

Intended for
Department of Regional NSW

Document type
Review of Environmental Factors

Date
October 2022

CAPTAINS FLAT LEAD ABATEMENT WORKS REVIEW OF ENVIRONMENTAL FACTORS (OTHER SITES)

CAPTAINS FLAT LEAD ABATEMENT WORKS **REVIEW OF ENVIRONMENTAL FACTORS (OTHER SITES)**

Project name **Captains Flat Lead Abatement Works**
Project no. **31800193-T12a**
Recipient **Department of Regional NSW**
Document type **Review of Environmental Factors**
Version **V2**
Date **06/10/2022**
Prepared by **C Butterfield / C Whitehill / T Hancock**
Checked by **Shaun Taylor (CEnvP (IA) No. IA11058)**
Approved by **Rowena Salmon**
Description **This Review of Environmental Factors has been prepared to consider the potential environmental impacts associated with the proposed lead abatement works at six public locations at Captains Flat, New South Wales.**



DOCUMENT REVIEW

Revisions

Date	Revision	Details	Section	Page
25/02/2022	V0.1	Draft Review of Environmental Factors	All	All
13/05/2022	V1	Final Review of Environmental Factors	All	All
06/10/2022	V2	Final Review of Environmental Factors	All	All

REVIEW OF ENVIRONMENTAL FACTORS CERTIFICATION

Project Number:

**Certification by Queanbeyan-Palerang Regional Council Environmental Coordinator/
Environmental Manager**

This environmental proposal assessment (Review of Environmental Factors (Review) is an appropriate and balanced review of the Project activities potentially effecting the environment. The assessment encompasses all activities incumbent to the activities described in this Review likely to affect the environment. The accompanying assessment information clearly determines this project as being highly unlikely to significantly affect the environment and does not require an Environmental Impact Statement (EIS) and/or Species Impact Statement (SIS).

Name:

Signature: _____ **Date:**

Certification by Department of Regional NSW Project Manager/ Program Manager

I would ensure the management measures relevant to the Project as incorporated into the Construction Environmental Management Plan would be communicated to all relevant staff and contractors. I would ensure the management methods are implemented onsite and maintained throughout the duration of the works. I would undertake all possible action to ensure effective communication of the management measures with all onsite personnel and contractors undertaking the works.

Name:

Signature: _____ **Date:**

EXECUTIVE SUMMARY

This Review of Environmental Factors has been prepared by Ramboll Australia Pty Ltd for the Department of Regional NSW to consider and address the potential environmental impacts associated with the proposed lead abatement works at six locations on public land at Captains Flat, New South Wales (the Project). The Project is located within the Queanbeyan-Palerang Local Government Area.

Historic metalliferous mining and land-fill activities have contaminated Captains Flat. The Project is required to remediate the lead contaminated soils in public spaces within the Captains Flat Community and make safe the sites for public use and potential future redevelopment. The Project is necessary to maintain the safety of the affected community and to prevent harmful exposure to lead contaminated soils.

The Department of Regional NSW is coordinating development of the Captains Flat Lead Management Plan to ensure contamination of public land is managed and that residents have access to information relevant to reducing exposure to lead on private land. A taskforce of local and state government representatives was established in late 2020 to: oversee the work; provide a coordinated approach to dealing with lead contamination; and keep the local community informed. The Taskforce is also driving the rehabilitation of the Lake George mine site including construction of a containment cell for contaminated soils and the rail corridor rehabilitation. The eastern embankment to the west of the six public locations described in this Review of Environmental Factors would also be subject to a public space abatement program.

Queanbeyan-Palerang Regional Council is the determining authority for the Project within the meaning of Part 5 of the *Environmental Planning and Assessment Act 1979*. This Review of Environmental Factors considers the potential environmental impacts associated with the Project and details the appropriate mitigation measures to be implemented to allow Queanbeyan-Palerang Regional Council to assess and determine the Project.

The Review of Environmental Factors has considered impacts relating to:

- Soils and landform
- Waste
- Surface Water and Groundwater
- Traffic, Transport and Access
- Noise and Vibration
- Air Quality
- Biodiversity
- Heritage
- Social and Visual
- Other Issues
- Cumulative impacts.

The key potential impacts identified for the Project include:

- Erosion and sedimentation to local waterways and nearby properties resulting from abatement work activities
- Exposure of soils with elevated levels of lead, and to a lesser extent, arsenic and/or other heavy metals during the works
- Pollution to nearby waterways from sediments or accidental spills
- Increased traffic movements associated with delivery of construction materials, removal or spoils and wastes and by construction personnel
- Removal of approximately 0.29 hectares of (Ribbon Gum - tea-tree - River Tussock riparian scrub along tablelands streambanks, South East Corner Bioregion (not identified

as threatened ecological communities however provide marginal habitat for identified threatened fauna species)

- Temporary amenity impacts (noise, air, visual, traffic).

It is also noted that the disposal method for contaminated wastes generated onsite requires further investigation, including an assessment for contaminants of potential concern other than metals (eg: asbestos, pesticides, hydrocarbons) which may affect waste classification. Abatement includes offsite chemical immobilisation of lead followed by disposal as immobilised General Solid Waste at an appropriately licensed landfill. A waste facility capable of receiving the volume and type of material proposed to be generated during onsite remediation has not yet been identified. A pathway for offsite disposal exists however through amendment to the Environment Protection License (EPL) of a local landfill to allow treatment as a precursor to disposal as General Solid Waste. This would require additional investigation in the form of a treatability trial (assessing the reagents and process required to immobilise lead in the waste stream), an immobilisation application and approval in accordance with Part 2 of the Waste Classification Guidelines.

The environmental assessment undertaken for the Review of Environmental Factors has concluded that the Project is unlikely to have a significant effect on the environment with implementation of the management and mitigation measures described.

An Environmental Management Plan has been prepared for the Project consistent with the *Guideline for the Preparation of Environmental Management Plans* (NSW Department of Infrastructure, Planning and Natural Resources, 2004) and *Environmental Management Systems Guidelines* (NSW Government, Edition 3 - August 2013) and is included in **Appendix 2**. The Environmental Management Plan documents how the abatement phase environmental management measures described in this Review of Environmental Factors would be implemented.

GLOSSARY OF TERMS

Abatement Plans	Lead Abatement Plan reports prepared by Ramboll Australia Pty Ltd (2022) included in Appendix 1
Channel	An area that contains continuously or periodically flowing water that is confined by banks and a streambed
Embankment	A bank of earth to prevent a river flooding an area
Ramboll	Ramboll Australia Pty Ltd
The mine site	The old Lake George Mine located west of the Site
The Project	The proposed Project as described in Section 3 , generally comprising the abatement works of six public locations in the Captains Flat Community
The Sites	The area containing the Project. It is located on: <ul style="list-style-type: none">• Lot 1 DP 251188• Crown Road Reserve 1084055075• Part Lot 7004 DP 1020764• Part Lot 166 DP 754866• Part Lot 7004 DP 1020764• Lots 101 and 107 DP 754870
The Taskforce	A taskforce of local and state government representatives established to oversee the work, provide a coordinated approach to dealing with lead contamination and keep the local community informed. The taskforce includes representatives from: <ul style="list-style-type: none">• Department of Regional NSW – Regional Development; Mining, Exploration and Geoscience; Primary Industries• NSW Environment Protection Authority• NSW Health• NSW Department of Planning and Environment – Crown Lands• Queanbeyan-Palerang Regional Council• Transport for NSW• NSW Department of Education.

ACRONYMS AND ABRIEVIATIONS

ABS	Australian Bureau of Statistics
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ASRIS	Australian Soil Resource Information System
BC Act	<i>Biodiversity Conservation Act 2016</i>
BOM	Bureau of Meteorology
CLM Act	<i>Contaminated Land Management Act 1997</i>
Council	Queanbeyan-Palerang Regional Council
CSM	Conceptual Site Model
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DRNSW	Department of Regional NSW
EMP	Environmental Management Plan
ENM	Excavated natural material
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2021</i>
EPA	Environment Protection Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
FM Act	<i>Fisheries Management Act 1994</i>
GSW	General Solid Waste
Heritage Act	<i>Heritage Act 1977</i>
IBRA	Indian Tropical Islands Bioregion
ICNG	<i>Interim Construction Noise Guideline</i> (Department of Environment and Climate Change 2009)
km	Kilometres
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
LLS Act	<i>Local Land Services Act 2013</i>
m	Metre
mm	Millimetre
MNES	Matters of National Environmental Significance

NEPM	<i>National Environment Protection (Assessment of Site Contamination) Measure</i>
NP&W Act	<i>National Parks and Wildlife Act 1974</i>
NSW	New South Wales
Palerang LEP	<i>Palerang Local Environmental Plan 2014</i>
PCT	Plant Community Type
PCU	Passenger Car Units
PMST	Protected Matters Search Tool
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
POEO Waste Regulation	<i>Protection of the Environment Operations (Waste) Regulation 2014</i>
PPV	Peak Particle Velocity
RBL	Rating Background Level
Review	Review of Environmental Factors
RFS	Rural Fire Service
SAQP	Sampling and Analysis Quality Plan
SEPP	State Environmental Planning Policy
SEPP 55	<i>State Environmental Planning Policy No 55 – Remediation of Land</i>
SEPP T&I	<i>State Environmental Planning Policy (Transport and Infrastructure) 2021</i>
SEPP R&H	<i>State Environmental Planning Policy (Resilience and Hazards) 2021</i>
SIS	Species Impact Statement
TEC	Threatened Ecological Community
TSP	Total Suspended Particulates
VENM	Virgin excavated natural materials
WARR Act	<i>Waste Avoidance and Resource Recovery Act 2001</i>
WM Act	<i>Water Management Act 2000</i>
XRF	Field portable x-ray fluorescence metals analyser

CONTENTS

EXECUTIVE SUMMARY	4
GLOSSARY OF TERMS	6
ACRONYMS AND ABBREVIATIONS	7
1. Introduction	12
1.1 Site History	12
1.2 Purpose of the Project	12
1.3 Proponent of the Works	12
1.4 Document Purpose	13
2. Site Context	14
2.1 Location and Setting	14
2.2 Topography	19
2.3 Hydrology	19
2.4 Climate	22
2.5 Geotechnical	24
2.6 Road Network	24
2.7 Site details	25
3. Needs and Alternatives	33
3.1 Need for the Project	33
3.2 Assessment of Alternatives	33
4. Project Description	37
4.1 Project Overview	37
4.2 Site Establishment	37
4.3 Abatement Works	38
4.4 Spoil Management	41
4.5 Materials Tracking	42
4.6 Imported Fill	42
4.7 Final Landform	42
4.8 Operation	43
4.9 Environmental Management Plan	43
5. Stakeholder Consultation	44
5.1 Consultation undertaken for the Project	44
5.2 Consultation undertaken during preparation of the Review	44
5.3 Future consultation	45
6. Planning and Statutory Setting	46
6.1 Local Planning	46
6.2 State Matters	48
6.3 Commonwealth Environment Protection and Biodiversity Conservation Act 1999	54
6.4 Summary of Agreements and Approvals Required	54
7. Environmental Assessment	55
7.1 Soils and Landform	55
7.2 Waste	60
7.3 Surface Water and Groundwater	62
7.4 Traffic, Transport and Access	66

7.5	Noise and Vibration	70
7.6	Air Quality	76
7.7	Biodiversity	79
7.8	Heritage	86
7.9	Social and Visual	91
7.10	Other Issues	94
7.11	Cumulative	95
8.	Management and Mitigation Summary	96
9.	Conclusion	105
10.	References	106
11.	Limitations	107
11.1	User Reliance	107

TABLE OF TABLES

Table 2-1:	Road widths along Foxlow Street	24
Table 2-2:	Site description – Foxlow Parklet	26
Table 2-3:	Site description – Crown Land Parcel Adjacent to Preschool	28
Table 2-4:	Site description – Southern End of Foxlow Street	29
Table 2-5:	Site description – Tennis and Basketball Courts	30
Table 2-6:	Site description – Flood Berms and Playing Fields	31
Table 2-7:	Site description – Former Preschool	32
Table 3-1:	Abatement Option Evaluation Metrics	35
Table 3-2:	Abatement Scores	36
Table 4-1:	Soil Assessment Criteria (mg/kg)	38
Table 5-1:	Comments from the EPA on the Review and Response	44
Table 6-1:	Land Zoning	46
Table 6-2:	Palerang LEP Clause 6.1 considerations	47
Table 6-3:	Relevant State Environmental Planning Policies	51
Table 6-4:	Other Relevant NSW Legislation	51
Table 6-5:	Summary of agreements and approvals required	54
Table 7-1:	Summary of lead contamination results (Ramboll, 2021b)	57
Table 7-2:	Management and Mitigation Measures – Soils and Landform	58
Table 7-3:	Management and Mitigation Measures – Waste	61
Table 7-4:	Summary of Surface water and Groundwater Monitoring Results	63
Table 7-5:	The Sites and the Palerang LEP Flood Planning Area	64
Table 7-6:	Management and Mitigation Measures – Surface Water and Groundwater	65
Table 7-7:	Daily expected truck and dog combination volumes	67
Table 7-8:	Proposed Access Routes for the Sites	68
Table 7-9:	Management and Mitigation Measures – Traffic and Transport	69
Table 7-10:	Background Noise Monitoring Results	71
Table 7-11:	ICNG Noise Guidelines at Receptors	71
Table 7-12:	Acceptable vibration dose values for intermittent vibration (m/s ^{1.75})	73
Table 7-13:	DIN 4150-3 Guideline values for vibration velocity to be used when evaluating the effects of short- term vibration on structures	73
Table 7-14:	Recommended Minimum Safe Working Distances for Vibration Intensive Plant from Sensitive Receiver	74
Table 7-15:	Management and Mitigation Measures – Amenity (noise, vibration and air quality)	75

Table 7-16: Management and Mitigation Measures – Contamination	78
Table 7-17: Management and Mitigation Measures - Biodiversity	85
Table 7-18: Local Heritage Items	86
Table 7-19: Generic Due Diligence Process	89
Table 7-20: Management and Mitigation Measures – Heritage	90
Table 7-21: Social and Visual Characteristics of the Sites	91
Table 7-22: Management and Mitigation Measures – Social and Visual	93
Table 7-23: Bushfire Prone Land mapping	94
Table 7-24: Management and Mitigation Measures – Other Issues	95
Table 8-1: Summary of Management and Mitigation Measures	96

TABLE OF FIGURES

Figure 2-1: Site Locality	15
Figure 2-2: Terrain, surface water and groundwater features	20
Figure 2-3: Real Time Daily Flow Data from Mongolo River at Kobada	21
Figure 2-4: Annual rainfall statistics from Foxlow Street weather station (070016)	22
Figure 2-5: Annual Wind Rose 9am and 3pm at Tuggeranong (Station number 070339) (BOM, 2021)	23
Figure 7-1: Biodiversity	81
Figure 7-2: Heritage Items	88

APPENDICES

Appendix 1

Abatement Plans

Appendix 2

Environmental Management Plan

Appendix 3

Consideration of Clause 171(2) Factors and MNES

Appendix 4

Traffic Transport and Access Assessment Report

Appendix 5

Noise and Vibration Assessment Report

Appendix 6

Biodiversity Assessment Report

Appendix 7

AHIMS Search Results

1. INTRODUCTION

This Review of Environmental Factors (Review) has been prepared by Ramboll Australia Pty Ltd (Ramboll) for the Department of Regional NSW (DRNSW) to consider and address the potential environmental impacts associated with the proposed lead abatement works at six locations on public land at Captains Flat, New South Wales (NSW) (the Project). The detailed Abatement Plans for the Project, prepared by Ramboll are provided in **Appendix 1**.

1.1 Site History

Historic metalliferous mining and land-fill activities have contaminated Captains Flat. In February 2021, the NSW Environment Protection Authority (EPA) carried out precautionary testing of surface soils in public and community spaces at Captains Flat. Results of the sampling program identified that concentrations of lead were above the *National Environment Protection (Assessment of Site Contamination) Measure* (NEPM) 2013 health-based soil investigation level for residential land use (HIL A) in the areas sampled.

A subsequent soil assessment was undertaken by Ramboll as part of the Conceptual Site Model (Ramboll, 2021b) (CSM). As part of the assessment, the potential human health risks for lead in soil were categorised as either 'high', 'moderate' or 'low' risk. Seven public spaces within Captains Flat were identified as either high or moderate risk as a result.

An assessment of abatement options was completed for the seven public spaces identified as high or moderate risk (Ramboll, 2021c). Six of the seven public spaces are the subject of this assessment. The seventh site (the eastern embankment) is subject to a separate Review.

1.2 Purpose of the Project

The lead abatement works are necessary for the remediation of lead contamination at the six public locations described in **Section 2.1**. The Project aligns with object (2) of Chapter 4 Remediation of Land in the State Environmental Planning Policy (Resilience and Hazards) 2021 (SEPP R&H) (formerly SEPP 55): *"this Policy aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment"*.

1.3 Proponent of the Works

DRNSW is coordinating development of the Captains Flat Lead Management Plan to ensure contamination of public land is managed and that residents have access to information relevant to reducing exposure to lead on private land.

A taskforce of local and state government representatives was established in late 2020 to oversee the work, provide a coordinated approach to dealing with lead contamination, and to keep the local community informed. The Captains Flat Taskforce (the Taskforce) is working to provide the best possible outcomes for the Captains Flat community to achieve the following outcomes:

- Health: limit exposure to the local community
- Environmental: limit exposure to the local environment
- Social/cultural/economic: provide community benefits.

The Taskforce includes representatives from:

- Department of Regional NSW – Regional Development; Mining, Exploration and Geoscience; Department of Primary Industries
- EPA
- NSW Health
- NSW Department of Planning and Environment – Crown Lands

- Queanbeyan-Palerang Regional Council
- Transport for NSW
- NSW Department of Education.

This Review has been prepared in consultation with the Taskforce.

The Taskforce is also driving the rehabilitation of the Lake George mine site including construction of a containment cell for contaminated soils and the rail corridor rehabilitation. The eastern embankment (Part Lot 7317 DP1141049) to the west of the six public locations described in this Review would also be subject to a public place abatement program. These projects, although not the subject of this Review, are considered and referred to throughout this Review as the timing and scheduling of those activities are key considerations for the sequencing of the public space abatement.

1.4 Document Purpose

The purpose of this Review is to assess the potential environmental impacts of the Project and detail the appropriate mitigation measures to be implemented. This Review has regard to the following environmental assessment requirements:

- Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act)
- Section 5.5 and 5.7 of the EP&A Act
- Clause 228(2) of the *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation)
- *Biodiversity Conservation Act 2016* (BC Act)
- *Contaminated Land Management Act 1997*
- *Crown Lands Management Act 2016*
- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- Other relevant State legislative instruments as identified in **Section 6.2.4**.

Queanbeyan-Palerang Regional Council (Council) is the determining authority for the Project within the meaning of Part 5 of the EP&A Act. This Review has been prepared to allow Council to assess and determine the Project.

2. SITE CONTEXT

2.1 Location and Setting

The Project is within the Queanbeyan-Palerang Local Government Area (LGA) and comprises six separate public locations within Captains Flat, NSW, approximately 45 kilometres southeast of Queanbeyan and 77 kilometres northeast of Cooma. Collectively, the six abatement sites are referred to as 'the Sites' in this Review.

