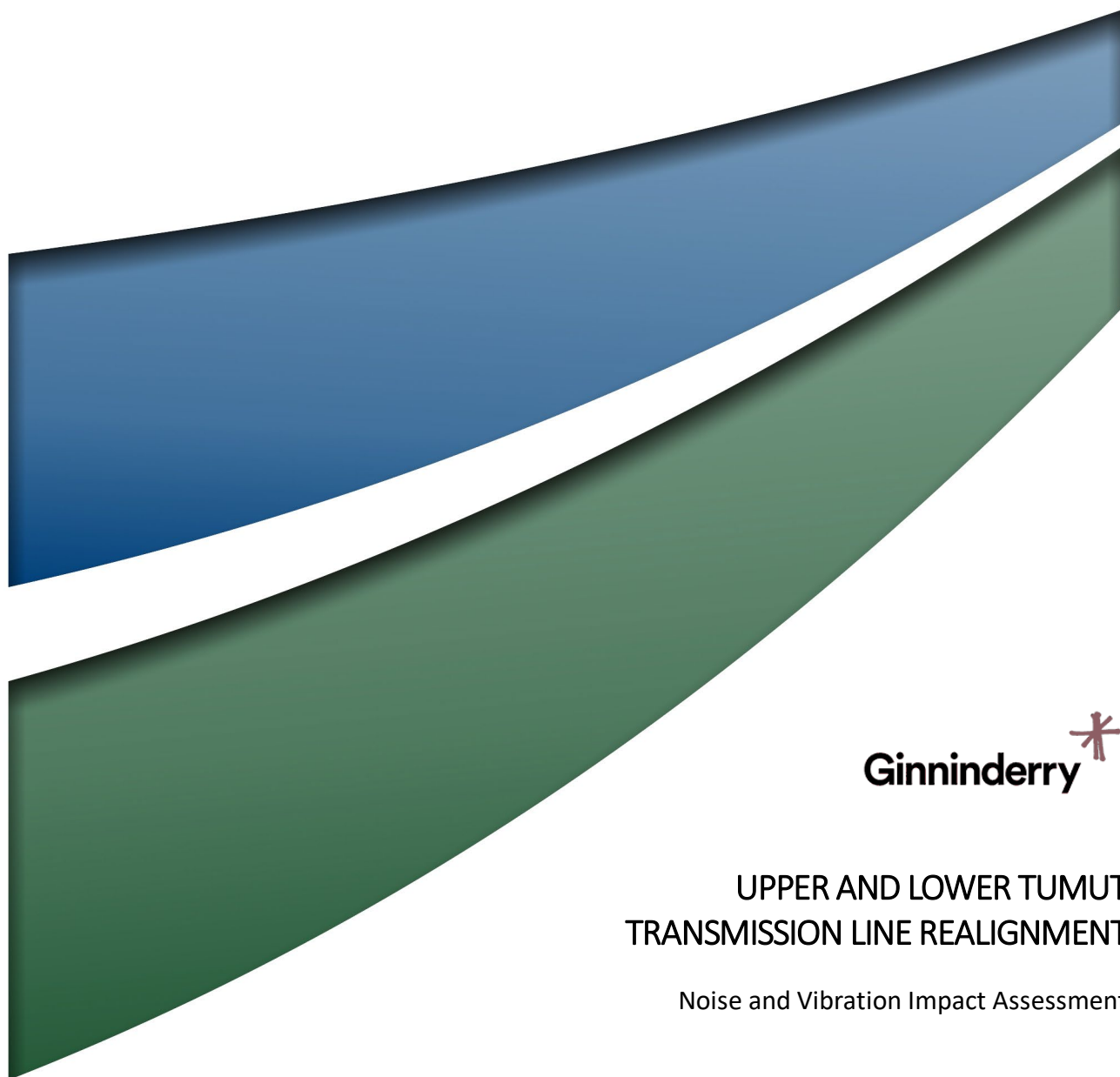




Ginninderry 

UPPER AND LOWER TUMUT
TRANSMISSION LINE REALIGNMENT

Noise and Vibration Impact Assessment

DRAFT

January 2024



UPPER AND LOWER TUMUT TRANSMISSION LINE REALIGNMENT

Noise and Vibration Impact Assessment

DRAFT

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Ginninderry Joint Venture

Project Director: Karina Carwardine
Project Manager: Keira Banks
Technical Director: Tim Procter
Technical Manager: Amanda Buckeridge
Report No. 21968/R07
Date: January 2024



This report was prepared using
Umwelt's ISO 9001 certified
Quality Management System.

Acknowledgement of Country

Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

Disclaimer

This document has been prepared for the sole use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that for which it was supplied by Umwelt (Australia) Pty Ltd (Umwelt). No other party should rely on this document without the prior written consent of Umwelt.

Umwelt undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. Umwelt assumes no liability to a third party for any inaccuracies in or omissions to that information. Where this document indicates that information has been provided by third parties, Umwelt has made no independent verification of this information except as expressly stated.

©Umwelt (Australia) Pty Ltd

Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
V1	Caitlin Adcock	02/01/2024	Caitlin Adcock	04/01/2024
V2	Tim Procter	07/03/2024	Keira Banks	07/03/2024

Table of Contents

1.0	Introduction	1
2.0	Assessment Framework	6
3.0	Existing Environment	7
3.1	Background and Ambient Noise	7
3.1.1	ACT Receiver Environment	7
3.1.2	NSW Receiver Environment	7
3.2	Receivers Included in this Assessment	8
4.0	Noise and Vibration Criteria	14
4.1	ACT Noise Criteria	14
4.1.1	ACT Construction Noise	15
4.1.2	ACT Site Specific Criteria	16
4.1.3	ACT Modifying Factor Corrections	18
4.2	NSW Noise Criteria	19
4.2.1	NSW Construction Noise Management Levels	19
4.2.2	NSW Operational Noise Criteria	19
4.3	Road Traffic Noise Criteria	23
4.3.1	ACT Road Traffic Noise	23
4.3.2	NSW Road Traffic Noise	24
4.4	Vibration Criteria	24
4.4.1	Vibration Effects on Structures	24
4.4.2	Heritage Structures	24
4.4.3	Human Perception of Vibration	25
5.0	Modelling Methodology	26
6.0	Construction and Demolition Noise and Vibration Assessment	27
6.1	Construction and Demolition Noise	27
6.1.1	Construction and Demolition Hours	27
6.1.2	Construction and Demolition Stages and Timing	28
6.1.3	Construction and Demolition Equipment and Noise Levels	28
6.1.4	Construction Noise Predictions	29
6.2	Construction and Demolition Vibration	45
6.2.1	Canberra Substation and Stockdill Substation	46
6.2.2	Heritage Structures	46

6.3	Construction and Demolition Mitigation Measures	47
6.3.1	Noise Mitigation Measures	47
6.3.2	Vibration Mitigation Measures	48
6.3.3	Construction Noise and Vibration Management Plan	48
7.0	Operational Noise Assessment	49
7.1	Operational Noise Sources	49
7.2	Operational Noise Mitigation Measures	53
7.3	Maintenance Noise Levels	53
8.0	Traffic Noise Assessment	54
8.1	Construction Traffic	54
8.2	Operational Traffic	54
9.0	Cumulative Noise Assessment	55
9.1	Cumulative Construction Noise	55
9.2	Cumulative Operational Noise	55
10.0	References	56

Figures

Figure 1.1	Proposal Locality	3
Figure 1.2	Construction and Operational Footprints of the Proposal	4
Figure 1.3	Land Use Zoning	5
Figure 3.1	ACT Receivers Included in this Assessment	12
Figure 3.2	NSW Receivers Included in this Assessment	13
Figure 6.1	Scenario 1 – Location of new access tracks and their proximity to the new Line 1 and 7 alignments	30
Figure 6.2	Scenario 2 – New footings locations along the proposed Line 1 and 7	34
Figure 6.3	Scenario 3 – Stringing Lines 1, 7 and 3C	38
Figure 6.4	Scenario 4 – Destringing and demolition of existing Lines 1 and 7	42

Tables

Table 3.1	Adopted Background Noise Levels for NSW Receivers	7
Table 3.2	ACT Receivers Included in this Assessment	8
Table 3.3	NSW Receivers Included in this Assessment	10
Table 4.1	Table 2.1 from the Environment Protection Regulation 2005	14

Table 4.2	Table 2.2 from the Environment Protection Regulations 2005	15
Table 4.3	Noise Exemptions (Table 2.3 of EPR)	16
Table 4.4	Applicable Noise Standards	16
Table 4.5	Modifying Factor Corrections	18
Table 4.6	ICNG Construction Noise Management Levels, dB(A)	19
Table 4.7	NSW Construction Noise Management Levels	19
Table 4.8	Minimum Assumed RBLs and PINLs (NPfl Table 2.1)	20
Table 4.9	NPfl Derived Project Amenity Noise Levels, dB(A)	21
Table 4.10	Project Noise Trigger Levels – Residential Receivers, LAeq(15 minute), dB(A)	21
Table 4.11	Sleep Disturbance Assessment Levels - Residential Receivers, LAeq,15minute and LAFmax dB(A)	22
Table 4.12	Cumulative noise criteria – LAeq(15min), dB(A)	23
Table 4.13	BS7385 Vibration Criteria for Cosmetic Damage to Structures	24
Table 4.14	Vibration Guideline Values for Continuous and Impulsive Vibration for Human Comfort	25
Table 4.15	Vibration Guideline Acceptable Vibration Dose Values for Intermittent Vibration for Human Comfort (VDV m/s ^{1.75})	25
Table 6.1	Indicative Construction Scenarios, Equipment and Sound Power Levels	28
Table 6.2	Scenario 1 ACT Predicted Construction Noise Levels, dB(A)	31
Table 6.3	Scenario 1 NSW Predicted Construction Noise Levels, dB(A)	33
Table 6.4	Scenario 2 ACT Predicted Construction Noise Levels, dB(A)	35
Table 6.5	Scenario 2 NSW Predicted Construction Noise Levels, dB(A)	37
Table 6.6	Scenario 3 ACT Predicted Construction Noise Levels, dB(A)	39
Table 6.7	Scenario 3 NSW Predicted Construction Noise Levels, dB(A)	41
Table 6.8	Scenario 4 ACT Predicted Construction Noise Levels, dB(A)	43
Table 6.9	Scenario 4 NSW Predicted Construction Noise Levels, dB(A)	45
Table 6.10	Recommended Minimum Working Distances for Vibration Generating Plant from a Residential Sensitive Receiver (CNVG Table 2)	46
Table 7.1	ACT Predicted Operational Noise Levels, dB(A)	50
Table 7.2	NSW Predicted Operational Noise Levels, dB(A)	52
Table 7.3	Exempt Operational Activities from EPR Noise Standards	53
Table 8.1	Indicative Construction Related Traffic Vehicles	54

Appendices

Appendix A	Construction Noise Model Predictions for All Receivers
Appendix B	Operational Noise Model Predictions for All Receivers

1.0 Introduction

The Proposal involves the relocation of part of the Upper and Lower Tumut transmission lines near their point of connection in the Australian Capital Territory (ACT) (Lines 1 and 7, respectively). The two lines extend from Kosciuszko National Park in New South Wales (NSW) into the ACT, where they connect to the Canberra Substation. The new alignments would divert from near the ACT/NSW border and extend southeast, crossing the Murrumbidgee and Molonglo Rivers in the ACT, then connecting to existing towers at the Stockdill Substation on Stockdill Drive in western Belconnen, ACT (see **Figure 1.1**). The new alignments traverse a distance of up to approximately 6.2 kilometres (km).

The Proposal also involves the decommissioning and removal of part of Lines 1 and 7. Lines 1 and 7 currently extend northeast from NSW and cross the Murrumbidgee River in the ACT, with Line 7 connecting directly into the Canberra Substation in Macnamara, while Line 1 extends to the south and connects into the Stockdill Substation (see **Figure 1.2**). The sections to be removed are adjacent to the Canberra Substation and traverse a combined distance of approximately 14.2 km.

The key objective of the Proposal is to move the existing 330 kV transmission lines out of the West Belconnen Future Urban Area (FUA), where the Ginninderry residential development is underway, to increase the availability of housing in the area, particularly affordable housing. Removal of the lines would also improve local amenity by reducing visual impacts on residential areas and would remove infrastructure from within the Ginninderry Conservation Corridor (GCC), which was established under the West Belconnen Strategic Assessment, and from within other nature reserves such as the Woodstock Nature Reserve. This would allow for improved conservation outcomes in these areas.

The Proposal is being proposed by the Ginninderry Joint Venture (GJV); a joint venture between the ACT Government (Suburban Land Agency (SLA)) and Riverview Group which is developing the Ginninderry residential area. Once operational, the Proposal would be owned and operated by Transgrid, which manages the high voltage electricity transmission network in NSW and the ACT.

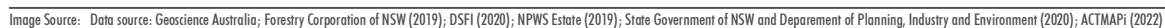
The Proposal (including both the ACT and NSW scopes of works) comprises the following activities:

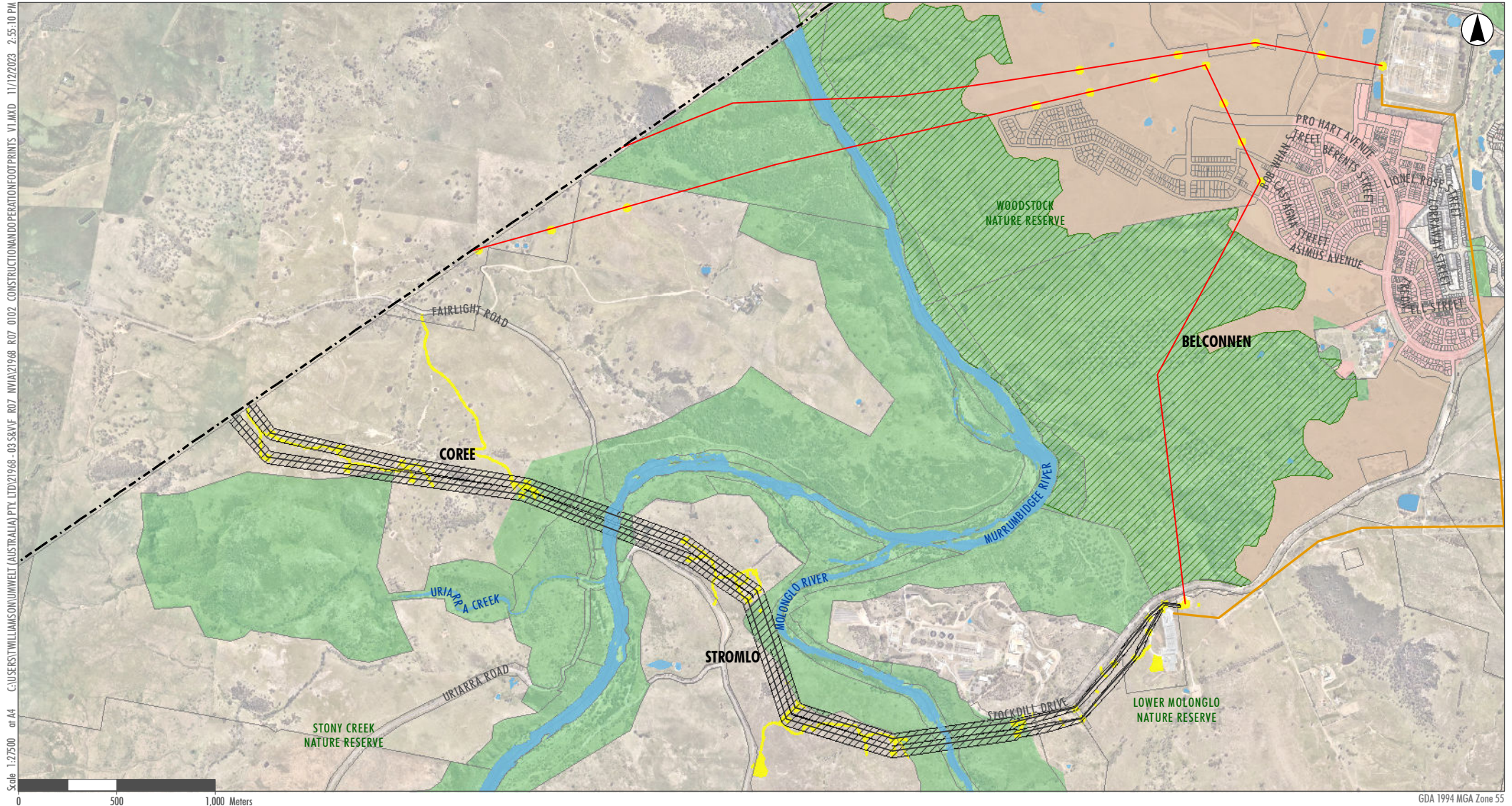
- Installation of new towers and overhead transmission lines associated with the realignment of part of the existing Lines 1 and 7, including the construction of 10 new towers and four new poles for Line 1 and 11 new towers and five new poles for Line 7. The towers would range in height from approximately 34 m to 40 m above ground level, and the poles would be between 40 m and 56 m tall. The taller towers would generally be located adjacent to the river crossings to maximise transmission line heights and spans between towers, and to avoid tree removal, while the tallest poles would be adjacent to Stockdill Drive to maximise transmission line heights and minimise tree removal.
- Electrical works to connect the new Line 1 to the Stockdill Substation (replacing the existing Line 1 connection).
- Stringing of additional conductors along the part of Line 3C located between the Stockdill Substation and Canberra Substation.
- Decommissioning and removal of part of the existing Lines 1 and 7, including:

- Removal of 24 towers from Line 1, involving complete removal of 16 tower foundations with the remaining foundations to be left in situ to reduce the overall impact within conservation areas.
- Removal of 14 towers from Line 7, involving complete removal of 10 tower foundations with the remaining foundations to be left in situ.
- Civil works to prepare for construction of the new tower foundations, involving vegetation removal and modification if required, earthworks to level the site if required, and foundation preparation (excavation and/or boring, steel fabrication works and concrete pours).
- Civil works associated with construction of temporary construction access tracks (5 m-wide), involving vegetation removal and modification, levelling, and laying of sub-base and/or metal grids for access across wet areas, as required. Access would be from the existing road network including Stockdill Drive, Uriarra Road and Fairlight Road.
- Installation of temporary facilities associated with construction, including material laydown areas, construction compounds, carparking, and a site office.
- Following completion of the construction works, the temporary construction areas (access tracks, laydown areas etc.) would be rehabilitated.

