



APPROVAL CITY & SOUTHWEST ACOUSTICS ADVISOR

Review of:	Sydney Metro City and South West - Line Wide Works - Noise and Vibration Assessment: Victoria Cross track construction and tunnel fit-out	Document reference:	TK685-03-13F02 CNVIS C2S_P3 VICX Trackworks(r2)
Prepared by:	Daniel Weston Acoustics Advisor		Prepared by Renzo Tonin & Associates Pty Ltd
Date of issue:	8 December 2021	-	7 December 2021

As approved Acoustics Advisor for the Sydney Metro City & Southwest project, and as required under A27 (d) of the project approval conditions (SSI 15-7400), I have reviewed and provided comment on the Noise and Vibration Assessment (NVA) for proposed Line Wide Victoria Cross track construction and tunnel fit-out works which are proposed outside of standard construction hours.

I am satisfied that the NVA is technically valid and includes appropriate noise and vibration mitigation and management. I also confirm that all proposed out of hours construction activity is predicted to satisfy construction noise management levels. On this basis, I endorse the NVA referenced herein.

Daniel Weston, City & Southwest Acoustics Advisor



7 December 2021 TK685-03-13F02 CNVIS C2S_P3 VICX Trackworks(r2)

Systems Connect Level 1, 116 Miller Street North Sydney 2060

Sydney Metro City and South West - Line Wide Works - Noise and Vibration Assessment: Victoria Cross track construction and tunnel fit-out

1 Introduction

This Noise and Vibration Assessment (NVA) has been prepared on behalf of Systems Connect in accordance with the Construction Noise and Vibration Management Plan (CNVMP) [SMCSWLWC-SYC-1NL-PM-PLN-000032] [1], for the Design and Construction of the Line-Wide Works (LWW) of the Sydney Metro City & Southwest Project (the Project).

This NVA applies to works at the Victoria Cross Station underground worksite and includes works to be undertaken wholly within the cavern and tunnels underground. There are limited works proposed on the site surface during standard construction hours (i.e. concrete deliveries and pours). The expected duration of construction activities is outlined in Table C1 of APPENDIX C.

Works will be completed during standard construction hours as well as outside of standard construction hours. The construction hours of work are defined by the Project Planning Approval conditions and Environment Protection Licence (EPL 21423) as outlined in the CNVMP. This NVA forms part of the CNVMP for the Project.

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

2 Description of construction works and hours

2.1 Summary of works addressed in this NVA

This NVA provides an assessment of noise and vibration impacts from track construction and tunnel fitout for the C2S Line Wide Works at the Victoria Cross Station underground worksite.





The site location and layout are identified on an aerial photograph located in APPENDIX B.

The proposed works, likely plant and equipment and indicative Project timing is presented in APPENDIX C. The primary construction activity would be skeleton track works; concrete trackform; concrete FST upstands; FST deliver and place, aluminothermic welding and mechanical and electrical fit-out work (including walkways). The proposed works will be undertaken wholly within the Victoria Cross Station cavern and tunnels underground, except for concrete deliveries to Victoria Cross North worksite during standard construction hours only. There will be no movement of other Systems Connect material from the surface at the Victoria Cross North or South surface worksites to the cavern or tunnels. All materials delivery and ventilation will be via Barangaroo or Chatswood sites (as noted in Table C1). Noise impacts from these activities have been assessed in the CNVIS for Chatswood [10] and Barangaroo [11].

There is one opening to the surface which provides access for the other contractors working at the Victoria Cross North worksite (see Figure C2 in APPENDIX C). At the Victoria Cross South worksite there is no direct surface opening as the integrated station development (ISD) now covers this. As noted above, this opening at the Victoria Cross North worksite will not be used by Systems Connect, except for concrete pumping during standard construction hours within the Victoria Cross North worksite (Figure C2 in APPENDIX C).

