

FORD CIVIL CONTRACTING PTY LTD

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# CONSTRUCTION NOISE AND VIBRATION MANAGEMENT PLAN FOR CNSW DEVELOPMENT, WILSON PARK SILVERWATER NSW

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## Construction Noise and Vibration Management Plan for CNSW Development, Wilson Park Silverwater NSW

Ford Civil Contracting PTY LTD

WSP

Level 3, 51-55 Bolton St

Newcastle NSW 2300

PO Box 1162




Newcastle NSW 2300

Tel: +61 2 4929 8300

Fax: +61 2 4929 8382

wsp.com

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	NAME	DATE	SIGNATURE
Prepared by:	Tom Gouvernet	27/10/2020	
Reviewed by:	Ben Ison	27/10/2020	
Approved by:	Aaron Young	29/10/2020	

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# 1 INTRODUCTION

The Cricket New South Wales (CNSW) Centre of Excellence is a state significant development (SSD-10354) for which Ford Civil Contracting Limited (FCC) are the remediation contractor. WSP Australia Pty Ltd (WSP) was engaged by FCC to provide environmental support services for the Wilson Park project (the Project).

The site is located at Wilson Park, Newington Road, Silverwater NSW which comprises Lot C in Deposited Plan (DP) 421320 and is part of the Parramatta Local Government Area and Sydney Olympic Park (north-western corner). It is owned by the Sydney Olympic Park Authority (SOPA).

FCC has received an approved Development Application (DA) for the project, which contains a range of noise and vibration conditions. The primary acoustic condition requires the production of a Construction Noise and Vibration Management Plan (CNVMP). WSP has been engaged to prepare this document.

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## 1.1 PROJECT BACKGROUND

The Project incorporates the demolition of existing single-storey grandstand and construction and operation of a new centre of excellence for Cricket NSW, including:

- Two-storey cricket centre building, including offices, and facilities for the community, sports science, and indoor training
- Two cricket ovals and associated seating
- Outdoor practice cricket wickets
- Associated car parking, storage building, landscaping and public domain works
- Signage zones.

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## 1.2 PURPOSE OF THIS PLAN

The CNVMP has been developed to satisfy the *Development Consent conditions, Application Number SSD 10354, NSW Government, Department of Planning Industry and Environment, 2020* 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.

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## 1.3 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)
- *NSW Road Noise Policy* (Department of Environment and Climate Change and Water (DECCW), 2011), RNP
- *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)

## 2 EXISTING NOISE ENVIRONMENT

### 2.1 SITE LOCATION AND IDENTIFIED SENSITIVE RECEIVERS

The project has the potential to adversely impact nearby properties that are considered sensitive to noise and vibration. Multistorey residential apartments are located to the north of the project across the Parramatta River. Commercial properties surround the project to the west and south, with the Silverwater Correctional Complex located to the east.

Receivers have been categorised geographically into Noise Catchment Areas (NCAs) based on similar noise environments within these areas, to assist with assessment, consultation and notification.

Receivers outlined in Table 2.1 represent the closest receivers of each category to the works and are expected to define the worst-case impacts.

Figure 2-1 provides an indicative site map of the proposed works, noise monitoring locations, NCAs, and representative sensitive receivers.

Table 2.1 List of representative sensitive receivers

ID	NAME	CATEGORY	MINIMUM DISTANCE FROM SITE (m)
AR1	Halvorsen Park Playground	Active Recreation	270
C1	214 Silverwater Road, Silverwater	Commercial	100
C2	4 Newington Road, Silverwater	Commercial	75
R1	74A Allambie Street, Ermington	Residential	170
R2	71 Seamist Avenue, Ermington	Residential	340
R3	45 Seamist Avenue, Ermington	Residential	390
R4	32 Koorine Street, Ermington	Residential	320
R5	Silverwater Correctional Complex	Residential	190

### 2.2 BACKGROUND NOISE LEVELS

The existing environment is predominantly defined by road traffic along Silverwater Road. The results of unattended noise monitoring have been sourced from the *Cricket NSW Centre of Excellence, Sydney Olympic Park – Preliminary Construction Noise and Vibration Management Plan (Document Reference 20190901.3/1710A/R0/WY, dated 17/10/2019)*.