Figure 1.2 shows the Proposal layout once operational, including locations of the new alignments and the towers to be removed. The Proposal Area is defined by the construction and operational footprints of the Proposal, including a 30 x 30 metre (m) buffer around the new towers, a 20 m radius buffer around the tower footings to be removed, and a 60 m-wide transmission line easement.

All of the above works would be located across several blocks in the ACT and NSW, as shown in **Figure 1.3**. ACT land in the Proposal Area is zoned NUZ4 River Corridor, NUZ3 Hills, Ridges and Buffer Areas, or NUZ2 Rural, while NSW land in the Proposal Area is zoned RU1 Primary Production or C3 Environmental Management.

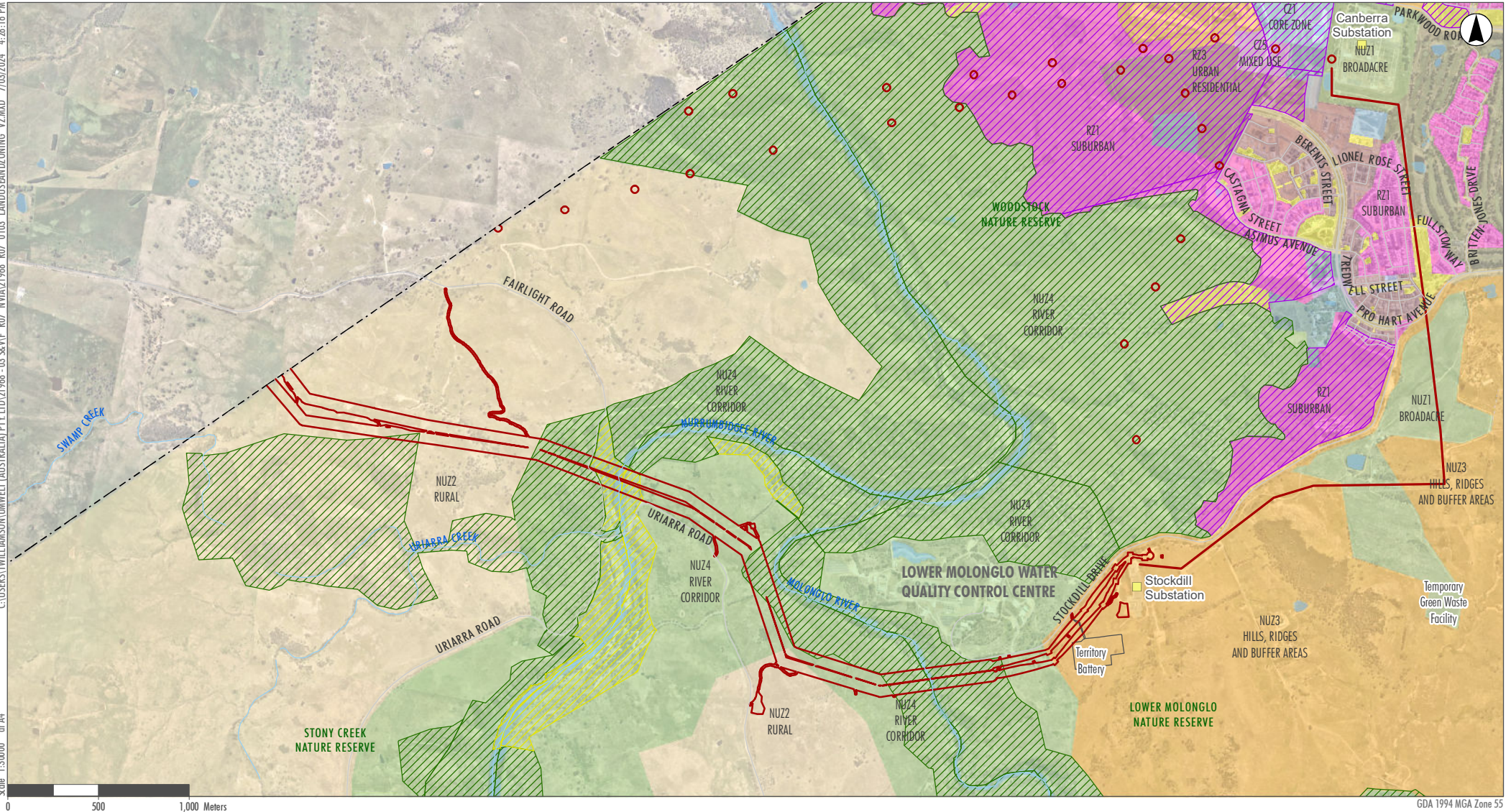




Legend

- | | |
|---|--|
| Construction Footprint | Ginninderry Conservation Corridor |
| Operational Footprint | Ginninderry / Parkwood Development |
| New Transmission Lines | Watercourses |
| Transmission Lines to be Removed | Nature Reserves |
| Line 3C (Additional Conductor Stringing) | Property Boundaries |
| | |

FIGURE 1.2
Construction and Operational
Footprints of the Proposal



Legend

- | | | | | |
|----------------|---------------------------|--|----------------------------------|-------------------------------|
| Proposal Area | Land Use Zones | NUZ2 – RURAL | RZ3 – URBAN RESIDENTIAL | Overlay Zones |
| ACT/NSW Border | CF – COMMUNITY FACILITIES | NUZ3 – HILLS, RIDGES AND BUFFER AREAS | RZ4 – MEDIUM DENSITY RESIDENTIAL | FUA – Future Urban Areas |
| Road | CZ1 – CORE ZONE | NUZ4 – RIVER CORRIDOR | RZ5 – HIGH DENSITY RESIDENTIAL | Pc – Nature Reserve. |
| Drainage Line | CZ4 – LOCAL CENTRE | PRZ1 – URBAN OPEN SPACE | TSZ1 – TRANSPORT | Pd – Special Purpose Reserve. |
| Waterbodies | CZ5 – MIXED USE | PRZ2 – RESTRICTED ACCESS RECREATION ZONE | TSZ2 – SERVICES | |
| | NUZ1 – BROADACRE | RZ1 – SUBURBAN | | |

FIGURE 1.3
Land Use Zoning

2.0 Assessment Framework

The Proposal Area is on the ACT's north-western border with NSW with some Proposal components in NSW, but the majority in the ACT. This Noise and Vibration Impact Assessment (NVIA) has been prepared in accordance with the relevant guidelines and legislative requirements of both the ACT and NSW as outlined below.

Noise impacts for receivers located in the ACT have been assessed in accordance with:

- ACT Environment Protection Regulation 2005 (EPR).
- Noise Environment Protection Policy (NEPP), 2010.
- Noise Measurement Manual (NMM), 2009.
- ACT Territory Plan 2023
- Roads ACT Noise Management Guidelines (NMG), 2018.

In the ACT, both construction noise and operational noise are governed by the same noise standards. The EPR however contains certain clauses that provide exemptions (with conditions) for construction noise. This is discussed further in **Section 4.1.1**.

Noise impacts for receivers located in NSW have been assessed in accordance with:

- Interim Construction Noise Guideline (ICNG), NSW Department of Environment and Climate Change (DECC), 2009.
- Noise Policy for Industry (NPfI), NSW Environment Protection Authority (EPA), 2017.
- NSW Road Noise Policy (RNP), Department of Environment, Climate Change and Water (DECCW), 2011.

The ACT does not have assessment guidelines for the effects of vibration on people, therefore NSW guidelines have been used to assess human comfort vibration impacts for all receivers in this NVIA. As Australia does not currently have any standards relating to the assessment of building damage (cosmetic or structural) from vibration, a German Standard has been used to assess impacts in this NVIA.

Vibration impacts in this NVIA have been assessed in accordance with:

- Assessing Vibration: A Technical Guideline (the Vibration Guideline), Department of Environment and Conservation (DEC), 2006.
- German Institute for Standardisation DIN 4150-3:1999-02 Structural vibration – Effects of vibration on structures (DIN4150).

Recommended minimum offset distances from vibration generating equipment have been sourced from NSW guidelines such as the Construction Noise and Vibration Guideline (CNVG) (TfNSW, 2022).

Noise impacts associated with demolition activities of the Proposal have been assessed as construction noise.

3.0 Existing Environment

3.1 Background and Ambient Noise

The Proposal Area is on the ACT's north-western border with NSW and there are noise receivers in both the ACT and NSW (see **Figure 3.1** and **Figure 3.2**).

The general surrounds of the Proposal Area are rural or residential environments expected to have typically low background noise levels. While determining noise criteria under NSW noise policies takes into account the background noise levels (measured or assumed) of an area, noise criteria in the ACT are determined by noise zones outlined in the EPR.

3.1.1 ACT Receiver Environment

The land immediately surrounding the majority of the Proposal Area are primarily scattered rural receivers in the ACT. There are more densely residentially populated areas to the north-east of the Proposal Area, including new housing release areas while the Lower Molonglo Water Quality Control Centre (LMWQCC) is near the proposed new transmission lines on Stockdill Drive.

3.1.2 NSW Receiver Environment

NSW receivers to the west and north-west of the Proposal Area are located wholly within the Yass Valley Local Government Area. The majority of NSW receivers are located in rural residential land (zoned RU1 Primary Production), with some zoned R1 General Residential in a developing residential area (Parkwood) to the north-west of the Proposal Area and others scattered in land zoned E2 Environmental Conservation near the Murrumbidgee River. Given the rural environment, minimum background noise levels have been adopted in accordance with the NPfI.

As the Proposal Area is in a rural region, it is assumed that the Rating Background Level (RBL) at all NSW receivers during the day will be less than 35 dB(A) and less than 30 dB(A) during the evening and night periods. The minimum RBLs of 35 dB(A) for the day and 30 dB(A) for the evening and night periods are set in accordance with the requirements of the NPfI. The adopted background noise levels are presented in **Table 3.1**.

Table 3.1 Adopted Background Noise Levels for NSW Receivers

Receiver Category/Land-use	Adopted RBLs ¹ , dB(A)		
	Day 7.00 am–6.00 pm	Evening 6.00 pm–10.00 pm	Night 10.00 pm–7.00 am
Rural Residential: RU1 Primary Production R1 General Residential E2 Environmental Conservation	35	30	30

Note: ¹ Values shown represent the minimum RBLs for each period in accordance with the NPfI.

3.2 Receivers Included in this Assessment

To simplify the presentation of results, some isolated receivers nearest the Proposal Area have been included in the models as individual receiver points while groups of receivers further from noise sources have been grouped into Noise Catchment Areas (NCAs). NCAs allow for the logical grouping of receivers similarly affected by a Proposal to assist with assessment and possible future consultation.

Multiple locations for some receivers have been included in the assessment for some ACT NCAs to understand predicted impacts, as noise criteria applies on the boundary of the property and different boundaries will be more affected by construction or operational noise sources than others.

The majority of ACT and NSW receiver points to be included in this assessment were supplied by the client. These locations were used in the noise models or were used to determine suitable NCAs, with some additional NCAs being added to include developing residential areas to the north of the Proposal Area. ACT noise receivers and their details are shown in **Table 3.2** and **Figure 3.1** while NSW receivers and their details are shown in **Table 3.3** and **Figure 3.2**.

Some ACT receiver points represent dwellings, as supplied by the client and others represent the receiver's boundary where ACT noise criteria apply. Where more than one dwelling is present in the same ACT block, postscript letters have been used in the Receiver ID. It is noted that receiver R01 is the Lower Molonglo Water Quality Control Centre and is likely to be a less sensitive receiver than a residential dwelling. It is also noted that at the time of this assessment, receiver R02 (a rural residential property) is unoccupied.

NSW receiver points are representative of the reasonably most-affected point within 30 metres of the residence.

Table 3.2 ACT Receivers Included in this Assessment

Receiver ID	GDA 2020 MGA55	
	Easting	Northing
R01_BoundaryS	679641	6097510
R01a	679499	6097667
R02_BoundaryN	678152	6097730
R02a	679267	6094620
R02b	679264	6094504
R03_BoundaryN	678040	6100142
R03_BoundarySW	677527	6098869
R03a	678341	6099593
R03b	678202	6099599
R04_BoundaryN	680695	6097984
R04a	681253	6097661
R05_BoundarySE	681898	6098444
R05a	681759	6098510
R05b	681805	6098697

Receiver ID	GDA 2020 MGA55	
	Easting	Northing
R06_BoundarySW	681446	6098669
R06a	681566	6098744
R07_BoundaryE	681604	6099398
R07_Boundary_W	681177	6099447
R07a	681459	6099204
R07b	681451	6099367
R07c	681525	6099478
R08_BoundaryW	682133	6098682
R08a	682329	6099480
R08b	682301	6099272
R08c	682385	6099002
R09_BoundaryW	682676	6098720
R09	682992	6099175
R10_BoundaryW	682980	6098903
R10	683722	6099018
R11	681351	6101273
R12a	681414	6101251
R12b	681424	6101297
R13	681452	6101255
R14	681679	6101239
R15	681744	6101314
R16_Boundary	680883	6100938
R16a	680954	6101237
R16b	680815	6101568
R16c	680547	6102134
R17_Boundary	679863	6101135
R17a	679808	6101209
R17b	679953	6101278
R17c	679898	6101329
R17d	679865	6101400
R17e	679873	6101432
R18_Boundary	680745	6101894
R18a	680985	6102128
R18b	680722	6102168
R18c	681031	6102414

Receiver ID	GDA 2020 MGA55	
	Easting	Northing
NCA1_North	679990	6100602
NCA1_Centre	680331	6100323
NCA1_East	680841	6100192
NCA2_East	681939	6100000
NCA2_Centre	681547	6100049
NCA2_West	680942	6100184
NCA3_North	682055	6100438
NCA3_South	682232	6100003
NCA4_North	682489	6100182
NCA4_South	682672	6099663
NCA5	681297	6101201

Table 3.3 NSW Receivers Included in this Assessment

Receiver ID	GDA 2020 MGA55	
	Easting	Northing
R19	680457	6102353
R20	680530	6103129
R21	680277	6103143
R22	680221	6103190
R23	680148	6103172
R24 (NCA6)	679992	6103130
R25	680254	6103474
R26	680088	6103413
R27	678820	6103164
R28 (NCA7)	678942	6103226
R29	678861	6103262
R30	678984	6103294
R31	678956	6103333
R32	678935	6103350
R33	678270	6103255
R34 (NCA8)	678262	6103229
R35	678253	6103125
R36	678149	6102814
R37	678179	6102149
R38 (NCA9)	678182	6102214

Receiver ID	GDA 2020 MGA55	
	Easting	Northing
R39	677578	6102356
R40	677080	6102373
R41	674832	6100714
R42	674208	6100052
R43	674062	6100026
R44	674091	6099859
R45	674023	6099863
R46	674025	6099774
R47 (NCA10)	674288	6099474
R48	673596	6098959
R49 (NCA11)	674183	6098681
R50	674154	6098648
R51	673456	6097974
R52	673786	6097836
R53	673524	6097762
R54	673529	6097688
R55 (NCA12)	673661	6097636