This assessment has considered the potential construction noise and vibration impacts to the nearest sensitive receivers from concrete deliveries and pours at the Victoria Cross North during standard construction hours and from trackworks and tunnel fitout works in the underground Victoria Cross Station during and outside standard construction hours.

2.2 Construction traffic

The only surface traffic movements on public roads at Victoria Cross Station will be concrete deliveries (approx. 4 per hour during standard construction hours) which will use Miller Street and Maclaren Street to access the worksites. Construction traffic noise impact is expected to be minor as these roads have high heavy traffic volumes during the day and Systems Connect limited number of concrete deliveries (up to 4 per hour during the day) would not cause a noticeable increase in road traffic noise levels.

2.3 Cumulative impacts

CSSI 7400 Condition of Approval E39 requires Systems Connect to consult with proponents of other construction works in the vicinity of the worksite and take reasonable steps to coordinate works to minimise cumulative impacts of noise and vibration and maximise respite for affected sensitive receivers. As OOHW will be wholly underground, the risk of cumulative impact is low outside standard construction hours. The surface concrete works during standard construction hours may occur concurrent with the ISD works. As a worst-case scenario, the cumulative noise levels may be up to 3 dB(A) higher than the predicted noise levels from the Systems Connect concrete pumping works during standard construction hours.

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2.4 Construction hours

In relation to the works at the Victoria Cross Station underground worksite, the construction hours for the Project are defined by Project Planning Approval (PPA) Conditions E36 and E44. The EPL 21423 is consistent with these conditions.

The standard construction hours of work are defined by the CSSI-7400 Condition E36. The standard construction hours for the Project are summarised in the table below.

Table 2-1: Standard construction hours

Construction Activity	Monday to Friday	Saturday	Sunday/ Public holiday
Above ground activities: construction sites and construction traffic	7:00 am to 6:00 pm	8:00 am to 1:00 pm	No work

The track works are an essential component of the Project due to be completed and open to rail traffic in 2024. This completion date has been calculated assuming track work, tunnel systems works and fit out works within the tunnel will be undertaken 24 hours a day, seven days per week.

CSSI-7400 Condition E48 allows 24-hour construction for station and tunnel fitout.

Relevant to the track works at the Victoria Cross Station underground worksite, construction may be undertaken outside standard construction hours in accordance with EPL (21423) Condition L4.4 where:

- Construction noise generated by the works are that causes LAeq(15 minute) noise levels:
 - no more than 5 dB(A) above the rating background level at any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009),
 - LA1(1 minute) or LAmax noise levels greater than 15dB above the night RBL for night works; and
- Continuous or impulsive vibration values, measured at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), and
- Intermittent vibration values measured at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006).

3 Nearest sensitive receivers

To assess and manage construction noise and vibration impacts, the residential areas surrounding the site have been divided into Noise Catchment Areas (NCAs) based on each area's similar acoustic environment prior to the start of construction work. The NCAs are based on those established in the EIS for the Project, with some modifications to allow for site specific characteristics. In addition, 'other' noise and vibration sensitive receivers such as passive recreation areas, recording studios, places of worship and heritage items surrounding the construction area have been identified.

All relevant noise and vibration sensitive receivers near the worksite are identified on an aerial photograph located in APPENDIX B.

4 **Construction noise and vibration objectives**

4.1 Noise management levels (NMLs)

Construction noise management levels (NMLs) have been determined using the Construction Environmental Management Framework (CEMF)[9], CSSI-7400 Conditions, in accordance with the Sydney Metro City & Southwest Construction Noise and Vibration Strategy (SMCSNVS) [8] and as set out in the CNVMP. The noise goals are presented in Table B1 of APPENDIX B.

