any other relevant information, will be provided in a noise/vibration report to the contractor to assist in producing the Compliance Reporting as required under Conditions C22 to C25 of the Development Consent.

The following should be included as a minimum (where relevant) in the noise/vibration monitoring reports:

- The type of monitoring conducted (for example, at a stage of the project or following complaints) and a brief statement of the measurement method;
- The noise/vibration conditions in the Development Consent, or the relevant noise management levels;
- Descriptions of the nearest affected residences and other sensitive land uses or, in the case of complaints, description of the complainant location and complaint;
- Description of the instrumentation used;
- The results of monitoring at each monitoring location, including a comparison with the consent conditions or relevant noise/vibration management levels;
- Vibration monitoring results in summary together with notes describing any vibration intensive activities (if applicable);
- Summary of measurements exceeding the vibration management levels and descriptions of the plant or operations causing these exceedances (if available);
- Details of corrective action applicable to vibration management levels exceedances and confirmation of its successful implementation. Where corrective action has not yet been implemented, it may be shown as pending and the status of its implementation will be carried forward to the following reports;

- The location of the construction works in relation to the monitoring position (sketch plan & sections, photos);
- Details of the various construction equipment in use during the measurement period;
- Details as to the likely dominant noise sources;
- Meteorological conditions (i.e. temperature, humidity, cloud cover, and wind speed and direction);
- A clear statement outlining the Project's compliance or non-compliance with the conditions or management levels where the monitored level is higher than the conditions or management levels; and
- The reasons for non-compliance should be stated, strategies for minimising noise/vibration identified and stated, and the appropriate actions to implement the mitigation and or management strategies.

9.5 Incident Notification and Reporting

In the event of an incident (as defined under the SSD-9787 Development Consent) occurring onsite relating to noise and vibration, the following protocol applies in accordance with Conditions A26 and A27:

(1) Built will notify the Superintendent, dwp Newcastle immediately after becoming aware of an incident.

(2) The Superintendent will notify the Planning Secretary in writing to compliance@planning.nsw.gov.au immediately after the Applicant becomes aware of an incident. The notification must identify the development (including the development application number and the name of the development if it has one) and set out the location and nature of the incident.

(3) An investigation will be completed by Built and any required parties to gather the information required to comply with Step 4

(4) Subsequent notification must be given, and reports submitted in accordance with the requirements set out in SSD-9787 Development Consent Appendix 2

9.6 Non-Compliance Notification

In the event of a non-compliance (as defined under the SSD-9787 Development Consent) relating noise and vibration, the following protocol applies in accordance with Conditions A28 to A30:

(1) If identified by a party other than dwp Newcastle, Built and/or the identifying party must notify dwp Newcastle immediately after becoming aware of the non-compliance.

(2) Dwp Newcastle will notify the Planning Secretary in writing to compliance@planning.nsw.gov.au within seven days after the Applicant becomes aware of any non-compliance. The Certifier must also notify the Planning Secretary in writing to compliance@planning.nsw.gov.au within seven days after they identify any non-compliance.

(3) The notification must identify the development and the application number for it set out the condition of consent that the development is non-compliant with, the way in which it does not comply and the reasons for the non-

compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance. A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.

(4) Built to complete any actions arising from the non-compliance (as required)

9.7 Noise and Vibration Compliance Audits

Audits (both internal and external) will be undertaken on the project to assess the effectiveness of noise and vibration controls, compliance with this CNVMSP, consent conditions and other relevant approvals, licenses, and guidelines.

Internal environmental audits are conducted every three (3) months on a rotating basis.

The internal audit types include:

- **HSE System Audit** completed by the HSE Manager. This audit typically involves a review of the Project Environmental Management system/plans to ensure they address the current activities and noise and vibration impacts on site. Inspection and monitoring records will also be reviewed to assess compliance with the monitoring program.

- **HSE Assessment** completed by the HSE Manager and/or Officer. This audit typically involves a detailed site inspection to assess the effectiveness of the noise and vibration management measures implemented onsite and environmental performance of the project.