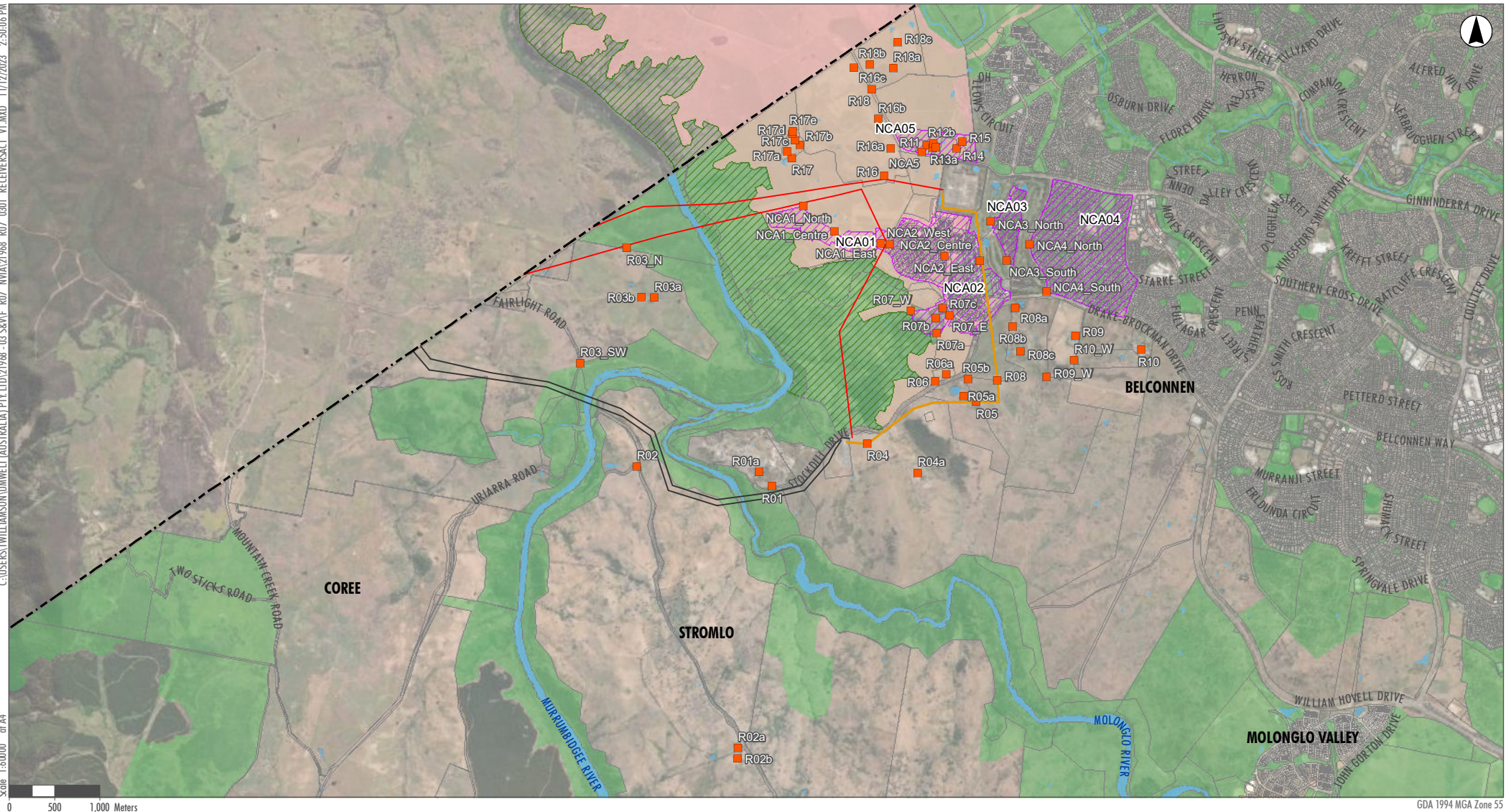
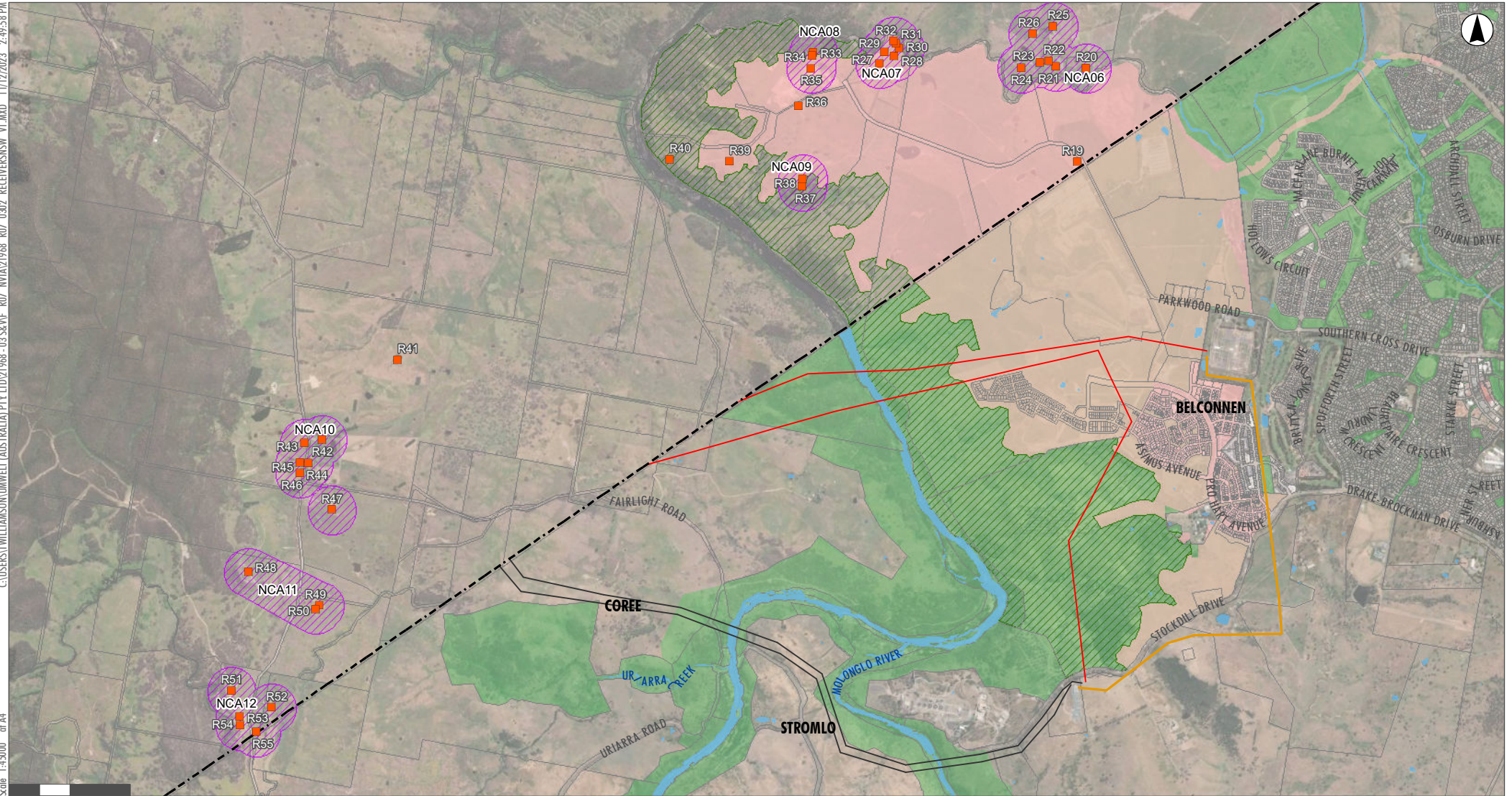


FIGURE 3.1
ACT Receivers Included in this
Assessment



GDA 1994 MGA Zone 55

Legend

- Receivers (37)
- New Transmission Lines
- Transmission Lines to be Removed
- Line 3C (Additional Conductor Stringing)
- ▨ Noise Catchment Areas
- ▭ Property Boundaries
- ▨ Ginninderry Conservation Corridor
- ▨ Ginninderry / Parkwood Development
- ▭ ACT/NSW Border
- ▭ Watercourses
- ▭ Nature Reserves

Image Source: Nearmap (2022) Data source: ACT Government (2021)

FIGURE 3.2
NSW Receivers Included in this
Assessment

4.0 Noise and Vibration Criteria

4.1 ACT Noise Criteria

The EPR provides a framework for setting noise criteria for different types of activities and developments. Schedule 2 of the EPR specifies information regarding noise zones, noise standards and conditions. Noise zones are applied to ACT and adjacent NSW land and have associated noise standards in units of L_{10} dB(A). Part 3 (Noise) of the EPR references Schedule 2 and provides definitions and information on the noise regulations for the ACT.

Noise standards in the EPR are provided according to the land use zone of any given land parcel, as identified on ACTmapi and in the Territory Plan. The noise zones of ACT and adjacent NSW land is described within Schedule 2, Part 2.1 of the EPR and is reproduced in **Table 4.1**. Schedule 2, Part 2.2 of the EPR, provides the allowable noise standards (L_{10} dB(A)) for each zone and is reproduced in **Table 4.2**.

Table 4.1 Table 2.1 from the Environment Protection Regulation 2005

Column 1 item	Column 2 noise zone	Column 3 ACT land	Column 4 NSW land
1	Zone A	land in an industrial zone	land in the Queanbeyan city industrial zone
2	Zone B1	land in the city centre or a town centre	-
3	Zone B2	land in the Central National Area (City Hill Precinct)	land in the Queanbeyan city business zone
4	Zone C1	land in a group centre	-
5	Zone C2	land in a corridor site or an office site	-
		land in the Central National Area (Parliamentary Zone and Other Areas)	-
6	Zone D	land (other than land in the city centre, town centres and group centres) in a commercial CZ4 zone	-
7	Zone E	land (other than land in the city centre, town centres and group centres) in— - a restricted access recreation zone - a broadacre zone	-
8	Zone F	land (other than land in the city centre, town centres and group centres) in— - a commercial CZ5 zone - a TSZ2 services zone - a community facility zone - a leisure and accommodation zone	land in the Queanbeyan city special uses zone
9	Zone G	all other land, other than land in the Central National Area (Fairbairn)	all other NSW land

Table 4.2 Table 2.2 from the Environment Protection Regulations 2005

Column 1 Item	Column 2 Noise zone	Column 3 Noise standard (L ₁₀ dB(A)) Monday–Saturday 7 am–10 pm Sunday and public holiday 8 am–10 pm	Column 4 Noise standard (L ₁₀ dB(A)) Monday–Saturday 10 pm–7 am Sunday and public holiday 10 pm–8 am
1	Zone A	65	55
2	Zone B ¹	60	50
3	Zone C ²	55	45
4	Zone D	50	35
5	Zone E	50	40
6	Zone F	same as the noise standard for the adjoining noise zone with the loudest noise standard for the time period	
7	Zone G	45	35

Notes:

¹ Zone B1 Column 3 time: Monday–Thursday 7 am–10 pm, Friday and Saturday 7 am–12 am and Sunday and public holiday 8 am–10 pm.

² Zone C1 Column 3 time: Monday–Thursday 7 am–10 pm, Friday and Saturday 7 am–11 pm and Sunday and public holiday 8 am–10 pm.

4.1.1 ACT Construction Noise

The EPR and the site-specific noise standards determined in **Table 4.2** apply to both operational noise and construction noise. However, in accordance with Division 3.2 Section 29 of the EPR, exemptions for construction noise apply if certain conditions are met by the Proposal.

The exemption clauses are outlined in Table 2.3 of the EPR and are presented in **Table 4.3** along with their applicability to the Proposal. If the conditions are met when carrying out the relevant activities, the associated noise is exempt from meeting the noise standards.

For out-of-hours work, of which there are none proposed at this stage, the noise zone standards outlined in **Table 4.2** are required to be achieved.

Table 4.3 Noise Exemptions (Table 2.3 of EPR)

Column 1 Item	Column 2 Noise	Column 3 Conditions	Project Applicability
21	Noise emitted in the course of development ¹	the noise is emitted from a place other than a place in noise zone A or B;	Applicable – Project located on a place in noise zone G.
		the building work or development will not be finished within 2 weeks after the day it started;	Applicable – Construction timeframe of over 18 months.
		all relevant noise reduction measures mentioned in AS 2436, as in force from time to time, are implemented;	Applicable – all relevant noise reduction measures from AS 2436 will be implemented (see Section 6.3).
		the noise is emitted between 7 am and 6 pm on Monday to Saturday, excluding public holidays	Applicable – proposed construction hours are 8 am to 6 pm weekdays and 8 am to 1 pm on Saturdays (see Section 6.1.1).

Note: ¹ In accordance with the ACT Territory Plan, as a major service conduit the definitions of 'development' matches the definition of Major utility installation.

4.1.2 ACT Site Specific Criteria

This assessment has utilised the EPR noise zones and noise standards presented in **Table 4.1** and **Table 4.2**. The noise standard is typically applied at the boundary of the development site, ACT receivers and NCAs are in Zone E, F or G and the corresponding noise standards are shown in **Table 4.4**. In assessing the noise impact at sensitive receivers, the EPR describes the compliance point as any point as near as practicable to the property boundary. While the noise standard does not technically apply at the residence or dwelling (represented by receivers with numbers and letters in this assessment) these levels have been presented for information purposes since some of the boundary positions are on the powerline easements and are therefore very close to some construction sources. Reporting predictions at dwellings aids in the understanding of the potential impact of the construction stages modelled.

Table 4.4 Applicable Noise Standards

Receiver ID	ACT Territory Plan Noise Zone	Noise Standard, LA10(10 minute) ¹ dB(A)	
		Day ²	Night ³
R01_BoundaryS	Zone G	45	35
R01a	Zone G	45	35
R02_BoundaryN	Zone G	45	35
R02a	Zone G	45	35
R02b	Zone G	45	35
R03_BoundaryN	Zone G	45	35
R03_BoundarySW	Zone G	45	35
R03a	Zone G	45	35
R03b	Zone G	45	35
R04_BoundaryN	Zone G	45	35
R04a	Zone G	45	35
R05_BoundarySE	Zone E	50	40
R05a	Zone E	50	40

Receiver ID	ACT Territory Plan Noise Zone	Noise Standard, LA10(10 minute) ¹ dB(A)	
		Day ²	Night ³
R05b	Zone E	50	40
R06_BoundarySW	Zone G	45	35
R06a	Zone G	45	35
R07_BoundaryE	Zone F	45	35
R07_Boundary_W	Zone F	45	35
R07a	Zone F	45	35
R07b	Zone F	45	35
R07c	Zone F	45	35
R08_BoundaryW	Zone G	45	35
R08a	Zone G	45	35
R08b	Zone G	45	35
R08c	Zone G	45	35
R09_BoundaryW	Zone E	50	40
R09	Zone E	50	40
R10_BoundaryW	Zone E	50	40
R10	Zone E	50	40
R11	Zone F	45	35
R12a	Zone F	45	35
R12b	Zone F	45	35
R13	Zone F	45	35
R14	Zone F	45	35
R15	Zone F	45	35
R16_Boundary	Zone G	45	35
R16a	Zone G	45	35
R16b	Zone G	45	35
R16c	Zone G	45	35
R17_Boundary	Zone G	45	35
R17a	Zone G	45	35
R17b	Zone G	45	35
R17c	Zone G	45	35
R17d	Zone G	45	35
R17e	Zone G	45	35
R18_Boundary	Zone G	45	35
R18a	Zone G	45	35
R18b	Zone F	45	35
R18c	Zone G	45	35
NCA1_North	Zone G	45	35
NCA1_Centre	Zone G	45	35
NCA1_East	Zone G	45	35

Receiver ID	ACT Territory Plan Noise Zone	Noise Standard, LA10(10 minute) ¹ dB(A)	
		Day ²	Night ³
NCA2_East	Zone G	45	35
NCA2_Centre	Zone G	45	35
NCA2_West	Zone G	45	35
NCA3_North	Zone G	45	35
NCA3_South	Zone G	45	35
NCA4_North	Zone G	45	35
NCA4_South	Zone G	45	35
NCA5	Zone F	45	35

Notes: ¹ The ACT Noise Measurement Manual, 2009 recommends a period between 5 to 15 minutes, with a 10 minute measurement period deemed appropriate for a time-varying sound source.

² Day: Monday-Saturday 7 am–10 pm and Sunday and public holiday 8 am–10 pm.

³ Night: Any other time.

The EPR does not specify criteria for high level, short duration noise events. NSW maximum noise event levels have been adopted for ACT receivers in this assessment, as outlined in **Section 4.2.2.5**.

4.1.3 ACT Modifying Factor Corrections

Where a noise source contains certain characteristics such as tonality, impulsiveness, intermittency, irregularity or dominant low-frequency content, modifying factors corrections are applied to account for the greater annoyance that the sources may cause.

The ACT NMM prescribes specific modifying factors that should be considered in the assessment of the relevant noise events. These are presented in **Table 4.5**.

Table 4.5 Modifying Factor Corrections

Factor	Assessment/measurement	When to apply	Correction ¹
Tonal noise	One third octave or narrow band analysis	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: • 5 dB or more if the centre frequency of the band containing the tone is above 400 Hz. • 8 dB or more if the centre frequency of the band containing the tone is 160 to 400 Hz inclusive. • 15 dB or more if the centre frequency of the band containing the tone is below 160 Hz.	5 dB ²
Low-frequency noise	Measurement of C-weighted and A-weighted level	Measure to assess C- and A-weighted levels over same time period. Correction to be applied if the difference between the two levels is 15 dB or more.	5 dB ²
Impulsive noise	A-weighted fast response and impulse response	If a difference in A-weighted maximum noise levels between fast response and impulse response is greater than 2 dB.	Apply difference in measured levels as the correction, up to a maximum of 5 dB

Factor	Assessment/ measurement	When to apply	Correction ¹
Intermittent noise	Subjectively assessed	Level varies by more than 5 dB.	5 dB ³
Duration	Single-event noise duration may range from 1.5min to 2.5hr	One event in any 24-hour period.	0 to -20 dB

Notes:

¹ Where two or more modifying factors are present, the maximum correction is limited to 10 dB.

² Where a source emits noise which has both tonal and low-frequency components, only one 5 dB correction should be applied.

³ Adjustment to be applied for one event in night time only.

4.2 NSW Noise Criteria

4.2.1 NSW Construction Noise Management Levels

Assessment levels for noise from construction activities, excluding noise from construction-related traffic on public roads, are defined in the Department of Environment and Climate Change ICNG, 2009.

Table 4.6 presents the ICNG construction Noise Management Levels (NMLs) for NSW receivers near the Proposal Area. The assessment levels are intended to guide the need for and the selection of feasible and reasonable work practices to minimise construction noise impacts.

Table 4.6 ICNG Construction Noise Management Levels, dB(A)

Land use	Construction time	Noise Management Level LAeq(15 min)
Residential	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(A)
		Highly noise affected: 75 dB(A)
	Outside recommended standard hours	Noise affected: RBL + 5 dB(A)

Note: ¹ All construction work for the Proposal is proposed to be carried out during standard construction hours (Monday to Friday 7.00 am–6.00 pm; Saturday 8.00 am–1.00 pm). Outside standard hours construction NMLs are provided for information only.