4.2 Construction vibration goals

As reported in Section 5.4 and 5.5 of the CNVMP [1], construction vibration goals have been determined using:

- for human exposure, the acceptable vibration values set out in the Environmental Noise Management Assessing Vibration: A Technical Guideline (Department of Environment and Conservation, 2006) [4]
- for structural damage, the vibration limits set out in the
 - British Standard BS 7385-2:1993 Evaluation and measurement for vibration in buildings.
 Guide to damage levels from ground-borne vibration [5] and
 - German Standard DIN 4150-3: Structural Vibration effects of vibration on structures [6].

5 Construction noise and vibration assessment

5.1 Construction noise assessment

The track works at the Victoria Cross Station underground worksite will be completed underground, within the tunnels and cavern. There is one opening to the surface through which noise from the trackworks and tunnel fitout works may emanate. Airborne noise emission from the works inside the tunnels and caverns has been predicted based on the plant and equipment list outlined in Table C1 of APPENDIX C.

Predicted noise levels from the concrete pumping surface works to the worst affected point of the closest sensitive receiver at:

- 237 Miller Street (near Victoria Cross North)
 - $L_{Aeq(15min)} < 67 dB(A)$, which is below the day NML of 69 dB(A).

Predicted noise levels from the trackworks and tunnel fitout works to the worst affected point of the closest sensitive receivers at:

- 79-81 Berry Street (near Victoria Cross South)
 - $L_{Aeq(15min)} < 40 \text{ dB}(A)$, which is below the night NML of 57 dB(A).
 - L_{Amax} <55 dB(A), which is below the sleep disturbance screening level of 67 dB(A)
- 237 Miller Street (near Victoria Cross North)
 - $L_{Aeq(15min)} < 40 \text{ dB}(A)$, which is below the night NML of 49 dB(A)
 - L_{Amax} <55 dB(A), which is below the sleep disturbance screening level of 59 dB(A).

No airborne noise impacts from the works are predicted as noise generated by the works to the nearest residential receiver are expected to be:

- L_{Aeq(15min)} noise levels no more than 5 dB(A) above the rating background level at any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009), and
- L_{Amax} noise levels less than 15dB above the night rating background level.

Therefore, EPL 21423 Condition L4.4 is satisfied, and works may be completed during and outside of standard construction hours. It is noted that due to the low noise levels from the Victoria Cross Station underground trackwork, the likelihood of cumulative impact is low.

5.2 Construction vibration assessment

From the plant and equipment listed in APPENDIX C, the dominant vibration generating plant and equipment include an excavator with rock hammer (13 tonne).

The recommended minimum working distances for vibration intensive plant are presented in Table 5-1 for cosmetic damage and Table 5-2 for human annoyance.

	Minimum working distance (m)						
Plant item	Reinforced or framed structures (e.g. commercial buildings) ¹	Unreinforced or light framed structures (e.g. residential buildings) ¹	Sensitive structures (e.g. heritage structures) ²				
Excavator with rock hammer (12T)	5	10	15				

Table 5-1: Minimum working distances (m) for cosmetic damage (continuous vibration)

Notes 1) Initial screening test criteria reduced by 50% due to potential dynamic magnification in accordance with BS7385.
2) In accordance with Section 5.8.1 of CNVMP, a site inspection should determine whether a heritage structure is structurally unsound.

3) Minimum working distances are in 5m increments only to account for the intrinsic uncertainty of this screening method.

Table 5-2: Minimum working distances (m) for human annoyance (continuous vibration)

	Minimum working distances, m							
Plant item	Critical	Residences		Off 34	Workshops ⁴			
	areas ^{1,4}	Day ²	Night ²	Offices				
Excavator with rock hammer (12T)	45	30	40	20	15			

Notes 1: Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring.

2: Daytime is 7 am to 10 pm; Night-time is 10 pm to 7am.

3: Examples include offices, schools, educational institutions and place of worship.

4: Applicable when in use.

The works are approximately 30 to 40 metres below ground level. There are no sensitive receivers within the minimum working distances detailed above. Therefore, construction vibration noise impact is negligible.

Therefore, EPL 21423 Condition L4.4 is satisfied and works may be completed during and outside of standard construction hours.

