ROHRIG CONSTRUCTION

APPENDIX A

CONSTRUCTION NOISE AND VIBRATION MANAGEMENT PLAN

WILLIAM CLARKE COLLEGE

KELLYVILLE, NSW

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Construction Noise and Vibration Management Plan for William Clarke College Kellyville, NSW

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1 INTRODUCTION

The proposed construction works involves the construction of stage 1 works at William Clarke College in Kellyville NSW. This stage of work is part of an approved masterplan for the school to meet the demands of the growing local community.

Stage 1 works have been approved by the Minister for Planning and Public Spaces (NSW) under section 4.38 of the Environmental Planning and Assessment Act (1979).

The purpose of the Construction Environmental Management Plan (CEMP) is to meet the criteria as defined within the approved State Significant Development (SSD-35715221). Schedule 3 Part C of the conditions of consent, clause C14 states the requirement for preparation of a Construction Environmental Management Plan (CEMP). Under clause c) of this requirement, a Construction Noise and Vibration sub plan (CNVMP) must be produced.

WSP has been engaged to prepare this CNVMP to assist in the management of risks associated with construction of this project.

1.1 PROJECT BACKGROUND

The planned construction activities for achieving the scope of works are as follows:

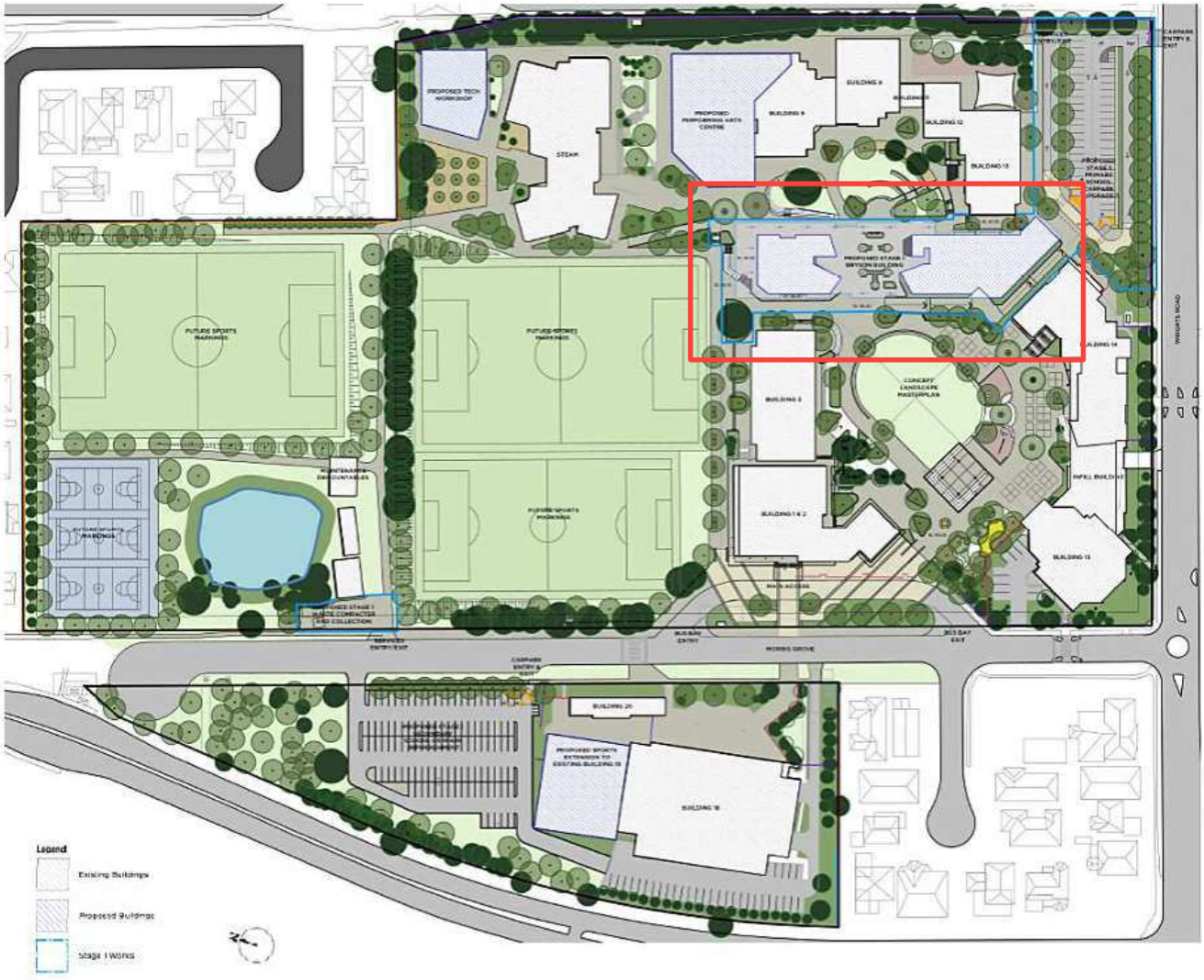
- Site preparation, being tree removal; bulk earthworks; and civil works for the Bryson Building
- Construction of the Bryson Building for use as classrooms, staff rooms, library and ancillary teaching spaces, to be located in the centre of the site
- Landscaping ancillary to Bryson Building including tree planting

1.2 PROJECT LOCATION

The project site is within a school: William Clarke College, located at 10 Morris Grove, Kellyville NSW and is legally described as Lot 10 in DP 1169003).