#### 2.2.1 UNATTENDED NOISE SURVEYS

Unattended noise monitoring was conducted from 7<sup>th</sup> August 2019 to 24<sup>th</sup> August 2019. Table 2.2 presents the unattended monitoring results for the monitoring survey. It is noted that while Monitor 1 was not located at the nearest affected noise sensitive receivers, attended noise monitoring undertaken and outlined in the *Preliminary Construction Noise and Vibration Management Plan* confirmed that Monitor 1 is indicative of the noise environment at these receivers.

Table 2.2      Attended noise monitoring results from 7 to 24 August 2019

LOCATIONS	TIME OF DAY	MEASURED NOISE LEVEL dBA
		L <sub>90</sub> , 15min
Monitor 1: Northern boundary	Day period	48
	Monday – Saturday (7am – 6pm)	
Monitor 2: Eastern boundary		43





Figure 2-1 Project site location, noise sensitive receivers, and noise monitoring locations

# 3 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT CRITERIA

## 3.1.1 DEVELOPMENT CONSENT CONDITIONS (APPLICATION NUMBER SSD 10354)

The CNVMP will be prepared to comply with the *Development Consent conditions, Application Number SSD 10354, NSW Government, Department of Planning Industry and Environment, 2020*. The following conditions have been noted to specifically outline expectations for noise and vibration management:

*C19. Prior to the commencement of works, a Construction Noise and Vibration Management Plan (CNVMP) prepared by a suitably qualified person shall be submitted to the Certifier. The CNVMP must be prepared in consultation with and be endorsed by SOPA, and address the relevant requirements of the EPA. The CNVMP shall (including but not limited to):*

- a. be prepared in accordance with the EPA's Interim Construction Noise Guideline;*
- b. identify nearby sensitive receivers and land uses;*
- c. identify the noise management levels for the project;*
- d. identify the construction methodology and equipment to be used and the key sources of noise and vibration;*
- e. include details of all reasonable and feasible management and mitigation measures to be implemented to minimise construction noise and vibration;*
- f. address the relevant provisions of Australian Standard 2436-2010 Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites;*
- g. be consistent with and incorporate all relevant recommendations and noise and vibration mitigation measures outlined in the Preliminary Construction Noise and Vibration Management Plan Revision 0, prepared by Acoustic Logic, dated 17 October 2019;*
- h. ensure all potentially impacted sensitive receivers are informed by letterbox drops prior to the commencement of construction of the nature of works to be carried out, the expected noise levels and duration, as well as contact details for a construction community liaison officer; and*
- i. include a suitable proactive construction noise and vibration monitoring program which aims to ensure the construction noise and vibration criteria in this consent are not exceeded.*

(...)

*D2. Construction, including the delivery of materials to and from the site, may only be carried out between the following hours:*

- a. between 7.00 am and 6.00 pm, Mondays to Fridays inclusive; and*
- b. between 7.30 am and 3.00 pm, Saturdays.*

*D3. No work may be carried out on Sundays or public holidays.*

*D4. Activities may be undertaken outside of these hours 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.*

*D5. Notification of such activities must be given to affected residents before undertaking the activities or as soon as is*

*practical afterwards.*

*D6. Rockbreaking, rock hammering, sheet piling and similar activities may only be carried out between the following hours:*

- c. 9:00am to 12:00pm Monday to Friday*
- d. 2:00pm to 5:00pm Monday to Friday*
- e. 9:00am to 12:00pm Saturday*

*(...)*

*D8. The development must be constructed with the aim of achieving the construction noise management levels detailed in the Interim Construction Noise Guideline (Department of Environment and Climate Change, 2009). All feasible and reasonable noise and vibration mitigation measures shall be implemented and any activities that could exceed the construction noise or vibration management levels shall be identified and managed in accordance with the CEMP and CNVMP.*

*D9. If the noise from a construction activity is substantially tonal or impulsive in nature (as described in Chapter 4 of the NSW Industrial Noise Policy), 5 dB(A) must be added to the measured construction noise level when comparing the measured noise with the construction noise management levels.*