5.3 Noise and vibration mitigation measures

Noise and vibration mitigation and management measures presented in the CNVMP will be applied to the track works undertaken at the Victoria Cross Station underground worksite and surface concrete pumping worksite.

5.3.1 Attended monitoring

Attended noise monitoring will be undertaken during works at one of the representative receivers identified in the table below for each site. Nominated attended measurement locations have been selected with the best opportunity to verify that noise from the track works is below the NMLs.

Table 5.3:	Nominated	verification	monitoring	locations

NCA		
VC_05	237 Miller Street, North Sydney	M1 - Footpath on McLaren Street
VC_07	79-81 Berry Street, North Sydney	M2 - Footpath on Denison Street

NCA	Nominated receiver address	Monitoring location	
Note:	Monitoring on private property is subject to owner	consent and where relevant, occupier consent	

Monitoring locations shown on Figure B1 are indicative only and may change subject to observations on site. Inspect worksite prior to measurement to confirm the most representative measurement location, as identified above, especially for 79-81 Berry St

If verification monitoring shows that noise from the underground track works is audible and above the relevant NMLs at night, more detailed analysis would be conducted to determine additional on-site mitigation measures or other management measures. Additional on-site mitigation measures, such as providing temporary screening of openings where noise is escaping to the surface, and other management measures will be determined based on what aspect of the activity causes the measured exceedance, on a case-by-case basis.

Vibration monitoring would only be undertaken in response to a complaint in relation to vibration from the proposed works.

5.3.2 Complaints handlings

Any noise or vibration complaints received and responded to will be managed in accordance with the CNVMP and the Community Consultation Strategy.

Transport for NSW operate a 24-hour construction complaints line (1800 171 386). Enquiries/ complaints may also be received through the Sydney Metro project email (linewide@transport.nsw.gov.au).

6 Conclusion

Works associated with the C2S track works at the Victoria Cross Station underground worksite and surface concrete pumping worksite have been identified and described in this report. The expected duration of construction activities is outlined in Table C1 of APPENDIX C.

Airborne noise and vibration generated by the proposed works are anticipated to be below the noise and vibration objectives established in Section 4. Therefore, works may be undertaken during and outside of Standard Construction Hours, in accordance with CSSI-7400 Condition E44(d) and EPL Condition L4.4.

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
06.12.2021	Initial issue	0	1	T. Gowen	-	M. Tabacchi
7.12.2021	Updated to address AA comments	-	2	T. Gowen	-	M. Tabacchi

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Important Disclaimers:

The work presented in this document was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian/New Zealand Standard AS/NZS ISO 9001.

This document is issued subject to review and authorisation by the suitably qualified and experienced person named in the last column above. If no name appears, this document shall be considered as preliminary or draft only and no reliance shall be placed upon it other than for information to be verified later.

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We have derived data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination and re-evaluation of the data, findings, observations and conclusions expressed in this report.

We have prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

The information contained herein is for the purpose of acoustics only. No claims are made and no liability is accepted in respect of design and construction issues falling outside of the specialist field of acoustics engineering including and not limited to structural integrity, fire rating, architectural buildability and fit-for-purpose, waterproofing and the like. Supplementary professional advice should be sought in respect of these issues.

External cladding disclaimer: No claims are made and no liability is accepted in respect of any external wall and/or roof systems (eg facade / cladding materials, insulation etc) that are: (a) not compliant with or do not conform to any relevant non-acoustic legislation, regulation, standard, instructions or Building Codes; or (b) installed, applied, specified or utilised in such a manner that is not compliant with or does not conform to any relevant non-acoustic legislation, regulation, standard, instructions or Building Codes; or (b) installed, applied, specified or utilised in Such a manner that is not compliant with or does not conform to any relevant non-acoustic legislation, regulation, standard, instructions or Building Codes.