The construction Noise Management Levels for NSW receivers are summarised in **Table 4.7** based on the adopted RBLs presented in **Table 3.1**.

Table 4.7 NSW Construction Noise Management Levels

Receiver Area	Noise Management levels (NML), dB(A)	
	Standard hours of Construction ¹	Highly Noise Affected
	LAeq(15 minute)	LAeq(15 minute)
All NSW rural/residential receivers	45	75

Note: ¹ Recommended standard hours: Monday to Friday 7.00 am–6.00 pm; Saturday 8.00 am–1.00 pm.

4.2.2 NSW Operational Noise Criteria

Potential operational noise impacts of the Proposal have been assessed against the NPfI, as it is the

applicable NSW guideline for the assessment of industrial noise, which includes noise from utilities. The existing environment for NSW receivers is discussed in **Section 3.1.2**. The NPfI sets out two noise criteria to assess potential noise impacts resulting from the Proposal. The first criterion derived by the procedures outlined in the NPfI is used to control the intrusive noise from a noise source and its impacts on receivers whilst the second criterion is used to protect against cumulative noise impacts and maintain noise level amenity for particular land uses including residences. Applying the more stringent of the two as the project noise trigger level ensures that intrusive noise is limited and amenity is protected and that no single noise producing activity can unacceptably change the noise level of an area.

The Project Noise Trigger Levels (PNTLs) derived in accordance with the NPfI provide a benchmark or objective for assessing a proposal or site. They are not intended for use as a mandatory requirement. The PNTL is a level that, if exceeded, would indicate a potential noise impact on the community, and so 'trigger' a management response, for example, further investigation of mitigation measures.

The PNTL, feasible and reasonable mitigation, and consideration of residual noise impacts are used together to assess noise impact and manage the noise from a proposal or site.

The PNTL is the lower (that is, the more stringent) value of the Project Intrusiveness Noise Level (PINL) and Project Amenity Noise Level (PANL) determined in the NPfI Sections 2.3 and 2.4. Neither the intrusiveness noise levels nor the amenity noise levels are used directly as regulatory noise limits.

4.2.2.1 Project Intrusiveness Noise Level

The Project Intrusiveness Noise Level (PINL) (LAeq(15 minute)) is defined as the rating background noise level (RBL) + 5 dB. The RBL is determined by measurement of the long-term background noise level LA90 and calculated in accordance with the NPfI Fact Sheets A and B.

The NPfI (Table 2.1) provides minimum assumed RBLs which may be used in lieu of long-term background noise monitoring results. The minimum assumed RBLs and PINLs are shown in **Table 4.8**.

Table 4.8 Minimum Assumed RBLs and PINLs (NPfI Table 2.1)

Time of day ¹	Minimum assumed RBL dB(A)	Minimum PINL LAeq,15 minute dB(A)
Day period	35	40
Evening period	30	35
Night period	30	35

Note: ¹ Day period is 7.00 am–6.00 pm Monday–Saturday and 8.00 am–6.00 pm Sunday and public holidays, evening period is 6.00 pm–10.00 pm and night period is 10.00 pm to commencement of day period.

4.2.2.2 Project Amenity Noise Level

The Project Amenity Noise Level (PANL) (LAeq(period)) at receivers are defined as the recommended amenity noise levels in NPfI Table 2.2 minus 5 dB(A). For derivation of the PTNLs, the PANLs LAeq(period) are converted to LAeq(15 minute) by the addition of 3 dB(A). The PANL at a receiver depends on the type of receiver and the noise amenity area of each receiver.

The residential receivers surrounding the Proposal are primarily zoned RU1 Primary Production which is typical of a rural environment. With reference to Table 2.3 of the NPfI, all residential receivers potentially affected by the Proposal have been assigned a Rural Residential amenity.

The project amenity noise levels for all receivers surrounding the Proposal Area are shown in **Table 4.9**.

Table 4.9 NPfI Derived Project Amenity Noise Levels, dB(A)

Receiver / land use category	Time of day ¹	Recommended amenity noise level LAeq(period)	Project amenity noise level LAeq(period)	Project amenity noise level LAeq(15 min)
All NSW residential receivers: Rural Residential	Day	50	45	48
	Evening	45	40	43
	Night	40	35	38

Notes: ¹ Day period is 7.00 am-6.00 pm Monday-Saturday and 8.00 am-6.00 pm Sunday and public holidays, evening period is 6.00 pm-10.00 pm and night period is 10.00 pm to commencement of day period.

4.2.2.3 Project Noise Trigger Level

The PNTLs are defined as the lower (that is, the more stringent) of the PINL and the PANL in terms of LAeq(15 minute) noise levels. The PNTLs for each NCA are shown in **Table 4.10**.

Table 4.10 Project Noise Trigger Levels – Residential Receivers, LAeq(15 minute), dB(A)

Receiver / land use category	Time of day ¹	PINL	PANL	PNTL
All NSW residential receivers: Rural Residential	Day	40	48	40
	Evening	35	43	35
	Night	35	38	35

Notes: ¹ Day period is 7.00 am-6.00 pm Monday-Saturday and 8.00 am-6.00 pm Sunday and public holidays, evening period is 6.00 pm-10.00 pm and night period is 10.00 pm to commencement of day period.

4.2.2.4 Correction Factors

Where a noise source contains characteristics, such as tonality, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. Conversely, some noise sources may cause less annoyance where only a single event occurs for a limited duration.

Fact Sheet C of the NPfI outlines how correction factors should be applied to source noise levels at the receiver before comparison with the respective project noise trigger levels. These correction factors account for the additional annoyance caused by the factors that modify the noise.

Operational noise sources associated with the Proposal are not expected to generate low frequency, tonal or intermittent noise, as defined in the NPfI.

4.2.2.5 Maximum Noise Event Assessment Levels (Sleep Disturbance)

The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. According to the NPfI, where the development's night-time noise levels at a residential location exceed:

- $L_{Aeq,15minute}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater; and/or
- L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater.

a detailed maximum noise level event assessment should be undertaken. A detailed assessment considered the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period. This is discussed further in **Section 7.0** in relation to the assessment of corona noise.

The sleep disturbance assessment levels for each defined receiver are provided in **Table 4.11**. This level has been adopted for all receivers in the assessment of operational noise.

Table 4.11 Sleep Disturbance Assessment Levels - Residential Receivers, $L_{Aeq,15minute}$ and L_{AFmax} dB(A)

Receivers	Night-time Period (10:00 pm–7:00 am)	
	Assessment Level $L_{Aeq,15minute}$	Assessment Level L_{AFmax}
Residential or rural receivers	40 ¹	52 ²

Notes: ¹ As per NPfI Section 2.5, minimum sleep disturbance assessment level is the greater of $L_{Aeq,15minute}$ 40 dB(A) or RBL + 5 dB. In this case RBL + 5 lower than 40 dB.

² As per NPfI Section 2.5, minimum sleep disturbance assessment level is the greater of L_{AFmax} 52 dB(A) or RBL + 15 dB. In this case RBL + 15 lower than 52 dB.

4.2.2.6 Cumulative Operational Noise Criteria

As specified in the NPfI, the recommended amenity noise levels represent the objective for total industrial noise at a receiver location, whereas PANL represents the objective for noise from a single industrial development at a receiver location. For this Proposal, by adopting a PANL that is 5 dB below the recommended amenity noise level, ensures that industrial noise levels from up to three or four industrial noise sources (as in the case for this Proposal) remain within the recommended amenity noise level for an area.

Further, Section 2.4 of the NPfI states:

Where the project amenity noise level applies and it can be met, no additional consideration of cumulative industrial noise is required.

While it is unlikely to be an issue within NSW, predicted compliance with the established PANL will be used to address cumulative noise in accordance with the NPfI. For clarity, the cumulative noise limits are specified below in **Table 4.12**. It is also noted that the EPR does not specify cumulative noise criteria. As a result, the levels in **Table 4.12** have been adopted for both NSW and ACT receivers.

Table 4.12 Cumulative noise criteria – LAeq(15min), dB(A)

NSW receivers	Period ¹	PANL or Cumulative noise criteria
All Rural Residential receivers	Day	48
	Evening	43
	Night	38

Notes: ¹ Day period is 7.00 am–6.00 pm Monday-Saturday and 8.00 am–6.00 pm Sunday and public holidays, evening period is 6.00 pm–10.00 pm and night period is 10.00 pm to commencement of day period.

4.3 Road Traffic Noise Criteria

An assessment of potential noise levels from Proposal-related traffic is required. Egis prepared *Traffic Impact Memorandum – Stage 1A Strathnairn Transmission Line Realignment Project*, dated 2023 (TIA), specifies that Pro Hart Avenue, Stockdill Drive, Parkwood Road, Uriarra Road, and Fairlight Road are assumed to be directly impacted by construction traffic.

4.3.1 ACT Road Traffic Noise

In the ACT, the Roads ACT NMG 2018 sets out a framework for assessing the impact of road traffic noise for land uses sensitive to noise intrusion.

The NMG provides road traffic noise planning guideline levels for new developments based on the land/building usage. For the purpose of assessing noise, roads in the Proposal Area are classified as ‘Existing roads in existing areas’ and the applicable noise planning guidelines are:

External noise levels for noise sensitive residential developments (based on existing conditions at the receiver):

- 60 dBA daytime Leq, 15-hour. from 7am to 10pm (1 metre from façade).
- 55 dBA Leq, 9-hour from 10pm to 7am (1 metre from façade).

Additionally, guidance within the NSW Road Noise Policy (RNP) 2011 has been used to undertake a screening assessment to determine potential road noise impacts. The EPA publication *Applying the NSW Road Noise Policy* states:

“...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 dB above that of the noise level without the development. This limit applies wherever the noise level without the development is within 2 dB of, or exceeds, the relevant day or night noise assessment criterion.”

In assessing noise impact, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

4.3.2 NSW Road Traffic Noise

Construction and operational road traffic routes for the Proposal Area are predominantly located in the ACT. A small portion of the traffic route, along Fairlight Road, extends into NSW land but the nearest NSW Receiver (R47) is located approximately 1 km away. Given the large separation distance and expectation that traffic will originate from Canberra, potential traffic noise impact on NSW receivers is anticipated to be negligible and has not been assessed further in this report.

4.4 Vibration Criteria

4.4.1 Vibration Effects on Structures

Criteria for vibration effects on building structures recommended in the NSW DEC Vibration Guideline are based on British Standard *BS7385 (1993) Part 2 Evaluation and measurement of vibration in buildings* (BS7385). The criteria in BS7385 are given in terms of peak component (x-, y- or z-axes separately) vibration velocity values from transient (impulsive) vibration events. The criteria for continuous vibration are recommended to be 50% lower than for impulsive vibration. The vibration criteria for the protection of structures and buildings from cosmetic damage (e.g. hairline cracks in drywalls) are given in **Table 4.13**.

Table 4.13 BS7385 Vibration Criteria for Cosmetic Damage to Structures

Type of Structure	Peak Component Particle Velocity (mm/s)		
	4 Hz–15 Hz	15 Hz–40 Hz	40 Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50 (transient (impulsive) vibration) 25 (continuous vibration)		
Un-reinforced or light framed structures Residential or light commercial type buildings	15–20 (transient vibration) 7.5–10 (continuous vibration)	20–50 (transient vibration) 10–25 (continuous vibration)	50 (transient vibration) 25 (continuous vibration)

4.4.2 Heritage Structures

Assessment guidelines for vibration damage to heritage-protected structures are commonly referenced from the German Institute for Standardisation DIN4150. This standard differentiates between short-term and long-term vibration. Short-term vibration is caused by sources such as drop-hammers and impact piling, and all other sources of vibration are considered to be long-term.

The guideline value for heritage-protected structures for short-term and long-term vibration is respectively 3 mm/s peak partial velocity (PPV) and 2.5 mm/s PPV in the horizontal plane at all frequencies. This guideline value is primarily intended for older, sensitive, above-ground structures (typically buildings).

In regard to heritage buildings, *BS7385 Part 2 (1993)* notes that a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive.

4.4.3 Human Perception of Vibration

Criteria for the human perception of vibration from construction activities are given in the Vibration Guideline. The criteria in the Vibration Guideline are given for continuous vibration, impulsive vibration and for intermittent vibration. For continuous and impulsive vibration, the criteria are given in terms of root-mean-square (rms) vibration acceleration (m/s^2) in the frequency range 1–80 Hertz (Hz). For intermittent vibration, the criteria are given in terms of vibration dose value (VDV), which is a parameter used for assessing the combined magnitude and the total duration of vibration impacts.

The criteria given in the Vibration Guideline for continuous or impulsive vibration relevant to the receivers in the area are provided in **Table 4.14**. The frequency weightings can be found in Appendix B3 of the Vibration Guideline.

Table 4.14 Vibration Guideline Values for Continuous and Impulsive Vibration for Human Comfort

Location	Assessment Period ¹	Weighted vibration acceleration (m/s ² at 1-80 Hz)			
		Preferred values		Maximum values	
		z-axis	x- and y-axes	z-axis	x- and y-axes
Continuous vibration					
Residences	Day	0.010	0.0071	0.020	0.014
	Night	0.007	0.005	0.014	0.010
Impulsive vibration					
Residences	Day	0.30	0.21	0.60	0.42
	Night	0.10	0.071	0.20	0.14

Note: ¹ Day time period is 7.00 am–10.00 pm. Night period is 10.00 pm–7.00 am.

The criteria for intermittent vibration given in the Vibration Guideline for the relevant receivers near the Proposal Area are shown in **Table 4.15**. The vibration dose value (VDV) is calculated using the frequency-weighted rms acceleration as described in the Vibration Guideline.

Table 4.15 Vibration Guideline Acceptable Vibration Dose Values for Intermittent Vibration for Human Comfort (VDV $\text{m/s}^{1.75}$)

Location	Daytime period ¹		Night-time period ¹	
	Preferred value	Maximum value	Preferred value	Maximum value
Residences	0.20	0.40	0.13	0.26

Notes: ¹ Day time period is 7.00 am–10.00 pm. Night period is 10.00 pm–7.00 am.

According to the Vibration Guideline, the ‘preferred’ vibration limits are not mandatory but should be sought to be achieved through reasonable mitigation measures. Where all possible and reasonable measures have been applied, values up to the ‘maximum’ value may be used if they can be justified. For values beyond the maximum value, direct negotiation with the affected receivers must be carried out.

5.0 Modelling Methodology

Prediction of the construction, demolition and operational noise levels in this NVIA was undertaken with the proprietary computer noise modelling software CadnaA (Version 2023 MR 2), using the CONCAWE noise prediction algorithms. Default worst-case noise-enhancing meteorological conditions (downwind in all directions) have been utilised for the assessment as follows:

- Atmospheric stability class 'D', wind speed 3 m/s for daytime construction scenarios.
- Atmospheric stability class 'F', wind speed 2 m/s for night time operational noise.

The CadnaA software is approved for use by the NSW Department of Planning, Industry and Environment (DPIE) and both the NSW and ACT Environmental Protection Authority (EPA). The software utilises terrain data, source and receptor locations and heights, source sound power levels (in octave or 1/3 octave frequency bands) and input meteorological conditions to predict noise levels. The CONCAWE prediction method accounts for the influence of noise propagation from atmospheric temperature, atmospheric relative humidity, wind speed, wind direction and Atmospheric Pasquil Stability Class (for defining the presence and strength of temperature inversions).

The noise prediction model considers:

- Location and separation distance between noise sources and sensitive receiver locations. Source locations used are based on the indicative layout provided in **Figure 1.2** and receiver locations described and shown in **Section 3.0**.
- A receiver height of 1.5 m above ground level, referenced to 3-dimensional digital ground contours with a 5 m contour interval.
- Source heights were set according to the source item, referenced to 3-dimensional digital ground contours with a 5 m contour interval.
- Ground type and reflections between sources and receivers. A ground absorption factor for soft ground (absorption factor of 1.0) has been applied in the models.
- Geometric spreading and air absorption.
- Attenuation from earth bunds, buildings and structures (natural terrain and purpose built) where present.
- Construction noise scenarios which include the number and type of machines proposed to be used in different stages (refer to **Section 6.1.3**).
- The noise source levels of individual plant and equipment (refer to **Section 6.1.3** and **Section 7.1**).

Atmospheric losses and the meteorological conditions (refer to **Section 5.0** and **Section 7.1**).

6.0 Construction and Demolition Noise and Vibration Assessment

6.1 Construction and Demolition Noise

Construction noise levels have been predicted for the four indicative construction/demolition scenarios described further in **Section 6.1.4**, and include:

1. Scenario 1 (Sc.1) – Access works (construction of new access tracks around the new alignments).
2. Scenario 2 (Sc.2) – Construction of new tower footings (Line 1 and 7).
3. Scenario 3 (Sc.3) – Conductor stringing lines (Lines 1, 7 and 3C).
4. Scenario 4 (Sc.4) – Destraining and demolition (Lines 1 and 7).

Scenario details including equipment to be used was supplied by the client. Typical sound powers for each plant item were sourced from the NSW Roads and Maritime's *Construction and Maintenance Noise Estimator Tool* supplemented with data from Umwelt's technical database and verified by the client.

The predictions are conservative and assume all equipment associated with each scenario is operating simultaneously and as described in the following sections. A receiver would experience a range of noise levels throughout the construction period, depending upon the number of plant items operating at any one time and their precise location on site. The results therefore represent an expected worst-case noise level from each scenario, which may only occur rarely or perhaps not even at all.

A summary of results for each construction scenario for the identified receivers are presented in the following sections. Due to the large size of the Proposal Area and large number of receivers in this assessment, only predicted results over 35 dB(A) are presented in the main body of this report. All construction results for all receivers are presented in **Appendix A**.