The works footprint is Stage 1 works and is within the school grounds as shown in Figure 1.1.

Figure 1.1 William Clarke College Masterplan (Extract from EIS) – Stage 1 outlined in red



1.3 PURPOSE OF THIS PLAN

The CNVMP has been developed to satisfy the *Development Consent conditions, Application Number SSD 35715221, NSW Government, Department of Planning and Environment, 2023* relating to environmental noise and vibration.

The CNVMP aims to achieve the following:

- Identify the relevant legislative requirements
- Identify potential noise impacts and sensitive receivers associated with the project
- Identify potential vibration impacts associated with the project
- Outline systems and management measures to reduce or eliminate identified noise or vibration impacts
- Outline the responsibilities of those involved in the control of noise and vibration impacts
- Outline an effective monitoring, auditing and reporting framework to assess the effectiveness of the controls implemented.

Assessment within this document has been sourced from the *Noise & Vibration Impact Assessment, William Clarke College Kellyville Concept Masterplan & Stage 1 Works, (610.30786-R01-v1.1, SLR, August 2022)*

1.4 RELEVANT GUIDELINES

Noise and vibration guidelines for construction activities are based on publications managed by the New South Wales (NSW) Environment Protection Authority (EPA). The EPA guidelines applicable to this assessment include:

- *Interim Construction Noise Guideline* (Department of Environment and Climate Change (DECC), 2009), (ICNG)
- *Australian Standard 2436: 2010, Guide to noise and vibration control on construction, demolition and maintenance sites* (AS2436)
- *Assessing Vibration: a technical guideline* (DECC, 2006), (AVaTG)
- *British Standard 6472-1: 2008, Guide to evaluation of human exposure to vibration in buildings Part 1: Vibration sources other than blasting* (BS 6472-1, 2008)
- *German Standard 4150-3 Structural Vibration, Part 3: Effects of Vibration on Structures* (DIN 4150-3)
- *NSW Noise Policy for Industry* (EPA, 2017), (NPfI)
- *Construction Noise and Vibration Guideline (Roads),* Transport for NSW, July 2023 (EMF-NV-GD-0056)

2 EXISTING NOISE ENVIRONMENT

2.1 SITE LOCATION AND IDENTIFIED SENSITIVE RECEIVERS

The project is located in a suburban area in Sydney's north-west. The site has frontage to Green Road, Wrights Road and Cormack Circuit, with vehicle access from Morris Grove and Wrights Road. The campus is bound by residential dwellings to the north, Wrights Road to the south, Cormack Circuit to the east and Green Road to the west. Residential dwellings are located further south of Wrights Road, east of Cormack Circuit and also bound the site to the southwest. Kellyville Village, a commercial shopping centre lies east of Green Road and approximately 200m southwest of the site boundary.

The existing noise environment at the site is generally influenced by road traffic from the surrounding road network with the nearest major road being Wrights Road, which bounds the southern site boundary. Other existing noise sources include children's play associated with WCC and environmental noise (birdlife)

The nearest sensitive receivers are residential dwellings located 15 m to the southwest and adjacent to the northern and north-eastern site boundary.

The receivers are grouped into Noise Catchment Areas (NCAs) based on their surrounding noise environment and sensitivity to noise and vibration. The study area includes all nearby locations that could be affected by noise and vibration from the proposed construction and operational activities at the Project. The identified NCAs and receivers help in understanding the potential impacts on these areas. Refer to the *Noise & Vibration Impact Assessment, William Clarke College Kellyville Concept Masterplan & Stage 1 Works, (610.30786-R01-v1.1, SLR, August 2022).*

Figure 2.1 provides an indicative site map of the noise monitoring locations, NCAs, and noise-sensitive receivers within the assessment area.

Figure 2.1 Site Location, Surrounding Receivers and Noise Monitoring Locations (source, SLR Consulting)

2.2 BACKGROUND NOISE LEVELS

The existing noise environment is predominantly defined by road traffic along the surrounding road network. Other existing noise sources include children's play associated with WCC and environmental noise (birdlife). The results of unattended noise monitoring have been sourced from the *Noise & Vibration Impact Assessment, William Clarke College Kellyville Concept Masterplan & Stage 1 Works, (610.30786-R01-v1.1, SLR, August 2022)*.

2.2.1 UNATTENDED NOISE SURVEYS

Unattended noise monitoring was conducted at the site from 22 March to 5 April 2024. Monitoring equipment was placed to measure noise levels representative of the most affected receivers. The equipment, certified and calibrated according to NATA standards, recorded noise levels continuously in 15-minute intervals throughout the day, evening, and night. The measured data has been processed to exclude noise from extraneous events and periods affected by adverse weather conditions, such as strong wind or rain, to establish representative existing noise levels in each NCA.

Table 2.1 presents the unattended monitoring results for the monitoring survey.