An aerial view of the Sites and the surrounding locality is in **Figure 2-1**. Further detail of the six abatement locations is provided in **Figure 2-1 a, b and c**.

The Sites are all located on the western side of Foxlow Street, part from the footpaths at the southern end of Foxlow Street which are on the eastern and western sides. Foxlow Street is the main north-south through road that services the Captains Flat township and to the east of the old Lake George Mine site. The Site comprises approximately 28,650 square metres of Council owned land.

The old Lake George Mine (the former mine site) is located west of the Sites and includes the smelter site, mine processing sites and the railway precinct. The former mine site comprises approximately 100 hectares of derelict mine workings, used between 1882 to 1962 to mine for gold and pyritic ores (Dobos and Associates, 2002). The mining activities used to extract commodities and the methods of disposal of waste together with surficial deposition (runoff from the mine and or wind / dust deposition) have resulted in elevated metal concentrations detected in soils within the Captains Flat township.

Residential development in Captains Flat is concentrated on the east side of Foxlow Street opposite the playing fields, swimming pool and tennis courts in the north of the town. The Captains Flat RSL, the Community Hall and the Captains Flat Hotel are situated on the west side of Foxlow Street and further residential development is located within the southern part of the town.

The Captains Flat sewerage treatment works is located immediately west of the playing fields, between the Molonglo River and the former mine site. The general store, service station and Captains Flat Public School are located on the eastern side of Foxlow Street within the central part of the town north of the playing fields (as shown in **Figure 2-1**).

Page left blank for

* * *

Figure 2-1: Site Locality

Page left blank for

* * *

Figure 2-2a: Site Locality – Abatement Area 1

Page left blank for

* * *

Figure 2-2b: Site Locality – Abatement Areas 2, 4 and 8

Page left blank for

* * *

Figure 2-2c: Site Locality – Abatement Areas 5, 6 and 7

2.2 Topography

The Captains Flat area is part of the Southern Tablelands of NSW and is situated on the western slopes of the Great Dividing Range. The local elevation of the Sites are generally around 840 metres Australian Height Datum (AHD) at the banks of the Molonglo River to 870 metres at the Foxlow Parklet at the northern end of the Captains Flat township.

Locally, the Captains Flat township is generally flat within a valley and the steeper areas occurring on the vegetated slopes to the east and the west (refer to **Figure 2-2**). Alluvial flats are associated with the northern part of the Molonglo Valley further north of the Sites.

2.3 Hydrology

2.3.1 Surface water

Surface water features of the Captains Flat area are shown on **Figure 2-2**.

The Sites are situated in the upper reaches of the Molonglo River catchment, part of the wider Murrumbidgee catchment within the Murray-Darling basin. The Molonglo River catchment covers an area of approximately 2,000 square kilometres, extending from the Murrumbidgee River to the headwaters of the Molonglo and Queanbeyan Rivers. The land use of the catchment varies considerably, ranging from highly developed areas within Canberra and Queanbeyan, to wetlands, pine forests and rural land.

The Molonglo River is a perennial river which meanders north to south through the township of Captains Flat, adjacent to the Sites. The river runs along the southeastern extent of the town before passing under Foxlow Street bridge at the intersection with Braidwood Road, at the southern boundary of the playing fields site north of the Bowling Club. It is situated along the western boundary of the playing fields, courts and flood berms site between the township and the old mine site in a northwest direction toward Queanbeyan where it continues into Lake Burley Griffin in Canberra (approximately 70 km downstream).

The river has been dammed south of the township to form Captains Flat Dam, an 820 megalitre on-stream dam. The town's water supply system sources raw water directly from Captains Flat Dam. The dam is a remnant of the old mining scheme from the early 1900s.

The Molonglo River includes a number of tributaries within close vicinity to the Sites including Copper Creek, Kerrs Creek and Forsters Creek. Local drainage features include the Forsters Creek and Molonglo River confluence which is at the southern extent of Foxlow Street. Kerrs Creek originates in the higher ground east of Captains Flat and flows west through the township where it is piped under Foxlow Street, the tennis court and basketball courts site, and discharges at an outlet directing flow into the Molonglo River.

Page left blank for

Figure 2-2: Terrain, surface water and groundwater features

The 'Mongolo River at Kobada' monitoring station (Station 4100208), located downstream of Captains Flat within Molonglo River, provides daily flow data from 2004 to 2021 (WaterNSW, 2021). The daily maximum, minimum, mean and median flow values recorded at the site are shown on **Figure 2-3**. The data indicates that flows typically peak in March, June, September and December.

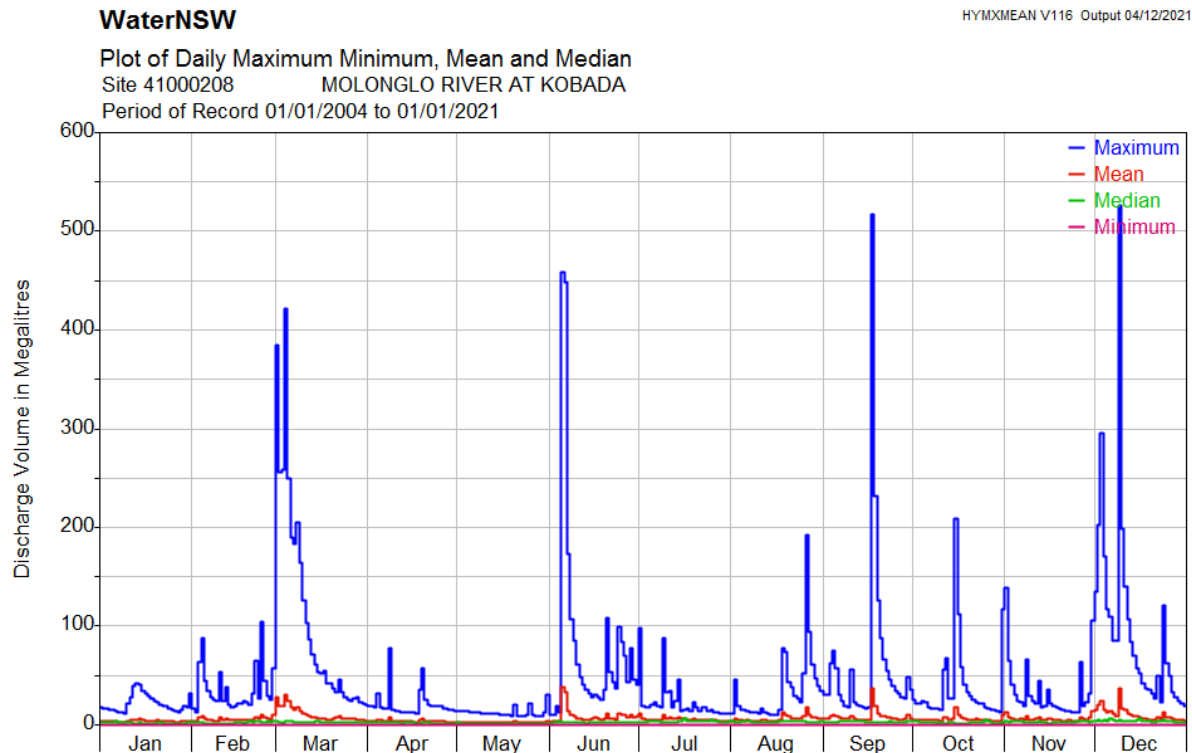


Figure 2-3: Real Time Daily Flow Data from Mongolo River at Kobada

2.3.2 Groundwater

The Hydrogeology Map of Australia (Geoscience Australia, 2000) indicates the Sites are within an area of fractured or fissured aquifers of low to moderate productivity (Ramboll, 2021d). Two aquifers occur in the volcanic and sedimentary rocks around Copper Creek (Ramboll 2021a). A shallow aquifer in alluvium adjacent the Molonglo River was also identified. Reversible recharge / discharge between this alluvial aquifer and the Molonglo River driven by rainfall and surface water levels is considered likely (Ramboll, 2021d).

A review of the BOM's National Groundwater Information System (BOM, 2019) indicated that no registered groundwater bores are located within one kilometre of the Sites (Ramboll, 2021d).

2.4 Climate

2.4.1 Temperature

The nearest meteorological station that provides long-term climate statistics is the Bureau of Meteorology's (BOM) Braidwood Station (Station Number 069010) located approximately 34.5 kilometres northeast of the Sites. The Braidwood Station provides data from 1887 to September 2021.

Data recorded at the Braidwood Station indicates that temperatures are highest in January with a mean maximum temperature of 25.9°C. Temperatures are lowest in July with a mean minimum temperature of -0.2°C (BOM, 2021).

2.4.2 Rainfall

The Foxlow Street weather station (070016) at Captains Flat has collected rainfall data since 1898. Annual rainfall statistics recorded at the station obtained from the BOM database is shown on **Figure 2-4**. The average annual rainfall from January 1898 to October 2021 is 737.4 millimetres (mm) with the highest mean monthly rainfall occurring in November (71.7 mm) and the lowest mean monthly rainfall occurring in July (48.9 mm) (BOM, 2021).

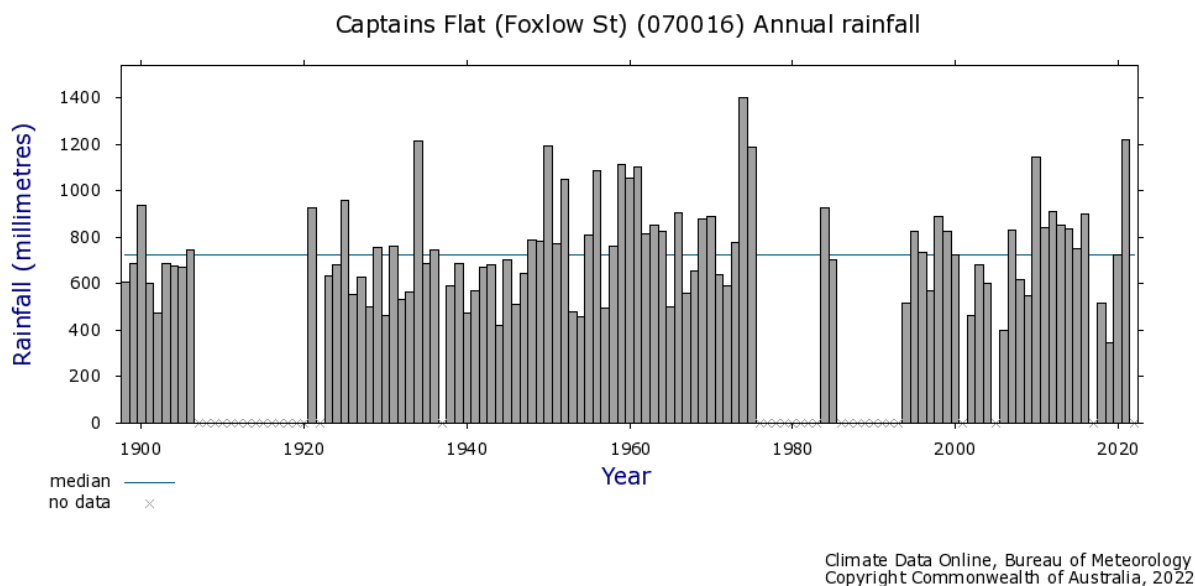


Figure 2-4: Annual rainfall statistics from Foxlow Street weather station (070016)

2.4.3 Wind

As the Braidwood Station does not include wind data, the BOM Tuggeranong Station (Station number 070339) has been used for reference. The station is located approximately 36 kilometres to the northwest of the Sites. Given Tuggeranong is a relatively flat urban environment and Captains Flat has a distinctive valley terrain orientated roughly north to south, the wind data is considered unlikely to be representative of local conditions in Captains Flat, however is used for reference.

Annual wind roses for Tuggeranong are shown at **Figure 2-5**. The 3pm average wind rose indicates a prevailing north-westerly at 10 to 30 kilometres per hour. Wind speeds are typically higher in the afternoon period and calmer in the morning period. The terrain at Captains Flat is likely to steer winds through the valley in northerly and southerly directions.

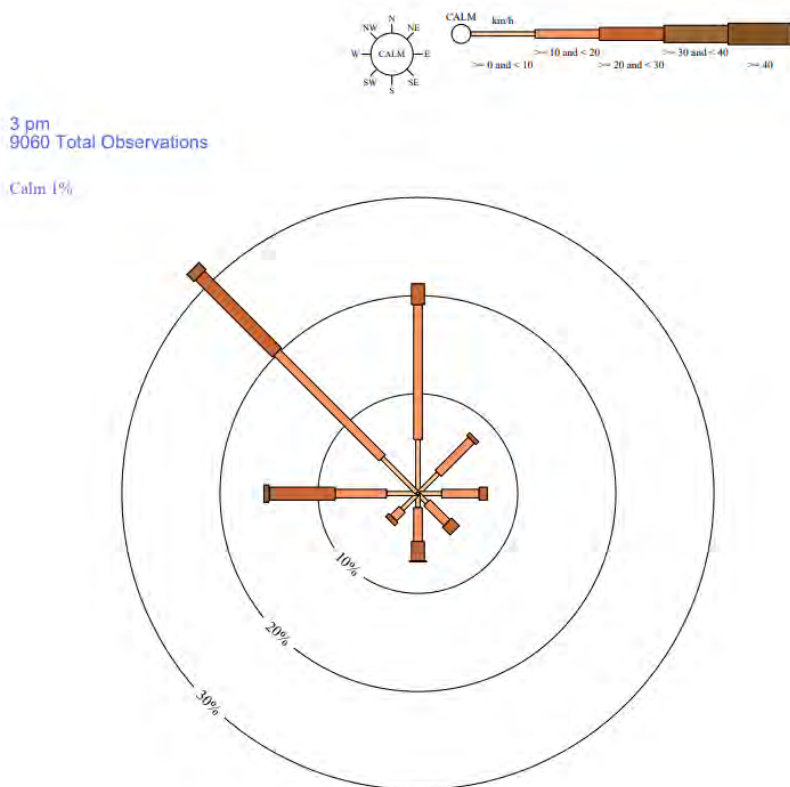
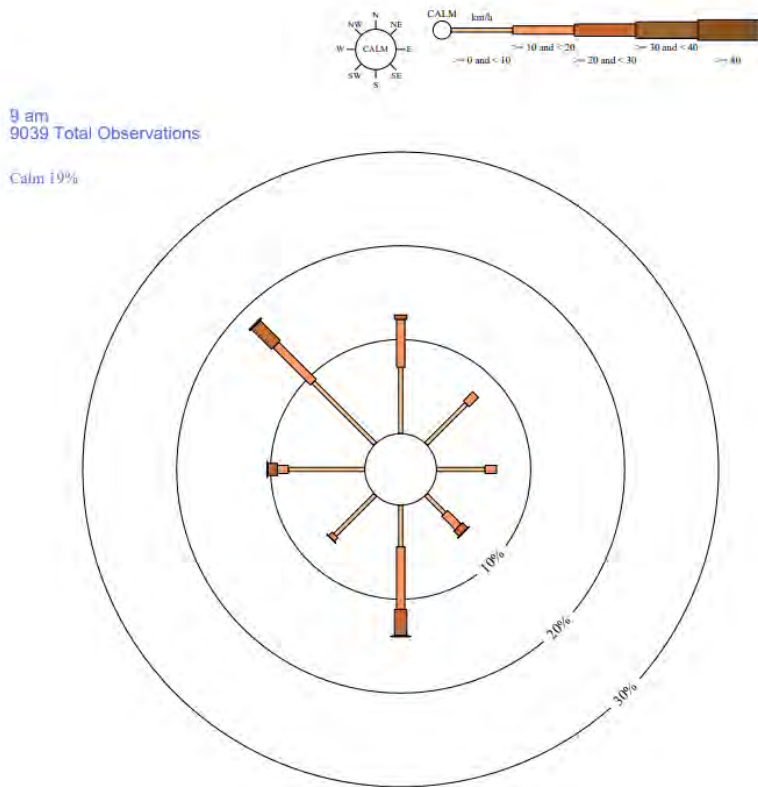


Figure 2-5: Annual Wind Rose 9am and 3pm at Tuggeranong (Station number 070339) (BOM, 2021)

2.5 Geotechnical

The regional geology of the Captains Flat area is characterised by a well-defined north-south Valley (2 to 8 km wide). Review of the Department of Regional NSW interactive GIS portal MinView indicates the Narongo Fault passes through the Sites orientated north to south between Copper Creek Road and Copper Creek.

The soil lithology of Captains Flat comprises quaternary alluvial sediment consisting of sand, silt and gravel (Ramboll, 2021b); (C&R, 2021). The soil profiles are composed of sandy clay fill material with abundant gravel fragments (top 0.5-0.7 mbgl) grading towards natural light brown/yellow clay with coarse gravel and pebbles until 1.3-1.5 mbgl (C&R, 2021).

2.6 Road Network

The regional and local network is shown in **Figure 2-1**. Access to Captains Flat is provided through Jerangle Road from the south and Captains Flat Road from the north and south. When accessing the town from the south, Captains Flat Road converts into Braidwood Road which intersects with Foxlow Street. Similarly, Jerangle Road, when entering the town from the south, turns into Foxlow Street which intersects with Captains Flat Road (Ramboll, 2022).

The key local roads are outlined below.

2.6.1 Foxlow Street

Foxlow Street is a north-south road carrying two-way traffic through Captains Flat. It is a fully sealed road with a speed limit of 50 km/hr and varies in width from five metres when travelling northbound from Jerangle Road to 13 metres between Braidwood Road and Captains Flat Road. The road widths along Foxlow Street are summarised in **Table 2-1**.

Table 2-1: Road widths along Foxlow Street

Section of Foxlow Street	Approximate road width
Jerangle Road to Miners Road	5-8 metres
Miners Road to Molonglo River Bridge	12 metres
Foxlow Street Bridge	6 metres
Braidwood Road to Captains Flat Road	13 metres
Captains Flat Road to Blatchford Street	10 metres
Blatchford Street to Spring Street	5 metres
Spring Street to Beazley Street	3-5 metres

Foxlow Street crosses the Molonglo River to a T-junction with Foxlow Street and Braidwood Road. When crossing the Molonglo River, vehicles need to pass over Foxlow Street Bridge with a road width of approximately six metres. This bridge was recently upgraded, with construction completed in November 2021, removing load limits that were previously present (confirmed by QPRC) (Ramboll, 2022).

2.6.2 Captains Flat Road

Captains Flat Road provides access to Captains Flat from the north and south but moves through the town in an east-west direction. When entering the town from the south, it turns into Braidwood Road, eventually intersecting with Foxlow Street. Captains Flat Road then continues north of the tennis courts on Foxlow Street in a westbound direction, north of Captains Flat mine, and eventually in a northbound direction out of the Captains Flat area.

Captains Flat Road is a two-way road with varying road conditions and a speed limit of 80km/hr. However, on Captains Flat Road, to the north and south of the town, the road is winding on approach to the town, requiring vehicles to slow down to manoeuvre some of the turns.