SSD-9787 Conditions D29 – D34 require an Independent Environmental Audit to be completed within eight (8) weeks of the notified date of commencement and subsequently no later than six (6) months from the initial audit. The Planning Secretary may require additional audits to be undertaken at different times upon giving BUILT four (4) weeks' notice upon which the audit must be commenced. GHD Newcastle (GHD) has been nominated by the Superintendent (dwp Newcastle) to complete independent environmental audits on the project.

GHD will prepare a report based on the audit findings highlighting the environmental impacts and performance of the project as well as compliance with SSD-9787 Conditions of Consent. The report identifies corrective actions and recommendations for improving the project's environmental management system and/or performance on site (implementation of management measures).

9.8 Periodic Reviews and Updates

It is acknowledged that Condition A31 regarding the revision of strategies, plans, and programs, requires that within three (3) months of:

(a) the submission of a compliance report under Condition C22

(b) the submission of an incident report under Condition A27

(c) the submission of an Independent Audit under Condition D32

(d) the approval of any modification of the conditions of this consent; or

(e) the issue of a direction of the Planning Secretary under Condition A2 which requires a review, the strategies, plans, and programs required under this consent must be reviewed, and the Planning Secretary and the Certifier must be notified in writing that a review is being carried out.

If necessary, to either improve the environmental performance of the development, cater for a modification or comply with a direction, the strategies, plans, programs or drawings required under this consent must be revised, to the satisfaction of the Planning Secretary and/or Certifier (where relevant). Where revisions are required, the revised document must be submitted to the Planning Secretary and/or Certifier for approval and/or information (where relevant) within six (6) weeks of the review.

The aim of this Condition is to ensure strategies, plans and programs are updated on a regular basis and to incorporate any recommended measures to improve the environmental performance of the development.

Built's standard procedure is to review all management plans every three (3) months or as required by any significant event, incident, instruction (internal or external), change in project scope and/or conditions. It must be noted that a review may not result in the revision of strategies, plans, and programs if deemed to still be adequately addressing the noise and vibration requirements of the project.

Reviews and revisions (if required) are completed by the Built project team, typically consisting of the Project Manager, HSE Manager, and Site Manager. Revised management plans are issued to all required consultants, employees and subcontractors to ensure compliance within Condition A25.

10.0 Community Consultation and Complaint Management

10.1 Community Consultation for Development of Sub Plan

Built has implemented all recommendations within the NVA by EMM Consulting, however, in accordance with Condition A8, C11(d) and C 11(e), Built consulted with the key stakeholders on a number of occasions to identify any concerns regarding noise and vibration and to develop strategies for managing high noise and vibration generating works.

Descriptions and outcomes of the community consultation are detailed in Table 17 below.

Table 17 Description of community consultation in the development of mitigation strategies

Date	Type	Description	Outcome
04/11/19	LB[1]	• Identified Built as being awarded the project • Advised of upcoming demolition works. • Offered stakeholders a dilapidation inspection of their property prior to commencement of works at Built's expense. • Advised to contact the undersigned for any queries.	• Most stakeholders accepted the offer for a pre-construction dilapidation report. • Dilapidation inspections were completed by a qualified Structural Engineer to assess the existing condition of neighbouring properties. • Dilapidation Reports were finalised and submitted to required parties.
13/12/19	M[2]	Consultation meeting held with Hunter New England Health / James Fletcher Hospital (JFH). Key points raised were: • Main contacts for JFH & their operations • Main contacts for Built • Discussed potential environmental impacts around access, noise, vibration, dust and approved hours of construction. • JFH requested proactive communication. • Built advised of construction program including demolition, piling, crane erection • Agreed to ongoing meetings/discussions regarding the program and potential impacts	• JFH key contacts included in the community liaison contact register. • JFH highlighted as a sensitive receiver and operation requirements are taken into consideration for planning of works. • Noise and vibration monitoring implemented at JFH as required and data submitted for their records. • Built to consult with JFH regarding retention works to heritage retaining wall on the southern boundary. • Built reviewed and altered demolition methodology to minimise noise and vibration by using shears instead of jackhammers.
19/12/19	C[3]	Notice of Commencement of Works • Advised of site establishment and early works • Advised of commencing demolition beginning of January 2020 • Advised that demolition works will generate noise and that Built will implement appropriate mitigation and control measures • Acknowledged that these works may be disruptive • Advised of community liaison contact – nihon@built.com.au • Advised to contact the undersigned for any queries, concerns or complaints	• No responses received