References

- Sydney Metro City & Southwest Line Wide Works Contract Construction Noise and Vibration Management Plan (SMCSWLWC-SYC-1NL-PM-PLN-000032-A-CNVMP-C2B)
- [2] SLR Consulting Australia Pty Ltd 2016 Sydney Metro Chatswood to Sydenham Technical Paper 2: Noise and Vibration Report Number 610.14718R1 – 28 April 2016
- [3] Department of Environment and Climate Change 2009 NSW Interim Construction Noise Guideline
- [4] Department of Environment Conservation NSW 2006 Assessing Vibration; a technical guideline
- [5] British Standard BS 7385 Part 2 1993, Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration
- [6] German Standard DIN 4150-3:2016-12 Vibration in buildings Part 3: Effects on structures
- [7] British Standard BS 6472-2008, Evaluation of human exposure to vibration in buildings (1-80Hz)
- [8] Transport for NSW Sydney Metro City & Southwest Construction Noise Strategy (ref: 610.14213-R3)
 08 August 2016
- [9] Transport for NSW Sydney Metro Construction Environmental Management Framework August 2016
- [10] Renzo Tonin & Associates 2021 Sydney Metro City and South West Line-Wide Works Noise and Vibration Assessment: Victoria Cross track construction and tunnel fit-out (ref: TK685-03-7F01 CNVIS C2S_P3 CHW(r2))
- [11] Renzo Tonin & Associates 2021 Barangaroo Metro Station Construction Noise and Vibration Impact Statement – Underground station fit-out works (ref: TK685-03-13F02 CNVIS C2S_P3 VICX Trackworks(r2))

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APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Assessment point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds:
	0dB The faintest sound we can hear
	30dB A quiet library or in a quiet location in the country
	45dB Typical office space. Ambience in the city at night
	60dB CBD mall at lunch time
	70dB The sound of a car passing on the street
	80dB Loud music played at home
	90dB The sound of a truck passing on the street
	100dBThe sound of a rock band
	115dBLimit of sound permitted in industry
	120dBDeafening
dB(A)	A-weighted decibels. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L _{Max}	The maximum sound pressure level measured over a given period.
L _{Min}	The minimum sound pressure level measured over a given period.

L ₁	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L ₁₀	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L ₉₀	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L _{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B