Table 2.1 Unattended noise monitoring results

ID	LOCATIONS	MEASURED NOISE LEVEL dBA					
		Background Noise ($L_{90, 15min}$)			Average Noise (L_{Aeq})		
		Day	Evening	Night	Day	Evening	Night
L1	Primary School Carpark (Southern Site Boundary)	37	40	35	53	54	45

ID	LOCATIONS	MEASURED NOISE LEVEL dBA					
		Background Noise ($L_{90, 15min}$)			Average Noise (L_{Aeq})		
		Day	Evening	Night	Day	Evening	Night
L2	Eastern Site Boundary (Opposite Building 8/11)	38	39	33	56	53	49
P1	Site boundary (Opposite 137 Wrights Road, Castle Hill	40	41	31	53	50	46

Note: The assessment periods are the daytime which is 7 am to 6 pm Monday to Saturday and 8 am to 6 pm on Sundays and public holidays, the evening which is 6 pm to 10 pm, and the night-time which is 10 pm to 7 am on Monday to Saturday and 10 pm to 8 am on Sunday and public holidays. See the NSW EPA Noise Policy for Industry.

2.2.2 ATTENDED NOISE SURVEYS

Short-term attended noise monitoring was conducted at each location to identify the contributions of various noise sources. These measurements were generally consistent with the unattended noise monitoring results, indicating that existing noise levels are primarily influenced by road traffic from the surrounding network, with noise from children's play at the school contributing during the daytime.

3 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT CRITERIA

3.1.1 DEVELOPMENT CONSENT CONDITIONS (APPLICATION NUMBER SSD 35715221)

The CNVMP will be prepared to comply with the *Development Consent conditions, Application Number SSD 35715221, NSW Government, Department of Planning and Environment, 2023*. The following conditions have been noted to specifically outline expectations for noise and vibration management:

C17. The Construction Noise and Vibration Management Sub-Plan (CNVMSP) must address, but not be limited to, the following:

(a) be prepared by a suitably qualified and experienced noise expert:

(b) be consistent with recommendations in Stage 1 Works Noise and Vibration Impact Assessments dated 20 March 2023 and prepared by SLR Consulting Australia Pty Ltd:

(c) describe procedures for achieving the noise management levels in EPA's Interim Construction Noise Guideline (DECC, 2009).

(d) describe the measures to be implemented to manage high noise generating works such as piling, in close proximity to sensitive receivers.

(e) include strategies that have been developed with the community for managing high noise generating works.

(f) describe the community consultation undertaken to develop the strategies in Schedule 3 condition Cl 7(e).

(g) include a complaints management system that would be implemented for the duration of the construction, and.

(h) 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 Schedule 3 condition C13.

(...)

Construction Hours

D5. Construction, including the delivery of materials to and from the site, may only be carried out between the following hours:

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

(b) between 8am and 1pm, Saturdays.

No work may be carried out on Sundays or public holidays.

D6. Construction activities may be undertaken outside of the hours in Schedule 3 condition D5 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.

D7. Notification of such construction activities as referenced in Schedule 3 condition D6 must be given to affected residents before undertaking the activities or as soon as is practical afterwards.

D8. 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.

(...)

Construction Noise Limits

D13. 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 CNVMSP required by Schedule 3 condition C17.

D14. 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 Schedule 3 condition D5 unless approved by Schedule 3 condition D6.

D15. The Applicant 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.

Vibration Criteria

D16. 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).

D17. Vibratory compactors must not be used closer than 30m from residential buildings unless vibration monitoring confirms compliance with the vibration criteria specified in Schedule 3 condition D16.

D18. The limits in Schedule 3 condition D16 and Schedule 3 condition D17 apply unless otherwise outlined in a CNVMSP required by Schedule 3 condition C17.

3.2 CONSTRUCTION NOISE

The applicable assessment criteria for noise is found in the *Interim Construction Noise Guideline* (ICNG).

A quantitative assessment requires the development of noise management levels (NML) based on existing rating background noise levels (RBLs) and a comparison of predicted construction noise levels against the NML.

Recommended standard hours represent the times of the day when receivers are likely to be less sensitive to noise impacts. Where work is proposed outside of standard hours, justification is required and more stringent NMLs apply. For all other receiver types, the NMLs only apply when the receiver is typically occupied. Table 3.1 sets out the application of the management levels for noise at residences.

Table 3.1 Application of the ICNG noise management levels

SETTING AND APPLYING NMLS AT RESIDENCES		
TIME OF DAY	**NML, $L_{eq,15min}$ dBA**	**HOW TO APPLY**
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected >75	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority may require respite periods by restricting the hours that the very noisy activities can occur, taking into account 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 in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	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 noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.

It is noted that the working hours for construction of the project as contained within the consent condition are limited to the recommended standard hours. Exceptions to these hours are only allowed under the following circumstances:

(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.

In consideration of the results of noise monitoring, Table 3.2 presents the NMLs for residential receivers and Table 3.3 for the nearest non-residential sensitive receivers.