20/01/20	C	Notice of Planned Asbestos Removal Works • Although not related to noise and vibration, an additional opportunity was given for stakeholders to raise any queries or concerns "to the above or the project in general".	• No responses received
23/01/20	M	Consultation meeting with Newcastle Police Station • Discussed upcoming works and potential disruptions due to noise, specifically to their operations/call centre on the adjoining boundary. • Built advised mitigation measures could be implemented to windows and/or doors.	• Newcastle Police Station advised on 04/02/2020 that they would like to proceed with acoustic measures discussed. • Built engaged RAPT Consulting to assess the locations and installed recommended acoustic seals to Operation Centre external doors.
05/02/20	M	Consultation meeting held with Newcastle Grammar School (NGS) • No concerns were raised regarding noise and vibration. • Requested that they are included in future community consultation/notices.	• NGS key contacts included on the community liaison contact register.
20/02/20	C	Construction Progress Update • Notified residents of upcoming structural demolition. • Advised of Work Zone permit approval. • Notified residents of decommissioning and relocating existing pedestrian crossing • Provided opportunity for stakeholders to raise any queries	• NGS responded thanking Built for the update. • No further responses/queries received.
03/04/20	C	Extended Construction Hours • Advised stakeholders of the introduction of the Environmental Planning and Assessment (COVID-19 Development – Construction Working Days) Order 2020 by the NSW Planning Minister. • Provided advance notice of changed/extended working hours being implemented onsite (Saturdays, Sundays and public holidays) in accordance with the Order 2020 and SSD-Conditions D5 and D6.	• Multiple community complaints from residents were received in response to normal working hours extending to Saturday's and Sunday's. • In response to the community complaints, Built revised the extended hours onsite in the short term to Saturdays only and notified the community. • Built will notify the community in advance if there are further changes to the revised extended hours in accordance with Condition D6.

(1) Letter Box Drop including parked cars on Church Street
(2) Meeting with key stakeholder
(3) Community Notice sent to all stakeholders via email correspondence

10.2 Ongoing Community Consultation

Ongoing consultation between BUILT, project stakeholders, the community and relevant agencies regarding the management of noise and vibration impacts will be undertaken during the construction of the Project as required. The process for the consultation is documented in the Community Liaison Plan (CLP) previously submitted to the NSW Dept. Planning, Industry and Environment.

BUILT will consult with receivers identified as being subject to levels that may exceed the Highly Noise Affected criteria with the objective of ensuring the construction hours specified within SSD-9787 are suitable to their hours of operation and will not adversely affect them. BUILT will always endeavour to consult and cooperate with the community to prevent complaints and to assure sensitive receivers that their needs are being considered.

During construction of the Project, it may be necessary for BUILT to undertake work outside the standard approved hours of work outlined in Condition D4. In the circumstances listed under Condition D5, on becoming aware of the need for such works, BUILT will notify the Planning Secretary of the need for such works. Prior to carrying out such works, BUILT will use their best endeavours to notify all affected sensitive receivers of the likely impact and duration of the works, as required by SSD-9787 Condition D6.

Prior to commencing significant stages of construction, BUILT will consult with the potentially affected community, educational institutions and noise and vibration-sensitive businesses to identify and discuss concerns around construction noise and vibration generated during the works. This will be in accordance with the CLP and includes letterbox drops, door knocking, and email notices through the community liaison address **nihon@built.com.au**. This email address is monitored daily by the BUILT Community Liaison Officers and will be used for:

- Project alerts and progress updates
- Formal notices
- Complaints and consultation

10.3 Complaint Management System

Complaints will be handled in an efficient manner, with immediate action by BUILT and a formal response issued by the Project Manager. The response will include details of the actions taken by BUILT and how BUILT intends to prevent similar complaints in the future. All complainants will be offered a face to face meeting to discuss their concerns. The complete complaints management procedure is as follows:

- The proponent will supply the relevant governing authorities with the names and appropriate contact numbers for the site construction manager during the construction period and one other senior staff member.
- An emergency after-hours contact phone number will be put in place to allow contact with the proponent in relation to any environmental matter including those concerned with noise and vibration issues. This phone number will be clearly displayed on the fence surrounding the construction site.
- All information relating to such complaints will be kept in a register. The register will include but not be restricted to the following information:

  - Date and time of complaint;

- Complainant details (i.e. full name, address and contact details);
- Nature and source of the complaint;
- Action taken; and
- Follow-up details with the complainant.

- The complaint register will be made available to any relevant regulatory authority upon request.
- The proponent will endeavour to action the complaint immediately and formally respond to any complaint within one working day of its receipt.

The complaint handling process adopted following complaints regarding noise and/or vibration include:

1) Identify the source that has caused the complaint through consultation with the complainant.
2) If related to noise, undertake immediate noise level spot check at the sensitive receiver/complaint location to verify exceedance of noise goals.
3) Assess whether the issue can be resolved easily and take immediate action if possible.
4) If not, assess the construction site and activities and determine whether there is any reason to believe noise or vibration levels are higher than anticipated.
5) Ensure all planned management measures have been appropriately implemented.
6) If steps 3 and 4 are correct, no further site actions are required (proceed to step 8).
7) If steps 3 and 4 are incorrect, implement all reasonable and practicable mitigation measures where possible and implement correct consultation procedures.
8) If deemed an appropriate response, engage an acoustic specialist to undertake additional monitoring
9) Ensure the complainant is well briefed on the existing mitigation measures in place during the activity and the justification for the activity and understands the details of the works.
10) Advise the complainant of actions undertaken.

Following the adoption of additional or alternative mitigation, if any, a further noise and/or vibration survey would be conducted at the complainant's location to demonstrate the effectiveness of the mitigation strategy if deemed necessary.

11.0 Appendices

Appendix A – Revision Change Register

Revision	Date	Section	Description
01	09/04/2020	Endorsement	Updated Letter of Endorsement by Greg Collins of RAPT Consulting dated 09/04/2020
		Contents	Complete reformat of management plan amended for readability and navigation in accordance with Condition C11
		Section 1.0	Minor amendments to Introduction section and included as individual section.
		Section 2.0	Project Information section simplified to be more precise.
		Section 3.0	Regulatory Framework included to show relevant development conditions and statutory requirements to the project and sub-plan.
		Section 5.2	DIN 4150-3:1992-02 identified as vibration criteria for cosmetic and structural damage in accordance with GHD corrective action and Condition D15
		Section 6.2	Additional predicted construction noise level data sourced from the NVA dated May 2019 by EMM Consulting
		Section 6.3	Additional information on assessed safe working distances and vibration impacts included
		Section 7.1	Amendments made regarding extended construction hours in accordance with NSW DPIE Environmental Planning and Assessment (COVID-19 Development - Construction Working Days) Order 2020
		Section 8.1	Amended noise and vibration measures to be implemented included in Table 14 showing stage of implementation and responsibility
		Section 9.2	Additional information included detailing training/communication of CNVMSP to personnel
		Section 9.3	Additional information on monitoring and inspections included and amended monitoring program prepared.
		Section 9.4	Section on Compliance Reporting included in accordance with Conditions C22 to C25
		Section 9.5	Procedure for Incident Notification and Reporting included
		Section 9.6	Non-compliance notification procedure included
		Section 9.7	Noise and vibration compliance audit information included detailing both internal and external audits.
		Section 9.8	Details on the periodic reviews and updates of management plans included
		Section 10.1	Descriptions and outcomes of community consultation in development of the mitigation strategies and sub-plan detailed in Table 16 in accordance with Condition A8
		Section 10.2	Complaint management procedure provided in further detail
02	21/06/2021	Section 7.1	Updated to reflect EPA (COVID-19 Development – Construction Work Days) Order (No 2) 2021
		Appendix B	Inclusion of EPA (COVID-19 Development – Construction Work Days) Order (No 2) 2021