When entering or exiting from Captains Flat Road south of the town, there is approximately 1.25 kilometres of sealed road from the T-junction of Braidwood Road and Foxlow Street before the road is unsealed. When entering or exiting from Captains Flat Road north of the town, there is a bridge over the Molonglo River located approximately 450 metres from the intersection of Captains Flat Road and Foxlow Street which has been upgraded from a one lane 60 km/hr bridge to a two lane 80 km/hr bridge. Captains Flat Road north of the town is fully sealed as it is a key route for people to move between Captains Flat towards Queanbeyan and Canberra (Ramboll, 2022).

2.6.3 Miners Road

Miners Road is a sealed publicly accessible two-way road that provides a route through the decommissioned Captains Flat mine site with entry and exit points on the northern side through Captains Flat Road and on the southern side through Foxlow Street. The entrance to Miners Road from Foxlow Street is an upwards gradient towards a hairpin turn at the top as well as an access road to the Captains Flat Sewage Treatment Plant. The road width of Miners Road varies from 4-6 metres, and it has a speed limit of 50 km/hr (Ramboll, 2022).

2.7 Site details

Descriptions of each of the six site locations are presented in this section along with photos from the site inspection undertaken by Ramboll between 7 and 11 June 2021. Site locations are shown in **Figure 2-1**.

2.7.1 Foxlow Parklet (site ID 1)

Table 2-2: Site description – Foxlow Parklet

Address	12 Spring Street Captains Flat
Lot references	Lot 1 DP251188
Approximate area (m²)	650
Current site use	Public open space and recreational use (access currently prevented)
Site description	The site is located at the northern extent of the Captains Flat township. The site comprises a relatively flat children's playground situated in a valley within Captains Flat with hills to the east and west
Hydrological features	Molonglo River lies approximately 70 m east of the site on the opposite side of Foxlow Street separated by dwellings
Vegetation	The site is grassed with a woodchipped area under the children's playground
Site access	The site is not fenced and open to public access from Foxlow Street to the east and Spring Street to the south
Nearby receptors	Residential properties occur in all directions around the site with the closest being immediately north adjacent to the site (approximately 5 m)



Photo 2-1: Foxlow Parklet facing northeast



Photo 2-2: Foxlow Parklet facing northwest

2.7.2 Crown land parcel adjacent to preschool (site ID 2)

Table 2-3: Site description – Crown Land Parcel Adjacent to Preschool

Address	27 Foxlow Street Captains Flat
Lot references	Crown reserve 1084055075
Approximate area (m²)	1,500
Current site use	Public open space and recreational use
Site description	The site comprises relatively flat vacant land adjacent a moderately steep embankment to the west
Hydrological features	Molonglo River traverses the northern portion of site
Vegetation	Exotic grass / cleared land
Site access	The site is bounded by the former preschool to the east, vacant land to the south and the eastern embankment to the west and north. None of the site boundaries are currently fenced
Nearby receptors	In addition to the preschool, residences and the Community Hall and Bowling Club occur approximately 15 m east of the site



Photo 2-3: Crown land parcel adjacent to preschool

2.7.3 Southern end of Foxlow Street (site ID 4)

Table 2-4: Site description – Southern End of Foxlow Street

Address	Foxlow Street (road reserve)
Lot references	Road reserve
Approximate area (m²)	12,500
Current site use	Public open space / road reserve and kerb and gutter
Site description	The site comprises relatively flat vacant land adjacent commercial and residential properties along Foxlow Street. There are Council footpaths either side of the site for approximately 600 m
Hydrological features	Forsters creek traverses the southern extent of site. Molonglo River bounds the site to the north
Vegetation	Exotic grass / cleared land
Site access	The site is not fenced and open to public access from Foxlow Street
Nearby receptors	The site is bounded by commercial and residential properties to the east and west. The Captains Flat RSL, the Community Hall and the Captains Flat Hotel are situated at the northern extent of the site



Photo 2-4: Southern end of Foxlow Street

2.7.4 Tennis and basketball courts and swimming pool (site ID 5)

Table 2-5: Site description – Tennis and Basketball Courts

Address	67-73 Foxlow Street
Lot references	Part Lot 166 DP 754866 and part Lot 7004 DP 1020764
Approximate area (m²)	3,000
Current site use	Public open space and recreational use
Site description	The site comprises relatively flat vacant land adjacent the swimming pool and basketball and tennis courts
Hydrological features	Molonglo River is situated along the western and southern boundaries of the site. Kerrs Creek traverses the site and is piped under the site
Vegetation	Exotic grass / cleared land
Site access	The site is bounded by Foxlow Street to the east and the playing fields to the south and west. The tennis and basketball courts are fenced however are open to the public
Nearby receptors	Residences are located approximately 25 m east of the site on the opposite side of Foxlow Street



Photo 2-5: Tennis courts

2.7.5 Flood berms and playing fields (site ID 6 and 7)

Table 2-6: Site description – Flood Berms and Playing Fields

Address	73 Foxlow Street
Lot references	Part Lot 7004 DP1020764 and waterway area
Approximate area (m²)	9,000 total (Flood berms 3,000 + Playing fields 6,000)
Current site use	Public open space and recreational use
Site description	The site comprises a flood berm running north – south adjacent to relatively flat playing fields to the east and a steep hill to the west of Molonglo River. The flood berms are approximately 1.5 m higher than the Molonglo River and cover an area approximately 210 m long by 10-12 m wide
Hydrological features	The Molonglo River borders the western side of the flood berm
Vegetation	The site is covered in sparse vegetation including shrubs and mature eucalyptus. Vegetation along the flood berm conforms to Ribbon Gum - tea-tree - River Tussock riparian scrub along tablelands streambanks, South East Corner Bioregion (low condition)
Site access	The site is not fenced and open to public access from the playing fields to the east off Foxlow Street
Nearby receptors	Residences occur east and south of the site. A petrol station is located across the road from the playing fields



Photo 2-6: Playing fields facing west

2.7.6 Former preschool (site ID 8)

Table 2-7: Site description – Former Preschool

Address	27 Foxlow Street Captains Flat
Lot references	Lots 101 and 107 DP 754870
Approximate area (m²)	2,000
Current site use	Former Preschool, currently vacant
Site description	The site is flat and sits at the base of the valley within the Captains Flat township with the eastern embankment to the west
Hydrological features	Molonglo River lies approximately 70 m east of the site on the opposite side of Foxlow Street separated by dwellings
Vegetation	Cleared land
Site access	The site is bounded by Foxlow Street to the east, vacant crown land to the south and west and residential properties to the north
Nearby receptors	Residential properties are located to the north

3. NEEDS AND ALTERNATIVES

3.1 Need for the Project

An extensive assessment has been completed targeting the environmental impacts of historic mining and land-fill activities within Captains Flat and the associated risks to human health and the environment. Key reports include:

- DPE Contaminants and Risks Team (C&R) *Nature and extent of contamination in the Captains Flat Region, NSW* (C&R, 2021)
- *EPA Captains Flat surface soil testing report* (NSW EPA, 2021)
- *Conceptual Site Model – Captains Flat Lead Management Plan* (Ramboll, 2021b) (CSM)
- *Abatement Options Assessment* (Ramboll, 2021c)
- *Captains Flat Lead Management Plan* (Ramboll, 2021d).

While elevated levels of lead in soils in and around the old mine site are not unexpected, the investigations carried out to date have determined that the concentration of lead at the six public site locations, when compared to national guidelines for contaminants in soil (NEPM) are above the acceptable levels and are a key driver of potential exposure risks.

The primary routes of exposure to human health and the environment are from dust generation and the transport of soils or dissolved contaminants with surface water. These actions can result in dermal contact, ingestion and inhalation of contaminated soils and water. The abatement of 'moderate' and 'high' potential risk areas on public land is necessary.

Ramboll prepared the Abatement Options Assessment (Ramboll 2021c) to assess the opportunity for various abatement strategies and define the most appropriate alternative for each of the six sites within the Project. Individual Abatement Plans have been prepared based on the findings of this report and discussion with the Taskforce (refer to **Appendix 1**).

3.2 Assessment of Alternatives

Ramboll (2021c) undertook an options study to determine the most appropriate alternative to achieve the NSW government objectives. The three options relevant to the Sites assessed by this Review are described below.

3.2.1 Alternative 1 – disposal of contaminated material at the former mine site containment cell and reinstatement of the existing landform

At each location, this alternative would be applied by either:

- a) Capping of contaminated soils without excavation;
- b) Excavating soil to the depth of contamination (i.e. soils where lead concentrations exceed adopted assessment criteria); or
- c) Excavating material to accommodate capping layers.

Excavated material would be transported to the Northern Tailing Dump. This would be followed by pH buffering to reduce leachate risks and consolidation / isolation within the proposed containment cell at the former mine site. The containment cell is to be constructed under a separate project and therefore the details of the containment cell is not covered by the environmental assessment within this Review.

This option would include either reinstatement or maintenance of existing capping/hardstand or installation of marker layer, geotechnical stabilisation (where required), placement of clean capping layers and revegetation. This option would require ongoing management at each location. Specific ongoing management techniques are detailed in the Abatement Plans prepared for each location. Excavation of soil to the depth of contamination would not require ongoing management.

3.2.2 Alternative 2 - offsite treatment and disposal of contaminated soil at landfill and reinstatement of existing landform

Alternative 2 involves the offsite treatment and disposal of contaminated soil at landfill. The options considered under this alternative include:

- a) Capping of contaminated soils without excavation;
- b) Excavation of all contaminated soils; or
- c) Excavation of material to accommodate capping layers.

Excavation for offsite treatment of excavated soil would occur through chemical immobilisation followed by disposal at an approved facility as immobilised General Solid Waste (GSW). This would be followed by geotechnical stabilisation (where required) and placement of clean backfill layers.

A waste facility capable of receiving the volume and type of material proposed to be generated as part of the Project has not yet been identified. A pathway for offsite disposal exists however through amendment to the Environment Protection License (EPL) of a local landfill to allow treatment (where lead concentrations warrant treatment) as a precursor to disposal as GSW).

This pathway would include:

- A treatability trial to confirm an optimal treatment process
- Application for an immobilisation approval for disposal of treated waste as immobilised GSW
- Environmental planning and approvals to allow chemical immobilisation at the waste facility or at the former mine site
- Mixing of soils with immobilising reagents
- Stockpiling to allow confirmatory sampling to assess success of immobilisation
- Confirmation of waste classification and disposal as immobilised GSW.

As per Alternative 1, this option would include either reinstatement or maintenance of existing capping/hardstand or installation of marker layer, geotechnical stabilisation (where required), placement of clean capping layers and revegetation and would require ongoing management if excavation of all contaminated soils was not completed.

3.2.3 Alternative 3 - do nothing.

Although the "do nothing" alternative would present a cost saving solution, the consequences of not taking action to abate the lead contaminated soils could lead to human health risks associated with exposure to lead. The advantages of abatement are considered to outweigh the impact of leaving contaminated soils in-situ in its current condition. These advantages include:

- The removal of the potential exposure pathway to contaminated soils through soil removal from, or by capping of contaminated soils within, the public sites across the locality significantly reduces the risk of human exposure which carries significant health risk and raises community concern
- Improved landscaping and revegetation of the public spaces as part of the program minimises soil erosion and enhances the amenity of the public spaces
- A reduction in the level of lead concentrations in areas that lead directly to offsite receiving waters including the Molonglo River and its associated riparian environments.

The alternative of 'do nothing' was therefore not considered to be a viable alternative.

3.2.4 Preferred alternative

A semi-quantitative system for evaluating abatement options was developed by Ramboll (2021c) based on the evaluation metrics described in **Table 3-1**. Final scores are presented in summary at **Table 3-2**.

Bold and underlined values represent the highest abatement scores and therefore preferred abatement options. However, as planning for receipt of abatement excavation spoil in the mine containment cell continues, to provide confidence that the abatement options would be implementable disposal of spoil at landfill has been substituted for mine site containment where relevant.

Table 3-1: Abatement Option Evaluation Metrics

Evaluation Metrics	Weighting (1 to 5)	Rationale
Reliability & Effectiveness	5	Reliability and effectiveness of abatement options is a high priority due to the potential for widespread environmental and human health exposure risks
Ecologically sustainable remediation	2	Large land remediation projects can use significant amounts of energy and emit large quantities of greenhouse gases. Since the late 2000s, there has been a global push to embrace sustainable approaches to remediation that provide a net benefit to the environment
Cost - Initial works	3	Large areas of contamination have been identified and costs may affect abatement feasibility
Cost - Ongoing management	2	Allocation of funds is required to ensure long term management if / where ongoing management is required and may affect abatement feasibility
Community Impact	4	Contaminant exposure risks and responsibility for management of contamination that may remain after abatement could impact current and future generations

Abatement option evaluation is based on multiplying a ranking (1, 2 or 3) for each metric under each option by the weighting for each metric. The weightings have been applied as an initial estimate by Ramboll and are to be confirmed by the Taskforce. Final scores for each option in each area are determined by multiplying the score by the weighting for each criterion and then summing the resultant values. The highest scores represent the preferred option.

Table 3-2: Abatement Scores

	Foxlow Parklet	Crown Road Reserve Adjacent Preschool	Southern end of Foxlow Street	Playing Fields and Flood Berms	Tennis / Basketball Courts	Former Preschool	
Option 1: Mine Site Containment		NA	NA	NA	NA	NA	NA
Options 2: Disposal at Landfill		40	28	28	NF	NF	31
Option 3: Cap Existing Landform		38	40	NF	37	32	NF
Option 3b: Excavate Cap Thickness to Mine then Cap		NA	NA	NA	NA	NA	NA
Option 3c Excavate Cap Thickness to Landfill then Cap		36	33	35	30	30	37

Notes:

- NF (not feasible) - Capping on top of the existing landform not considered feasible in consideration of adjacent ground levels or complete removal not feasible due to depth of contamination
- NA (not applicable) - Abatement options integrating containment of surplus excavation spoil at the former mine site scored higher than offsite disposal however the Taskforce has elected to progress planning for offsite disposal.

Abatement options integrating containment of surplus excavation spoil at the former mine site scored higher than offsite disposal however the Taskforce has elected to progress planning for offsite disposal.

Ongoing management costs have been conservatively projected and significantly affect the evaluation of abatement options.

4. PROJECT DESCRIPTION

4.1 Project Overview

The Project involves the abatement of existing lead contamination in surface soils within six public places within Captains Flat. The abatement works proposed are in the Abatement Plans prepared by Ramboll in **Appendix 1**. Construction activities would generally include:

- Site establishment
- Abatement works
- Spoil management
- Final landform and site demobilisation.

The components of each stage are described in detail below.

An Environmental Management Plan (EMP) has been prepared for the Project consistent with the *Guideline for the Preparation of Environmental Management Plans* (NSW Department of Infrastructure, Planning and Natural Resources, 2004) and *Environmental Management Systems Guidelines* (NSW Government, Edition 3 - August 2013) and is included in **Appendix 2**. The EMP documents how the abatement phase environmental management measures described in this Review would be implemented.

The estimated cost for the entire abatement program (including works at the eastern embankment site) is between \$3.8 million to \$7.1 million with financial assurance costs projected at \$2.95 million.

4.2 Site Establishment

Site preparation works would include some vegetation clearing, and the establishment of environmental controls, access areas and laydown areas. Plant equipment required to be mobilised progressively throughout the abatement works would likely include an excavator to excavate the contaminated soils, a dozer for spreading of imported capping material (**Section 4.3.6**) and a roller for imported capping material compaction.

Temporary fencing would be erected around the boundary of each location to restrict public access and to maintain safety and security of the worksite. Boundaries would be set up to contain the abatement works and lead work controls would be established by the Principal Contractor including notification to WorkSafe NSW.

The Project's Environmental Representative would refine the excavation extents in and around the proposed capping areas and work with the Principal Contractor to mark-out excavation and capping areas onsite.

Personnel likely to be onsite at various key stages of the works would include contractor representatives (operators, surveyor and supervisor), Council representatives and Principal's Environmental Representative.

A site compound and a portable toilet would be brought to the Sites by the Principal Contractor.

Environmental controls to be established prior to undertaking the works are discussed in **Section 8**.

All sites, except for the flood berm site, have existing access directly from Foxlow Street which would be utilised during construction. The flood berm site would maintain temporary access though the playing field site and both these sites would undergo abatement works concurrently to reduce the risk of contamination migration through the sites. Construction traffic and authorised access to the site would be managed through the traffic management described in **Section 7.4**.

Vegetation at the Sites is largely dominated by scattered trees and native vegetation is largely absent. Denser vegetation along the banks of the Molonglo River, adjacent to flood berms and playing fields, is characteristic of a riparian corridor. Clearing of weeds would be appropriately managed during establishment of the Sites, including undertaking targeted weed management and proper disposal, to reduce spread to adjacent sites (refer to **Section 7.7**).

4.3 Abatement Works

4.3.1 Adopted soil remediation criteria

The nominated assessment levels for the Sites have been selected based on Urban Residential, Public Open Space or Commercial/Industrial land use. Site specific trigger levels were developed for lead in soil and was determined through representative sampling and analyses of Captains Flat soils (Ramboll, 2021b). Health investigation levels (HILs) are generic and apply across Australia to all soil types generally to a depth of three metres below surface and Ecological investigation levels (EILs) depend on specific soil physicochemical properties and land use scenarios and generally apply to the top two metres of soil.

HIL C criteria applies to public open spaces, parks, playgrounds and playing fields and therefore is applied to all the sites except for the preschool. Based on the sensitive site use as the preschool site, HIL A and EILs for urban residential/public open space have been adopted.

The adopted remediation criteria are presented in **Table 4-1**.

Table 4-1: Soil Assessment Criteria (mg/kg)

Contaminant	HIL C (all sites except former preschool)	HIL A (former preschool site)	EIL (Urban residential/ public open space)
Lead	600 / 700 ^b	300 / 400 ^b	1,100

Note:

- Indicates no criteria available

^b Site Specific Trigger Level

The 95% upper confidence limit of the arithmetic mean lead reading (as measured by fpXRF in the field) would be assessed against the criteria nominated in **Table 4-1** where the following conditions are met:

- the standard deviation of the results is less than 50% of the criteria, and
- no single value should exceed 250% of the criteria.

Where these conditions are not met absolute lead readings would be adopted.

4.3.2 Abatement strategy

Abatement Plans have been prepared specifically for each location to define an abatement strategy to reduce community exposure risks. The Abatement Plans include relevant drawings to and details to guide the execution of the nominated strategy.

All abatement strategies except the Crown land adjacent the preschool include offsite disposal of contaminated soils at landfill. These strategies include a treatability trial to confirm optimum pH amendment strategy for the contaminated soils to remain beneath capping and to confirm the immobilisation pathway for surplus excavation spoil from the playing fields that would be disposed of offsite. This would inform a Specific Immobilisation Application to be prepared in accordance with provision described under Part 2 of the NSW EPA Waste Classification Guidelines (2014).

The key actions for the proposed works for each location are described below. Further detail is provided in the individual Abatement Plans prepared by Ramboll in **Appendix 1**.

Foxlow Parklet (site ID 1)

The abatement strategy for Foxlow Parklet includes:

- Excavation of the upper 0.5-1.0 metres of contaminated soil (a field portable x-ray fluorescence metals analyser (XRF) would be used onsite to identify the exact depth of soil excavation)
- Offsite chemical immobilisation to satisfy requirements of a Specific Immobilisation Approval (TBC) and disposal as immobilised GSW at an appropriately licensed waste facility
- Construction of cap through placement of clean backfill layers
- Reinstatement of play equipment and revegetation of the final capped surface to minimise soil erosion.