*D10. The Applicant must schedule intra-day 'respite periods' for construction activities predicted to result in noise levels in excess of the "highly noise affected" levels, including the addition of 5 dB to the predicted levels for those activities identified in the Interim Construction Noise Guideline as being particularly annoying to noise sensitive receivers.*

*D11. Any noise generated during the construction of the development must not be offensive noise within the meaning of the Protection of the Environment Operations Act 1997 or exceed approved noise limits for the Subject Site.*

*D12. All work, including demolition, excavation and building work must comply with the Australian Standard 2436-1981 'Guide to Noise Control on Construction, Maintenance and Demolition Sites'.*

*D13. Wherever practical, and where sensitive receivers may be affected, piling activities are completed using bored piles. If driven piles are required, they must only be installed where outlined in the CEMP.*

*D14. Vibration caused by construction at any residence or structure outside the subject site must be limited to:*

- a. for structural damage vibration to buildings (excluding heritage buildings), British Standard BS 7385 Part 2-1993 Evaluation and Measurement for Vibration in Buildings;*
- b. for structural damage vibration to heritage buildings, German Standard DIN 4150 Part 3 Structural Vibration in Buildings Effects on Structure;*
- c. for human exposure to vibration, the evaluation criteria presented in British Standard BS 6472- Guide to Evaluate Human Exposure to Vibration in Buildings (1Hz to 80 Hz) for low probability of adverse comment; and*
- d. these limits apply unless otherwise outlined in the CEMP.*

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## 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	<p>The noise affected level represents the point above which there may be some community reaction to noise.</p> <p>Where the predicted or measured <math>L_{Aeq}(15 min)</math> is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.</p> <p>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.</p>
	Highly noise affected >75	<p>The highly noise affected level represents the point above which there may be strong community reaction to noise.</p> <p>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.</p>
Outside recommended standard hours	Noise affected RBL + 5 dB	<p>A strong justification would typically be required for works outside the recommended standard hours.</p> <p>The proponent should apply all feasible and reasonable work practices to meet the noise affected level.</p> <p>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.</p>

It is noted that the working hours approved for construction of the project as contained within the consent condition are as follows:

- Monday to Friday 7am to 6pm
- Saturday 7:30am to 3pm
- Sundays and public holidays Not permitted

As such, Saturday morning (7:30am to 8am) and Saturday afternoons (1pm to 3pm) are classified under the ICNG as out of hours (although they are allowed under the Consent Conditions for the project). Work outside these extended hours will not proceed without community consultation and approval from the Sydney Olympic Park Authority (SOPA).

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	RESIDENTIAL NOISE MANAGEMENT LEVELS			
	TIME <sup>1,2</sup>	RBL dBA	NOISE MANAGEMENT LEVEL	HIGHLY NOISE AFFECTED LEVEL
			Leq,15min dBA	Leq,15min dBA
NCA01	Day – Standard hours	48	58	75
	Day – Out-of-hours works	48	53	-
NCA02	Day – Standard hours	43	53	75
	Day – Out-of-hours works	43	48	-

Note 1: Standard ICNG hours are defined as Monday to Friday (7am – 6pm), Saturday (8am – 1pm)

Note 2: Approved extended hours are defined as Saturday morning (7:30am to 8:30am) and Saturday afternoon (1pm to 3pm)

Table 3.3 Noise management levels for non-residential sensitive receivers

NOISE MANAGEMENT LEVELS	
LAND USE	MANAGEMENT NOISE LEVEL (EXTERNAL) (When in use) Leq,15min dBA
Active Recreation	65
Commercial	70

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 <sup>1</sup>		
		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 <sup>2</sup>	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 <sup>1.75</sup>	
		PREFERRED VALUES	MAXIMUM VALUES
Critical areas	Day or night time	0.10	0.20
Residences	Daytime	0.20	0.40
	Night time	0.13	0.26
Offices, schools, educational institutions, and places of worship	Day or night time	0.40	0.80
Workshops	Day or night time	0.80	1.60

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## 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 <sub>eq</sub> 15hr dBA	55 L <sub>eq</sub> 9hr 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 construction activity with the greatest potential to generate noise impacts has been assessed. Table 4.1 presents the work stages, assessed activities, equipment and utilisation, and estimated durations. Construction activities highlighted red indicate the activity with the greatest potential to generate noise impacts within each stage, which has been modelled for this assessment.