Table 3.2 Noise management levels at residential receivers

NCA	MONITORING LOCATION	RESIDENTIAL NOISE MANAGEMENT LEVELS $L_{eq,15min}$ dBA			
		Standard Construction (RBL + 10 dB)[1]	Out of Hours (RBL + 5 dB)		
		Daytime	Daytime[2]	Evening	Night-time
NCA01	L1	47	42	45	40
NCA02	L1	47	42	45	40
NCA03	L2	48	43	44	38
NCA04	P1	50	45	46	36
NCA05	L2	48	43	44	38

Note 1: RBL = Rating Background Level

Note 2: Daytime out of hours is 7 am to 8 am and 1 pm to 6 pm on Saturday, and 8 am to 6 pm on Sunday and public holidays

Table 3.3 Noise management levels for non-residential sensitive receivers

NCA	LAND USE	MANAGEMENT NOISE LEVEL (WHEN IN USE) $L_{EQ,15MIN}$ DBA	
		Internal	External
(R1)	Classrooms at schools and other educational institutions	45	551
(R2, R3)	Commercial		70
	Active Recreation (characterised by sporting activities and activities which generate noise)	-	65
	Passive recreation areas (characterised by contemplative activities that generate little noise)	-	60

Note 1: It is assumed that these receivers have windows partially open for ventilation which results in internal noise levels being around 10 dB lower than the external noise level.

Feasible and reasonable safeguards and management measures should be implemented where NMLs are exceeded either during or outside of recommended standard hours for construction work.

3.3 VIBRATION

Construction vibration is assessed for two potential impacts as follows:

- Cosmetic building damage
- Loss of amenity due to perceptible vibration, termed human comfort.

Importantly, cosmetic damage is regarded as minor in nature; it is readily repairable and does not affect a building's structural integrity. If there is no significant risk of cosmetic damage, then structural damage is considered highly unlikely.

3.3.1 COSMETIC BUILDING DAMAGE AND STRUCTURAL INTEGRITY

There are no vibration limits for buildings and structures in Assessing Vibration: A Technical Guideline. Therefore, the limits set out in British Standard BS 7358-2: *Evaluation and measurement for vibration in buildings guide to damage levels from ground-borne vibration* have been adopted.

A summary of the limits is provided in Table 3.4. These peak vibration limits are set so that the risk of cosmetic damage is minimal. They have been set at the lowest level above which damage has been credibly demonstrated. The limits also assume that the equipment causing the vibration is only used intermittently.

For heritage structures, different vibration limits may apply depending on the structural integrity or significance of the item.

Table 3.4 BS 7385-2 Guideline vibration limits for cosmetic damage

GROUP	TYPE OF STRUCTURE	PEAK COMPONENT PARTICLE VELOCITY, mm/s [1]		
		4–15 Hz	15–40 Hz	40 Hz AND ABOVE
1	Reinforced or framed structures Industrial or heavy commercial buildings	50		
2	Un-reinforced or light framed structures Residential or light commercial buildings	15 – 20[2]	20 – 50	50

Note 1: Values referred to are at the base of the building, on the side of the building facing the source of vibration (where feasible).

Note 2: At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.

3.3.1.1 HERITAGE STRUCTURES

Building structures classified as being of heritage significance are to be considered on a case-by-case basis, as a heritage listed structure may not be assumed to be more sensitive to vibration unless it is structurally unsound which is unlikely for a regularly maintained structure. Where a historic structure is deemed to be sensitive to damage from vibration following inspection by qualified structural and / or civil engineers, more conservative superficial cosmetic damage criterion based on peak component particle velocity (PPV) (German Standard DIN 4150-3: 1999 *Structural Vibration – Part 3: Effects of vibration on structures* or equivalent) should be considered.

Where a historic building is deemed to be sensitive to damage from vibration (structurally unsound), a conservative superficial cosmetic damage criterion of 3mm/s peak component particle velocity (based on DIN 4150) may be applicable.

It is noted that no vibration sensitive heritage structures have been identified in the vicinity of the project and as such, potential heritage impacts have not been assessed further. Should any heritage items be identified during the work, work

will cease until a determination of any impact can be made. These criteria should be applied to any assessment of impacts.

3.3.2 HUMAN COMFORT (AMENITY)

Table 3.5 presents the limits (vibration dose values) above which there is considered to be a risk that the amenity and comfort of people occupying buildings would be affected by intermittent vibration from construction works. These limits are taken from Assessing Vibration: A Technical Guideline.

Table 3.5 Human comfort (amenity) guideline vibration limits (intermittent work)

LOCATION	ASSESSMENT PERIOD	VIBRATION DOSE VALUE, $m/s^{1.75}$	
		PREFERRED VALUES	MAXIMUM VALUES
Critical areas	Day or nighttime	0.10	0.20
Residences	Daytime	0.20	0.40
	Nighttime	0.13	0.26
Offices, schools, educational institutions, and places of worship	Day or nighttime	0.40	0.80
Workshops	Day or nighttime	0.80	1.60

3.4 CONSTRUCTION TRAFFIC

The Road Noise Policy (RNP) provides guidance on the assessment of noise impacts from road traffic noise on sensitive receiver types.

The RNP application notes state that 'for existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level as a result of the development should be limited to 2 dBA above that of the noise level without the development. This limit applies wherever the noise level without the development is within 2 dBA of, or exceeds, the relevant day or night noise assessment criterion.'