6.1.1 Construction and Demolition Hours

Construction activities are proposed to be undertaken during standard construction hours specified in the EPR and ICNG. The proposed construction hours are as follows:

- Monday to Friday: 8.00 am–6.00 pm.
- Saturday: 8.00 am–1.00 pm.
- Sunday and public holidays: No work.

6.1.2 Construction and Demolition Stages and Timing

Construction for the Proposal is intended to occur from November 2024 until May 2026, with demolition of the existing lines to occur following on from that from November 2026 until August 2026.

Mobilisation to site and civil works would be undertaken first, involving established of construction laydown areas and access tracks for the new alignments. Stringing of Line 3C would then occur (within an already approved Transgrid transmission line easement), followed by the installation of new tower footings along the new Line 1 and 7 alignments then stringing of the new lines. Once the new transmission lines have been connected to the transmission network and are operational, deststringing and demolition of existing Lines 1 and 7 would occur.

There is not expected to be a significant overlap in construction activities in terms of noise impacts at receivers due to the staging of the works. The preliminary assessment of the construction activities indicates some construction stages may overlap, however these will be in different areas of the Proposal Area in the sequencing of works for practical reasons which will also minimise impacts on receivers. Noise levels have been predicted for each stage individually as receivers are likely to be most affected by only one scenario at a time.

6.1.3 Construction and Demolition Equipment and Noise Levels

The typical construction activities (Scenarios 1 to 4), equipment and respective sound power levels (SWLs) of equipment are outlined in **Table 6.1**. Typical sound power levels have been sourced from the *Roads and Maritime Construction Noise Estimator Tool* and Umwelt's noise source library. Where more than one type of equipment has been included in the scenario, the number of units is indicated in parenthesis.

Table 6.1 Indicative Construction Scenarios, Equipment and Sound Power Levels

Construction Stages / Scenarios	Activity description	Equipment	Sound Power Levels dB(A)/ unit	Combined Sound Power Level dB(A)
Sc.1	Access works	4 x 4 Ute (4)	103	118
		Posi track (2)	110	
		Excavator 5 t (2)	106	
		Truck and dog	108	
		Grader	113	
Sc.2	Tower footing construction	4 x 4 Ute (6)	103	126
		Drill rig 45 t	124	
		Excavator 20 t with hydraulic hammer	122	
		Truck trailer	108	
		Excavator 3 t	106	
		Agi truck	109	
Sc.3	Stringing Line 1, 7 and 3C	4 x 4 Ute (7)	103	113
		Franna	98	
		EWP 50 m (2)	98	

Construction Stages / Scenarios	Activity description	Equipment	Sound Power Levels dB(A)/ unit	Combined Sound Power Level dB(A)
		Truck with Hiab 10 t	108	
Sc.4	Destringing and demolition	4 x 4 Ute (3)	103	125
		Posi track	110	
		Excavator 20 t with hydraulic hammer (2)	122	
		Truck and dog	108	

Equipment listed is expected to generate relatively continuous noise levels while in use, therefore penalties applied to results for annoying characteristics such as tonality and impulsiveness have been considered unnecessary for construction noise scenarios. Scenarios 2 and 4 which involve the use of an excavator with a hydraulic hammer have incorporated a higher sound power to account for the impulsiveness character of this source.

6.1.4 Construction Noise Predictions

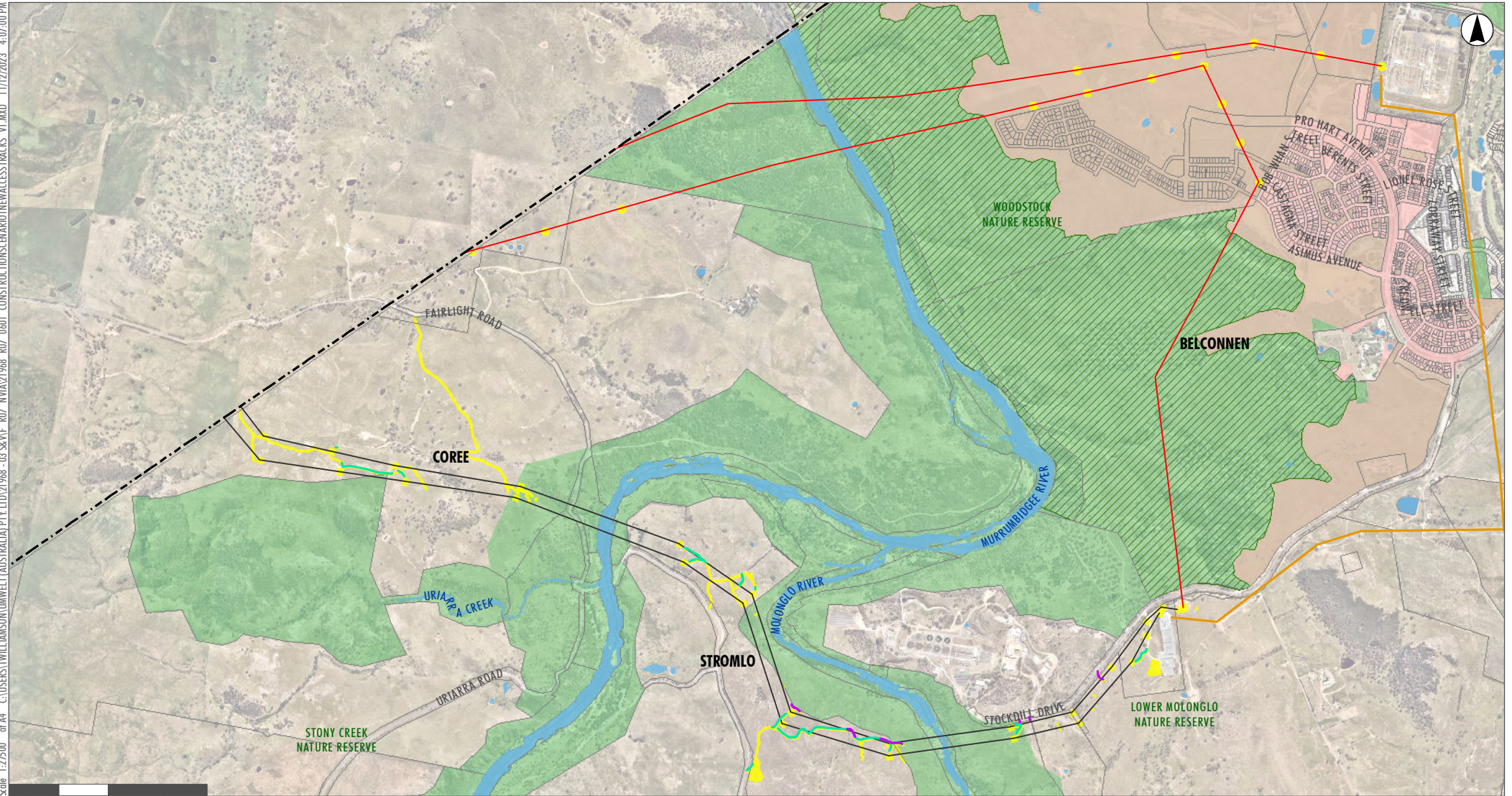
6.1.4.1 Scenario 1 – Access works

Scenario 1 involves the construction of access tracks located as shown in **Figure 6.1**. A line source with the total sound power of 118 dB(A) was modelled moving along each individual access track and the highest predicted noise level at each receiver (for all possible access tracks) was reported as the result. The model assumes that construction works along the access tracks will be undertaken progressively, so the result presented is the worst case result from construction impacts along any track.

Predicted results for Scenario 1 are presented in **Table 6.2** for ACT receivers. Exceedances of the Noise Standard at boundary positions are shown in bold.

Table 6.3 presents noise predictions for NSW receivers for Scenario 1.

Results for all receivers for construction Scenario 1 are presented in **Appendix A**.



Legend

- | | | |
|---|--|---|
| Construction Footprint | Access Tracks - No Sediment Control | Nature Reserves |
| New Transmission Lines | Property Boundaries | |
| Transmission Lines to be Removed | Ginninderry Conservation Corridor | |
| Line 3C (Additional Conductor Stringing) | Ginninderry / Parkwood Development | |
| Access Tracks - Sediment Control | ACT/NSW Border | |
| | Watercourses | |

FIGURE 6.1
Construction Scenario 1 -
Location of New Access Tracks

Table 6.2 Scenario 1 ACT Predicted Construction Noise Levels, dB(A)

Receiver ID	Predicted Noise Levels (dB LA10)	ACT Noise Standard (dB LA10) (Day)
	Sc. 1	
R01_BoundaryS	68	45
R01a	48	45
R02_BoundaryN	47	45
R02a	30	45
R02b	24	45
R03_BoundaryN	25	45
R03_BoundarySW	47	45
R03a	36	45
R03b	33	45
R04_BoundaryN	43	45
R04a	20	45
R05_BoundarySE	12	50
R05a	14	50
R05b	17	50
R06_BoundarySW	24	45
R06a	24	45
R07_BoundaryE	21	45
R07_Boundary_W	31	45
R07a	24	45
R07b	24	45
R07c	21	45
R08_BoundaryW	12	45
R08a	13	45
R08b	13	45
R08c	11	45
R09_BoundaryW	<10	50
R09	10	50
R10_BoundaryW	<10	50
R10	<10	50
R11	20	45
R12a	17	45
R12b	17	45
R13	17	45
R14	20	45

Receiver ID	Predicted Noise Levels (dB LA10)	ACT Noise Standard (dB LA10) (Day)
	Sc. 1	
R15	19	45
R16_Boundary	24	45
R16a	25	45
R16b	17	45
R16c	17	45
R17_Boundary	22	45
R17a	24	45
R17b	24	45
R17c	29	45
R17d	29	45
R17e	29	45
R18_Boundary	13	45
R18a	17	45
R18b	16	45
R18c	16	45
NCA1_North	32	45
NCA1_Centre	34	45
NCA1_East	34	45
NCA2_East	19	45
NCA2_Centre	27	45
NCA2_West	34	45
NCA3_North	19	45
NCA3_South	17	45
NCA4_North	14	45
NCA4_South	15	45
NCA5	21	45

Noise results at three receiver boundaries exceed the Noise Standard. Providing construction will occur during standard day time hours and the recommendations in AS 2436 are implemented, construction activities associated with the Proposal will be exempt from the Noise Standards.

Table 6.3 Scenario 1 NSW Predicted Construction Noise Levels, dB(A)

Receiver ID	Predicted Noise Levels (dB LAeq)	NSW Noise Management Level (dB LAeq) (Day)
	Sc. 1	
R19	18	45
NCA 6 (R24)	17	45
NCA 7 (R28)	14	45
NCA 8 (R34)	18	45
R36	26	45
NCA 9 (R38)	19	45
R39	23	45
R40	12	45
R41	35	45
NCA 10 (R47)	42	45
NCA 11 (R49)	40	45
NCA 12 (R55)	32	45

All predicted NSW results are within the NML for construction Scenario 1.

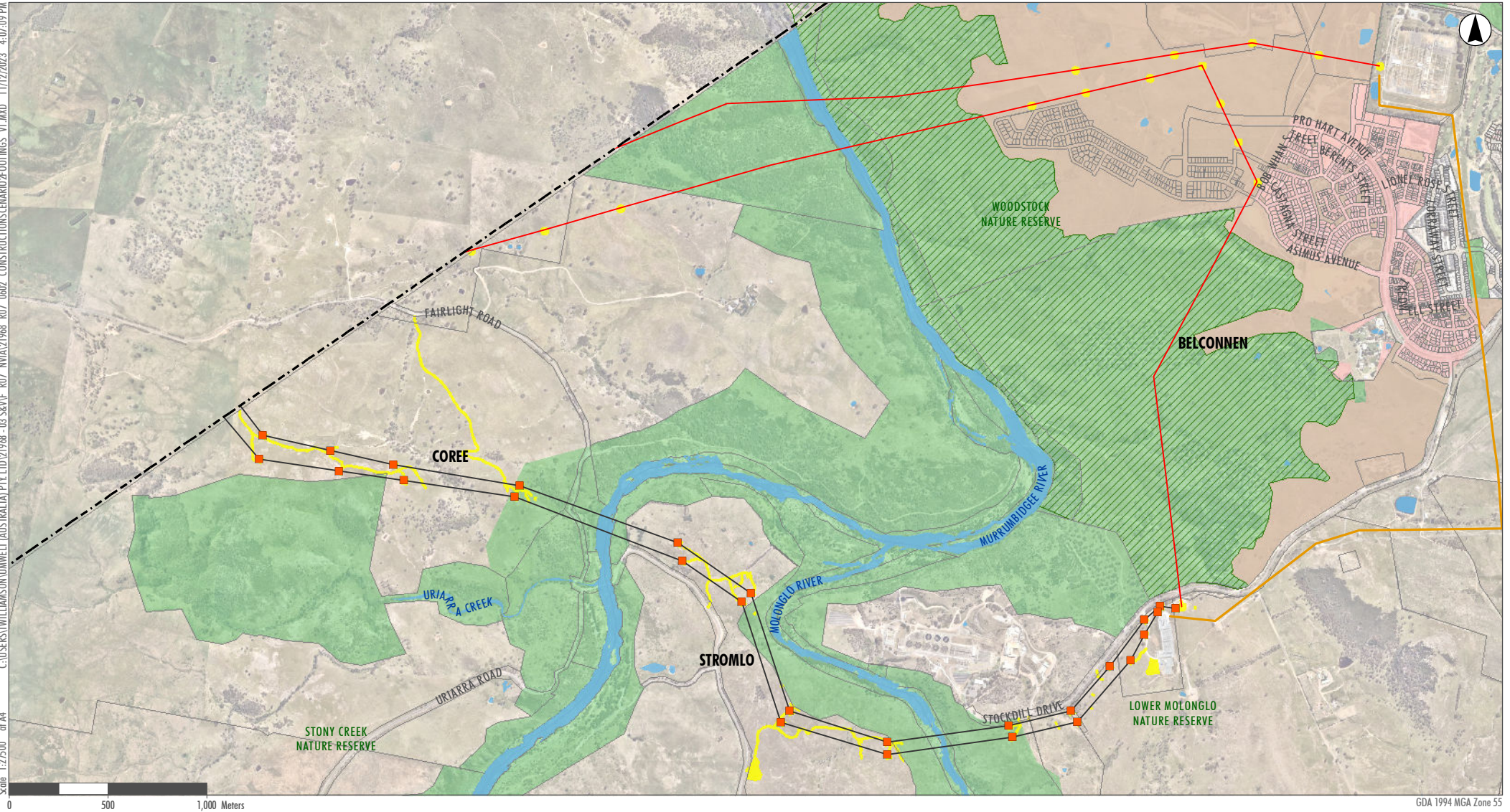
6.1.4.2 Scenario 2 – Tower footing construction

Scenario 2 involves the construction of footings for the new towers along the new Line 1 and 7 alignments as shown in **Figure 6.2**. Point sources with the total sound power of 126 dB(A) were placed in the model at each new tower location and the highest predicted noise level at each receiver (for all new tower locations) was reported as the result.

Predicted results for Scenario 2 are presented in **Table 6.4** for ACT receivers. Exceedances of the Noise Standard at boundary positions are shown in bold.

Table 6.5 presents noise predictions for NSW receivers for Scenario 2.

Results for all receivers for construction Scenario 2 are presented in **Appendix A**.



Legend

- | | | |
|---|--|--|
| Construction Footprint | Property Boundaries | Nature Reserves |
| New Transmission Lines | Ginninderry Conservation Corridor | |
| Transmission Lines to be Removed | Ginninderry / Parkwood Development | |
| Line 3C (Additional Conductor Stringing) | ACT/NSW Border | |
| New Tower Locations | Watercourses | |

FIGURE 6.2
Construction Scenario 2 -
Footings

Table 6.4 Scenario 2 ACT Predicted Construction Noise Levels, dB(A)

Receiver ID	Predicted Noise Levels (dB LA10)	ACT Noise Standard (dB LA10) (Day)
	Sc. 2	
R01_BoundaryS	76	45
R01a	57	45
R02_BoundaryN	60	45
R02a	38	45
R02b	33	45
R03_BoundaryN	38	45
R03_BoundarySW	55	45
R03a	44	45
R03b	41	45
R04_BoundaryN	53	45
R04a	28	45
R05_BoundarySE	24	50
R05a	27	50
R05b	36	50
R06_BoundarySW	45	45
R06a	44	45
R07_BoundaryE	35	45
R07_Boundary_W	47	45
R07a	39	45
R07b	35	45
R07c	34	45
R08_BoundaryW	27	45
R08a	27	45
R08b	28	45
R08c	26	45
R09_BoundaryW	20	50
R09	25	50
R10_BoundaryW	21	50
R10	18	50
R11	31	45
R12a	28	45
R12b	28	45
R13	30	45
R14	32	45

Receiver ID	Predicted Noise Levels (dB LA10)	ACT Noise Standard (dB LA10) (Day)
	Sc. 2	
R15	31	45
R16_Boundary	34	45
R16a	34	45
R16b	27	45
R16c	25	45
R17_Boundary	33	45
R17a	33	45
R17b	34	45
R17c	38	45
R17d	37	45
R17e	37	45
R18_Boundary	23	45
R18a	29	45
R18b	23	45
R18c	28	45
NCA1_North	41	45
NCA1_Centre	43	45
NCA1_East	43	45
NCA2_East	34	45
NCA2_Centre	42	45
NCA2_West	43	45
NCA3_North	34	45
NCA3_South	32	45
NCA4_North	27	45
NCA4_South	28	45
NCA5	32	45

Noise results at five receiver boundaries exceed the Noise Standard for Scenario 2. Providing construction will occur during standard day time hours and the recommendations in AS 2436 are implemented, construction activities associated with the Proposal will be exempt from the Noise Standards.