Table 4.1 Construction activities

STAGE	CONSTRUCTION ACTIVITY	DURATION	EQUIPMENT	UTILISATION PER 15 MINUTES
S01 - Demolition	Grandstand demo	8 days	2x Excavator	90%
			1x Excavator with Hammer	20%
	Light tower footings	2 days	1x Excavator with Hammer	80%
	Eastern slab demo	5 days	1x Excavator with Hammer	80%
	Tree removal	15 days	2x Chainsaw	90%
			1x Excavator	80%
			1x Large wood chipper trailer	80%
	Demo for services	5 days	1x Excavator + hammer	80%
			1x Concrete Saw	20%
			1x Bogie Truck	80%
S02 - Site preparation	Sediment fence	1 days	1x Ditch Witch Sed Fence Installer	100%
S03 - Construction – general bulk earthworks & filling	Asbestos hotspot relocation	15 days	1x Excavator	100%
			1x Dump Truck	50%
	Relocate contaminated mound to shallow burial location	6 days	2x Excavator	100%
			1x Dump Truck	100%
	Strip topsoil and relocate	5 days	2x Excavators	100%
			3x Dump Truck	80%
	Deep excavation for GPT and drainage tank – excavation, soil treatment and relocation	14 days	2x Excavator	100%
			3x Dump Truck	60%
	Material import and fill	70 days	3x Excavator	100%



STAGE	CONSTRUCTION ACTIVITY	DURATION	EQUIPMENT	UTILISATION PER 15 MINUTES
	Site trimming	15 days	1x Compactor	100%
			1x Padfoot Roller	100%
			1x Grader	100%
			1x Smooth Drum Roller	80%
S04 - Construction – retaining walls	Detail excavation	11 days	1x Excavator	100%
	Footing FRP	12 days	1x Concrete pump	60%
			1x Concrete Truck	60%
	Block wall installation	45 days	1x Cement Mixer	100%
	Boulder wall	25 days	1x Excavator	100%
			1x Dump Truck	100%
S05 - Construction – stormwater pits, pipes & GPT unit	Stormwater culvert	15 days	1x Excavator	80%
	Drainage (pits and pipes) install	70 days	1x Excavator	100%
			1x Dump Truck	100%
			1x Tipper Truck	100%
	GPT unit	10 days	1x Excavator	80%
			1x Dump Truck	50%
			1x Franna	50%
S06 - Construction – hydraulic and electrical services	Hydraulics – potable, fire hydrant, gas and sewer (all concurrent)	40 days	4x Excavator	60%
			1x Bogie Truck	50%
			1x Horizontal Auger Boring Machine	100%
			1x Trench Roller and CC10 Roller	50%
	Electrical services	60 days	2x Excavator	80%
			1x Tipper Truck	100%
			1x Trench Roller and CC10 Roller	50%
S07 - Site clean-up & demobilisation	Clean up	5 days	1x Tipper Truck	100%
			1x Excavator	100%
	Demobilisation	5 days	5x Float Truck	20%
			5x Tilt Tray Truck	20%

## HOURS OF CONSTRUCTION

Construction activities would be undertaken during the working hours defined in the *Development Consent conditions, Application Number SSD 10354, NSW Government, Department of Planning Industry and Environment, 2020* as follows:

*D2. Construction, including the delivery of materials to and from the site, may only be carried out between the following hours:*

- a. between 7.00 am and 6.00 pm, Mondays to Fridays inclusive; and*
- b. between 7.30 am and 3.00 pm, Saturdays.*

*D3. No work may be carried out on Sundays or public holidays.*

*D4. Activities may be undertaken outside of these hours if required: (a) by the Police or a public authority for the delivery of vehicles, plant or materials; or in an emergency to avoid the loss of life, damage to property or to prevent environmental harm.*

*D5. Notification of such activities must be given to affected residents before undertaking the activities or as soon as is practical afterwards.*