Crown land adjacent to preschool (site ID 2)

The abatement strategy for the land adjacent to the preschool includes:

- Mixing/tilling surficial with pH amendment to the extent practical to reduce ongoing leachate risks
- Placement of a geofabric marker layer on the top of the contaminated soil surface to act as a visual and physical barrier
- Placement of a clean capping layer with a minimum of 0.3 metre thickness over the extent of the site
- Revegetation of the final capped surface to minimise soil erosion and damage to the capping layer.
- Management of remnant contamination under an LTEMP.

Southern end of Foxlow Street (site ID 4)

The abatement strategy for the southern end of Foxlow Street includes:

- Excavation of shallow soils to a depth of 0.1 m to allow capping with hardstand pavement to reinstate current landform levels. Further removal of 300 m³ is included to allow for drainage tie-ins, in-situ tree / plant boxes etc.
- Offsite chemical immobilisation to satisfy requirements of a Specific Immobilisation Approval (TBC) and disposal as immobilised GSW at an appropriately licensed waste facility
- Construction of hardstand pavement along both sides of Foxlow Street from the Molonglo River bridge, south to Jerangle Road
- Management of remnant contamination under an LTEMP.

Tennis and basketball courts and swimming pool (site ID 5)

Based on the evaluation completed the preferred abatement option for the playing courts and swimming pool is to resurface / maintain the existing hardstand. The maintenance of hardstand pavement in these areas as required to retain functionality of these facilities could be expected to result in ongoing maintenance as part of routine operations. Further assessment of accessible soils / pavement within the pool fence may identify additional abatement requirements in this area. Management of remnant contamination would be required under an LTEMP.

Flood berms and playing fields (site ID 6 and 7)

The abatement strategy for the flood berms and playing fields includes:

- Preparation of a detailed landform / drainage design for the flood berms and playing field
- Refinement of the lateral extent of abatement through field measurement of lead concentrations using fpXRF to supplement existing sampling data.
- Excavation and re-contouring the currently eroded flood berms.
- Excavation of the upper 0.3 m of soil from the southern end of the playing fields.
- Offsite chemical immobilisation to satisfy requirements of a Specific Immobilisation Approval (TBC) and disposal as immobilised GSW at an appropriately licensed waste facility
- Mixing/tilling surficial recontoured soils from the flood berms and surficial remnant soils beneath the Southern Playing Fields with pH amendment to the extent practical to reduce ongoing leachate risks
- Survey the final surface (X, Y, Z co-ordinates) for remnant contaminated soil.
- Placement of a geofabric marker layer on the top of the contaminated soil surface to act as a visual and physical barrier.
- Placement of a clean capping layer with a minimum of 0.3 m thickness over the extent of the Abatement Areas 6 and 7 to cover the recontoured flood berms and reinstate the playing field surface level. During this stage sub-surface watering system infrastructure is to be installed at the playing fields to facilitate maintenance of grass over the final surfaces. Geogrid may be required to stabilise the flood berms and provide additional erosion and scour protection.
- Survey of the top surface of the capping layer (X, Y, Z co-ordinates) to ensure that the required thickness has been achieved.
- Revegetation of the final capped surface to minimise soil erosion and damage to the capping layer.
- Management of remnant contamination under an LTEMP.

Former preschool (site ID 8)

The Abatement strategy for the former preschool includes:

- Excavation of the top 0.3 metres of soil in open areas around the Preschool
- Mixing/tilling surficial after excavation with pH amendment to the extent practical to reduce ongoing leachate risks
- Offsite chemical immobilisation to satisfy requirements of a Specific Immobilisation Approval (TBC) and disposal as immobilised GSW at an appropriately licensed waste facility
- Placement of a geofabric marker layer on the top of the contaminated soil surface to act as a visual and physical barrier
- Placement of a clean capping layer with a minimum of 0.3 metre thickness over the extent of the site
- Revegetation of the final capped surface to minimise soil erosion and damage to the capping layer.

4.3.3 Hours, duration and workforce

Construction of the Project would be undertaken during the hours described in the EPA *Interim Construction Noise Guideline* (ICNG) and the Council *Development Construction Specification C101 General* (2019), unless under direction from relevant authority for safety reasons or in the event of an emergency:

- 7:00am to 6:00pm Monday to Friday
- 7:00am to 1:00pm Saturday
- No construction works on Sunday or public holidays.

Construction activities would commence in mid-2022 (subject to regulatory approval, budget provisions and scheduling with the programs of remediation for the former mine site and rail corridor) for an estimated duration of 41 weeks. It is likely the works would occur over several temporally separate campaigns based on annual budget provisions. Although unlikely to occur, for the purpose of the environmental assessment in **Chapter 7**, this Review has considered the possibility of the abatement works of all six sites occurring concurrently as a worst-case scenario.

A peak workforce of up to 30 construction personnel would be required.

To reduce potential for recontamination of public spaces in the southern end of town after abatement, rehabilitation of the former mine site and rail corridor uphill of the eastern embankment and the abatement of the eastern embankment is likely necessary as a precursor to the abatement of the locations subject to this Review. The proposed abatement of the former mine site, rail corridor and eastern embankment site are subject to separate planning approvals.

4.3.4 Plant and equipment

Plant and equipment needed for the Project would include:

- Excavators
- Front end loaders
- Light vehicles
- Smooth drum rollers
- Backhoes
- Compactors
- Dump trucks
- Water trucks.

4.4 Spoil Management

4.4.1 Stockpiles

The Project would generate up to 10,900 cubic metres of spoil (including the eastern embankment site subject to a separate Review). The sites to which this Review applies, would generate 4,700 cubic metres of spoil. Spoil would be stockpiled within the Site. The stockpile areas would be underlain with geofabric and have erosion and sediment controls installed as appropriate to minimise disturbance and potential contamination.

The following general principles would be incorporated into management of stockpiles:

- Stockpiles are to be placed on plastic sheeting and located within the extent of abatement footprint
- Covering with plastic sheeting of all contaminated soil stockpiles remaining on the Sites for more than 24 hours
- All stockpiles would be placed on a level area as a low elongated mound
- Further erosion and sediment controls in accordance with the EMP (**Appendix 2**) are to be implemented.

Additionally, the abatement sites include areas adjacent private residences and/or natural water courses. All abatement activities involving excavation have the potential to increase contaminant exposure risks via airborne dust and surface water run-off. Protection of the surrounding community and environment during implementation of spoil management is essential. Management measures are discussed in detail in **Chapter 8** and have been included in the EMP (refer to **Appendix 2**).

4.4.2 Waste management

The waste management strategy is to excavate the contaminated soil, transport to an offsite location, chemically immobilise the lead and potentially other contaminants (which are to be appropriately assessed) and dispose of the spoil as immobilised GSW at an appropriately licensed landfill.

A waste facility capable of receiving the volume and type of material proposed to be generated during onsite remediation has not yet been identified. A pathway for offsite disposal exists however through amendment to the EPL of a local landfill to allow treatment (where lead concentrations warrant treatment) as a precursor to disposal as GSW. This pathway would include:

- A treatability trial to confirm an optimal treatment process
- Application for an immobilisation approval for disposal of treated waste as immobilised GSW
- Environmental planning and approvals to allow chemical immobilisation at the waste facility or at the former mine site
- Mixing of soils with immobilising reagents
- Stockpiling to allow confirmatory sampling to assess success of immobilisation
- Confirmation of waste classification and disposal as immobilised GSW.

Chemical immobilisation of the spoil is not included within this Review. DRNSW is investigating the chemical immobilisation option as the preferred method of disposal.

4.5 Materials Tracking

A procedure for materials tracking would be executed which would include:

- Truck logging at the Sites entrances and exits for materials being exported and imported
- As it is proposed to transport contaminated soils from the Site, the transport process needs to be controlled as per the NSW EPA requirements of waste tracking and acceptance, where classified as a waste that must be tracked. Waste disposal docketts are to form part of the Validation Report.

4.6 Imported Fill

Approximately 14,700 cubic metres of capping material would be required for the Project (including the eastern embankment site subject to a separate Review). The sites to which this Review applies, would require approximately 6,200 cubic metres of imported fill. Topsoil and landscaping material may be brought onto the Sites if it has been classified as virgin excavated natural materials (VENM), excavated natural materials (ENM) or under a resource recovery exemption prior to import.

Documentation is to include volume, origin, description, photographs and classification. On import, visual verification including photographs should be completed to confirm that the verified material is consistent with the material received to the Sites.

4.7 Final Landform

Following completion of activities, the Sites would be reinstated to a suitable condition consistent with or similar to pre-construction conditions. This would include the removal of wastes and works infrastructure (such as fencing and environmental controls) unless agreed to by Council.

Capping with clean soils would be undertaken to reinstate the current landform levels at each site with the exception of the Crown land parcel adjacent to the former preschool and the flood berm. Works at the flood berm would include recontouring and raising of the current landform level to improve stabilisation and minimise erosion. Geogrid may also be required to stabilise the flood

berms and provide additional erosion and scour protection. The final capped surface would be revegetated to minimise soil erosion and damage to the capping layer.

4.8 Operation

Ongoing maintenance of the Project would generally relate to repairs of the capping if required and maintenance of landscaping and vegetation in the public areas. The Project has been designed and would be installed to minimise the potential for capping damage requiring such repairs. A long term EMP would be required where capping is installed.

4.9 Environmental Management Plan

An EMP has been prepared for the Project consistent with the *Guideline for the Preparation of Environmental Management Plans* (NSW Department of Infrastructure, Planning and Natural Resources, 2004) and *Environmental Management Systems Guidelines* (NSW Government, Edition 3 - August 2013) and is included in **Appendix 2**. The EMP is to address the environmental impacts discussed in **Chapter 7**.

5. STAKEHOLDER CONSULTATION

5.1 Consultation undertaken for the Project

DRNSW has managed community relations through assessment and management of contamination at Captains Flat to date. DRNSW would continue to manage community relations throughout the abatement works according to a formalised community relations plan.

Consultation with local and state government departments has been undertaken through the Taskforce which was established in late 2020 to oversee the work, provide a coordinated approach to dealing with lead contamination and keep the local community informed. The Taskforce was consulted during preparation of the abatement plans (refer to **Appendix 1**). The Taskforce includes representatives from:

- Department of Regional NSW – Regional Development; Mining, Exploration and Geoscience; Department of Primary Industries
- EPA
- NSW Health
- NSW Department of Planning and Environment – Crown Lands
- Queanbeyan-Palerang Regional Council
- Transport for NSW
- NSW Department of Education.

Community information sessions were held in March 2021 to inform the community of potential contaminant exposure risks and in September 2021 to communicate findings of the contamination assessments undertaken and of the pathway to develop a lead management plan. A community water usage survey was also completed to help inform the assessment of exposure risks.

5.2 Consultation undertaken during preparation of the Review

A draft of the Review was provided to the EPA for comment. Details of the comments received and response are provided in **Table 5-1**.

Table 5-1: Comments from the EPA on the Review and Response

EPA Comment	Response
<p>The NSW EPA has reviewed the Captains Flat Lead Abatement Works Review of Environmental Factors (REF) which identifies and outlines potential remediation options for six public locations where lead concentrations exceed the NEPM guidelines and there are potential exposure risks and provides the following comments. The REF discusses three alternatives for the abatement of the site:</p> <ol style="list-style-type: none"> 1. The disposal of contaminated material at the mine site containment cell and reinstatement of existing landforms; 2. Offsite treatment and disposal of contaminated at landfill and reinstatement of existing landforms; and 3. Do nothing <p>The EPA notes that, although investigated as a potential abatement option, the use of the mine site containment cell for disposal of contaminated material has not been discussed in the REF.</p>	<p>Noted. The use of the mine site containment cell for disposal of contaminated material is outside the scope of this Review, and is the subject of a separate environmental assessment and planning approval process.</p>

EPA Comment	Response
<p>The abatement options discussed in the REF involve the offsite treatment and disposal of contaminated soil at a landfill for all sites other than the Crown land adjacent to the preschool. The EPA understands that a Specific Immobilisation Application would be prepared and, if approved, used to complete offsite chemical immobilisation of the contaminated soil prior to disposal at an appropriate waste facility. The REF does not include information regarding the chemical immobilisation of the soil, however investigations into the treatment of the material at a waste facility or at the mine site are underway. The EPA notes that an appropriate licensed facility capable of receiving the volume and type of material to be generated has yet to be identified. An Environment Protection Licence or variation to an EPL for a current licensed waste facility would likely be required to facilitate the offsite chemical treatment and disposal of material. Consideration of the environmental factors would need to be considered and addressed at the chosen site and any EPL application or variation completed prior to any works commencing.</p>	<p>Noted. Consistent with the Review and future pathway for the project.</p>
<p>The REF identifies that the Project would generate up to 10,900 m³ of spoil which would be stockpiled onsite. The EPA notes that the stockpiles would be placed on plastic sheeting, covered if on site for longer than 24hrs and additional sediment and erosion controls be implemented. Given the nature of the material to be stockpiles, a high standard of sediment and erosion controls, included pre-rainfall procedures, must be developed and implemented to ensure the protection of the environment.</p>	<p>Noted. Consistent with management measures included in Section 7.1.4.</p>

5.3 Future consultation

The Taskforce and/or the relevant agency would undertake community engagement as part of the Project in accordance with a community relations plan. Consultation to be undertaken prior to and during the Project would include:

- Notification to affected residences prior to commencement of works (particularly regarding noise impacts as described in **Section 7.1**)
- Notification to WorkSafe NSW prior to commencement of 'lead risk work'
- Response to community queries or complaints during the works in accordance with a community relations plan
- Ongoing communication with the Taskforce on Project progress
- Ongoing communications with Council representative/s, in particular around any works on/near Council infrastructure and underground services
- Consent from the Land Division, Department of Primary Industries for the abatement works over Crown Land (refer to **Section 6.2.4**)
- The Mogo Local Aboriginal Land Council (LALC) would be briefed on the proposed works and invited to provide feedback on the Aboriginal due diligence survey (refer to **Section 7.8**).

6. PLANNING AND STATUTORY SETTING

6.1 Local Planning

6.1.1 Palerang Local Environmental Plan Local Environment Plan 2014

The Sites are zoned RE1 – Public Recreation and RU5 - Village under the *Palerang Local Environmental Plan 2014* (Palerang LEP). The land use zoning applicable to each parcel is in **Table 6-1**.

The Project is not a permitted use under the applicable zoning, however Section 3.28 of the EP&A Act provides that a State Environmental Planning Policy (SEPP) prevails over a LEP in the event of any inconsistency. Therefore, the development is permitted through the provision of SEPP R&H (refer to **Section 6.2.3.2**).

Table 6-1: Land Zoning

Zone	Location	Consistency with zone objectives
RE1 – Public Recreation	Foxlow Parklet Flood berms Playing Fields, Tennis and Basketball Courts	There would be no loss of recreational land associated with the project The project would contribute to the safe and functional recreational use of the park, courts and playing fields for public use on completion of the works
RU5 - Village	Southern end of Foxlow street Former Preschool Flood berms	The abatement works would enhance the streetscape and improve the amenity of the locality by removing contaminated soils and reinstating the road verge to a functional condition The project would improve the amenity of existing or future residential premises along the southern end of Foxlow Street and allow for the use of the preschool site for various community uses

6.1.1.1 Miscellaneous Provisions of the Palerang LEP

Clause 5.10 Heritage Conservation

The Palerang LEP lists heritage items and heritage conservations areas in Schedule 5 of the LEP. Clause 5.10 outlines matters for consideration before development consent is granted to the Project. The consent authority must consider the extent to which the carrying out of the proposed development would affect the heritage significance of the heritage item or heritage conservation area concerned. The heritage items within proximity to the Sites have been considered in **Section 7.8** of this Review.

Clause 5.21 Flood planning

Clause 5.21 aims to—

- (a) to minimise the flood risk to life and property associated with the use of land,*
- (b) to allow development on land that is compatible with the flood function and behaviour on the land, taking into account projected changes as a result of climate change,*
- (c) to avoid adverse or cumulative impacts on flood behaviour and the environment,*
- (d) to enable the safe occupation and efficient evacuation of people in the event of a flood.*

The site is in proximity to the Molonglo River and parts of the site are mapped as 'Flood Planning Area'.

Although majority of the site would be re-instated to its original surface levels, the flood berms would be recontoured and capped and a clean capping layer with a thickness of approximately 0.3 metres would be placed over the extent of the abatement area in this area and the Crown land parcel adjacent to the former preschool. It is not expected that the recontouring of the flood berms would impact on drainage activity particularly because the land in this location does not function as a mechanism for controlling flood behaviour.

The impacts of the Project on the waterway and flood behaviour have been assessed in **Section 7.4**.

6.1.1.2 Additional Local Provisions of the Palerang LEP

The Palerang LEP outlines matters for consideration before development consent is granted to the Project. In deciding whether to grant development consent for earthworks (or for development involving ancillary earthworks), the consent authority must consider the following matters outlined in **Table 6-2** under clause 6.1.

Table 6-2: Palerang LEP Clause 6.1 considerations

Clause 6.1	Comment
(a) the likely disruption of, or any detrimental effect on, drainage patterns and soil stability in the locality of the development,	<p>The abatement works have been refined to avoid unnecessary vegetation clearance within riparian areas to protect the stability of the soil, particularly in areas close to the banks of the Molonglo River</p> <p>The landform would be reinstated to current landform levels on all sites apart from the flood berm and the Crown land adjacent to the preschool site. The flood berms would be recontoured and capped. It is not expected that the recontouring of the flood berms would impact on drainage activity as the berms would be recontoured and capped with at least 0.3 metres of clean capping raising the current landform levels and therefore increasing flood protection within this area</p> <p>A clean capping layer with a thickness of approximately 0.3 m would be placed over the extent of the abatement area at the Crown land parcel adjacent to the preschool. The sites would be revegetated to encourage soil stability and drainage</p>
(b) the effect of the development on the likely future use or redevelopment of the land,	The Project is for the abatement of lead contaminated soils to make safe the sites for public use and potential future redevelopment
(c) the quality of the fill or the soil to be excavated, or both,	As discussed in Section 4.4 , Section 4.5 and Section 4.6 , excavated and imported soils would be managed in accordance with a EMP
(d) the effect of the development on the existing and likely amenity of adjoining properties,	The implementation of spoil management through and approved EMP would provide protection of the surrounding community and environment during abatement works
(e) the source of any fill material and the destination of any excavated material,	Topsoil material brought onto the Sites would be classified as VENM, ENM or under a resource recovery exemption prior to import. Documentation would be provided that details volume, origin, description, photographs and classification
(f) the likelihood of disturbing relics,	As discussed in Section 7.8 , impacts on relics is considered low risk and would be managed in accordance with a EMP
(g) the proximity to, and potential for adverse impacts on, any waterway, drinking water catchment or environmentally sensitive area,	The Sites are in proximity to the Molonglo River. The impacts of the project on the waterway and surrounding riparian has been assessed in Section 7.3 , Section 7.7 and Appendix 7

Clause 6.1	Comment
(h) any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.	Management and mitigation measures to avoid or minimise impacts are in Chapter 7 and summarised in Chapter 8

6.2 State Matters

6.2.1 NSW Environmental Planning and Assessment Act 1979

The EP&A Act is the principal piece of environmental legislation which provides for development planning and control in NSW. Council is the determining authority under Part 5 of the EP&A Act.