Table 6.5 Scenario 2 NSW Predicted Construction Noise Levels, dB(A)

Receiver ID	Predicted Noise Levels (dB LAeq)	NSW Noise Management Level (dB LAeq) (Day)
	Sc. 2	
R19	25	45
NCA 6 (R24)	31	45
NCA 7 (R28)	23	45
NCA 8 (R34)	26	45
R36	33	45
NCA 9 (R38)	28	45
R39	31	45
R40	20	45
R41	43	45
NCA 10 (R47)	50	45
NCA 11 (R49)	48	45
NCA 12 (R55)	41	45

The majority of predicted NSW results are within the NML for construction Scenario 2. NCAs 10 and 11 are nearest to these works and are predicted to receive level in exceedance of the NML.

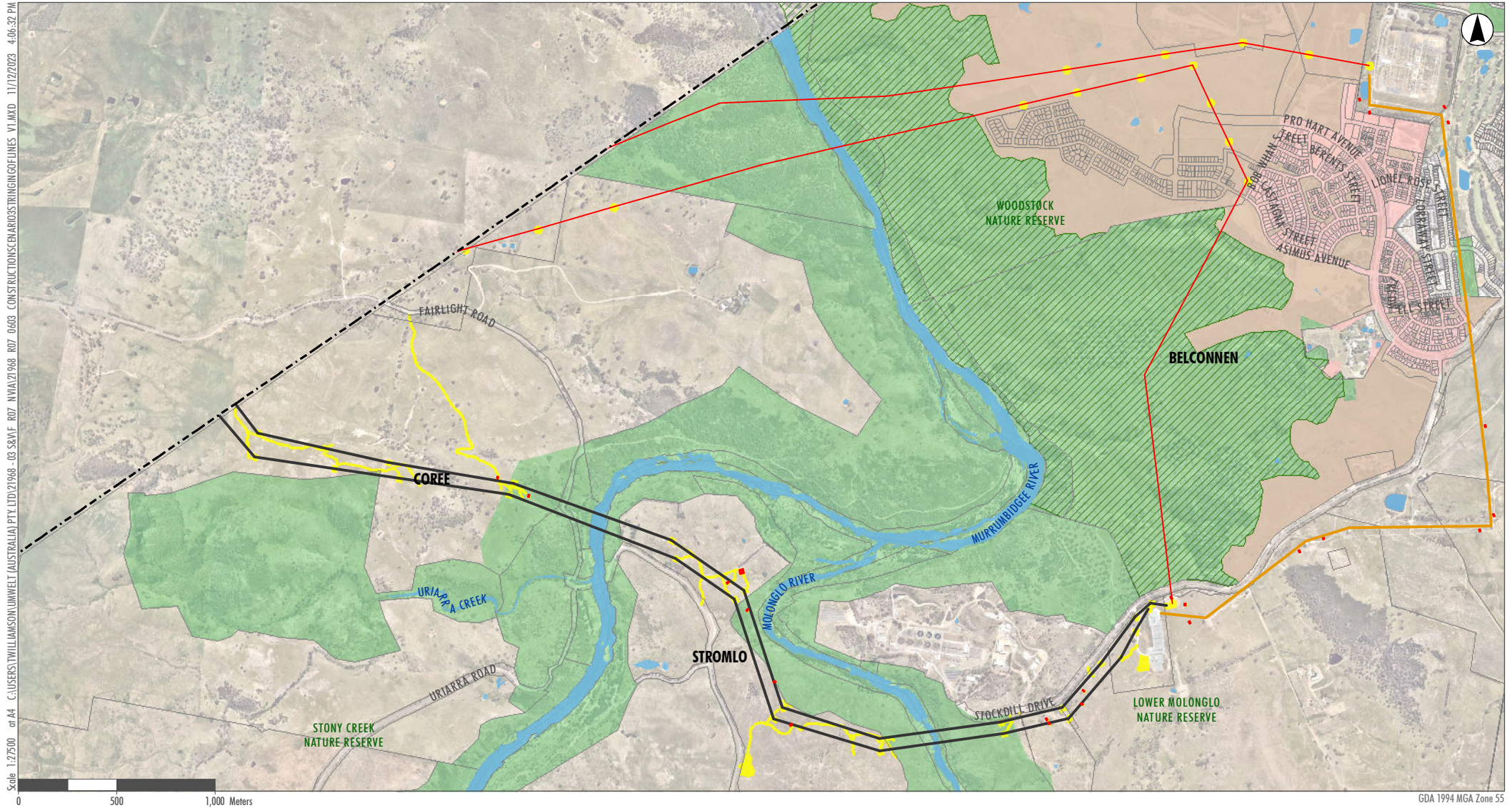
6.1.4.3 Scenario 3 – Stringing Lines 1, 7 and 3C

Scenario 3 involves the stringing of proposed Lines 1 and 7 and the additional stringing of existing Line 3C, with these locations shown in **Figure 6.3**. Point sources with the total sound power of 113 dB(A) were placed in the model at each brake and winch location for stringing activities and the highest predicted noise level at each receiver (for all brake and winch points) was reported as the result. The model assumes that stringing activities will be undertaken progressively, so the result presented is the worst case result from any brake and winch point.

Predicted results for Scenario 3 are presented in **Table 6.6** for ACT receivers. Exceedances of the Noise Standard at boundary positions are shown in bold.

Table 6.7 presents noise predictions for NSW receivers for Scenario 3.

Results for all receivers for construction Scenario 3 are presented in **Appendix A**.



Legend

- | | | |
|---|--|---|
| Construction Footprint | Property Boundaries | Nature Reserves |
| Break and Winch Pull Zones | Ginninderry Conservation Corridor | |
| New Transmission Lines (Lines 1 and 7) | Ginninderry / Parkwood Development | |
| Transmission Lines to be Removed | ACT/NSW Border | Watercourses |
| Line 3C (Additional Conductor Stringing) | | |

FIGURE 6.3
Construction Scenario 3 -
Stringing of Lines 1, 7 and 3C

Table 6.6 Scenario 3 ACT Predicted Construction Noise Levels, dB(A)

Receiver ID	Predicted Noise Levels (dB LA10)	ACT Noise Standard (dB LA10) (Day)
	Sc. 3	
R01_BoundaryS	50	45
R01a	43	45
R02_BoundaryN	42	45
R02a	24	45
R02b	20	45
R03_BoundaryN	25	45
R03_BoundarySW	27	45
R03a	28	45
R03b	28	45
R04_BoundaryN	48	45
R04a	36	45
R05_BoundarySE	52	50
R05a	44	50
R05b	44	50
R06_BoundarySW	48	45
R06a	45	45
R07_BoundaryE	33	45
R07_Boundary_W	38	45
R07a	35	45
R07b	32	45
R07c	33	45
R08_BoundaryW	46	45
R08a	37	45
R08b	42	45
R08c	49	45
R09_BoundaryW	43	50
R09	39	50
R10_BoundaryW	39	50
R10	30	50
R11	37	45
R12a	37	45
R12b	37	45
R13	37	45
R14	37	45

Receiver ID	Predicted Noise Levels (dB LA10)	ACT Noise Standard (dB LA10) (Day)
	Sc. 3	
R15	35	45
R16_Boundary	37	45
R16a	36	45
R16b	35	45
R16c	26	45
R17_Boundary	21	45
R17a	25	45
R17b	21	45
R17c	25	45
R17d	25	45
R17e	25	45
R18_Boundary	27	45
R18a	29	45
R18b	26	45
R18c	27	45
NCA1_North	28	45
NCA1_Centre	30	45
NCA1_East	32	45
NCA2_East	44	45
NCA2_Centre	37	45
NCA2_West	32	45
NCA3_North	54	45
NCA3_South	43	45
NCA4_North	37	45
NCA4_South	34	45
NCA5	38	45

Noise results at four receiver boundaries and one of the NCA boundaries exceed the Noise Standard for Scenario 3. Providing construction will occur during standard day time hours and the recommendations in AS 2436 are implemented, construction activities associated with the Proposal will be exempt from the Noise Standards.

Table 6.7 Scenario 3 NSW Predicted Construction Noise Levels, dB(A)

Receiver ID	Predicted Noise Levels (dB LAeq)	NSW Noise Management Level (dB LAeq) (Day)
	Sc. 3	
R19	25	45
NCA 6 (R24)	20	45
NCA 7 (R28)	13	45
NCA 8 (R34)	11	45
R36	18	45
NCA 9 (R38)	11	45
R39	18	45
R40	<10	45
R41	31	45
NCA 10 (R47)	36	45
NCA 11 (R49)	35	45
NCA 12 (R55)	27	45

All predicted NSW results are within the NML for construction Scenario 3.

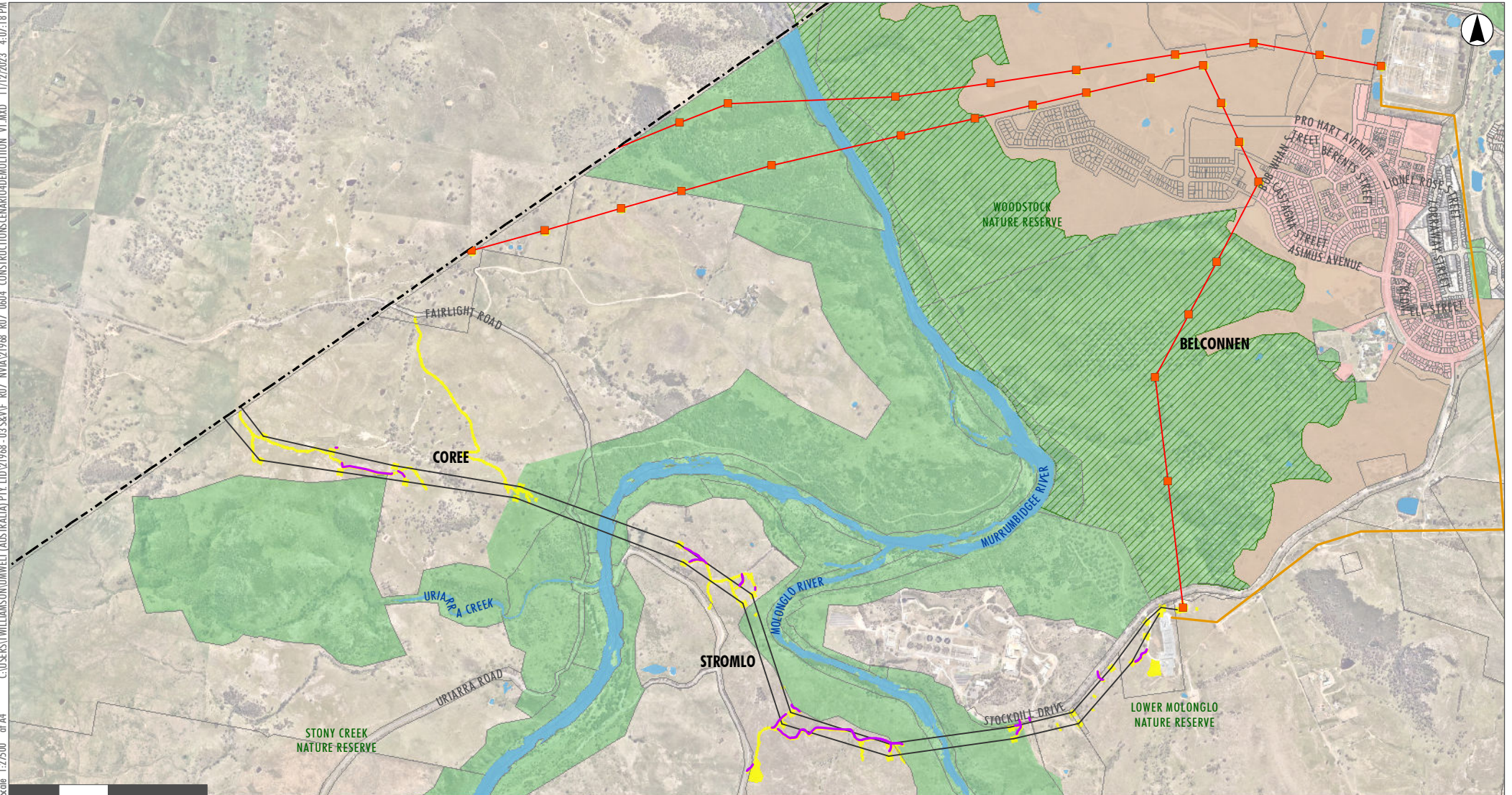
6.1.4.4 Scenario 4 – Destranging and demolition

Scenario 4 involves the destranging of existing Lines 1 and 7 and the demolition of towers and footings, with these locations shown in **Figure 6.4**. Point sources with the total sound power of 125 dB(A) were placed in the model at each brake and winch point for stringing activities and the highest predicted noise level at each receiver (for all brake and winch points) was reported as the result.

Predicted results for Scenario 4 are presented in **Table 6.8** for ACT receivers. Exceedances of the Noise Standard at boundary positions are shown in bold.

Table 6.9 presents noise predictions for NSW receivers for Scenario 4.

Results for all receivers for construction Scenario 4 are presented in **Appendix A**.



Legend

- | | | |
|---|--|--|
| Construction Footprint | ■ Towers to be Removed | Nature Reserves |
| New Transmission Lines | Property Boundaries | |
| Transmission Lines to be Removed | Ginninderry Conservation Corridor | |
| Line 3C (Additional Conductor Stringing) | Ginninderry / Parkwood Development | |
| New Access Tracks | ACT/NSW Border | |
| | Watercourses | |

FIGURE 6.4
Construction Scenario 4 -
Demolition

Table 6.8 Scenario 4 ACT Predicted Construction Noise Levels, dB(A)

Receiver ID	Predicted Noise Levels (dB LA10)	ACT Noise Standard (dB LA10) (Day)
	Sc. 4	
R01_BoundaryS	49	45
R01a	50	45
R02_BoundaryN	41	45
R02a	32	45
R02b	30	45
R03_BoundaryN	77	45
R03_BoundarySW	39	45
R03a	54	45
R03b	53	45
R04_BoundaryN	52	45
R04a	28	45
R05_BoundarySE	25	50
R05a	27	50
R05b	35	50
R06_BoundarySW	44	45
R06a	48	45
R07_BoundaryE	50	45
R07_Boundary_W	51	45
R07a	50	45
R07b	49	45
R07c	51	45
R08_BoundaryW	35	45
R08a	37	45
R08b	33	45
R08c	31	45
R09_BoundaryW	29	50
R09	31	50
R10_BoundaryW	28	50
R10	31	50
R11	52	45
R12a	52	45
R12b	51	45
R13	52	45
R14	55	45

Receiver ID	Predicted Noise Levels (dB LA10)	ACT Noise Standard (dB LA10) (Day)
	Sc. 4	
R15	49	45
R16_Boundary	83	45
R16a	53	45
R16b	46	45
R16c	39	45
R17_Boundary	54	45
R17a	57	45
R17b	56	45
R17c	55	45
R17d	54	45
R17e	54	45
R18_Boundary	40	45
R18a	42	45
R18b	39	45
R18c	40	45
NCA1_North	72	45
NCA1_Centre	57	45
NCA1_East	75	45
NCA2_East	46	45
NCA2_Centre	46	45
NCA2_West	80	45
NCA3_North	47	45
NCA3_South	46	45
NCA4_North	44	45
NCA4_South	38	45
NCA5	57	45

Noise results at seven receiver boundaries and nine of the NCA boundaries exceed the Noise Standard for Scenario 4. Providing construction will occur during standard day time hours and the recommendations in AS 2436 are implemented, construction activities associated with the Proposal will be exempt from the Noise Standards.

Table 6.9 Scenario 4 NSW Predicted Construction Noise Levels, dB(A)

Receiver ID	Predicted Noise Levels (dB LAeq)	NSW Noise Management Level (dB LAeq) (Day)
	Sc. 4	
R19	38	45
NCA 6 (R24)	33	45
NCA 7 (R28)	31	45
NCA 8 (R34)	31	45
R36	40	45
NCA 9 (R38)	38	45
R39	41	45
R40	31	45
R41	40	45
NCA 10 (R47)	48	45
NCA 11 (R49)	47	45
NCA 12 (R55)	40	45

The majority of predicted NSW results are within the NML for construction Scenario 4. NCAs 10 and 11 are nearest to these works and are predicted to receive level in exceedance of the NML.

6.2 Construction and Demolition Vibration

Many items of construction equipment generate vibration that may cause structural damage to buildings or other structures. The types of vibration-sensitive receivers in the surrounding area include:

- Residential dwellings.
- Commercial/agricultural buildings.

Any commercial/agricultural buildings in the area are assumed to be structurally similar to residential buildings, therefore the assessment for residential buildings is considered to be relevant for potential commercial/agricultural buildings as well.

Recommended safe working distances for vibration-generating equipment from sensitive receivers (i.e. the receiver building or its occupants) are given in Table 2 of the NSW CNVG (TfNSW, 2022) reproduced below in **Table 6.10**.