Nearest sensitive receivers and noise management levels

Table B1: Noise sensitive receivers and construction noise management levels

VICTO

NCA	Nearest construction	Receiver Type	Reference RBL	Existing Noise Levels L _{A90(15min)} , dB(A)		Residential NMLs based on ICNG (external), $L_{Aeq(15min)}$				Sleep Dist. L _{Amax}		Comment	
	work area			RBL Day	RBL Evening	RBL Night	NML DS	NML DO	NML E	NML N	Screening	Max	
VC_01	Victoria Cross Station	Residential west of Pacific Hwy and west of Miller	C2S EIS B.17	55	50	44	65	60	55	49	59	65	
		Street, south of Berry Street											
VC_02	Victoria Cross Station	Residential west of Miller Street, north of Berry St	C2S EIS B.17	55	50	44	65	60	55	49	59	65	
VC_03	Victoria Cross Station	Residential (low rise), north of McLaren Street	WM Report No 16200	54	47	40	64	59	52	45	55	65	
VC_04	Victoria Cross Station	Residential (high rise), along McLaren St	RTA TH511-L03 29 McLaren St, North Sydney	49 y	45	39	59	54	50	44	55	65	
VC_05	Victoria Cross Station	Residential (high rise), East of VC_03 and VC_04, west of Warringah Freeway	WM May-June 2015 - 138 Walker St	3 59	57	44	69	64	62	49	59	65	
VC_06	Victoria Cross Station	Commercial district with some residential (high rise), east of Miller Street and west of Warringah Freeway, surrounding southern site	Energy2U Alliance,ref60100174- RPT02.03, 16/09/2010	54	51	46	64	59	56	61			
VC_07	Victoria Cross Station	Commercial district with some residential (high rise) & childcare receivers, east of Miller Street and west of Warringah Freeway, surrounding southern site	C2S EIS B.16	65	63	52	75	70	68	57	67	65	
Other sensiti	ive receivers						Sensitive R	eceiver NMLs ba	ased on ICNG (see comments f	or details), L _{Aeq(1}	5min)	
Studio buildir	ng (music recording studio)						45	45	45	45			Source: AS
Studio buildir	ng (film or television studio)						50	50	50	50			Source: AS
Cinema space	e, theatre, auditorium						55	55	55	55			Source: AS
Hotel (Sleepi	ng areas: Hotels near major	roads)					60	60	60	60			Source: AS
Classrooms a	t schools and other education	onal institutions					55	55	55	55			Source: IC
Chilcare cent	re (internal play and sleepin	g areas)					50	50	50	50			Source: AA
													conservati
Hospital ward	ds and operating theatres						65	65	65	65			Source: IC
Places of wor	rship						55	55	55	55			Source: IC
Library (read	ing areas)						65	65	65	65			Source: AS
Office buildin	g (general office areas)						65	65	65	65			Source: AS
Hotel (bars a	nd lounges)						70	70	70	70			Source: AS
Community o	entres – Municipal Building	5					60	60	60	60			Source: AS
Restaurant, b	oar (Bars and lounges/ Resta	urant)					70	70	70	70			Source: AS
Railway platf	orm and concourse areas						75	75	75	75			Source: AS
Café/ Restau	rant/ Bar (outdoors)						60	60	60	60			Source: AS
Passive recre	ation areas (e.g. area used f	or reading, meditation)					60	60	60	60			Source: ICI
Active recrea	tion areas (e.g. sports fields						65	65	65	65			Source: ICI
Commercial	premises (including offices a	nd retail outlets)					70	70	70	70			Source: ICI
Industrial pre	emises						75	75	75	75			Source: ICI
Netes													

1 - Levels are estimated assuming an open windows (i.e. 10dBA façade losss)
DS: standard construction hours from 7 am to 6 pm Monday to Friday and from 8 am to 6 pm Saturday

DO: out-of-hours day period from 8 am to 6 pm Sunday and Public holidays - OOHW P1

E: evening period from 6 pm to 10 pm Monday to Sunday - OOHW P1

N: night-time period from 10 pm to 7 am Monday to Friday, from 10 pm am to 8 am Saturday, Sunday and Public holidays - OOHW P2

7/12/2021

RIA	CROSS	STATION	TRACKWORKS	& TUNNEL	FITOUT

2107 'maximum', assuming a conservative façade loss of 20 dB(A)
2107 'maximum', assuming a conservative façade loss of 20 dB(A)
2107 'maximum', assuming a conservative façade loss of 20 dB(A)
2107 'maximum', assuming a conservative façade loss of 20 dB(A)
IG, assuming a conservative façade loss of 10 dB(A)
AC - guideline for Child Care Centre Acoustic Assessment, assuming a
re façade loss of 10 dB(A)
IG, assuming a conservative façade loss of 20 dB(A)
IG, assuming a conservative façade loss of 10 dB(A)
2107 'maximum', assuming a conservative façade loss of 20 dB(A)
2107 'maximum', assuming a conservative façade loss of 20 dB(A)
2107 'maximum', assuming a conservative façade loss of 20 dB(A)
2107 'maximum', assuming a conservative façade loss of 10 dB(A)
2107 'maximum', assuming a conservative façade loss of 20 dB(A)
2107 'maximum', assuming a conservative façade loss of 20 dB(A)
2107 'maximum1'
IG
IG
IG
IG