Under Section 5.5 of the EP&A Act, a determining authority is required to consider the environmental impact of an activity:

"(1) For the purpose of attaining the objects of this Act relating to the protection and enhancement of the environment, a determining authority in its consideration of an activity shall, notwithstanding any other provisions of this Act or the provisions of any other Act or of any instrument made under this or any other Act, examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity.

(2) (Repealed)

(3) Without limiting subsection (1), a determining authority shall consider the effect of an activity on any wilderness area (within the meaning of the Wilderness Act 1987) in the locality in which the activity is intended to be carried on.

(4) (Repealed)"

The Review has been prepared under Part 5 of the EP&A Act and describes the matters affecting or likely to affect the environment as a result of the Project.

The Sites are not in a declared wilderness area.

6.2.2 NSW Environmental Planning and Assessment Regulation 2021

6.2.2.1 Clause 171

Clause 171 of the EP&A Regulation prescribes the factors to be considered concerning the impact of an activity on the environment. Clause 171 states:

"(1) When considering the likely impact of an activity on the environment, the determining authority must take into account the environmental factors specified in the environmental factors guidelines that apply to the activity.

(2) If there are no environmental factors guidelines in force, the determining authority must take into account the following environmental factors—

(a) the environmental impact on the community,

(b) the transformation of the locality,

(c) the environmental impact on the ecosystems of the locality,

(d) reduction of the aesthetic, recreational, scientific or other environmental quality or value of the locality,

(e) the effects on any locality, place or building that has—

(i) aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance, or

(ii) other special value for present or future generations,

(f) the impact on the habitat of protected animals, within the meaning of the Biodiversity Conservation Act 2016,

- (g) the endangering of a species of animal, plant or other form of life, whether living on land, in water or in the air,
- (h) long-term effects on the environment,
- (i) degradation of the quality of the environment,
- (j) risk to the safety of the environment,
- (k) reduction in the range of beneficial uses of the environment,
- (l) pollution of the environment,
- (m) environmental problems associated with the disposal of waste,
- (n) increased demands on natural or other resources that are, or are likely to become, in short supply,
- (o) the cumulative environmental effect with other existing or likely future activities,
- (p) the impact on coastal processes and coastal hazards, including those under projected climate change conditions,
- (q) applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1,
- (r) other relevant environmental factors.”.

The factors referred to in Clause 171(2) are listed and addressed in **Appendix 3**. This Review provides a detailed review of the relevant environmental factors in accordance with Clause 171 of the EP&A Regulation.

6.2.2.2 Designated development

Designated Development refers to developments that are high-impact developments (e.g. likely to generate pollution) or are located in or near an environmentally sensitive area (e.g. a wetland). There are two ways a development can be categorised as ‘designated development’:

- the class of development can be listed in Schedule 3 of the EP&A Regulation as being designated development, or
- a LEP or SEPP can declare certain types of development to be designated.

Clause 15 in Schedule 3 outlines the triggered for designated development relating to contaminated soil treatment works as follows:

“Contaminated soil treatment works (being works for on-site or off-site treatment of contaminated soil, including incineration or storage of contaminated soil, but excluding excavation for treatment at another site)—

- (a) *that treat or store contaminated soil not originating from the site on which the development is proposed to be carried out and are located—*
 - (i) *within 100 metres of a natural waterbody or wetland, or*
 - (ii) *in an area of high watertable or highly permeable soils, or*
 - (iii) *within a drinking water catchment, or*
 - (iv) *on land that slopes at more than 6 degrees to the horizontal, or*
 - (v) *on a floodplain, or*
 - (vi) *within 100 metres of a dwelling not associated with the development, or*
- (b) *that treat more than 1,000 cubic metres per year of contaminated soil not originating from the site on which the development is located, or*
- (c) *that treat contaminated soil originating exclusively from the site on which the development is located and—*
 - (i) *incinerate more than 1,000 cubic metres per year of contaminated soil, or*
 - (ii) *treat otherwise than by incineration and store more than 30,000 cubic metres of contaminated soil, or*
 - (iii) *disturb more than an aggregate area of 3 hectares of contaminated soil.”.*

The Project does not meet the requirements under Clause 15 and is therefore not considered to be designated development.

6.2.3 State Environmental Planning Policies

6.2.3.1 State Environmental Planning Policy (Transport and Infrastructure) 2021

Development consent

Clause 5.2 provides for those activities defined as “environmental management works”. Environmental management works is defined as:

- “(a) works for the purpose of avoiding, reducing, minimising or managing the environmental effects of development (including effects on water, soil, air, biodiversity, traffic or amenity), and*
- (b) environmental protection works.”.*

The Project is within the meaning of “environmental protection works” as defined by the *Standard Instrument—Principal Local Environmental Plan* as follows:

“environmental protection works means works associated with the rehabilitation of land towards its natural state or any work to protect land from environmental degradation, and includes bush regeneration works, wetland protection works, erosion protection works, dune restoration works and the like, but does not include coastal protection works.”

Environmental management works are listed in Clause 2.73 of the SEPP T&I as works permitted without consent:

- “(3) Any of the following development may be carried out by or on behalf of a council without consent on a public reserve under the control of or vested in the council –*
- (b) environmental management works”.*

Council is defined as a public authority within the meaning of the EP&A Act under the *Local Government Act 1993*:

“public authority means a public authority constituted by or under an Act, a government department or a statutory body representing the Crown, and includes a person exercising any function on behalf of the authority, department or body and any person prescribed by the regulations to be a public authority”.

Council is a public authority under the EP&A Act and the Project is identified as environmental protection works under the Standard Instrument. Development consent is not required for the Project and assessment under Part 5 of the EP&A Act is required.

6.2.3.2 State Environmental Planning Policy (Resilience and Hazards) 2021

On 1 March 2022 Chapter 4 of SEPP R&H replaced SEPP 55 in relation to the remediation of land. The Chapter aims to provide a state-wide planning approach to the remediation of contaminated land and to reduce the risk of harm to human health and the environment by consideration of contaminated land as part of the planning process. Under SEPP R&H, a consent authority must not consent to the carrying out of development on land unless it has considered any potential contamination issues. A contamination assessment has been undertaken for the Project and is discussed in **Section 7.1**.

Category 2 remediation work: work not needing consent

Category 2 remediation work is permitted under clause 4.7 of SEPP R&H despite any provision to the contrary in an environmental planning instrument. Clause 4.7(3) provides that:

“A person may carry out a category 2 remediation work without the consent of the consent authority.”

The Project may be carried out without consent under the provisions of Clause 2.73 of the SEPP T&I and therefore is considered within the meaning of “category 2 remediation work” as defined by Clause 4.11:

*“(b) a remediation work that –
(ii) may be carried out without consent under another State environmental planning policy or a regional environmental plan (as referred to in clause 4.16(4)),*

Prior notice of category 2 remediation work

In accordance with Clause 4.13, notice of the proposed work would be given to Queanbeyan-Palerang Council as the council for the local government area in which the land is situated.

6.2.3.3 Other State Environmental Planning Policies

Table 6-3 provides a summary of the relevant SEPPs considered for the Project.

Table 6-3: Relevant State Environmental Planning Policies

Instrument	Relevance to The Project
<i>State Environmental Planning Policy (Planning Systems) 2021</i>	The <i>State Environmental Planning Policy (Planning Systems) 2021</i> identifies development that is State or regionally significant. Schedule 1 of the SEPP lists those projects which are considered state significant. The Project is not listed as a state significant development.

6.2.4 Other Key NSW Legislation

Table 6-4 identifies the key requirements of other NSW environmental legislation and its relevance to the Project.

Table 6-4: Other Relevant NSW Legislation

Legislation	Relevance to The Project
<i>Protection of the Environment Operations Act 1997 (POEO Act)</i>	<p>The POEO Act aims to protect, restore and enhance the quality of the environment to maintain ecologically sustainable development and provides the key framework to regulate environmental pollution. Under Part 5.3 it is an offence to pollute any waters.</p> <p>The potential pollution impacts to waterways from the Project have been considered in Section 7.3 and Section 7.7. Pollution of waterways is not expected to occur as a result of the Project with implementation of the management and mitigation measures described in Section 7.3 and Section 7.7.</p>
<i>Water Management Act 2000 (WM Act) and Water Management (General) Regulation 2018 (WM Regulation)</i>	<p>The WM Act aims to provide for the sustainable and integrated management of the State's water in accordance with ecologically sustainable development principles. Under section 91 of the Act, a controlled activity approval is required for certain types of activities which are carried out on waterfront land. 'Waterfront land' is defined in the WM Act as the bed of any river, lake or estuary, and the land within 40 m of the river banks, lake shore or estuary mean high water mark.</p> <p>A 'controlled activity' means:</p> <ul style="list-style-type: none">• Erection of a building• Carrying out a work

Legislation	Relevance to The Project
	<ul style="list-style-type: none"> • Removing material from waterfront land, such as vegetation or extractive material • Depositing material on waterfront land, such as extractive material • Carrying out an activity which affects the quantity or flow of water in a water source <p>The Project meets the definition of a controlled activity on waterfront land. However, Clause 41 of the WM Regulation specifies that an exemption applies to public authorities (as defined in the WM Act) in relation to all controlled activities that it carries out in, or under waterfront land.</p> <p>Council is defined as a public authority within the meaning of the WM Act and therefore a controlled activity approval is not required.</p>
<p><i>Contaminated Land Management Act 1997</i> (CLM Act)</p>	<p>Section 60 of the CLM Act requires landowners to notify the EPA if their activities have resulted in contamination of the land.</p> <p>A contamination assessment has been undertaken for the Project and is discussed in Section 7.1. Notification to the EPA would be required if any Project activities result in the contamination of land. This is not expected to occur with implementation of the management and mitigation measures described in Section 7.1.</p>
<p><i>Protection of the Environment Operations (Waste) Regulation 2014</i> (POEO Waste Regulation)</p>	<p>The POEO Waste Regulation specifies the requirements to manage the transportation and disposal of contaminated wastes. The Sites contains areas of fill with elevated contaminant concentrations (refer to discussion in Section 7.1).</p> <p>Waste management for the Project (including disposal of contaminated soils) is considered in Section 7.2.</p>
<p><i>Waste Avoidance and Resource Recovery Act 2001</i> (WARR Act)</p>	<p>The WARR Act establishes a hierarchy of waste management (avoid, recover, dispose) encouraging efficient use of resources and minimising waste. Waste management for the Project is considered in Section 7.2.</p>
<p><i>Biodiversity Conservation Act 2016</i> (BC Act)</p>	<p>The BC Act provides a framework for the assessment of a Project's potential impacts on threatened species, population and Endangered Ecological Communities.</p> <p>Section 7.8 of the BC Act states an assessment under Part 5 of the EP&A Act needs a species impact statement or a biodiversity development assessment report where an activity is likely to significantly affect threatened species.</p> <p>An assessment of the Project impacts on biodiversity is included in Section 7.7. The Project is unlikely to significantly affect a threatened species and therefore a species impact statement or a biodiversity development assessment report is not required.</p>
<p><i>Local Land Services Act 2013</i> (LLS Act)</p>	<p>The LLS Act provides for framework for the management of local land services and includes the requirement to obtain approval under Part 5A of the Act to remove native vegetation. Under Clause 20 of Part 2 of Schedule 5A, clearing of the purpose of 'public works' is permitted without approval. Public works include:</p> <p><i>"(1) Clearing native vegetation for the construction, operation or maintenance of infrastructure by a public or local authority in the exercise of its land management activities.</i></p> <p><i>(2) The native vegetation must not comprise (or be likely to comprise):</i></p> <p style="padding-left: 40px;"><i>(a) a threatened species or part of a threatened ecological community or the habitat of a threatened species under the Biodiversity Conservation Act 2016, or</i></p> <p style="padding-left: 40px;"><i>(b) the habitat of threatened species, populations or ecological communities of fish under the Fisheries Management Act 1994."</i></p> <p>Council is a local authority within the meaning of the LLS Act and therefore clearing of native vegetation is permitted provided the vegetation does not comprise those specified in 2(a) or (b).</p>

Legislation	Relevance to The Project
	An assessment of the Project impacts on biodiversity is included in Section 7.7 . The Project would not involve the clearing of native vegetation comprising the characteristics described in Clause 20 (2)(a) or (b) of Part 2 of Schedule 5A of the LLS Act.
<i>Biosecurity Act 2015</i>	The <i>Biosecurity Act 2015</i> provides guidance for managing diseases and pests that may cause harm to human, animal or plant health or the environment. Weed management for the Project is considered in Section 7.7 .
<i>Fisheries Management Act 1994 (FM Act)</i>	<p>The FM Act provides for the conservation and management of the key: habitats; threatened species; populations; and communities as they relate to fish and the marine environment. Permits are required from the Minister under section 201 (for dredging or reclamation works), or section 219 (blockage of fish passageway) of the FM Act.</p> <p><u>Dredging and Reclamation Works</u></p> <p>Section 198A of the FM Act defines:</p> <ul style="list-style-type: none"> • Dredging work as “any work that involves excavating water land, or any work that involves moving material on water land or removing material from water land that is prescribed by the regulations as being dredging work to which this Division applies”. Water land means land submerged by water either permanently or intermittently. • Reclamation work means any work that involves using any material to fill in or reclaim water land or depositing any such material on water land for the purpose of constructing anything over water land or draining water from water land for the purpose of its reclamation. <p>Under section 200 of the FM Act, a local government authority must not carry out dredging work or reclamation work except under the authority of a permit issued by the Minister.</p> <p>The abatement works would not be undertaken on water land and therefore approvals for dredging or reclamation works would not be required.</p> <p><u>Blockage of Fish Passageway</u></p> <p>Under section 219 of the FM Act it is an offence to obstruct a fish passageway unless a permit is obtained from the Minister.</p> <p>An assessment of the Project impacts on threatened fish and key fish habitats is included in Section 7.7. No threatened fish distributions have been mapped within the section of the Molonglo River occurring in the study area.</p>
<i>National Parks and Wildlife Act 1974 (NP&W Act)</i>	An Aboriginal Heritage Impact Permit (AHIP) is required under Section 90 of the NP&W Act for works that would disturb Aboriginal sites or relics. An assessment of the potential impacts to Aboriginal heritage is included in Section 7.8 . An AHIP is not required for the Project, however requirements under Section 90 would apply to unexpected finds.
<i>Heritage Act 1977 (Heritage Act)</i>	<p>Under the Heritage Act approval is required under Part 4 (effect on interim heritage orders and listing on State Heritage Register), or an excavation permit under Section 139 (disturbance or excavation of relic) and Division 8 Part 6 of the Act.</p> <p>An assessment of the potential impacts to heritage is included in Section 7.8. Approvals under the Heritage Act are not required for the Project, however, would apply to any unexpected finds.</p>
<i>Crown Land Management Act 2016</i>	The Project affects some portions of Crown Land. Consent from the Land Division, Department of Primary Industries would be required for the abatement works over Crown Land.

6.3 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth EPBC Act is the core piece of legislation protecting Matters of National Environmental Significance (MNES) and Commonwealth land. There are nine MNES identified under the EPBC Act:

- World Heritage Properties
- National Heritage Places
- Wetlands of international importance
- Listed threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions
- A water resource, in relation to coal seam gas development and large coal mining development.

Under the EPBC Act, a referral is required to be submitted to the Department of Agriculture, Water and the Environment (DAWE) for any 'action' that is considered likely to have a significant impact on any MNES. If DAWE determines the action to be a 'controlled activity' approval is required from the Minister of the Environment.

Consideration of the MNES is included in **Appendix 3**. The project would not have a significant impact on any MNES.

A search of the EPBC Act Protected Matters Search Tool was undertaken by Umwelt Australia Pty Ltd (Umwelt) on 10 January 2022. The search results are provided in **Appendix 6**.

6.4 Summary of Agreements and Approvals Required

Table 6-5 provides a summary of the agreements and approvals required for the Project prior to commencement of construction.

Table 6-5: Summary of agreements and approvals required

Stakeholder	Agreements / Approvals Required
TfNSW	<ul style="list-style-type: none">• Payment of a licence fee for access and to undertake temporary works
Crown land	<ul style="list-style-type: none">• Consent from the Land Division, Department of Primary Industries for the abatement works over Crown Land

7. ENVIRONMENTAL ASSESSMENT

7.1 Soils and Landform

7.1.1 Assessment methodology

The soils and landform assessment involved the following:

- Review of topographical mapping (refer to **Figure 2-2**)
- A review of previous assessment reports including:
 - DPE Contaminants and Risks Team (C&R) *Nature and extent of contamination in the Captains Flat Region, NSW* (C&R, 2021)
 - *EPA Captains Flat surface soil testing report* (NSW EPA, 2021)
 - *Conceptual Site Model – Captains Flat Lead Management Plan* (Ramboll, 2021b) (CSM) *Abatement Options Assessment* (Ramboll, 2021c)
 - *Captains Flat Lead Management Plan* (Ramboll, 2021d).
- Observations from the site inspection undertaken by Ramboll between 7 and 11 June 2021.

7.1.2 Existing Environment

7.1.2.1 Landform

The topography of Captains Flat is generally flat with steeper areas occurring on the vegetated slopes to the east and the west (refer to discussion in **Section 2.2**). Alluvial flats are associated with the northern part of the Molonglo Valley further north of the Site.

The landform of the Sites is generally stable except for the flood berms which show evidence of erosion and require recontouring to improve stabilisation (Ramboll, 2021b) (refer to **Section 4.3.2**).

7.1.2.2 Soils

The soil lithology of Captains Flat comprises quaternary alluvial sediment consisting of sand, silt and gravel overlying residual clay formed from weathered bedrock (Ramboll, 2021b); (C&R, 2021).

Alluvial soils occur around Molonglo River and surrounding drainage lines (Ramboll, 2021b). The soil profiles are composed of sandy clay fill material with abundant gravel fragments (top 0.5-0.7 mbgl) grading towards natural light brown/yellow clay with coarse gravel and pebbles until 1.3-1.5 mbgl (C&R, 2021).

Fill occurs at multiple locations across the Sites and comprised a mix of mining waste (ore, waste rock, quartz) with clay, silt, sand and gravel. Underlying conglomerate and shale occur on hills east and west of the Molonglo River) (Ramboll, 2021b); (C&R, 2021).

According to the Australian Soil Resource Information System (ASRIS) database, the Sites have an 'extremely low probability' of acid sulfate soils occurring (CSIRO, 2001).

7.1.2.3 Contamination

Historic metalliferous mining and land-fill activities have contaminated Captains Flat.

Investigations into the heavy metal exposure risks within Captains Flat have been undertaken since 2018. Results of these investigations identified elevated metal concentrations (arsenic, cadmium, cobalt, copper, lead, manganese, mercury, nickel, zinc) in mine site soils. Elevated lead concentrations were also identified in shallow soils within the community.

The NSW EPA conducted a residential sampling program in Captains Flat in 2021 comprised of sampling over 40 properties using a portable XRF to a maximum depth of 50 millimetres. Results of the sampling program identified that concentrations of lead were above the NEPM 2013 health-based soil investigation level for residential land use (HIL A) in the areas sampled. Lead concentrations were higher on average south of the Molonglo Bridge. The area north of Molonglo Bridge also reported levels of zinc above the HIL A and the area south of Molonglo Bridge reported levels of arsenic above the HIL A.