The RNP criteria apply to traffic generated by construction activities. The existing roads immediately surrounding the project site are classified as arterial and sub-arterial. Arterial, sub-arterial and collector roads are assessed over day (7 am-10 pm) and night (10 pm-7 am) periods and local roads are assessed over a one-hour period (typically the peak hour) within the respective day and night periods. Table 3.6 presents a summary of the applicable criteria for residences.

Table 3.6 Road traffic noise criteria for residential receivers on existing roads affected by additional traffic from land use developments

ROAD TYPE	ROAD TRAFFIC	NOISE CRITERIA
	DAY	NIGHT
Arterial/Sub-arterial/Collector	60 $L_{eq\ 15hr}$ dBA	55 $L_{eq\ 9hr}$ dBA
Local Road (Newington Road)	55 $L_{eq\ 1hr}$ dBA	50 $L_{eq\ 1hr}$ dBA

Where the road traffic noise levels increase by more than 2 dBA as a result of the proposed construction traffic and the criteria in Table 3.6 are exceeded, investigation of mitigation options would be required.

4 ASSESSMENT OF NOISE AND VIBRATION IMPACTS

4.1 CONSTRUCTION ACTIVITIES

The work will be completed in stages comprising different activities. Within each stage, the item of equipment with the greatest potential to generate noise impacts has been assessed. Table 4.1 presents the assessed activities, equipment, and total sound power levels for each construction stage according to the *Noise & Vibration Impact Assessment, William Clarke College Kellyville Concept Masterplan & Stage 1 Works, (610.30786-R01-v1.1, SLR, August 2022)*. In accordance with the commissioned WSP scope of works, no additional assessment has been undertaken.

Table 4.1 Construction activities (Source SLR)

Construction scenario	Plant and equipment	Sound Power Level dBA per source	Sound Power Level dBA total per scenario
1 - Site Establishment	Crane (60 tonne)	100	115
	Excavator (22 tonne)	100	
	Grader	113	
	Hand Tools	94	
	Power Auger	103	
	Vibratory Roller (12 tonne)	109	
	Truck (10 tonne)	108	
2 – Groundworks and Substructure (Primary Carpark)	Excavator (22 tonne)	100	115
	Grader	113	
	Mobile Crane (22 tonne)	98	
	Vibratory Roller (12 tonne)	109	
3 – Ground works and Substructure (Byron Building)	Concrete Agitator	109	116
	Concrete Pump	106	
	Concrete Vibrator	113	
	Crane (60 tonne)	100	
	Excavator (22 tonne)	100	
	Hand Tools	94	
	Pilling Rig (Bored)	111	
	Truck (10 tonne)	108	
4 – Structure	Concrete Agitator	109	114

Construction scenario	Plant and equipment	Sound Power Level dBA per source	Sound Power Level dBA total per scenario
(Byron Building)	Concrete Pump	106	
	Concrete Vibrator	113	
	Crane (60 tonne)	100	
	Power generator (Site compounds)	103	
	Hand Tools	94	
	Truck (10 tonne)	108	
5-Cladding and Roofing (Byron Building)	Crane (60 tonne)	100	104
	Hand Tools	94	
	Forklift	101	
6- Internal Services & Finishes (Byron Building)	Crane (60 tonne)	100	107
	Hand Tools	94	
	Truck (10 tonne)	108	
	Elevated Working Platform	94	

HOURS OF CONSTRUCTION

Construction activities would be undertaken during the working hours defined in the *Development Consent conditions, Application Number SSD 35715221, NSW Government, Department of Planning and Environment, 2023* as follows:

D5. Construction, including the delivery of materials to and from the site, may only be carried out between the following hours:

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

(b) between 8am and 1pm, Saturdays.

No work may be carried out on Sundays or public holidays.

D8. 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.

Any works outside of these hours will be approved by SOPA and community / neighbour notification will occur at least 24 hours in advance.

4.2 ASSESSMENT METHOD

The *Noise & Vibration Impact Assessment, William Clarke College Kellyville Concept Masterplan & Stage 1 Works, (610.30786-R01-v1.1, SLR, August 2022)* outlines the assessment of potential impacts during construction works. The

construction noise and vibration assessment is relative to the S1W only, which includes the construction of The Bryson Building and the Primary School Car Park, as well as the relocation of the waste compound.

Local terrain, receiver buildings and structures were digitised in the noise model to develop a three-dimensional representation of the construction sites and surrounding areas.

Construction modelling was undertaken using model parameters consistent with operational noise modelling for typical day time neutral conditions with the ISO 9613-2 industrial noise algorithm in noise Version 2021.11.

The assessment uses 'realistic worst-case' scenarios to determine the impacts from the noisiest 15-minute period that are likely to occur for each work scenario, as required by the ICNG. The impacts represent construction noise levels without mitigation applied.

4.3 PREDICTED NOISE LEVELS

Table 4.2 presents the predicted number of NCA exceedances for each assessed construction scenarios compared to the relevant NMLs.