Table 6.10 Recommended Minimum Working Distances for Vibration Generating Plant from a Residential Sensitive Receiver (CNVG Table 2)

Plant Item	Rating/Description	Minimum Working Distance ^{1, 2}	
		Cosmetic Damage (Residential Building)	Human Response
Vibratory Roller	< 50 kN (Typically 1–2 tonnes)	5 m	15 m to 20 m
	< 100 kN (Typically 2–4 tonnes)	6 m	20 m
	< 200 kN (Typically 4–6 tonnes)	12 m	40 m
	< 300 kN (Typically 7–13 tonnes)	15 m	100 m
	> 300 kN (Typically 13–18 tonnes)	20 m	100 m
	> 300 kN (> 18 tonnes)	25 m	100 m
Small Hydraulic Hammer	300 kg – 5 to 12 t excavator	2 m	7 m
Medium Hydraulic Hammer	900 kg – 12 to 18 t excavator	7 m	23 m
Large Hydraulic Hammer	1600 kg – 18 to 34 t excavator	22 m	73 m
Vibratory Pile Driver	Sheet piles	2 m to 20 m	20 m
Pile Boring	≤ 800 mm	2 m (nominal)	4 m
Jackhammer	Handheld	1 m (nominal)	2 m

Notes: ¹ For alternative equipment with higher vibration levels, larger minimum working distances are required.

² More stringent conditions may apply to heritage or other sensitive structures.

All receiver structures and dwellings included in this assessment fall outside of the minimum working distances outlined in Table 2 of the CNVG, therefore no vibration impacts are anticipated.

6.2.1 Canberra Substation and Stockdill Substation

The Canberra Substation and Stockdill Substation (see **Figure 1.3**) may contain infrastructure and equipment that is sensitive to vibration. The susceptibility of substation infrastructure and equipment to vibration and specific vibration criterion will need to be determined on site prior to works.

For the purposes of this assessment, it has been assumed to be structurally similar to residential buildings. Canberra Substation and Stockdill Substation fall outside of the minimum working distances outlined in Table 2 of the CNVG.

6.2.2 Heritage Structures

There are no identified heritage structures within or immediately adjacent to the Proposal Area. Huntly Pastoral Property is located south of the Proposal Area with structures approximately 2 km south of the Molonglo River.

These structures are located safely outside the minimum working distance outlined in Table 2 of the CNVG for a medium sized hydraulic hammer which is proposed to be used in demolition works. Vibration levels from construction activities would be anticipated to be negligible at this setback.

6.3 Construction and Demolition Mitigation Measures

6.3.1 Noise Mitigation Measures

Australian Standard AS2436-2010 *Guide to noise and vibration control on construction, demolition and maintenance sites* provides guidance on how to identify, measure, assess and plan for noise and vibration control on such sites. Measures outlined in the guide must be implemented so that noise exemptions can be applied under the EPR. The guide also covers the preparation of noise and vibration management plans, work method statements and environmental impact studies. The guide aims to protect the health and well-being of workers and neighbours from excessive noise and vibration levels.

Some of the noise control strategies recommended by the guide are:

- Selecting low-noise equipment and methods.
- Scheduling noisy activities to minimise exposure.
- Using barriers, enclosures and mufflers to reduce noise emission.
- Implementing noise control zones and signage.
- Providing hearing protection and training for workers.
- Communicating with neighbours and authorities.
- Monitoring noise and vibration levels and compliance.
- Additionally, overlapping construction stages will be undertaken in different locations of the Proposal Area to minimise impacts on receivers. This will be required in practical terms, as construction stages such as civil works for the footings will need to be completed ahead of tower assembly / erection.

Similar mitigation measures can be found in the ICNG, which recommends that all reasonable and feasible work practices should be implemented to minimise noise impacts. This approach allows flexibility for different situations and risks.

The ICNG suggest the following work practices to minimise noise impacts:

- Identify work practices likely to be major contributors to noise.
- Select relevant reasonable and feasible work practices to be adopted. These practices include the regular training of workers, contractors and visitors, spot checks around the site to verify noise levels, avoiding the use of radios and public address systems, adhering to designated vehicle routes, regular communication with employees by way of a summary of consent conditions on a central noticeboard.

The construction and demolition noise controls to be implemented by the Proposal shall be documented in a Construction Noise and Vibration Management Plan (CNVMP) (see **Section 6.3.3**).

6.3.2 Vibration Mitigation Measures

The actual construction equipment to be used on site would be confirmed by the construction contractor during the detailed design phase of the Proposal. For any vibration-generating plant not listed in **Table 6.10**, minimum working distances would need to be established.

In the event that any vibration-generating equipment would be used within the recommended safe working distances nominated in **Table 6.10**, or in the event that undocumented heritage structures are discovered during construction, the following is recommended:

- An independent specific structural assessment is undertaken on the structure to ascertain the structural integrity and its ability to withstand vibration, and establishment of an appropriate vibration criterion. This includes the infrastructure and equipment associated with the Canberra Substation and Stockdill Substation.
- A dilapidation survey is undertaken on the structure prior to works commencing, and regular inspection of the structure throughout the construction activities.
- Establish site specific vibration minimum working distances for the nominated equipment on site.
- Where appropriate, continuous vibration monitoring is conducted on the structure for the duration of the period of construction while vibration generating equipment is used. The vibration logger should be equipped with the facility to remotely alert the site to reduce or cease construction activities if vibration levels are approaching the criterion threshold.

The construction and demolition vibration controls to be implemented by the Proposal shall be documented in a Construction Noise and Vibration Management Plan (CNVMP) (see **Section 6.3.3**).

6.3.3 Construction Noise and Vibration Management Plan

In order to comply with the ACT's EPR and the NSW ICNG, a CNVMP shall be developed for the Proposal to incorporate mitigation measures outlined in AS2436 and the ICNG, as summarised in **Section 6.3.1** and **Section 6.3.2**. This will be particularly important for minimising the impact of construction activities where it has been identified that NSW receivers may experience noise levels over 45 dB(A) in accordance with the ICNG through the implementation of reasonable and feasible measures.

Measures in the CNVMP should include scheduling the noisiest activities to occur during the least sensitive times of the day such as mid-morning and mid-afternoon, selecting machinery that produce less noise where possible and ensuring all machinery is well maintained.

7.0 Operational Noise Assessment

7.1 Operational Noise Sources

During operation of the electricity transmission network, noise emissions such as hissing or crackling noise associated with power lines can result from an effect called corona discharge, or corona effect. The intensity of the corona effect and the resulting noise is dependent on meteorological conditions such as humidity, rain, fog, wind, the concentration of airborne particles like dust or ash and the state of the conductor surface. Corona effects are more pronounced in humid or rainy conditions, as water droplets increase the conductivity of the air and lower the breakdown voltage.

Corona effects are relatively small in fair weather but can become evident during light rainfall and humid conditions as a consequence of water droplets mixing with dust on the conductor itself creating a migrating electricity leakage path. Corona effects can also become significant under electrically charged clouds.

The Bureau of Meteorology's (BOM's) statistical data from 2008 to 2023, indicates that on average Canberra Airport records approximately 71 rain days (days with recorded rain of over 1 mm) per year. While corona discharge may occur on these days, representing nearly 20% of the time, it is likely that the noise is masked by the rain itself for some of the time it is raining.

The BOM's statistical data for Canberra Airport between 1991 to 2020 indicates that relative humidity is highest at 9 am for the months of May, June and July, averaging over 80%. Humid/foggy early morning conditions in late Autumn into winter months may be the most likely time for corona noise in the Proposal Area. Stability class D and calm conditions have been used for non-enhancing conditions while stability class F and 2 m/s source to receiver meteorology conditions have been adopted as enhancing conditions to assess corona discharge in this assessment.

An indicative sound power level of 83 dB(A) has been adopted for corona discharge.

In terms of noise modelling, corona discharge is considered a point source. The client has advised that it can occur at cable joins as well as transmission tower conductors. For the purpose of this assessment the corona sound power was modelled as a point source at the tower height of 30 m along the extent of the proposed new lines with the maximum predicted noise level at each receiver presented in **Table 7.1** for ACT receivers and **Table 7.2** for NSW receivers.

While it has not been confirmed through detailed studies, anecdotal evidence suggests that corona noise more commonly occurs on newly installed powerlines and decreases over approximately three years. This is believed to be related to the time required for oil to dissipate from new cable joins, which in turn leads to less water droplets beading on the lines in humid conditions.

Community concerns relating to corona noise from the existing Line 3C were reported around 2021, more than three years prior to the planned installation of the Proposed additional lines. Based on the anecdotal evidence, corona noise from these existing lines would be expected to be significantly reduced by the time the additional lines are installed as part of the Proposal. To be conservative, an additional decibel could be added to the predicted noise levels of the Proposal to account for residual corona noise from existing powerlines (for the receivers near the Line 3C easement only) should it still be occurring when the Proposed lines are operational.

Table 7.1 ACT Predicted Operational Noise Levels, dB(A)

Receiver ID	Predicted Noise Levels (dB LA10)	Predicted Noise Levels (dB LA10)	ACT Noise Standard (dB LA10) (Night)
	Operational – Neutral met	Operational – Enhancing met	
R01_BoundaryS	38	39	35
R01a	27	30	35
R02_BoundaryN	27	30	35
R02a	<15	<15	35
R02b	<15	<15	35
R03_BoundaryN	<15	<15	35
R03_BoundarySW	24	29	35
R03a	<15	<15	35
R03b	<15	<15	35
R04_BoundaryN	46	46	35
R04a	17	23	35
R05_BoundarySE	43	43	40
R05a	37	38	40
R05b	26	30	40
R06_BoundarySW	27	30	35
R06a	25	29	35
R07_BoundaryE	22	27	35
R07_Boundary_W	<15	19	35
R07a	17	23	35
R07b	18	24	35
R07c	20	26	35
R08_BoundaryW	47	47	35
R08a	25	29	35
R08b	27	30	35
R08c	25	29	35
R09_BoundaryW	18	24	40
R09	<15	17	40
R10_BoundaryW	<15	18	40
R10	<15	<15	40
R11	20	25	35
R12a	21	26	35
R12b	20	25	35

Receiver ID	Predicted Noise Levels (dB LA10)	Predicted Noise Levels (dB LA10)	ACT Noise Standard (dB LA10) (Night)
	Operational – Neutral met	Operational – Enhancing met	
R13	21	26	35
R14	20	26	35
R15	18	23	35
R16_Boundary	17	23	35
R16a	15	21	35
R16b	<15	16	35
R16c	<15	<15	35
R17_Boundary	<15	<15	35
R17a	<15	<15	35
R17b	<15	<15	35
R17c	<15	<15	35
R17d	<15	<15	35
R17e	<15	<15	35
R18_Boundary	<15	<15	35
R18a	<15	<15	35
R18b	<15	<15	35
R18c	<15	<15	35
NCA1_North	<15	<15	35
NCA1_Centre	<15	<15	35
NCA1_East	<15	16	35
NCA2_East	45	45	35
NCA2_Centre	22	27	35
NCA2_West	<15	18	35
NCA3_North	31	33	35
NCA3_South	26	30	35
NCA4_North	19	24	35
NCA4_South	16	22	35
NCA5	21	26	35

Exceedances of the Noise Standard at ACT receiver boundary positions are shown in bold, assuming that corona discharge is occurring at a single point in the near vicinity along the proposed transmission lines. Due to their close proximity to the source, results for some receiver points are the same under calm and enhancing meteorological conditions.

With the exception of NCA2, the predicted exceedances at the boundary locations do not result in predicted exceedances at the residence location under both calm and enhancing conditions. This distinction has been made, as the potential early morning emissions of corona noise will likely have a greater impact at the residence, rather than at a boundary location which is often at the easement boundary some distance from the residence.

Due to the close proximity of NCA2 residences to Line 3C, noise levels at the residence have not been calculated as they will be similar to boundary results where the Noise Standard applies. The predictions indicate that exceedances may occur in the vicinity of NCA2 as a result of the additional lines being added to Line 3C.

Residual corona noise from existing lines (+ 1 decibel) will not result in any additional exceedances. Allowing for a second point of corona discharge from a second point in the near vicinity (+ 3 decibels) will result in additional exceedances of the Noise Standard at R05a and NCA3 under enhancing conditions.

Mitigation measures to address corona noise discharge for ACT receivers are discussed in **Section 7.2**.

Table 7.2 NSW Predicted Operational Noise Levels, dB(A)

Receiver ID	Predicted Noise Levels (dB LAeq)	Predicted Noise Levels (dB LAeq)	PNTL (dB LAeq) (Night)
	Operational – Neutral met	Operational – Enhancing met	
R19	<15	<15	35
NCA 6 (R24)	<15	<15	35
NCA 7 (R28)	<15	<15	35
NCA 8 (R34)	<15	<15	35
R36	<15	<15	35
NCA 9 (R38)	<15	<15	35
R39	<15	<15	35
R40	<15	<15	35
R41	<15	<15	35
NCA 10 (R47)	<15	<15	35
NCA 11 (R49)	<15	<15	35
NCA 12 (R55)	<15	<15	35

All predicted NSW results are within the PNTL for operational noise under both neutral and enhancing meteorological conditions. Allowing for a doubling of noise from a second point (+3 decibels) will still result in compliance for NSW receivers.

7.2 Operational Noise Mitigation Measures

Mitigation measures for corona discharge may include line fittings (such as hardware corona rings) and conductor arrangements (i.e. increasing the conductor size, increasing the distance between conductors and using bundled conductors) can reduce corona discharge.

If corona discharge noise is identified as an issue via community complaints, it is recommended that noise monitoring be undertaken to determine noise levels. As per standard practice, at-property treatments, if triggered, would need to be determined in consultation with the landholder and informed by a detailed building condition survey and final confirmed noise levels. Noise monitoring during corona discharge conditions and building condition surveys would determine if acoustic treatment is required and also the level of treatment required.

7.3 Maintenance Noise Levels

Following the construction of the Proposal, operational activity in the Proposal Area will be minimal, with occasional maintenance being required along the transmission lines. Most commonly, this would be in the form of inspections using light vehicles to access the Proposal Area through farm paddocks if required.

Noise levels associated with typical maintenance activities would be expected to be significantly less than those associated with construction and demolition activities. Given the distance between the Proposal Area and most receivers and the low construction noise levels predicted to these receivers, noise impacts from maintenance activities are anticipated to be minimal, if perceptible.

Operational noise related to the maintenance of the transmission line would be assessed under the EPR for ACT receivers. Maintenance and repairs of a network facility is an exempt activity as per Schedule 2 of the EPR during the hours specified in Table 2.3 and reproduced in **Table 7.3**, therefore an assessment for transmission line maintenance activities during this time period is not required.

Table 7.3 Exempt Operational Activities from EPR Noise Standards

Column 1 Item	Column 2 Noise	Column 3 Conditions
19	Noise emitted in the course of carrying out maintenance or repair of a network facility or territory network facility	The noise is emitted a) Between 7 am and 10 pm on Monday to Saturday; or b) Between 8 am and 10 pm on a Sunday or a public holiday.

8.0 Traffic Noise Assessment

8.1 Construction Traffic

The following assumptions have been applied in evaluating the potential traffic noise impacts:

- The estimated existing traffic and Proposal-related construction traffic vehicles has been sourced from the TIA (Version 2).
- The TIA existing AM and PM Peak vehicles per hour (vph) have been averaged for each road.
- For a conservative assessment, the maximum construction vph has been utilised for each road.

Based on the above inputs, the indicative construction-related traffic vehicles adopted for the noise assessment are presented in **Table 8.1**.

Based on a relative assessment, the expected increase in traffic noise levels due to the Proposal is shown in the last column of **Table 8.1**. The results show a maximum increase of 0.9 dB(A). This is considered a negligible increase and lower than the adopted 2 dB screening criteria outlined in **Section 4.3.1**.

Table 8.1 Indicative Construction Related Traffic Vehicles

Road	Existing vph	Proposal vph	Combined vph (Existing + Proposal)	Expected Increase in noise level dB(A) due to Proposal
Pro Hart Avenue	1047	9	1056	0.0
Stockdill Drive	39	9	48	0.9
Parkwood Road	533	9	542	0.1
Uriarra Road	57	9	66	0.6
Fairlight Road	57	9	66	0.6

8.2 Operational Traffic

The TIA does not specifically address operational traffic. Any movements are expected to be minimal and only occur on rare occasions for maintenance purposes. Therefore, road traffic noise from operational traffic is anticipated to be negligible and has not been assessed further in this report.

9.0 Cumulative Noise Assessment

9.1 Cumulative Construction Noise

Construction noise from the Proposal has the potential to impact receivers in combination with other construction activities in the area. Construction of the Neoen Territory Battery may add cumulative impacts to the predicted impacts from the Proposal, particularly for receivers to the southeast of the Proposal Area. Developing residential areas to the north and northeast of the Proposal Area also have the potential to generate cumulative construction impacts for receivers in this vicinity.

To minimise potential cumulative construction noise impacts, it is recommended that high noise generating activities of the Proposal be scheduled in consultation with other construction occurring in the area to minimise impacts on receivers, particularly the receivers identified above.

Adoption of the measures in AS 2436 ensures compliance with the EPR, however efforts should be taken to minimise cumulative noise impacts where possible. A procedure to formalise consultation with other construction noise sources in the vicinity of the Proposal Area is to be documented in the CNVMP.

Construction scenario 4 (demolition) predicted levels exceeding the NML for some NSW receivers. Management of cumulative construction impacts will be of particular importance for NSW receivers.

9.2 Cumulative Operational Noise

Other industries in the vicinity of the Proposal Area that have the potential to contribute cumulatively to the Proposal's operational noise levels include existing transmission lines, the LMWQCC, Stockdill Substation, Neoen Territory Battery (predicted to be operational in 2024) and the Canberra Substation.