The subsequent soil assessment undertaken as part of the CSM (Ramboll, 2021b) comprised a total of 683 surface Field portable XRF measurements across the larger Captains Flat Lead Management Plan Precinct encompassing the built areas of the Captains Flat community, the legacy Lake George Mine site and the Molonglo River from upstream of the water supply dam to a waterhole approximately 1.5 kilometres downstream of the mine. Measurements were collected to assess metal concentrations in at surface, and depth intervals below surface of 0.1m, 0.25m, 0.5m, 0.75m, one metre and then at one metre depth intervals until elevated lead concentrations had been vertically delineated.

Out of the 683 XRF measurements for soil, 237 exceeded the health-based criteria for lead, 30 for arsenic and one for manganese, mercury and zinc. At all locations where arsenic concentrations exceeded human health criteria lead also exceeded. The assessment concluded that lead is the primary driver for potential risks to human health and addressing the risk associated with elevated lead would also address the risk associated with elevated arsenic.

The potential human health risks for lead in soil were then categorised as either 'high', 'moderate' or 'low' risk and an assessment of abatement options was completed for seven public spaces identified as either high or moderate risk (Ramboll, 2021c). Six of the seven public spaces are the subject of this Review. The seventh site (the eastern embankment) is subject to a separate Review. A summary of the lead concentration results for the six sites as part of this assessment is presented in **Table 7-1**. As indicated in **Table 7-1**, maximum lead levels within the southern portion of the Sites near the preschool were detected in concentrations greater than 75,000 mg/kg.

Table 7-1: Summary of lead contamination results (Ramboll, 2021b)

Location	No. locations sampled	Lead concentration (mg/kg)			Site specific trigger level (mg/kg)	Depth of contamination
		Average	Minimum	Maximum		
Foxlow Parklet	11	3,717.5	195.7	15,422.1	700	<ul style="list-style-type: none"> Depth of lead impacts ranged from 0.0 m to 1.0 m The depth of impacts is assumed to be associated with the fill profile however further delineation sampling should be undertaken throughout the abatement works to refine the depth of excavations
Crown land parcel adjacent to preschool	7	3,743.8	814.5	9,500.0	700	<ul style="list-style-type: none"> The depth of impacts is not fully delineated and assumed to be associated with the fill profile
Southern end of Foxlow street	44	1,738.6	32.1	10,592.0	700	<ul style="list-style-type: none"> The depth of lead impacts ranged between 0.5 and 1.25 m however the full depth of impacts may vary across the site The depth of impacts is assumed to be associated with the fill profile
Tennis and basketball courts and swimming pool	7	1,126.5	75.9	5,595.1	700	<ul style="list-style-type: none"> The depth of impacts at the site is unknown however it is assumed to be associated with the fill profile
Flood berms and playing fields	16	1,319.1	4.4	4,063.6	700	<ul style="list-style-type: none"> The depth of lead impacts beneath the flood berm however are not known and assumed to be within the entire fill profile
Former Preschool	29	4,175.1	1.0	75,393.4	700	<ul style="list-style-type: none"> The depth of impacts is not fully delineated and assumed to be associated with the fill profile

7.1.3 Impact Assessment

The Project has the potential to result in the following impacts to soils and landform:

- Erosion and sedimentation loss downstream to Molonglo River, Forsters Creek and Kerrs Creek from activities such as:
 - Excavation and earthworks
 - Vehicular movements
 - Ground disturbance and removal of existing vegetative ground cover
 - Stockpiling of fill material
- Compaction of soil structure onsite from heavy vehicles and machinery
- A decline in nutrient content for soil stored in stockpiles
- Loss of soil resource from stripping activities
- An increase in sediment loads entering the drainage line and/or local runoff resulting in sedimentation of adjacent private properties.

As discussed in **Section 4.6**, approximately 14,700 cubic metres of capping material would be required for the Project. Topsoil and landscaping material may be brought onto the Sites if it has been classified as VENM, ENM or under a resource recovery exemption prior to import. Capping with clean soils would be undertaken to reinstate the current landform levels at each site with the exception of the flood berm site, which would include recontouring and raising of the current landform level to improve stabilisation and minimise erosion and Crown land near the former preschool. Geogrid may also be required to stabilise the flood berms and provide additional erosion and scour protection. The final capped surface would be revegetated to minimise soil erosion and damage to the capping layer.

The Project would generate up to 10,900 cubic metres of spoil which is to be stockpiled within the Sites and would be underlain with geofabric. The sites to which this Review applies, would generate 4,700 cubic metres of spoil. Management of stockpiles would follow the general principles described in **Section 4.4** and listed in the management and mitigation measures in **Section 7.1.4**. Implementation of these principles would minimise disturbance from sedimentation loss and reduce the potential for spreading contamination.

Due to the presence of known contaminants within the soils to be excavated, the Project has the potential to result in the following impacts regarding contamination:

- Contaminated sediment runoff (including transportation to nearby waterways) as a result of ground disturbance activities within contaminated soils
- Accidental fuel or chemical spills causing contamination of soils or the water way
- Exposure of soils with elevated levels of lead, and to a lesser extent, arsenic and/or other heavy metals.

Waste management associated with contaminated soils is discussed separately in **Section 7.2**.

7.1.4 Management and Mitigation Measures

Table 7-2 describes the management and mitigation measures that have been identified for the Project in relation to soils and landform.

Table 7-2: Management and Mitigation Measures – Soils and Landform

Management/Mitigation Control	Timing
The Principal Contractor would prepare and implement a Soil and Water Management Plan to manage soil and water during the works. The plan would include details of sediment and erosion control measures developed in accordance with <i>Managing Urban Stormwater: Soils and Construction</i> (Landcom 2004) (the 'Blue Book'). This would include the following measures:	Pre-construction and construction

Management/Mitigation Control	Timing
<ul style="list-style-type: none"> • Erosion and sediment controls would be designed and implemented before ground disturbance work commences • Erosion and sediment controls would be inspected regularly, particularly before and after a rainfall event and maintained to ensure effective operation • Erosion and sediment control measures would remain in place until all surfaces have been fully restored and stabilised (minimum 70% groundcover) • Stockpiles being left for greater than 20 days would be stabilised using revegetation, wetting or geofabric • Any spoil material storage areas or stockpiles would more than 40 m from a watercourse or drainage depression and have appropriate erosion control devices installed to prevent erosion, control runoff and prevent sedimentation. 	
<p>Vehicles would use the designated access roads/tracks to prevent ground disturbance. Additional care would be undertaken near drainage lines.</p>	Construction
<p>Vehicles would be refuelled at either a service station, a designated refuelling location within the Site or mobile refuelling. If mobile refuelling is to occur, the appropriate spill protection, such as a spill tray, would be used.</p>	Construction
<p>Laydown areas would be underlain with a geofabric and capping material layer to minimise contamination risks and avoid disturbance of the existing soils.</p>	Construction
<p>Topsoil and landscaping material may be brought onto the Sites if it has been classified as VENM, ENM or under a resource recovery exemption prior to import. Documentation records would include volume, origin, description, photographs and classification. On import, visual verification including photographs would be completed to confirm that the verified material is consistent with the material received to the Site.</p>	Construction
<p>Spoil would be stockpiled within the Sites and would be underlain with geofabric. The following general principles would apply to the management of spoil stockpiles:</p> <ul style="list-style-type: none"> • Stockpiles are to be placed on plastic sheeting and are to be located within the extent of abatement footprint • Covering with plastic sheeting of all contaminated soil stockpiles remaining on the Site for more than 24 hours • All stockpiles would be placed on a level area as a low elongated mound • Erosion and sediment controls in accordance with the Soil and Water Management Plan are to be implemented to minimise disturbance and potential contamination. 	Construction
<p>Any hazardous chemicals to be used during construction would be stored and handled in a manner consistent with their Material Data Sheet to minimise spill risk. No potentially hazardous materials such as chemicals, fuels, and/or waste would be stored within or adjacent to drainage lines or unsealed surfaces.</p>	Construction
<p>A spill kit would be available on site. Personnel trained to respond to any spill incidences (should they occur) would always be available on site. Spills are to be cleaned up and the area remediated as soon as practicable. Any collected clean up material would be disposed of consistent with the material's waste classification.</p>	Construction
<p>If any previously unidentified potential contamination (such as visual observation of potentially asbestos containing material, discoloured soil, strong chemical odour, refuse or leachate) is discovered during works, works must halt in this area and not recommence until an appropriate management strategy has been developed.</p>	Construction

Management/Mitigation Control	Timing
A geofabric marker layer would be placed on the top of the contaminated soil surface to act as a visual and physical barrier.	Construction
All areas where capping has been placed would be revegetated with suitable ground cover to stabilise soils and prevent erosion.	Post-construction

7.2 Waste

7.2.1 Assessment methodology

The waste assessment involved a review of the following:

- NSW EPA *Waste Classification Guideline* (2014)
- *Conceptual Site Model – Captains Flat Lead Management Plan* (Ramboll, 2021b) (CSM)
- *Abatement Options Assessment* (Ramboll, 2021c)
- *Captains Flat Lead Management Plan* (Ramboll, 2021d).

7.2.2 Existing Environment

The main waste stream generated by the project is the excavated lead contaminated materials. As stated in **Section 4.4**, the Project would generate up to 10,900 cubic metres of spoil.

The high lead concentration within the soil is the driver of the Project. A preliminary waste classification was completed by Ramboll (2021c) based on the CSM data and report. Due to the high lead contamination levels of the in-situ soil the excavated spoil across the majority of the Precinct would be classified as restricted solid waste in accordance with the NSW EPA *Waste Classification Guideline* (2014). Some areas would be classified as hazardous solid waste due to maximum lead concentration exceedances of the restricted solid waste threshold. The waste classification for the soil has not been determined in relation to other metals and contaminants.

Construction would generate other various wastes that would also be managed in accordance with the NSW EPA *Waste Classification Guideline* (2014). Other waste streams generated by the Project may include:

- Green waste from cleared native and exotic vegetation
- General domestic wastes such as food scraps, aluminium cans, glass bottles, plastic and paper containers and putrescible waste generated by site construction personnel.

7.2.3 Impact Assessment

The potential for impacts from waste materials would be managed consistent with the NSW EPA *Waste Classification Guideline* (2014). The following potential environmental impacts were identified for the Project in relation to waste:

- Improper storage of wastes could lead to contamination, cause windblown litter, odour or encourage pests or wildlife
- Improper handling and disposal of cleared vegetation could lead to the spread of weeds
- Human health impacts associated with exposure to contaminated materials
- Improper handling and storage of contaminated materials prior to removal from the site could lead to further contamination
- Strain on receiving landfill due to quantity of Hazardous Waste to be disposed of.

The waste management strategy is to excavate the contaminated soil, transport to an offsite location, chemically immobilise the lead (and potentially other contaminants which are to be appropriately assessed) and dispose of the spoil as immobilised GSW at an appropriately licensed landfill.

A waste facility capable of receiving the volume and type of material proposed to be generated during onsite remediation has not yet been identified. A pathway for offsite disposal exists however through amendment to the EPL of a local landfill to allow treatment (where lead concentrations warrant treatment) as a precursor to disposal as GSW. This pathway would include:

- Confirmation of the waste classification in relation to metals and contaminations other than lead
- A treatability trial to confirm an optimal treatment process
- Application for an immobilisation approval for disposal of treated waste as immobilised GSW
- Environmental planning and approvals to allow chemical immobilisation at the waste facility or at the former mine site
- Mixing of soils with immobilising reagents
- Stockpiling to allow confirmatory sampling to assess success of immobilisation
- Confirmation of waste classification and disposal as immobilised GSW.

Chemical immobilisation of the spoil is not included within this Review. DRNSW is investigating the chemical immobilisation option as the preferred method of disposal.

7.2.4 Management and Mitigation Measures

Table 7-3 describes the management and mitigation measures that have been identified for the Project in relation to waste.

Table 7-3: Management and Mitigation Measures – Waste

Management/Mitigation Control	Timing
The waste management strategy for the Project is to be confirmed and the appropriately licenced landfill facility identified prior to lead abatement works commencing.	Pre-construction
Waste management measures would be included in the EMP.	Pre-construction
All construction personnel would be informed during the site induction of the waste management hierarchy and the measures to be implemented (avoid, reduce, reuse, recycle and dispose).	Construction
Wastes would be managed in accordance with the EPA <i>Waste Classification Guidelines</i> .	Construction
All material handled during excavation of lead impacted materials is to be tracked to verify appropriate movement and handling.	Construction
Wastes would be appropriately segregated, and waste storage areas must have sufficient capacity and protection to provide for the type and volume of waste generated.	Construction
Transportation of soils in accordance with its classification as either Restricted Solid Waste or Hazardous Solid Waste under the EPA <i>Waste Classification Guidelines</i> .	Construction
Contaminated spoil would be disposed of at a facility licenced to the material. The preferred facility would also be licenced and approved to undertake immobilisation of lead (and potentially other contaminants) contamination prior to disposal within landfill.	Construction

Management/Mitigation Control	Timing
Any hazardous substances would be appropriately sealed, labelled and stored in bunded areas prior to removal from the site. Disposal would be at an appropriately licensed waste facility.	Construction
Trucks transporting waste materials from the Sites on public roads would be covered to minimise odour, spillage and spread of weeds.	Construction
Waste material is not to be left onsite once the works have been completed.	Post-construction

7.3 Surface Water and Groundwater

7.3.1 Assessment methodology

The surface water and groundwater assessment involved a review of the following:

- *Water Sharing Plan for the Murrumbidgee Unregulated and Alluvial Water Sources 2012* (NSW Government, 2022)
- *NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011* (NSW Government, 2022)
- Bureau of Meteorology Groundwater explorer (Bureau of Meteorology, 2019)
- Hydrogeology Map of Australia (Geoscience Australia, 2000)
- Palerang LEP
- *Captains Flat Floodplain Risk Management Study and Plan* (Cardno, 2015)
- *Conceptual Site Model – Captains Flat Lead Management Plan* (Ramboll, 2021b) (CSM)
- *Abatement Options Assessment* (Ramboll, 2021c)
- *Captains Flat Lead Management Plan* (Ramboll, 2021d).

7.3.2 Existing Environment

7.3.2.1 Surface Water

Surface water features of the site are described in **Section 2.3.1** and includes the Molonglo River, a perennial river which meanders north to south through the township of Captains Flat, and its tributaries including Copper Creek, Kerrs Creek and Forsters Creek.

Surface water is regulated under the *Water Sharing Plan for the Murrumbidgee Unregulated and Alluvial Water Sources 2012* within the Molonglo Water Source (NSW Government, 2022).

7.3.2.2 Groundwater

Groundwater features of the site are described in **Section 2.3.2**. Two aquifers occur in the volcanic and sedimentary rocks around Copper Creek, whilst a shallow aquifer in alluvium is adjacent the Molonglo River. Reversible recharge / discharge between this alluvial aquifer and the Molonglo River driven by rainfall and surface water levels is considered likely (Ramboll, 2021d).

Groundwater is regulated under the *NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011* within the Lachlan Ford Belt water source (NSW Government, 2022).

7.3.3 Results of the surface and groundwater monitoring program

Ramboll undertook surface and groundwater monitoring to further refine the CSM for the Captains Flat Lead Management Precinct. A summary of results for the surface and groundwater monitoring program are provided in **Table 7-4**.

Table 7-4: Summary of Surface water and Groundwater Monitoring Results

Location	Groundwater	Surface water
Foxlow Parklet	Groundwater monitoring well GW7 was installed approximately 600 m south of the site. The approximate depth to water strike at this location was recorded at 5.5 m. Groundwater impacts in this area are considered to be low based on the depth to groundwater	The nearest surface water sample (SW06) was collected from the Molonglo River bridge approximately 1.2 km southwest. Only local drainage networks exist between the site and the Molonglo River therefore surface water impacts nearby the site are considered to be low
Crown land parcel adjacent to preschool	Groundwater monitoring well GW1 was installed within the vicinity of the site. The approximate depth to water strike at this location was recorded at 5.5 m. The inferred groundwater flow direction was to the south. Concentrations of chromium, lead and zinc were above the adopted health-based criteria in GW1	The nearest surface water was collected from the confluence of Forsters Creek and Molonglo River (SW10) and exceed the adopted health-based criteria for lead
Southern end of Foxlow street	Three groundwater monitoring wells GW1-GW3 were installed within the vicinity of the site. The approximate depth to water strike at these locations ranged between 2.2 and 5.5 m. The inferred groundwater flow direction was to the north towards Molonglo River. Concentrations of cadmium and zinc were above the adopted health-based criteria in all monitoring wells (GW1-GW3). Additionally, concentrations of lead in GW1 and aluminium and copper in GW3 exceeded the adopted health-based criteria	The nearest surface water was collected from the confluence of Forsters Creek and Molonglo River (SW10) and exceed the adopted health-based criteria for lead
Tennis and basketball courts and swimming pool	Three groundwater monitoring wells GW4-GW6 were installed within the vicinity of the site. The approximate depth to water strike at these locations ranged between 1.2 and 4.0 m. The inferred groundwater flow direction was to the south towards Molonglo River. Concentrations of Manganese were above the adopted health-based criteria in monitoring wells GW4 and GW5. There were no other reported exceedances to health-based criteria	The nearest surface water was collected downgradient from Molonglo River (SW4) and exceeds the adopted health-based criteria for lead
Flood berms and playing fields	Groundwater monitoring wells GW4 and GW5 were installed within the vicinity of the Flood Berms. The approximate depth to water strike at these locations ranged between 1.2 and 1.9 m. The inferred groundwater flow direction was to the south. Concentrations of lead were below the adopted criteria and the limit of reporting in both monitoring wells	No surface water samples were collected in the vicinity of the site at the Molonglo River however surface water samples collected in the nearest upgradient (SW10) and downgradient (SW4) locations in Molonglo River exceed the adopted health-based guidelines for lead

Location	Groundwater	Surface water
Former Preschool	Groundwater monitoring well GW1 was installed within the vicinity of the site. The approximate depth to water strike at this location was recorded at 5.5 m. The inferred groundwater flow direction was to the south. Concentrations of chromium, lead and zinc were above the adopted health-based criteria in GW1	The nearest surface water was collected from the confluence of Forsters Creek and Molonglo River (SW10) and exceed the adopted health-based criteria for lead

7.3.3.1 Flooding

Historically flooding has occurred within the township of Captains Flat. A Floodplain Risk Management Study was completed by Cardno in 2015 to define the existing flood behaviour and associated hazards of the Captains Flat township, and to investigate possible mitigation options to reduce flood damage and risk (Cardno, 2015).

Areas within the township, including the Sites, are included within the *Flood Planning Area* of the Palerang LEP. The areas of the Site in the flood planning area are described in **Table 7-5**.

Table 7-5: The Sites and the Palerang LEP Flood Planning Area

Location	Within Flood Planning Area?
Foxlow Parklet	No
Crown land parcel adjacent to preschool	Yes, partly
Southern end of Foxlow Street	Yes, partly
Tennis and basketball courts and swimming pool	Yes
Flood berms and playing fields	Yes
Former Preschool	Yes

Source: (Department of Planning, Industry and Environment, 2022)

The existing flood berms located on the eastern bank of the Molonglo River, provide flood protection to the playing fields and residential properties to the east of the river. The flood berms are 1.5 metres in height, approximately 210 metres long and between 10 to 12 metres wide.