Table 4.2 Predicted number of residential exceedances for each construction stage

NCA/ID	Type	NML	Predicted Noise Level – $L_{ae(15minute)}$ (dBA)					
			Preliminary Works	Groundworks & Structure (Carpark)	Groundworks & Structure (Bryson)	Structure (Bryson)	Cladding & Roofing (Bryson)	Internal Services & Finishes (Bryson)
NCA01	Residential	47	65	38	65	64	53	50
NCA02		47	68	78	68	67	55	53
NCA03		48	57	66	57	56	53	53
NCA04		50	56	38	56	55	51	51
NCA05		48	49	34	49	48	44	44
R01	Educational Facility1	55	63	41	63	62	51	49
R02	Commercial	70	53	64	53	52	46	46
R03	Commercial	70	53	34	53	52	42	41

1. *Educational NML Criteria is only applicable when receiver is in use.*
2. ***Green** shaded cells indicated predicted noise levels exceed the daytime NMLs at this NCA.*

4.4 DISCUSSION

In summary, construction noise levels are predicted to:

- Comply with the Noise Management Levels for all scenarios at R01 with the exception of the 'Preliminary Works,' 'Groundworks and Substructure' and 'Structure' scenario relative to the Bryson Building.
- Comply with the Noise Management Levels at R02 for all construction scenarios
- Exceed the Noise Management Levels at NCA02 and NCA03 for all construction scenarios.
- Exceed the Noise Management Levels at NCA01 and NCA04 for all construction scenarios with the exception of the 'Groundworks and Substructure' scenario relative to the Primary Carpark.
- Comply with the Noise Management Levels for all scenarios at NCA05 with the exception of the 'Preliminary Works' and the 'Groundworks and Substructure' scenario relative to the Bryson Building.
- No exceedances of highly noise affected NMLs or non-residential NMLs have been predicted.

As exceedances of NMLs have been predicted, noise management measures have been provided in Section 5.

4.5 VIBRATION ASSESSMENT

Certain construction activities would require the use of vibration intensive equipment that may affect the nearest sensitive receivers. The major potential sources of vibration from the proposed construction activities would likely be during 'Preliminary Works' and 'Groundworks and Substructure' when vibratory rollers are being used.

Minimum working distances for typical vibration intensive construction equipment are provided in the Roads and Maritime (now Transport for NSW) Construction Noise and Vibration Guideline (CNVG) and are shown in Table 4.3. The minimum working distances are for both cosmetic damage (from BS 7385 and DIN 4150) and human comfort (from the NSW EPA Vibration Guideline). They are based on empirical data which suggests that where works are further from receivers than the quoted minimum distances then impacts are not considered likely.

The minimum working distances are indicative and will vary depending on the particular item of equipment and local geotechnical conditions. The distances apply to cosmetic damage of typical buildings under typical geotechnical conditions.

Table 4.3 Recommended minimum working distances for vibration intensive plant

PLANT ITEM	RATING/ DESCRIPTION	MINIMUM WORKING DISTANCE	
		Cosmetic damage residential and light commercial (BS 7385)	Human comfort (NSW EPA guideline)
Vibratory Roller	<50 kN (1–2 tonne)	5 m	15 m to 20 m
	<100 kN (2–4 tonne)	6 m	20 m
	<200 kN (4–6 tonne)	12 m	40 m
	<300 kN (7–13 tonne)	15 m	100 m
	>300 kN (13–18 tonne)	20 m	100 m
	>300 kN (>18 tonne)	25 m	100 m

Two residential properties near the proposed work site are within the minimum working distance for cosmetic damage when vibration intensive works are being conducted in the Primary Carpark, however it is noted that vibratory roller activity will be intermittent in nature and not continuous. These properties are:

- 152 Wrights Road, Kellyville
- 28 Cormack Circuit, Kellyville

The distance between the construction works and all other sensitive receivers is sufficient for receiver buildings to be outside of the cosmetic damage minimum working distance for vibration intensive equipment.

Residential buildings shown in Figure 4.1 Human Comfort minimum offset distance are within the human comfort minimum working distance and occupants of these buildings may be able to perceive vibration impacts at times when vibratory rollers are in use nearby. Where impacts are perceptible, they would likely only be apparent for relatively short durations when vibration intensive equipment is in use.

Figure 4.1 Human Comfort minimum offset distances

4.6 TRAFFIC ASSESSMENT

Section 10 of the Construction Management Plan (EIS Appendix FF) issued by Rohrig on 26 September 2022 states the following:

All construction traffic, temporary roads and storage of materials will occur within the site. All construction traffic will be advised to use Morris Grove. Once the Primary Carpark is ready to be completed, access from the South will be created.

(...)

The construction is likely to generate in any one day at its peak of up to 30 truck movements (15 in and 15 outbound), this is during concrete pours. Throughout the construction, the average number of daily construction vehicles onsite

- *Enabling works – 20 truck movements (10 in and 10 outbound)*
- *General construction - 30 truck movements (15 in and 15 outbound)*
- *Fitout - 30 truck movements (15 in and 15 outbound)*
- *Landscaping works - 20 truck movements (10 in and 10 outbound)*

The contractor is likely to require a on average 30-40 staff per day, with a maximum of 60 staff on a day. To accommodate this number of workers, on average there would be up to 30 light vehicles on site, whilst at the maximum there would be 50 light vehicles on site.

Moreover, construction vehicle access will be restricted during school terms at the following times.