file

APPENDIX C Construction details

RENZO TONIN ASSOCIATES

Table C1: Construction Activities/ Equipment

Work acitvity	Details	Indicative timing/	Work Status	Plant/ Equipment	Day	Evening	Night	Sound Pov Noise Mo	wer Level (Lv del, dB(A)	v re: 1pW) in	High noise	Vibration	Estimated activ
·····,		duration	for CNVIS	(as provided by client)	7am - 6pm	6pm - 10pm	10pm - 7am	L _{Aeq}	Penalty	L _{Amax}	plant (EPL E1)	plant	L _{eq(15min)}
VICTORIA CROSS STATION SUR	FACE ACCESS												
No plant access via	(Note 1) Delivering and removing equipment, machinery and	Nov-21 - May-22											
Victoria Cross Station	materials - access via Barangaroo or Chatswood												
(except concrete delivery)	(Note 2) Delivering of concrete via pressured pipe at Barangaroo or												
	Chatswood												
Construct skoloton track	Place cleaners, thread rail, in tunnel	Dec 21 Jan 22	Ongoing	Evenuator 20t Bubbar tura	1			102		109			107
	Place sleepers, thread fail - in tunner	Dec-21 - Jan-22	Ongoing	Bobcat	1	-	-	103	-	100	-	-	107
				Bail threader	1	_	_	104	_	107	_	_	
				Rail Wagon	-	-	-	103	-	111	-	-	
Concrete Trackform	Tunnel Concrete Placement - Surface Plant:	Jan-22 - Feb-22	Ongoing	Concrete Pump (Putz 1409)	1	-	-	116	-	118	-	-	116
				Concrete Agi	4 p.h.	-	-	106	-	111	-	-	
				Welder - Diesel	1	1	1	102	-	105	-	-	103
				Excavator 20t - Rubber tyre	1	1	1	103	-	108	-	-	_
	Tunnel Concrete Placement - Trackform concrete	Jan-22 - Feb-22	Ongoing	Concrete vibrator	5	-	-	97	-	100	-	-	112
				Hammer drill/ power saw	2	-	-	107	5	118	HN	-	
				Pressure Washer - Diesel	1	-	-	109	-	115	-	-	
				Air compressor - Diesel	1	-	-	102	-	103	-	-	
				Excavator 20t - Rubber tyre	1	1	1	103	-	108	-	-	103
Concrete FST upstands	Station Concrete Placement - Surface Plant:	Feb-22 - Mar-22	Ongoing	Concrete Pump (Putz 1409)	1	-	-	116	-	118	-	-	116
				Concrete Agi	4 p.h.	-	-	106	-	111	-	-	
	Station Concrete Placement - FST upstands	Feb-22 - Mar-22	Ongoing	Concrete vibrator	5	-	-	97	-	100	-	-	112
				Hammer drill/ power saw	2	-	-	107	5	118	HN	-	
				Pressure Washer - Diesel	1	-	-	109	-	115	-	-	
				Air compressor - Diesel	1	-	-	102	-	103	-	-	102
	Concrete Weeking out / descure	Mar 22 Jun 22	Onneine	Excavator 20t - Rubber tyre	1	1	1	103	-	108	-	-	103
	Concrete Washing-out / cleanup:	War-22- Jun-22	Ongoing	Pressure washer - Diesei	1	-	-	109	-	115	-	-	119
	dive / tuppel			Excavator 13t w hammer	1	-	-	121	5	129		- V	110
	dive / turner			Tipper Truck - Hi-rail	various	_	_	103	-	111	-	~	
EST deliver and place	Deliver precast units via rail from CHW	lan 2022 - April	Ongoing	Rail set (train consist)	1	1	1	98	-	102	-	-	112
isi denver und place	Place and jack to place bearings	2022	ongoing	Excavator 20t - Rubber tyre	2	2	2	103	-	102	-	-	
	ridee and jack to place bearings			Front end loader	1	1	1	110	-	115	-	-	_
				Rail trolley	1	1	1	-	-	-	-	-	
				Pallet jack	1	1	1	99	-	103	-	-	
				Compressor	1	1	1	102	-	103	-	-	
	Thread rail through station box			Rail threader	1	-	-	103	-	108	-	-	
Welding		Mar-22- Jun-22	Complete	Aluminothermic welding set-up	1	1	1	102	-	105	-	-	115
				Grinder	2	2	2	107	5	118	HN	-	
				Light vehicle	4 p.h.	1 p.h.	1 p.h.	89	-	100	-	-	
M&E Tunnel Fitout	M&E fitout works	Mar-22- Jun-22	Ongoing	Rattle gun	2	2	2	107	-	118	-	-	115
incl. walkways				Grinder	2	2	2	107	5	118	HN	-	
				Welder - Diesel	1	1	1	102	-	105	-	-	
				Generator - Diesel	1	1	1	94	-	95	-	-	
				EWP - Hi-rail	2	2	2	95	-	98	-	-	
				Trucks 12t rigid - Hi-rail	2	2	2	103	-	111	-	-	
				Fork Lift / material handler	2	2	2	99	-	103	-	-	_
				Excavator 20t - Rubber tyre	1	1	1	103	-	108	-	-	
				Rail set (train consist)	1	1	1	98	-	102	-	-	
LOGISTICS								102		107			100
Concrete deliveries	Surface works	Jan-22 - Apr-22		Concrete pump (line)	1	-	-	103	-	107	-	-	108
Matorial movement	Patwan spail shad and contracts	Mar 21 Cr 22		Concrete Agi	4 p.h.	-	-	105	-	111	-	-	100
iviaterial movement	Around whole site	war-21 - Sep-22		Talabandlar/farklift/france	2	1	1	102	-	102	-	-	100
	SCV pozzles south	Jan-22	Ongoing	Hammer drill/ power sow	1	-	-	107	5	119	HN	-	107
13. MODUSS CTS INSTALL		5011-22	ongoing	Rattle gun	1	2	2	107	-	118	-	_	107
				EWP - Hi-rail	-	1	1	95	-	98	-	-	
				Rail set (train consist)	-	1	1	98	-	102	-	-	
				Light vehicle	1 p.h.	1 p.h.	1 p.h.	89	-	100	-	-	