7.3.4 Impact Assessment

The Project has the potential to result in the following potential hydrological and water quality impacts:

- Impacts to surface water quality, such as increased turbidity, salinity, pH, nutrient levels, metals or temperature, from sediment runoff as a result of ground disturbance activities. This could include transportation of these contaminants downstream to Captains Flat Dam
- Potential contamination of waterways caused by accidental spills of fuels or chemicals
- Litter from construction activities polluting downstream watercourses.

The lead abatement works would not directly impact groundwater quality.

The lead abatement works would not increase the flooding hazard or flood damage to properties. The flood berms would be recontoured and capped with at least 0.3 metres of clean capping raising the current landform levels and therefore increasing flood protection within this area.

7.3.5 Management and Mitigation Measures

Table 7-6 describes the management and mitigation measures that have been identified for the Project in relation to surface water and groundwater.

Table 7-6: Management and Mitigation Measures – Surface Water and Groundwater

Management/Mitigation Control	Timing
The Principal Contractor would prepare and implement a Soil and Water Management Plan to manage soil and water during the works. The Principal Contractor must define and implement controls to prevent offsite contaminant migration above criteria protective of the receiving environment.	Pre-construction
Daily monitoring of local weather forecasts to pre-empt any significant rain event to allow sufficient time for implementation of measures to prevent offsite contamination migration	Construction
Water discharged from abatement areas during abatement works would be managed in accordance with the <i>Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000</i> (ANZECC Guidelines).	Construction
Erosion and sediment controls would be implemented as described in Section 7.1 to minimise/prevent sediment from entering waterways.	Construction
Surface ground levels within the Sites would be rehabilitated to pre-construction levels where appropriate or modified to improve site drainage and avoid unintentional waterlogging, so that adverse changes to surface water drainage patterns do not occur.	Construction
Spill kits would be readily available onsite and any spillage is to be immediately cleaned up.	Construction
Workers would be appropriately trained in the containment of spills on site.	Construction
When planning the location of facilities, plant lay-down areas, refuelling areas, stockpiles or chemical storage, areas that drain directly towards surface water or stormwater systems must be avoided in order to minimise risk of pollution.	Construction
Vehicles would be refuelled at either a service station, a designated refuelling location within the Site, or mobile refuelling. If mobile refuelling is to occur, the appropriate spill protection, such as a spill tray, would be used.	Construction
Scheduled surface and groundwater quality monitoring would occur to understand effectiveness of the abatement works and identify potential remnant or new contaminant pathways.	Post-construction

7.4 Traffic, Transport and Access

7.4.1 Assessment Methodology

A traffic impact assessment was undertaken to determine potential impacts resulting from transportation and access requirements of the Project and the existing traffic and transport configurations of the local road network. The traffic impact assessment is included in **Appendix 4**.

The assessment involved the following:

- Desktop review of the main transport routes in and out of Captains Flat
- Desktop review of the local road network within Captains Flat
- Assessment of the approximate cut and fill balance for the Sites and the resulting vehicle movements
- Assessment of the capacity of the local road network
- Analysis of available access routes to the Sites and recommendation of most appropriate route
- Provide recommendations for feasible and reasonable traffic mitigation and management measures, where potential impacts to the road network were identified.

7.4.2 Existing Environment

7.4.2.1 Road network

The local road network is shown on **Figure 2-1** and described in **Section 2.6**.

Traffic counts for Captains Flat were not available, however a 2010 traffic assessment for the Dargues Reef Gold Project was undertaken for Captains Flat Road near Majors Creek. The counts from this assessment were scaled with a standard traffic annual growth of 2% to show two-way volumes on Captains Flat Road of 1268 and 1352 vehicles per average day (seven day average) and average weekday (five day average) respectively (Ramboll, 2022).

A standard road has a capacity of 1400 Passenger Car Units (PCUs) per hour per direction. A two-way road has a capacity of 2800 PCUs per hour. Captains Flat Road is therefore currently operating well under capacity.

7.4.3 Impact Assessment

Traffic movements for the Project would be required for:

- Delivery of construction materials to Site
- Spoil and waste removal from Site to licenced facilities
- Delivery and removal of construction equipment and machinery
- Light vehicle movements by construction personnel and support vehicles.

The traffic generated by the Project, vehicle types and potential impacts are discussed below.

7.4.3.1 Proposed Vehicles

The proposed vehicles for the transportation of soil material to and from the Sites are truck and dog combinations. As per the NSW Heavy Vehicles Chart, truck and dog combinations have a maximum length of 19 metres. For this Project, the carrying capacity of the truck and dog combination is conservatively estimated at 30 tonnes (Ramboll, 2022).

7.4.3.2 Soil Movement

As stated in **Section 4.4** and **Section 4.6**, the Project would generate up to 10,900 cubic metres of spoil and require approximately 14,700 cubic metres of imported fill. The sites to which this

Review applies, would generate 4,700 cubic metres of spoil and require approximately 6,200 cubic metres of imported fill. The remaining cut and fill balance relates to the eastern embankment which is the subject of a separate Review.

Based on the assumption that one cubic metre of soil weighs 1.5 tonnes, this equates to a total of 7,050 tonnes of cut soil and 12,750 tonnes of fill soil required for the Sites.

7.4.3.3 Traffic Generation

Abatement works have an expected duration of 41 weeks. Based on the hours of operation stated in **Section 4.3.3**, it equated to 61 hours of abatement works per week. This means that the total available time for cut and fill activities is 891 hours for cut and 1610 hours for fill (2501 hours in total).

These hours and the amount of soil to be transported to and from the Sites has been used to extrapolate potential truck movements required per day. Given that all the time would not be used for truck movements, calculations for traffic generation have been done for 75% of abatement works time and 50% of abatement works time.

The number of daily trucks expected at 75% of abatement works time and 50% of abatement works time, using truck and dog combination trucks with a carrying capacity of 30 tonnes is summarised in **Table 7-7**.

Table 7-7: Daily expected truck and dog combination volumes

Abatement works time	Cut trucks (daily)		Fill trucks (daily)	
	Weekday	Saturday	Weekday	Saturday
50%	5-6	3-4	5-6	3-4
75%	5-6	2-3	5-6	2-3

Source: Ramboll, 2022

Based on the PCU stated in **Section 7.4.2**, even if all the vehicles from the counts mentioned above were to use the roads in Captains Flat, the local roads would still have significant capacity throughout the day.

Table 7-7 indicates that during abatement works, a maximum of six truck movements to the Sites would be required per day (up to 30 movements per week). As such, the introduction of up to six trucks per day would have negligible traffic impacts on the road network in and around Captains Flat.

7.4.3.4 Site access

The main access road for five of the abatement site locations is Foxlow Street which provides vehicular access from the east. The flood berms adjoin the western boundary of the playing fields between the playing fields and the Molonglo River. Foxlow Street intersects Captains Flat Road to the north of the tennis courts site and provides access to the old mine site approximately one kilometre along the road travelling west.

Based on the expected truck type and movements and the local road network conditions, access routes to the Sites were assessed and the recommended routes summarised in **Table 7-8**.

Table 7-8: Proposed Access Routes for the Sites

Site	Proposed Route	Considerations
Foxlow Parklet (Lot 1 DP 251188)	Enter and exit through Captains Flat Road north using Foxlow Street to move to and from the site	Truck and dog combination may be too big for this area. Rigid trucks would be more appropriate and manoeuvrable
Crown Parcel Land Behind Preschool (Crown Road Reserve 1084055075)	Can use the clockwise loop or enter and exit via Captains Flat Road north and move through Foxlow Street to and from the site	N/A
Southern end of Foxlow Street (Road Reserve)	Enter and exit through Captains Flat Road north using Foxlow Street to move to and from the site	Would likely need to use the shoulders of the road as loading areas so may need appropriate traffic management in place
Tennis court, basketball court and swimming pool (Part Lot 7004 DP1020764 and Part Lot 166 DP754866)	Enter and exit through Captains Flat Road north using Foxlow Street to move to and from the site	Would likely need to use the shoulders of the road as loading areas so may need appropriate traffic management in place
Flood berms (Part Lot 7004 DP1020764 and waterway area)	Enter and exit through Captains Flat Road north using Foxlow Street to move to and from the site	Would need to create an access way through Site 7 to reach Site 6. Appropriate turning paths should be provided for the trucks as well as sufficient space to turn back around. Would also need to consider the softness of the field soil for the weight of the trucks
Playing fields (Part Lot 7004 DP1020764)	Enter and exit through Captains Flat Road north using Foxlow Street to move to and from the site	Appropriate turning paths should be provided for the trucks to enter site, as well as sufficient space to turn back around. Would also need to consider the softness of the field soil for the weight of the trucks
Former Captains Flat Pre-School (Lot 101 DP754870 and Lot 107 DP754870)	Can use the clockwise loop or enter and exit via Captains Flat Road north and move through Foxlow Street to and from the site	Would likely need to use the shoulders of the road as loading areas so may need appropriate traffic management in place

Source: Ramboll, 2022

Potential impacts relating to traffic as identified include:

- Interaction of Project traffic with local traffic and pedestrians as all roads to be utilised are public roads
- Truck movements through Captains Flat have the potential to impact on local traffic during peak hours noting school zones in place for Captains Flat Public School
- Foxlow Street in the vicinity of the Foxlow Parklet site has a reduced width which may not be suitable for truck and dog combination vehicles due to manoeuvrability (refer **Table 2-1**)
- Transportation of contaminated material through Captains Flat township and potential for dust generation containing contaminated material
- Dilapidation of local road network due to heavy vehicle usage
- Increased road noise generated by Project traffic.

7.4.4 Management and Mitigation Measures

Table 7-9 describes the management and mitigation measures that have been identified for the Project in relation to traffic and transport.

Table 7-9: Management and Mitigation Measures – Traffic and Transport

Management/Mitigation Control	Timing
A Traffic Management Plan would be prepared in consultation with QPRC prior to commencement of construction.	Pre-construction
The Traffic Management Plan would address the potential impacts relating to the Sites including: <ul style="list-style-type: none"> • Road closures requirements and alternative routes • Vehicle movement paths or access routes to be followed • Traffic staging due to peak traffic times i.e., school pick up and drop off • Sight distance requirements for heavy vehicles 	Pre-construction
A survey of the local road network condition would be undertaken prior to construction commencing.	Pre-construction
Local residents would be informed of any changes to the local road network and alternative routes.	Pre-construction and construction
Trucks would enter/exit the Sites via designated access points.	Construction
The size of the truck is to be appropriate for the width of the local road network especially in relation to the Foxlow Parklet site where truck and dog may be too large for Foxlow Street.	Pre-construction and Construction
Appropriate exclusion barriers, signage and site supervision is to be employed to ensure that the construction footprint is controlled, and that unauthorised vehicles and pedestrians are excluded from the works area.	Construction
All traffic control devices are to be in accordance with <i>AS 1742.3-2009 – Manual of uniform traffic control devices Part 3: Traffic control for works on roads</i> and the Roads and Maritime Services (RMS) <i>Traffic control at work sites (TCAWS)</i> manual.	Construction
A dilapidation survey of the local road network would be undertaken post construction. Correction of impacts to the condition of the local road network would be discussed with QPRC.	Post construction

7.5 Noise and Vibration

7.5.1 Assessment methodology

A noise and vibration assessment was undertaken by RAPT Consulting Pty Limited (RAPT) to assess potential noise and vibration from the abatement works. The noise and vibration assessment report is included in **Appendix 5**.

The noise and vibration assessment involved the following:

- Initial desktop review to identify key environmental noise catchment areas and noise sensitive receptors from aerial photography
- Undertaking a series of attended noise measurements along the proposed abatement works areas in the vicinity of potentially sensitive receivers
- Establishing project noise and vibration goals for the construction of the Project
- Identifying the likely principal noise sources during construction and their potential impacts on noise receptors
- Assessing the potential noise and vibration impacts associated with construction, of the Project
- Identification of noise and vibration mitigation and management measures where noise or vibration objectives may be exceeded.

7.5.2 Existing Environment

7.5.2.1 Sensitive receptors

Sensitive receptors occur within proximity to the Sites, predominantly residences along Foxlow Street (refer to **Figure 2-1**).

7.5.2.2 Background noise

To establish background noise levels, attended measurements to collect background and ambient noise levels were conducted in the vicinity of the abatement works areas by RAPT on 15 February 2022. The locations selected were considered indicative of the local ambient noise environment and measurements were taken during calm conditions. The noise monitoring locations are shown in **Appendix 5**.

Existing noise sources within the vicinity of the Sites primarily include local road traffic, distant road traffic, and natural wildlife, indicative of a sub-urban noise environment. The L_{A90} descriptor is used to measure the background noise level and represents the noise level that is exceeded for 90 per cent of the time over a relevant period of measurement. The L_{A90} descriptor is used to establish the RBL. The L_{Aeq} is the equivalent continuous noise level which would have the same total acoustic energy over the measurement period as the varying noise actually measured, so it is in effect an energy average.

Results of the noise monitoring undertaken by RAPT are presented in **Table 7-10**.

Table 7-10: Background Noise Monitoring Results

Site/s	Noise level (dB(A))	
	L _{Aeq}	L _{A90}
Foxlow Parklet	40	36
Crown land parcel adjacent to preschool Former Preschool	47	39
Southern end of Foxlow street	44	39
Flood berms and playing fields Tennis and basketball courts and swimming pool	48	39

7.5.2.3 Construction noise

Construction noise guidelines

The ICNG provides noise management levels for construction noise at residential and other potentially sensitive receivers and sets out ways to deal with the impacts of construction noise.

As discussed in **Section 4.3.3**, construction activities associated with the Project would be undertaken during the standard construction hours specified in the ICNG (7am to 6pm Monday to Friday, 8am to 1pm Saturday and no construction works on Sunday or public holidays).

The ICNG provides noise management levels for construction noise at residential and other potentially sensitive receivers. These management levels are to be calculated based on the adopted rating background level (RBL) at nearby locations and are outlined in **Table 7-11**.

Table 7-11: ICNG Noise Guidelines at Receptors

Receptor	Management Level L _{Aeq} (15 min)
Residential recommended standard hours	Noise affected level: RBL + 10 Highly noise affected level: 75 dB(A)
Residential outside recommended standard hours	Noise affected level: RBL + 5
Classrooms at schools and other educational institutions	Internal Noise Level 45 dB(A) (applies when properties are being used)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	65 dB(A)
Offices, retail outlets (external)	70 dB(A)
Industrial premises (external)	75 dB(A)

The levels in **Table 7-11** apply at the boundary of the most affected receptor or within 30 metres from the residence, where the property boundary is more than 30 metres from the residence. The 'noise affected level' represents the point above which there may be some community reaction to noise. It is characterised as the background noise level plus 10 dB(A) during recommended standard hours, and the background noise level plus 5 dB(A) outside of recommended standard hours. The 'highly noise affected level' represents the point above which there may be strong community reaction to noise and is set at 75 dB(A).

Noise management levels

Based on the RBL determined for the Site, the construction noise management levels for the Project during standard hours are:

- Foxlow Parklet – 46 $L_{eq(15 \text{ min})}$ (dB(A))
- All other sites – 49 $L_{eq(15 \text{ min})}$ (dB(A)).

This represents the point above which there may be some community reaction to noise and all reasonable and feasible work practices to minimise noise should be applied.

Project noise sources

Noise generating plant and equipment needed for the Project would include:

- Excavator
- Front end loader
- Light vehicles
- Smooth drum roller
- Backhoe
- Compactor
- Dump truck
- Water truck.

7.5.2.4 Road noise

The NSW *Road Noise Policy* (RNP) recommends various criteria for different road developments and uses. Based on the definitions in the RNP, Foxlow Street is considered a local road. Road noise goals for 'land use development with potential to create additional traffic on local roads (external)' outlined in the RNP are:

- Day 7am to 10pm – 55 $L_{eq(1 \text{ hour})}$
- Night 10pm to 7am – 50 $L_{eq(1 \text{ hour})}$.

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by construction activities and or land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'. To increase noise levels by 2dB(A) the cumulative traffic volume would need to be increased by 60 percent.

7.5.2.5 Vibration

Human comfort

Vibration goals are sourced from the Department of Environment, Climate Change and Water's *Assessing Vibration: a technical guideline*, which is based on guidelines contained in British Standard (BS) 6472-1992, *Evaluation of human exposure to vibration in buildings (1-80 Hz)*.

Table 7-12 provides a summary of the acceptable values of vibration dose.

Table 7-12: Acceptable vibration dose values for intermittent vibration (m/s^{1.75})

Location	Daytime (7am-10pm)		Night-time (10pm-7am)	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Critical Areas (e.g. hospitals)	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Building damage

There is currently no Australian Standard that sets the criteria for the assessment of building damage caused by vibration. Guidance of limiting vibration values is attained from the British Standard *BS7385.2 - 1993 Evaluation and Measurement for Vibration in Buildings, Part 2 - Guide to damage levels from ground borne vibration*.

The recommended Peak Particle Velocity (PPV) guidelines for the possibility of vibration induced building damage are derived from the minimum vibration levels above which any damage may occur are presented in **Table 7-13**.

Table 7-13: DIN 4150-3 Guideline values for vibration velocity to be used when evaluating the effects of short-term vibration on structures

Type of Structure	Peak Component Particle Velocity, mm/s			
	Vibration at the foundation at a frequency of			Vibration of horizontal plane of highest floor at all frequencies
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz*	
Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20	20-40	40-50	40
Dwellings and buildings of similar design and/or occupancy	5	5-15	15-20	15
Structures that, because of their sensitivity to vibration, do not correspond to those listed in lines 1 and 2 of table 5-7 and are of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

Minimum working distances

The Transport for NSW *Construction Noise and Vibration Strategy* (2019) provides guidance for minimum working distances from sensitive receivers for typical items of vibration intensive plant which has been reproduced in **Table 7-14**. The minimum distances are quoted for both cosmetic damage and human comfort. DIN 4150 includes criteria for heritage structures. The minimum working distances are indicative and would vary depending on the particular item of plant and local geotechnical conditions.

Table 7-14: Recommended Minimum Safe Working Distances for Vibration Intensive Plant from Sensitive Receiver

Plant Item	Rating / Description	Minimum Distance Cosmetic Damage		Minimum Distance Human Response (NSW EPA Guideline)
		Residential and Light Commercial (BS 7385)	Heritage Items (DIN 4150, Group 3)	
Vibratory Roller	<50 kN (1-2 tonnes)	5m	11m	15m to 20m
	<100 kN (2-4 tonnes)	6m	13m	20m
	<200 kN (4-6 tonnes)	12m	15m	40m
	<300kN (7-13 tonnes)	15m	31m	100m
	>300kN (13-18 tonnes)	20m	40m	100m
	>300kN (>18 tonnes)	25m	50m	100m
Small Hydraulic Hammer	300kg (5 to 12 t excavator)	2m	5m	7m
Medium Hydraulic Hammer	900kg (12 to 18 t excavator)	7m	15m	23m
Large Hydraulic Hammer	1600kg (18 to 34 t excavator)	22m	44m	73m
Vibratory Pile Driver	Sheet Piles	2m to 20m	5m to 40m	20m
Pile Boring	≤ 800mm	2m (nominal)	5m	4m
Jack Hammer	Hand Held	1m (nominal)	3m	2m

7.5.3 Impact Assessment

The Project has the potential to result in the following impacts to noise and vibration:

- The noise modelling undertaken by RAPT (refer to **Appendix 5**) was based on the unlikely scenario of abatement works occurring concurrently at each location. The results of the noise modelling indicate that noise management levels in this scenario would be exceeded under the construction scenario modelled (refer to figures in **Appendix 5** for modelling results) and would require the implementation of noise management measures.