- 7:45am – 8:45am Monday – Friday
- 2:45pm – 3:45pm Monday – Friday

Existing road traffic movements are not known. As construction road traffic inputs are not assessed within the *Noise & Vibration Impact Assessment, William Clarke College Kellyville Concept Masterplan & Stage 1 Works, (610.30786-R01-v1.1, SLR, August 2022)* it is assumed that no impacts have been predicted.

5 NOISE AND VIBRATION MANAGEMENT MEASURES

5.1 INTRODUCTION

The assessment outlined in Section 4 has predicted NML exceedances throughout the duration of the works. No exceedances of highly noise affected NMLs have been predicted.

No exceedances of road traffic noise are expected to occur.

Exceedances of human comfort ground vibration minimum working distances are expected to occur

As such, suitable site-specific measures have been assessed to reduce the exceedance of NMLs during construction works.

5.2 NOISE MANAGEMENT

The *Noise & Vibration Impact Assessment* recommends consideration of the Transport of NSW 2018 Construction Noise and Vibration Strategy (CNVS), which provides further guidance on appropriate noise mitigation options depending on the level of exceedance predicted (refer Section 4.3). The recommended triggers for additional mitigation measures are shown in Table 5.1.

Table 5.1 Recommended Triggers for Additional Mitigation Measures – Airborne Noise

	dB(A) ABOVE NML	ADDITIONAL MITIGATION MEASURE
STANDARD HOURS: MON - FRI (7AM – 5:30PM), SAT (8AM – 1PM), SUN/PUB HOLIDAY (NIL)		
Noticeable	0	-
Clearly audible	<10	-
Moderately intrusive	10 to 20	PN, V
Highly intrusive	> 20	PN, V
75dB(A) or greater	-	PN, V, SN

PN = Project notification

V = Verification monitoring

SN = Specific Notification, individual briefings or phone call

As such, the following measures are recommended to be employed at the locations identified in Section 4.3:

- Verification monitoring
- Project Notification
- Specific Notification

5.3 MANAGEMENT MEASURES

The noise mitigation and management measures outlined in Table 5.2 will be implemented to reduce the predicted noise impacts.

Table 5.2 Management controls

CON5NDITION	TYPE OF ACTION	MANAGEMENT MEASURE	APPLIES	PROJECT STAGE	RESPONSIBILITY
N1	Construction hours and scheduling	Construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.	Noise	Planning	Contractor
N2	Implement community consultation measures	Community information leaflets about the works and activities should be prepared regarding potential noise impacts, and letter box dropped to potentially impacted sensitive receivers. This information should include the expected level and duration of noise impact, as well as contact details for a construction community liaison officer. Notification should be a minimum of 7 calendar days prior to the start of works. For most impacted receivers individual contact may be required.	Noise	Planning	Contractor
N3	Training	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: — all project specific and relevant standard noise and vibration mitigation measures — relevant licence and approval conditions — permissible hours of work — any limitations on high noise generating activities — location of nearest sensitive receivers — construction employee parking areas — designated loading/unloading areas and procedures — site opening/closing times (including deliveries) — environmental incident procedures.	Noise	Planning	Contractor
N4	Behavioural practices	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors.	Noise	Construction	Contractor
N5	Monitoring	Noise verification is to be carried out during early stages of construction to verify the predictions within the Noise and vibration assessment. Refer Section 6.2 for methodology.	Noise	Construction	Contractor
N6	Monitoring	At the commencement of vibratory compaction, attended vibration measurements should be undertaken at to confirm that vibration levels are within the acceptable range to prevent	Noise	Construction	Contractor

CON5NDITION	TYPE OF ACTION	MANAGEMENT MEASURE	APPLIES	PROJECT STAGE	RESPONSIBILITY
		cosmetic building damage. This should be undertaken at the properties outlined in Section 4.5. Refer Section 6.2 for methodology.			
N7		Undertake building dilapidation surveys on all buildings located within the identified buffer zone (refer Section 4.5) prior to commencement of activities with the potential to cause property damage	Noise	Planning	Contractor
N8	Plant and equipment	The noise levels of plant and equipment items are to be considered during the selection of plant. The noise levels of plant and equipment must have operating Sound Power or Sound Pressure Levels compliant with the criteria in Appendix H of the CNVG. Implement a noise monitoring audit program to ensure equipment remains within the more stringent of the manufacturer's specifications or Appendix H of the CNVG.	Noise	Planning	Contractor
N9	Plan worksites and activities to minimise noise and vibration	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Forward-in / forward-out movements are preferred.	Noise	Planning	Contractor
N10		Quieter construction methods will be used where feasible and reasonable Simultaneous use of noisy equipment should be avoided where reasonable and feasible.	Noise	Planning and Construction	Contractor
N11	Complaint record management	Recording and managing any complaints in accordance with the procedure set out in the project Environmental Management Plan.	Noise	Planning and Construction	Contractor
N12	Maintenance of plant	All plant and tools are to be regularly maintained and checked to ensure that they are running correctly and not producing excessive noise emissions — Periodic inspection of equipment shall be conducted to ensure that they have been maintained correctly and are not generating excessive noise and vibration	Noise	Construction	Contractor
N13	Compression Brakes	Truck drivers will limit compression braking as far as practicable	Noise	Construction	Contractor

6 COMPLIANCE MANAGEMENT

6.1 TRAINING

All employees, contractors and utility staff working on site will undergo site induction training relating to environmental issues, including noise and vibration management. The induction training will address the following elements related to noise and vibration management:

- The existence and requirements of this sub-plan
- Work hours and the requirement for strict compliance
- Delivery hours, trucking routes and loading / unloading locations
- Noise mitigation measures
- Project environmental responsibilities
- Location of sensitive noise receivers
- The importance of regular plant maintenance.