*D6. Rock breaking, rock hammering, sheet piling, pile driving and similar activities may only be carried out between the following hours:*

- a. 9.00 am to 12.00 pm, Monday to Friday;*
- b. 2.00 pm to 5.00 pm Monday to Friday; and*
- c. 9.00 am to 12.00 pm, Saturday.*

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

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## 4.2 ASSESSMENT METHOD

A noise propagation model was established utilising the SoundPLAN (Version 8.2) noise modelling software for the proposed works. The site and surrounding environment were digitised to create a 3-dimensional model of the study area using the inputs provided in Table 4.2.

Table 4.2 Noise modelling inputs

PARAMETER	INPUT DATA
Facade corrections	Standard façade correction +2.5 dB(A)
Receiver locations	Locations taken from aerial photography
Terrain	1 metre ground contours from NSW Dept Lands SIX Maps
Ground surface / absorption	The land surrounding the site has been modelled with a ground cover factor of 0 over water, representative of hard ground, and 0.6 across land
Source heights	Construction plant and equipment heights are modelled to be 2 metres above ground
Sources	All equipment in the modelled activities have been modelled as operating simultaneously at the closest point on the worksite to each receiver
Receiver heights	Ground floor receivers have been placed at an elevation of 1.5 m and first floor receivers at an elevation of 4.5 m
SoundPLAN module	ISO9613-2 1996 propagation model
Met condition	Neutral meteorological condition has been modelled

As all equipment has been modelled at the nearest point to each receiver, actual noise levels from the construction site would be expected to be generally lower than predicted as work is carried out at further distances.

The Sound Power Levels (SWLs) used for the calculations are presented in Table 4.3. The SWLs were taken from TfNSW's Construction Noise and Vibration Strategy (2019), and WSP's database.

Table 4.3 Sound Power Levels

ITEM	SOUND POWER LEVEL dBA
Padfoot Roller	109
Smooth Drum Roller	107
Dump Truck	110
Bogie Truck	103
Cement Mixer	103
Chainsaw <sup>1</sup>	119
Compactor	106
Concrete Saw <sup>1</sup>	123
Concrete Truck	109
Concrete pump	109
Ditch Witch Sed Fence Installer	102
Excavator	100
Excavator with Hammer <sup>1</sup>	123
Float Truck	103
Franna	98
Grader	113
Horizontal Auger Boring Machine	114
Large wood chipper trailer	116
Tilt Tray Truck	103
Tipper Truck	103
Trench Roller and CC10 Roller	107

(1) 5dB correction added for tonal characteristics

## 4.3 PREDICTED NOISE LEVELS

Noise levels have been predicted in accordance with the AS 2436-2010. Table 4.4 presents the predicted noise level at the representative receivers for each assessed phase compared against the relevant NMLs.

The formatting within the construction noise assessment table indicates the following:

- The orange shaded cells show exceedances of the standard-hours day period and the out-of-hours day period.
- The blue shaded cells show exceedances of the ICNG out-of-hours day period (extended hours) only.

Table 4.4 Predicted noise levels at receivers

RECEIVER	NML <sup>1, 2</sup>		PREDICTED NOISE LEVELS						
	Leq,15min dBA		Leq,15min dBA						
	Day – Standard Hours	Day – Out-of-hours	S01	S02	S03	S04	S05	S06	S07
R1	58	53	66	45	57	52	53	58	49
R2			61	41	53	47	48	54	45
R3			57	36	48	44	45	49	40
R4			59	39	51	46	47	52	43
R5	53	48	68	44	56	52	54	57	48
C1	70	70	76	52	64	56	60	65	56
C2			68	56	68	62	62	69	60
AR1	65	65	61	40	52	47	48	53	44

Note 1: Standard ICNG hours are defined as Monday to Friday (7am – 6pm), Saturday (8am – 1pm)

Note 2: Approved extended hours are defined as Saturday morning (7:30am to 8:30am) and Saturday afternoon (1pm to 3pm)

## 4.4 NOISE ASSESSMENT

In summary, predicted noise levels are expected to be below standard hours NMLs during all work stages, except for demolition works (S01), during which exceedances of NMLs up to 15 dB are predicted. The Silverwater Correctional Complex may also experience exceedances of standard hours NMLs during general bulk earthworks and filling, construction of stormwater pits, pipes & GPT unit, and construction of hydraulic and electrical services (S03, S05, S06) of up to 4 dB. No exceedances of highly noise affected NMLs have been predicted.