Other noise sources such as the LMWQCC, Neoen Territory Battery and nearby substations typically generate relatively constant and continuous noise when compared to the intermittent nature of corona noise which may be generated as a result of the Proposal. The 2022 noise assessment for the Neoen Territory Battery predicted operational noise exceedances without mitigation. Some of these levels exceeded the adopted high level, short term noise event in the vicinity of the site, therefore the contribution of any operational noise from the Proposal on the same receivers could have cumulative impacts. If corona discharge noise and associated cumulative noise impacts are identified as an issue, as per standard practice, at-property treatments, if triggered, would need to be determined in consultation with the landholder and informed by a detailed building condition survey and final confirmed noise levels. Cumulative noise monitoring during coronal discharge conditions and building condition surveys would determine if acoustic treatment is required.

All identified operational noise sources that have the potential to contribute to the cumulative noise level are located in the ACT and are kilometres from NSW receivers. Therefore no cumulative operational impacts are expected for NSW receivers.

10.0 References

Noise Policy for Industry, Environment Protection Authority, 2017 (NPfl, EPA).

Interim Construction Noise Guideline, NSW Department of Environment and Climate Change, 2009 (ICNG, DECC).

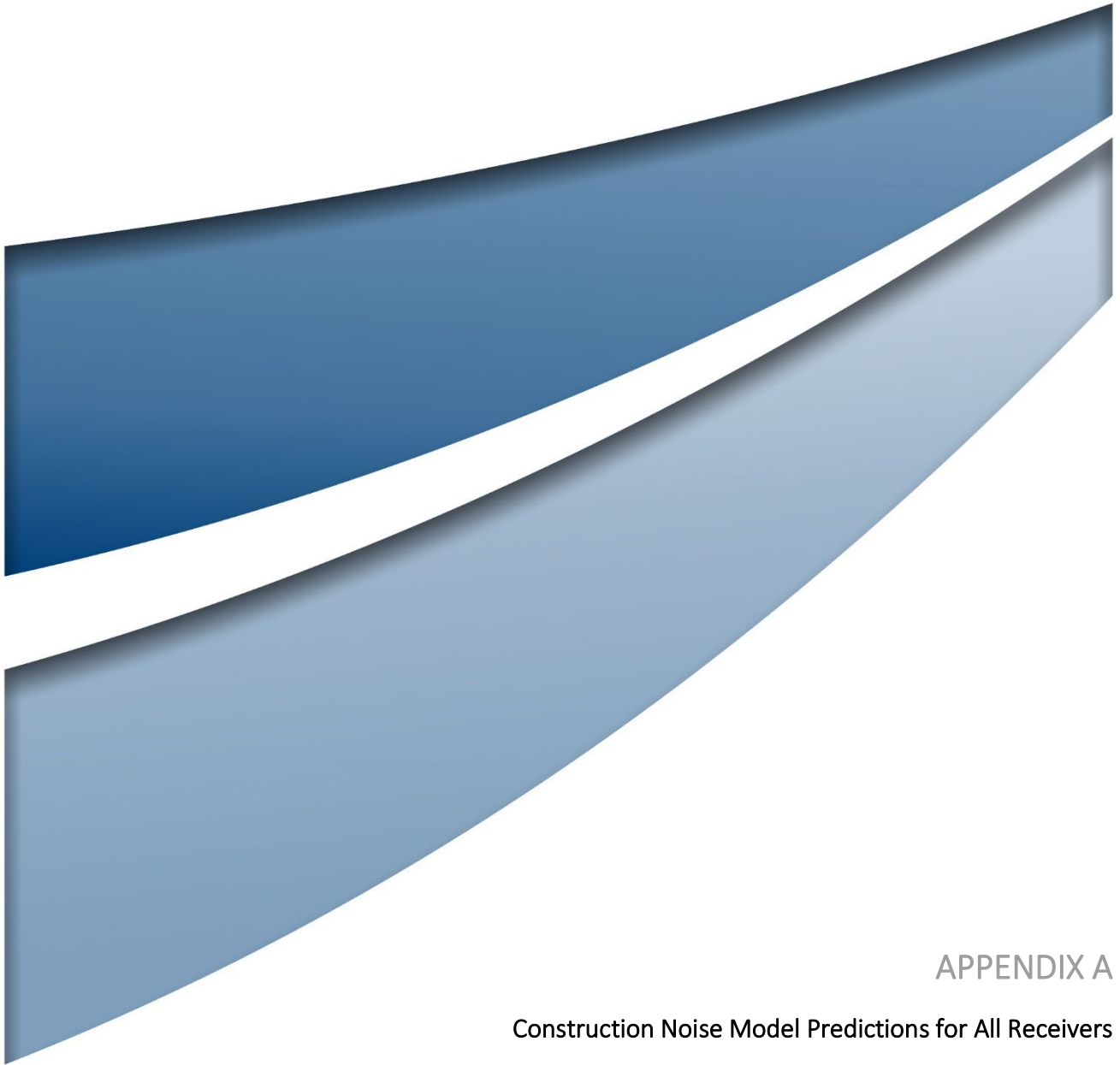
Construction Noise Estimator Tool, Roads and Maritime, version 4/08/2016.

Construction Noise and Vibration Guideline, Transport for NSW, v 1.1, 2022.

German Standard (Deutsche Norm) DIN 4150-3:1999-02 Structural Vibration Part 3: Effects of vibration on structures.

British Standard BS7385-2:1993 Evaluation and measurement for vibration in buildings Part 2. Guide to damage levels from ground borne vibration.

Australian Standard AS2436-2010 (2016) Guide to Noise Control on Construction, Demolition and Maintenance Sites.



APPENDIX A

Construction Noise Model Predictions for All Receivers

Table A.1 ACT Predicted Construction Noise Levels (Scenario 1 to 4), dB(A)

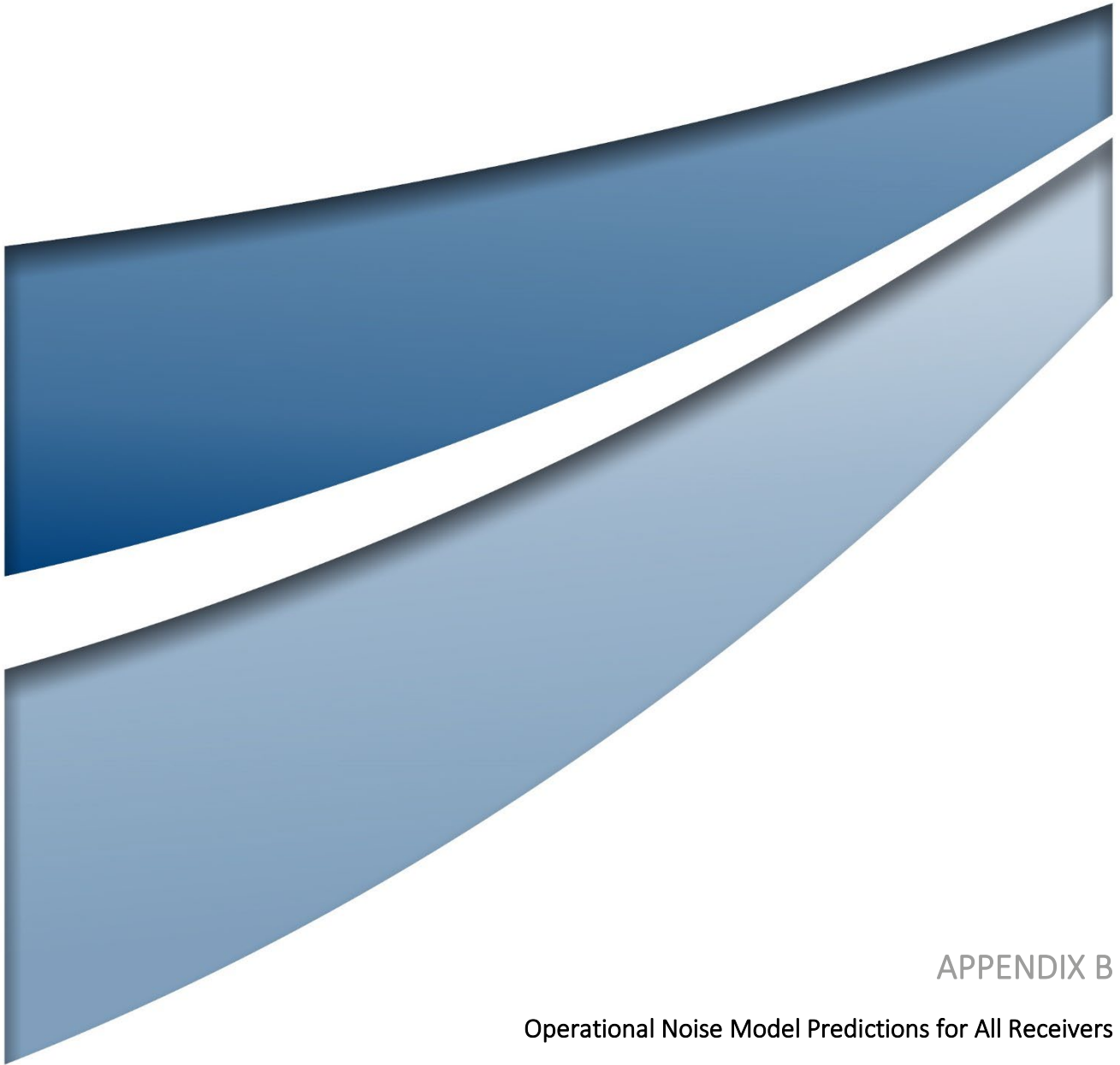
Receiver ID	Predicted Noise Levels (dB LA10)				ACT Noise Standard (dB LA10) (Day)
	Sc. 1	Sc. 2	Sc. 3	Sc. 4	
R01_BoundaryS	68	76	50	49	45
R01a	48	57	43	50	45
R02_BoundaryN	47	60	42	41	45
R02a	30	38	24	32	45
R02b	24	33	20	30	45
R03_BoundaryN	25	38	25	77	45
R03_BoundarySW	47	55	27	39	45
R03a	36	44	28	54	45
R03b	33	41	28	53	45
R04_BoundaryN	43	53	48	52	45
R04a	20	28	36	28	45
R05_BoundarySE	12	24	52	25	45
R05a	14	27	44	27	45
R05b	17	36	44	35	45
R06_BoundarySW	24	45	48	44	45
R06a	24	44	45	48	45
R07_BoundaryE	21	35	33	50	45
R07_Boundary_W	31	47	38	51	45
R07a	24	39	35	50	45
R07b	24	35	32	49	45
R07c	21	34	33	51	45
R08_BoundaryW	12	27	46	35	45
R08a	13	27	37	37	45
R08b	13	28	42	33	45
R08c	11	26	49	31	45
R09_BoundaryW	<10	20	43	29	45
R09	<10	25	39	31	45
R10_BoundaryW	<10	21	39	28	45
R10	<10	18	30	31	45
R11	20	31	37	52	45
R12a	17	28	37	52	45

Receiver ID	Predicted Noise Levels (dB LA10)				ACT Noise Standard (dB LA10) (Day)
	Sc. 1	Sc. 2	Sc. 3	Sc. 4	
R12b	17	28	37	51	45
R13	17	30	37	52	45
R14	20	32	37	55	45
R15	19	31	35	49	45
R16_Boundary	24	34	37	83	45
R16a	25	34	36	53	45
R16b	17	27	35	46	45
R16c	17	25	26	39	45
R17_Boundary	22	33	21	54	45
R17a	24	33	25	57	45
R17b	24	34	21	56	45
R17c	29	38	25	55	45
R17d	29	37	25	54	45
R17e	29	37	25	54	45
R18_Boundary	13	23	27	40	45
R18a	17	29	29	42	45
R18b	16	23	26	39	45
R18c	16	28	27	40	45
NCA1_North	32	41	28	72	45
NCA1_Centre	34	43	30	57	45
NCA1_East	34	43	32	75	45
NCA2_East	19	34	44	46	45
NCA2_Centre	27	42	37	46	45
NCA2_West	34	43	32	80	45
NCA3_North	19	34	54	47	45
NCA3_South	17	32	43	46	45
NCA4_North	14	27	37	44	45
NCA4_South	15	28	34	38	45
NCA5	21	32	38	57	45

Table A.2 NSW Predicted Construction Noise Levels (Scenario 1 to 4), dB(A)

Receiver ID	Predicted Noise Levels (dB LAeq)				NSW Noise Management Level (dB LAeq) (Day)
	Sc. 1	Sc. 2	Sc. 3	Sc. 4	
R19	18	25	25	38	45
R20	14	20	21	34	45
R21	22	30	24	38	45
R22	16	26	16	31	45
R23	17	31	20	33	45
R24	17	31	20	33	45
R25	17	26	20	33	45
R26	17	30	20	33	45
R27	12	22	12	30	45
R28	14	23	13	31	45
R29	10	19	11	27	45
R30	11	21	13	29	45
R31	<10	20	12	28	45
R32	<10	18	11	27	45
R33	15	23	11	28	45
R34	18	26	11	31	45
R35	19	27	12	34	45
R36	26	33	18	40	45
R37	18	26	11	38	45
R38	19	28	11	38	45
R39	23	31	18	41	45
R40	12	20	<10	31	45
R41	35	43	31	40	45
R42	39	47	34	45	45
R43	40	48	34	45	45
R44	40	48	35	45	45
R45	40	48	34	45	45
R46	40	48	34	45	45
R47	42	50	36	48	45
R48	35	44	31	43	45
R49	40	48	35	47	45

Receiver ID	Predicted Noise Levels (dB LAeq)				NSW Noise Management Level (dB LAeq) (Day)
	Sc. 1	Sc. 2	Sc. 3	Sc. 4	
R50	39	47	35	46	45
R51	21	33	17	30	45
R52	34	42	29	41	45
R53	30	38	25	37	45
R54	31	40	26	39	45
R55	32	41	27	40	45



APPENDIX B

Operational Noise Model Predictions for All Receivers

Table B.1 ACT Predicted Operational Noise Levels, dB(A)

Receiver ID	Predicted Noise Levels (dB LA10)	Predicted Noise Levels (dB LA10)	ACT Noise Standard (dB LA10) (Night)
	Operational – Neutral met	Operational – Enhancing met	
R01_BoundaryS	38	39	35
R01a	27	30	35
R02_BoundaryN	27	30	35
R02a	<15	<15	35
R02b	<15	<15	35
R03_BoundaryN	<15	<15	35
R03_BoundarySW	24	29	35
R03a	<15	<15	35
R03b	<15	<15	35
R04_BoundaryN	46	46	35
R04a	17	23	35
R05_BoundarySE	43	43	40
R05a	37	38	40
R05b	26	30	40
R06_BoundarySW	27	30	35
R06a	25	29	35
R07_BoundaryE	22	27	35
R07_Boundary_W	<15	19	35
R07a	17	23	35
R07b	18	24	35
R07c	20	26	35
R08_BoundaryW	47	47	35
R08a	25	29	35
R08b	27	30	35
R08c	25	29	35
R09_BoundaryW	18	24	40
R09	<15	17	40
R10_BoundaryW	<15	18	40
R10	<15	<15	40
R11	20	25	35
R12a	21	26	35
R12b	20	25	35

Receiver ID	Predicted Noise Levels (dB LA10)	Predicted Noise Levels (dB LA10)	ACT Noise Standard (dB LA10) (Night)
	Operational – Neutral met	Operational – Enhancing met	
R13	21	26	35
R14	20	26	35
R15	18	23	35
R16_Boundary	17	23	35
R16a	15	21	35
R16b	<15	16	35
R16c	<15	<15	35
R17_Boundary	<15	<15	35
R17a	<15	<15	35
R17b	<15	<15	35
R17c	<15	<15	35
R17d	<15	<15	35
R17e	<15	<15	35
R18_Boundary	<15	<15	35
R18a	<15	<15	35
R18b	<15	<15	35
R18c	<15	<15	35
NCA1_North	<15	<15	35
NCA1_Centre	<15	<15	35
NCA1_East	<15	16	35
NCA2_East	45	45	35
NCA2_Centre	22	27	35
NCA2_West	<15	18	35
NCA3_North	31	33	35
NCA3_South	26	30	35
NCA4_North	19	24	35
NCA4_South	16	22	35
NCA5	21	26	35

Table B.2 NSW Predicted Operational Noise Levels, dB(A)

Receiver ID	Predicted Noise Levels (dB LAeq)	Predicted Noise Levels (dB LAeq)	PNTL (dB LAeq) (Night)
	Operational – Neutral met	Operational – Enhancing met	
R19	<15	<15	35
R20	<15	<15	35
R21	<15	<15	35
R22	<15	<15	35
R23	<15	<15	35
R24	<15	<15	35
R25	<15	<15	35
R26	<15	<15	35
R27	<15	<15	35
R28	<15	<15	35
R29	<15	<15	35
R30	<15	<15	35
R31	<15	<15	35
R32	<15	<15	35
R33	<15	<15	35
R34	<15	<15	35
R35	<15	<15	35
R36	<15	<15	35
R37	<15	<15	35
R38	<15	<15	35
R39	<15	<15	35
R40	<15	<15	35
R41	<15	<15	35
R42	<15	<15	35
R43	<15	<15	35
R44	<15	<15	35
R45	<15	<15	35
R46	<15	<15	35
R47	<15	<15	35
R48	<15	<15	35
R49	<15	<15	35
R50	<15	<15	35

Receiver ID	Predicted Noise Levels (dB LAeq)	Predicted Noise Levels (dB LAeq)	PNTL (dB LAeq) (Night)
	Operational – Neutral met	Operational – Enhancing met	
R51	<15	<15	35
R52	<15	<15	35
R53	<15	<15	35
R54	<15	<15	35
R55	<15	<15	35