Appendix B – EPA (COVID-19 Development – Construction Work Days) Order (No 2) 2021

Environmental Planning and Assessment (COVID-19 Development—Construction Work Days) Order (No 2) 2021

I, Rob Stokes, the Minister for Planning and Public Spaces, make the following Order under section 10.17 of the *Environmental Planning and Assessment Act 1979.*

I am satisfied the Order is necessary to protect the health, safety and welfare of members of the public during the COVID-19 pandemic. I have also consulted with the Minister for Health and Medical Research in relation to the making of this Order.

The Hon. Rob Stokes, MP
Minister for Planning and Public Spaces

Dated: 10th June 2021

Explanatory note

The object of this Order is to permit any building work or work, or the demolition of a building or work on a Saturday between the hours of 7 am and 5 pm and specified works on a Sunday between the hours of 9 am and 5 pm.

Environmental Planning and Assessment (COVID-19 Development—Construction Work Days) Order (No 2) 2021

under the

Environmental Planning and Assessment Act 1979

Part 1 Preliminary

1 Name of Order

This Order is the *Environmental Planning and Assessment (COVID-19 Development—Construction Work Days) Order (No 2) 2021*.

2 Commencement

This Order commences on the day it is published in the Gazette and remains in force for the prescribed period within the meaning of section 10.17 of the Act.

3 Definitions

(1) In this Order—

the Act means the *Environmental Planning and Assessment Act 1979*.

Note. The Act and the *Interpretation Act 1987* contain definitions and other provisions that affect the interpretation and application of this Order.

(2) Notes included in this Order do not form part of this Order.

4 Relationship with orders under the *Public Health Act 2010*

To the extent that this Order is inconsistent with an order under Part 2 of the *Public Health Act 2010*, the order under that Part prevails.

Part 2

5 Development authorised by this Order

The development specified for this Order may be carried out without the need for any approval under the Act if it complies with the conditions specified for the development.

6 Construction work

(1) The carrying out of building work or work, or the demolition of a building or work, on a Saturday between the hours of 7 am and 5 pm is development specified for this Order.

(2) The carrying out of the following works or activities on a Sunday between the hours of 9 am and 5 pm is development specified for this Order:

(a) Professional works and administrative activities related to the construction site, such as inspections by certifiers, designers, engineers, or builders, which do not involve any physical construction works

(b) Painting

(c) Wall and Floor Tiling

(d) Waterproofing

(e) Silicone work (sealing)

(f) Builders clean (being the final clean by professional cleaners before handover, including vacuum and window cleaning, but does not include site clearing by use of bobcats or similar machinery).

(g) Carpet laying

(h) Prefabricated joinery installation

(i) Any other works occurring indoors which do not produce substantial noise.

(3) The conditions specified for the development are that the development must—

(a) be the subject of a development consent, and

(b) comply with all conditions of the consent other than any condition that restricts the hours of work or operation on a Saturday or a Sunday, and

(c) take all feasible and reasonable measures to minimise noise, and

(d) for work or operations on a Saturday— not involve the carrying out of rock breaking, rock hammering, sheet piling, pile driving or similar activities during the hours of work or operation that would not be permitted but for this Order,

(e) for works or activities permitted under subclause (2) on a Sunday –

i. not involve the use of the following:

1. pneumatic or gas-powered fastening tools or equipment (including nail guns),
2. explosive powered tools and equipment,
3. petrol- or diesel-powered tools and equipment, and
4. electric power tools and equipment, and

ii. the person carrying out the work or activity must not play music on any device or equipment or use a radio.

7 Suspension of regulatory instruments

(1) For the purpose of enabling development to be carried out in accordance with clause 6 of this Order, the following regulatory instruments do not apply to the extent necessary to serve that purpose:

(a) any agreement, covenant or other similar instrument that restricts the carrying out of that development, and

(b) an environment protection licence under the *Protection of the Environment Operations Act 1997* that was issued before the commencement of this Order.

Note. All other conditions of an environment protection licence continue to apply.