While exceedances of day ICNG out-of-hour NMLs have been predicted at multiple receivers, these works will only occur for approximately 3 hours in any given week (from 7:30am to 8am, and 1pm to 3pm on a Saturday) and are permitted under the project Conditions of Consent. Therefore, due to the short duration of the exceedances, the predicted noise impacts are expected to be minimal.

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

It should be noted that as plant items comprising each phase were modelled as operating simultaneously at the point in the construction footprint closest to each receiver and barrier attenuation has not been fully accounted for, predicted noise levels are conservative. It is expected that actual noise impacts during construction would typically be somewhat lower than these values.

## 4.5 VIBRATION ASSESSMENT

Certain construction activities would require the use of vibration intensive equipment that may affect the nearest sensitive receivers. The most vibration intensive plant nominated as part of the work is the use of hydraulic hammers.

Table 4.5 presents the indicative minimum working distances for the nominated construction plant to minimise the risk of structural damage and human comfort for sensitive receivers.

The minimum working distances are based on the typical distance from receivers' work permitted to be carried out to meet the limits set out in Section 3.3. The distances are indicative only and results may vary depending on the activity, equipment, local ground, and receiver conditions.

Table 4.5 Recommended minimum working distances for vibration intensive plant

PLANT ITEM	RATING / DESCRIPTION	MINIMUM WORKING DISTANCE	
		COSMETIC DAMAGE	HUMAN COMFORT
Large hydraulic hammer	(1600 kg - 18 to 34t excavator)	22 m	73 m

All identified receivers are located outside the minimum working distances therefore no adverse impacts are expected for cosmetic damage or human response on nearby sensitive receivers.

## 4.6 TRAFFIC ASSESSMENT

Construction works are expected to generate 200 trucks and 80 light vehicle movements per day during a worst-case scenario. These vehicles are expected to enter and exit the site from Silverwater Road.

Existing road traffic movements are in the order of 50,000 vehicles per day on Silverwater Road (Station ID 50260, RMS, 2020).

As a 60 per cent increase in traffic is required to increase traffic noise levels by more than 2 dB, impacts due to the project are expected to comply with the RNP criteria.

Traffic generated by the construction activities are not expected to be significant compared with the existing traffic and noise impacts on the existing road as a result of construction generated traffic are not anticipated to result in a 2dB increase on existing traffic noise levels.

# 5 NOISE AND VIBRATION MANAGEMENT MEASURES

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## 5.1 INTRODUCTION

The assessment outlined in Section 4 has predicted NML exceedances throughout the duration of the works, particularly during demolition works, and at the Silverwater Correctional Complex. Minor exceedances are also predicted during the ICNG Out of Hours work proposed for Saturday mornings and afternoons. The use of hydraulic hammers has been identified as key contributors to exceedances. No exceedances of highly noise affected NMLs have been predicted.

No exceedances of ground vibration or road traffic noise are expected to occur.

Site specific measures have been assessed to reduce the exceedance of NMLs during construction works.

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## 5.2 MANAGEMENT MEASURES

The noise mitigation and management measures outlined in Table 5.1 will be implemented to reduce the predicted noise impacts.