Records would be kept of all personnel undertaking the site induction and training, including the contents of the training, date and name of trainer/s in accordance with Section 6.6.

Key staff will undertake more comprehensive training relevant to their position and/or responsibility. This training may be provided as "toolbox" training or at a more advanced level by the Environmental or Safety Manager or delegated representatives.

6.2 MONITORING

Construction noise and vibration levels will be monitored at locations representative of impacted properties in response to complaints and at the commencement of construction activities to verify compliance with the noise and vibration objectives identified in Section 3.

Environmental monitoring will be conducted by a qualified acoustic specialist and in accordance with *AS1055-2018: Acoustics - Description and measurement of environmental noise* (AS1055-2018), ICNG, AVaTG and NPfI guidelines. The results of monitoring will include:

- Date, time and location of monitoring
- Name of person conducting the monitoring
- Relevant statistical descriptors to be recorded. For example, 15-minute intervals including L_{Aeq}, L_{AMax} and L_{A90} levels and the primary noise sources contributing to each statistic
- Noise instrumentation to be fitted with wind shields, and calibrated prior to measurements to measure drift
- Vibration instrumentation to be appropriately installed
- Details of site activity, environmental noise characteristics and weather to be noted
- Where required, noise monitoring of mobile plant to be carried out in accordance with AS2102.1 1990 *Acoustics- Measurement of airborne noise emitted by earth-moving machinery and agricultural tractors- stationary test conditions*

- Noise instrumentation to comply with the requirements of *AS 1259.2-1990. "Acoustics- Sound Level Meters, Part 2- Integrating and Averaging*" and carry appropriate NATA certification.

All records are to be kept in accordance with Section 6.6 and will be produced to any authorised officer upon request.

Where monitoring indicates exceedances of the project construction noise criteria outlined in Section 3, the non-conformance procedures outlined in Section 6.5 shall be followed.

6.3 COMPLAINTS MANAGEMENT

Noise complaints will be taken seriously and dealt with expeditiously. Each complaint will be investigated and where the noise in question is in excess of allowable limits, appropriate noise amelioration measures put in place to mitigate future occurrences.

Complaints will generally be managed in accordance with the *Better Practice Guide to Complaint Handling* (Australian Government, Commonwealth Ombudsman, 2009) and Australian Standard 10002-2006 *Customer Satisfaction—guidelines for complaints handling in organizations* (AS ISO 10002, 2006) with noise complaints being able to be lodged via a website and a phone hotline. The CEMP contains detail of the complaints handling process.

6.4 INSPECTIONS AND AUDITING

Audits (both internal and external) may be undertaken to assess the effectiveness of environmental controls, compliance with this sub plan and other relevant approvals, licences and guidelines.

6.5 NON-COMPLIANCES

All results of noise and vibration monitoring will be recorded and reviewed by the Contractor and site manager. Issues of concern or non-compliance will be documented and discussed with the site manager with the view of resolving the issue or determining a way forward. William Clarke College will be informed of all non-compliances.

Where identified exceedances may impact the safety of people or property, work at the concerned site shall cease immediately. Typical emergency situations that may result in substantial noise and/or vibration impacts may include substantial noise events during out of hours works or vibration causing significant structural damage to nearby buildings. These events are considered highly unlikely, however in the event of such an event occurring:

1. Work would cease immediately
2. Any occupants would be evacuated with due consideration to safety
3. The area would be secured to prevent unauthorised access
4. A structural assessment would be undertaken, and the results compared with any previous dilapidation survey
5. Where the damage is associated with construction, rectification work would be implemented, or compensation agreed.

An Environmental Incident Report form would be completed by the Contractor for any incident causing a noise and / or vibration impact on local residences. This form should identify the cause of the incident, the investigation of corrective actions and close out of the problem.

6.6 REPORTING

Records relating to noise and vibration on the project shall be maintained for a period of four years in the site Environmental register or equivalent. These records shall include details related to noise and vibration management, including:

- Training / inductions records
- Equipment inspections
- Noise or vibration monitoring reports
- Audit or reviews
- Communication regarding noise management
- Details of complaints

6.7 PLAN REVIEW

Continual improvement of this plan will be achieved by the continual evaluation of environmental management performance against proposed control measures, environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The continual improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management which leads to improved environmental performance
- Determine the root cause or causes of non-conformances and deficiencies
- Develop and implement a plan of corrective and preventative action to address non-conformances and deficiencies
- Verify the effectiveness of the corrective and preventative action
- Document any changes in procedures resulting from process improvement
- Make comparisons with objectives and targets.

Changes to this plan will be approved by the contractor and stakeholders (if required) and documented in the document control section for each revision. A copy of the updated plan and changes will be distributed to all relevant stakeholders.