VICTORIA CROSS STATION TRACKWORKS & TUNNEL FITOUT

y	
el	No

Estimated activity sound power level L _{eq(15min)} 107 dB(A)
Deliver sleepers via tunnel from Barangaroo
Concrete pumped from surface to place in trackway
Concrete pumped from surface to place in trackway
HDPE welding (in tunnel)
 Cast in HDPE placement (in tunnel)
Comprossor to blow back lines
Every ator to handle skin bins tow compressor
 Concrete numbed from surface to place in trackway
Concrete pumped from surface to place in trackway
 In station box
In station box
Compressor to blow back lines
Excavator to handle skip bins, tow compressor
Surface
As required, in tunnel
As required, in tunnel
Hand nuch electric nallet jack
Hand push electric pallet jack
Hand push electric pallet jack Jack slabs to install bearings
Hand push electric pallet jack Jack slabs to install bearings
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Hand push electric pallet jack Jack slabs to install bearings Major deliveries via track from Chatswood. Palletised goods via station box only Fixing brackets etc to nozzle to install compact tunnel sub (CTS) Fixing brackets etc to nozzle to install compact tunnel sub (CTS)
Hand push electric pallet jack Jack slabs to install bearings Major deliveries via track from Chatswood. Palletised goods via station box only Fixing brackets etc to nozzle to install compact tunnel sub (CTS) Fixing brackets etc to nozzle to install compact tunnel sub (CTS) Deliver and install CTS in nozzle (trackway)

Figure C1: Victoria Cross track underground cavern works area



VICTORIA CROSS STATION TRACKWORKS & TUNNEL FITOUT

Figure C2: Victoria Cross South concrete delivery and pumping



VICTORIA CROSS STATION TRACKWORKS & TUNNEL FITOUT