Table 5.1 Management controls

CONDITION	TYPE OF ACTION	MANAGEMENT MEASURE	APPLIES	PROJECT STAGE	RESPONSIBILITY
N1	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 and provided to SOPA. This information should include the expected level and duration of noise impact, as well as contact details for a construction community liaison officer.	Noise	Planning	Ford Civil
N2	Plant and equipment	The noise levels of plant and equipment items are to be considered during the selection of plant	Noise	Planning	Ford Civil
N3	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	Ford Civil
N4	Construction hours and scheduling	<p>Where feasible and reasonable, construction and deliveries will be carried out during the standard daytime working hours. Work generating high noise levels will be scheduled during less sensitive time periods. In particular in accordance with the Consent condition D6:</p> <p>Rockbreaking, rock hammering, sheet piling and similar activities may only be carried out between the following hours:</p> <ul style="list-style-type: none"> <li>a. 9:00am to 12:00pm Monday to Friday</li> <li>b. 2:00pm to 5:00pm Monday to Friday</li> <li>c. 9:00am to 12:00 pm Saturday</li> </ul>	Noise	Planning and Operation	Ford Civil
N5	Equipment selection	<p>Quieter construction methods will be used where feasible and reasonable</p> <p>Simultaneous use of noisy equipment should be avoided where reasonable and feasible.</p> <p>Number of plant operational during ICNG out of hours work kept to the minimum. Work outside of the permitted work hours as described within the Conditions of Consent is not permitted without prior approval from SOPA.</p>	Noise	Planning and Operation	Ford Civil

CONDITION	TYPE OF ACTION	MANAGEMENT MEASURE	APPLIES	PROJECT STAGE	RESPONSIBILITY
N6	Site inductions	<p>All employees, contractors and subcontractors are to receive a noise specific induction as part of their site induction. The induction must at least include:</p> <ul style="list-style-type: none"> <li>— All relevant project specific and standard noise mitigation measures</li> <li>— Relevant licence and approval conditions</li> <li>— Permissible hours of work</li> <li>— Any limitations on high noise generating activities</li> <li>— Location of nearest sensitive receivers</li> <li>— Construction employee parking areas</li> <li>— Designated loading/unloading areas and procedures</li> <li>— Site opening/closing times (including deliveries)</li> </ul> <p>Environmental incident procedures</p>	Noise	Operation	Ford Civil
N7	Behavioural practices	<p>No swearing or unnecessary shouting or loud stereos/radios on site</p> <p>No dropping of materials from height, throwing of metal items and slamming of doors</p>	Noise	Operation	Ford Civil
N8	Complaint record management	Recording and managing any complaints in accordance to the procedure set out in the project Environmental Management Plan.	Noise Vibration	Operation	Ford Civil
N9	Maintenance of plant	<p>All plant and tools are to be regularly maintained and checked to ensure that they are running correctly and not producing excessive noise emissions</p> <p>Periodic inspection of equipment shall be conducted to ensure that they have been maintained correctly and are not generating excessive noise and vibration</p>	Noise	Operation	Ford Civil
N10	Compression Brakes	Truck drivers will limit compression braking as far as practicable	Noise	Operation	Ford Civil
N11	Hydraulic hammer shrouding	Shrouding will be implemented on hydraulic hammers to minimise noise impacts generated by rock-breaking during demolition	Noise	Operation	Ford Civil
N12	Monitoring	A proactive construction noise and vibration monitoring program will be undertaken (refer Section 6.2)	Noise	Operation	Ford Civil



# 6 COMPLIANCE MANAGEMENT

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## 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.

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## 6.2 MONITORING

Construction noise levels will be monitored at locations representative of impacted properties during demolition works, and in response to noise complaints to verify compliance with the noise objectives identified in Section 3.

As all identified receivers are located outside the minimum working distances for vibration impacts, no monitoring is required.

Environmental noise 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 and NPfI guidelines. The results of monitoring will include:

- Date, time and location of monitoring
- Name of person conducting the monitoring
- Statistical descriptors to be recorded for 15 minute intervals include  $L_{Aeq}$ ,  $L_{AMax}$  and  $L_{A90}$  levels and the primary noise sources contributing to each statistic
- Instrumentation to be fitted with wind shields, and calibrated prior to measurements to measure drift
- 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 noise 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.

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## 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.

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## 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 as per FCC procedures.

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## 6.5 NON-COMPLIANCES

All results of noise and vibration monitoring will be recorded and reviewed by the Environmental Manager. Issues of concern or non-compliance will be documented and discussed with the FCC Project Manager with the view of resolving the issue or determining a way forward. SOPA 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; and
- 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 Environmental Manager 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. A copy of this report shall be provided to SOPA.

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## 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 FCC representatives 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.