If (as expected) abatement works are generally only taking place at one site at a time, exceedances of the noise management levels are generally expected to only occur in locations in close proximity to those work areas. Receptors further away would expect to experience noise levels complying with noise management levels.

- The highly affected noise level is expected to be complied with
- The amount of additional construction traffic on the road network as a result of the Project would be negligible and therefore would not increase overall traffic noise levels on the surrounding road network
- Given the proximity of nearest residential receptors from the Project, where vibratory rollers are proposed, it is recommended a <50 kN (1-2 t) roller be utilised. Additionally, if hydraulic hammering were to occur, it is recommended no larger than small 300 kN (5 to 12 t) excavator be utilised.

7.5.4 Management and Mitigation Measures

Table 7-15 describes the management and mitigation measures that have been identified for the Project in relation to amenity.

Table 7-15: Management and Mitigation Measures – Amenity (noise, vibration and air quality)

Management/Mitigation Control	Timing
A Noise and Vibration Management Plan (NVMP) would be prepared as part of the EMP prior to the commencement of works and implemented through all phases of the proposed construction works. The NVMP would provide the framework for the management of all potential noise impacts resulting from the construction works and would detail the environmental mitigation measures to be implemented throughout the construction works.	Pre-construction
Affected neighbours would be advised in advance of the proposed construction period at least one week prior to the commencement of works.	Pre-construction
All site workers (including subcontractors and temporary workforce) would be informed via a site induction and regular toolbox meetings of the potential for noise impacts upon residents and encouraged to take practical and reasonable measures to minimise noise during their activities.	Construction
The constructor or site supervisor (as appropriate) would provide a community liaison phone number and permanent site contact so that the noise related complaints, if any, can be received and addressed in a timely manner.	Construction
The constructor (as appropriate) would establish contact with the residents and communicate, particularly when noisy activities are planned.	Construction
Construction works would adopt Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA) practices as addressed in the ICNG. BMP includes factors discussed within this report and encouragement of a project objective to reduce noise emissions. BATEA practices involve incorporating the most advanced and affordable technology to minimise noise emissions.	Construction
All construction works would be scheduled for standard construction hours and would comply with the start and finish time.	Construction
Where practical, simultaneous operation of dominant noise generating plant would be managed to reduce noise impacts, such as operating at different times or increase the distance between plant and the nearest identified receptor.	Construction
High noise generating activities such as jack hammering would only be carried out in continuous blocks, not exceeding three hours each, with a minimum respite period of one hour between each block.	Construction
Where possible, reversing beepers on mobile equipment would be replaced with low-pitch tonal beepers (quackers). Alternatives to reversing beepers include the use of spotters and designing the site to reduce the need for reversing may assist in minimising the use of reversing beepers.	Construction
Equipment which is used intermittently would be shut down when not in use.	Construction
All engine covers would be kept close while equipment is operating.	Construction
The construction site would be arranged to minimise noise impacts by locating potentially noisy activities away from the nearest receivers wherever possible.	Construction

Management/Mitigation Control	Timing
To minimise heavy equipment handling noise, material stockpiles would be located as far as possible from receptors.	Construction
Loading and unloading areas would be located as far as possible from receptors.	Construction
Where possible, trucks associated with the work area would not be left standing with their engine operating in a street adjacent to a residential area.	Construction
All vehicular movements to and from the site would comply with the appropriate regulatory authority requirement for such activities.	Construction
Noise and vibration monitoring would be undertaken upon receipt of a complaint where an investigation has identified a works activity as source of excessive noise, to identify and quantify the issue and determine options to minimise impacts.	Construction
If valid noise and/or vibration data for an activity is available for the complainant property, from works of a similar severity and location, it is not expected that monitoring would be repeated upon receipt of repeated complaints for these activities, except where vibration levels are believed to be potentially damaging to the building.	Construction
Any noise and/or vibration monitoring would be undertaken by a qualified professional and with consideration to the relevant standards and guidelines. Attended noise and/or vibration monitoring would be undertaken upon receipt of a noise and/or vibration complaint. Monitoring would be undertaken and reported within a timely manner (three to five working days). If exceedance is detected, the situation would be reviewed to identify means to reduce the impact to acceptable levels.	Construction

7.6 Air Quality

7.6.1 Assessment methodology

The air quality assessment involved a review of the following:

- Climate data from the BOM dataset (BOM, 2021)
- *Sampling and Analysis Quality Plan (SAQP)* (Ramboll, 2021e)
- *Captains Flat Air Quality Monitoring Report – June to December 2021* (Ramboll, 2021a).

7.6.2 Existing Environment

7.6.2.1 Existing air shed

The area surrounding the Sites is a low-density residential environment. Air quality is expected to be fair and generally free from congestion. Potential air pollutant sources include motor vehicles (emissions and dust from unsealed roads), general garden maintenance emissions and smoke from chimneys during cooler periods. However, emissions from these sources are expected to be low. Exposed soils from the former mine site can also contribute to dust pollution to the local airshed from wind erosion and vehicle movements over the exposed areas.

7.6.2.2 Climate

Climate of the Captains Flat area is described in **Section 2.4**.

The well-defined valley at Captains Flat is likely to steer winds in northerly and southerly directions due to the terrain.

7.6.2.3 Air quality monitoring

A SAQP was prepared by Ramboll (Ramboll, 2021e) to refine the existing preliminary CSM (C&R 2021) and to provide a suitable platform for detailed data gaps assessment and development of the Captains Flat Lead Management Plan.

The absence of local meteorology data in Captains Flat was identified as a data gap for the program in the SAQP (Ramboll, 2021e). The Rural Fire Service (RFS) loaned a meteorological station to the program for short-term use which was decommissioned in October when it was required for RFS operations during fire season. The Project meteorological station (Lufft WSS800-UMB) was installed and commissioned by Ramboll in late September 2021. The Project meteorological station measures wind speed and direction, temperature, relative humidity, air pressure, precipitation intensity, precipitation quantity and radiation at 10 metre height. The sensors are mounted on a sensor arm fixed to a pump-up mast with lightning stake protection, with data capture and telemetry allowing remote access to the data.

An air quality monitoring program for total suspended particulates (TSP) and heavy metals was commissioned at five locations in Captains Flat with sampling commencing on 22 June 2021 and is ongoing with data being collected on a two-monthly basis.

The monitoring locations are:

- A residence at Old Mine Road
- A residence at 2 Copper Creek Road
- A residence at Residence at 2 Braidwood Road
- Captains Flat former preschool at 27 Foxlow Street
- The new Preschool at Foxlow Street.

Siting of all equipment was completed, as far as practicable, in accordance with the recommendations of *AS/NZS 3580.1.1 – Methods for sampling and analysis of ambient air – Part 1.1: Guide to siting air monitoring equipment*.

Reporting available at the time of preparing this Review summarises all data from 22 June to 7 December 2021. The summary includes the following conclusions for the five locations as a base line for the existing environment:

- All 24-hour TSP concentrations were below the annual average TSP air quality criteria
- Similarly all 24-hour lead concentrations were below the annual average lead air quality criteria
- The monitoring shows spatial and temporal variations in concentrations of arsenic, barium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, titanium and zinc around Captains Flat. Selenium was measured for the first-time above the limit of reporting since commencement of the program.

Air quality monitoring would continue throughout the Project.

7.6.3 Impact Assessment

Earthworks during excavation have the potential to generate dust and air quality impacts that could impact on nearby residents through:

- Excavation of soils and rock material
- Vehicles travelling over exposed soils
- Wind blowing over stockpiles and exposed soils
- Exhaust emissions from vehicles and machinery.

Excessive dust emissions could lead to the spread of lead contamination. The risk of this occurring would be minimised with the implementation of the management and mitigation measures described in **Section 7.6.4**.

Erosion and sediment control measures would be implemented to minimise the potential for dust generation. The controls described in **Section 7.6.4** would further mitigate potential impacts.

Given the nature and extent of the contaminants of concern identified for the Site, there is a low potential for odours to be emitted.

7.6.4 Management and Mitigation Measures

Table 7-16 describes the management and mitigation measures that have been identified for the Project in relation to contamination impacts.

Table 7-16: Management and Mitigation Measures – Contamination

Management/Mitigation Control	Timing
The Principal contractor would prepare a dust management plan to manage dust during the works. The plan would define and implement dust controls to prevent offsite contaminant migration above criteria protective of the receiving environment.	Pre-Construction
Residents immediately adjacent to the Sites would be notified of the proposed program.	Pre-Construction and Construction
Roads would be maintained where deposited dust or spillage is visible.	Construction
Vehicles would avoid the unnecessary use of and access to unsealed surfaces.	Construction
Vehicle and mobile plant speeds would be limited within the work area e.g. 10 km/h.	Construction
Operations would be modified or ceased during adverse meteorological or dust generating conditions.	Construction
Dust levels would be visually observed, and operations adapted where excessive amount of dust is being generated.	Construction
Wind breaks or shielding would be erected around materials and/or stockpiles where required to minimise dust generation.	Construction
Stockpiles would be maintained at a defined height, where the lowest practicable height is preferable.	Construction
Double-handling of materials would be avoided and to limit time stockpiled or handled.	Construction
All loads would be securely covered when transporting materials.	Construction
Sufficient resources would be allocated to the Project to manage dust risks.	Construction
Training and tool-box-talks would be undertaken with Project personnel addressing air quality management objectives, hazards, risks, controls, behaviours and consequences for inappropriate behaviour.	Construction
All contaminated soil stockpiles remaining onsite for more than 24 hours would be covered with plastic sheeting.	Construction
Where possible vehicles and machinery would be turned off or throttled down when not in use.	Construction
Project vehicles and machinery would be maintained in accordance with manufacturer's requirements.	Construction
As soon as practical after completion of abatement works soils are to be topsoiled and seeded with appropriate grass species for residential property to minimise erosion. Water and/ or	Construction

Management/Mitigation Control	Timing
other applications (such as hydromulching) may be required to ensure establishment of the grass once seed is distributed.	
Should a complaint be received regarding dust or odour during the works, the source of the dust or odour would be identified, and appropriate control measures identified and implemented where applicable.	Construction
Three months of continuous air quality monitoring would be completed post abatement to assess the effectiveness of the abatement works.	Post construction

7.7 Biodiversity

7.7.1 Assessment methodology

A biodiversity assessment was undertaken by Umwelt to assess the ecological values of the Sites. The biodiversity assessment is included in **Appendix 6**.

The biodiversity assessment involved review of the following:

- DPE BioNet Atlas (10 km radius)
- EPBC Act Protected Matters Search Tool (PMST)
- BioNet Threatened Biodiversity Data Collection (TBDC)
- BioNet Vegetation Classification
- Biodiversity Values Map Threshold Tool
- National Flying-fox viewer accessed by the DAWE Interactive Flying-fox Web Viewer
- DPI threatened fish distributions.

A site visit was conducted on 23 December 2021 to record observations of any threatened and/or migratory species, endangered populations, threatened ecological communities (TECs) and any other ecological features that had the potential to be impacted. The study area of the site assessment included a 20 metre buffer around the works area in all directions. Further detail on the site assessment methodology is included in **Appendix 6**.

7.7.2 Existing Environment

7.7.2.1 Vegetation

Captains Flat is located within the South Eastern Highlands Bioregion and within the Monaro Indian Tropical Islands Bioregion (IBRA) subregion. Dry sclerophyll forest, riparian forest and planted exotics dominate the vegetation within and adjacent to Captains Flat.

Vegetation within the Sites are mapped on **Figure 7-1** and includes the following plant community types (PCTs):

- PCT 1102: Ribbon Gum - tea-tree - River Tussock riparian scrub along tablelands streambanks, South East Corner Bioregion (low condition)
- Urban exotics and remnant natives
- Exotic grassland / cleared.

PCT 1102 does not confirm to a threatened ecological community (TEC) under the BC Act or EPBC Act based on the descriptions provided in the Scientific Committee's final determination.

The Molonglo River is identified in the Biodiversity Values Map and Threshold Tool as Protected Riparian Land.

Exotic weeds are common throughout the Sites.

7.7.2.2 Threatened Biodiversity

Two threatened flora species were identified with a moderate or higher likelihood of occurring at the Sites:

- Black Gum (*Eucalyptus aggregata*) – listed as vulnerable under the BC Act and EPBC Act
- Hoary Sunray (*Leucochrysum albicans subsp. tricolor*) – listed as endangered under the EPBC Act.

Neither flora species was observed by Umwelt during the site inspection.

Six threatened bird species and four threatened mammals were identified with a moderate or higher likelihood of occurring in the Sites:

- Regent Honeyeater (*Anthochaera phrygia*) – listed as critically endangered under the BC Act and EPBC Act
- Gang-gang Cockatoo (*Callocephalon fimbriatum*) – listed as vulnerable under the BC Act
- White-throated Needletail (*Hirundapus caudacutus*) – listed as vulnerable under the EPBC Act
- Powerful Owl (*Ninox strenua*) – listed as vulnerable under the BC Act
- Scarlet Robin (*Petroica boodang*) – listed as vulnerable under the BC Act
- Flame Robin (*Petroica phoenicea*) – listed as vulnerable under the BC Act
- Grey-headed Flying-fox (*Pteropus poliocephalus*) – listed as vulnerable under the BC Act and EPBC Act
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) – listed as vulnerable under the BC Act
- Southern Myotis (*Myotis macropus*) – listed as vulnerable under the BC Act
- Large-eared Pied Bat (*Chalinolobus dwyeri*) – listed as vulnerable under the BC Act and EPBC Act.

No threatened fauna species were observed during the site inspections by Umwelt.

7.7.2.3 Fauna Habitat

No threatened fauna habitat was observed during the inspections by Umwelt. However, PCT 1102 was assessed as supporting marginal feeding habitat for eight threatened fauna species.

No large tree hollows or large hollow logs (with openings greater than 20 cm across) were recorded within the Sites by Umwelt during the site inspection. However it is assumed that small tree hollows (openings less 20 cm across) and smaller logs would occur.

The Sites are located in the Central and Southern Tablelands Koala Management Area as identified by *State Environmental Planning Policy (Biodiversity and Conservation) 2021* and therefore require assessment as to whether the Sites support core koala habitat. Umwelt determined that Sites do not support core koala habitat for the following reasons:

- The occurrences of *Eucalyptus blakelyi*, *E. mannifera*, *E. melliodora* and *E. viminalis* (koala use trees as identified in Schedule 2 of SEPP (Koala Habitat Protection) 2021) in the Sites all occur as individual trees covering less than 15% of the total area
- The occurrences of the beforementioned koala use trees consist of less than 15% of the total abundance of trees occurring in the study area
- No records of koalas have been made from within the township of Captains Flat.

Figure 7-1: Biodiversity

Figure 7-4a: Biodiversity – Abatement area 1

Figure 7-4b: Biodiversity – Abatement areas 2, 4 and 8

Figure 7-4c: Biodiversity – Abatement areas 5, 6 and 7

7.7.2.4 Fish

No threatened fish distributions have been mapped within the section of the Molonglo River occurring in the Sites. However, the distribution of the Eel-tailed Catfish (*Tandanus tandanus*) and the distribution of the Macquarie Perch (*Macquaria australasica*) occur in the Molonglo River downstream of the Sites.

7.7.3 Impact Assessment

The following key environmental impacts were identified for the Project in relation to biodiversity:

- Up to 0.29 hectares of PCT 1102 is proposed to be cleared for the Project (in addition approximately 300 m² of PCT 1102 would be cleared at the eastern embankment site which is subject to a separate Review). PCT 1102 (Ribbon Gum - tea-tree - River Tussock riparian scrub along tablelands streambanks, South East Corner Bioregion (low condition)) is proposed to be cleared at the southern end of Foxlow Street, the flood berms and playing fields and the former preschool PCT 1102 provides marginal habitat for the threatened fauna species identified in **Section 7.7.2.2**
- Additionally, 0.28 hectares of the urban exotics and remnant natives' community and 2.09 hectares of the exotic grassland/cleared community are also expected to be directly impacted
- No threatened flora or fauna species were recorded within the vegetation expected to be cleared by the works
- Habitat for the eel-tailed catfish (*Tandanus tandanus*) and the Macquarie perch (*Macquaria australasica*) would not be directly impacted by the Project
- Potential for or indirect impacts such as:
 - Removal of vegetation may lead to erosion adjacent to cleared areas which can affect aquatic habitats by increasing turbidity and sedimentation in waterways
 - Clearing vegetation and moving soil may mobilise heavy metal contaminants into the Molonglo River and the adjacent riparian areas
 - The proposed works may increase the area of impervious watershed subsequently increasing runoff into existing drainage lines
 - Impeding the Molonglo River may reduce habitat connectivity along the watercourse and surrounding vegetation
 - The movement of machinery, soils and people, as well as clearing activities have the potential to spread weeds
 - Soil borne pathogens with the potential to infect plants (e.g., *Phytophthora cinnamomic*) may be mobilised by the works
 - Edge effects from clearing activities reducing the resilience of native vegetation and changing predator-prey relationships.

7.7.4 Management and Mitigation Measures

Table 7-17 describes the management and mitigation measures that have been identified for the Project in relation to biodiversity.

Table 7-17: Management and Mitigation Measures - Biodiversity

Management/Mitigation Control	Timing
Biodiversity management measures would be included in the EMP.	Pre-construction
Management measures would be included in the SWMP to prevent additional sediment run-off into the Molonglo River.	Pre-construction
Removal of native vegetation would be avoided and minimised through detailed design, specifically minimising clearing of riparian vegetation adjacent to the Molonglo River.	Pre-construction

Management/Mitigation Control	Timing
Clearing limits and exclusion zones would be established and maintained for the works.	Construction
Cleared areas would be revegetated following completion of the works to minimise erosion and prevent runoff.	Construction
Bank stabilisation measures would be implemented to minimise changes to hydrology.	Construction
Hygiene controls would be implemented for all plant and people working in the Sites to prevent the spread of weeds, seeds, pathogens, fungi and exotic species. This would include washing machinery prior to bringing them onsite.	Construction
All weed and soil material would be transported as hazardous waste to an immobilisation facility and once treated would be transported to disposal facility / landfill.	Construction

7.8 Heritage

7.8.1 Assessment methodology

The heritage assessment included a review of the following registers/lists:

- The NSW Biodiversity and Conservation Division Aboriginal Heritage Information Management System (AHIMS)
- National Native Title Register maintained by the National Native Title Tribunal
- The Palerang LEP (local heritage)
- The State Heritage Inventory maintained by NSW Biodiversity and Conservation Division
- The National Heritage List made under the EPBC Act
- The Commonwealth Heritage List made under the EPBC Act
- The Heritage and Conservation Register (s170 register) made under section 170 of the Heritage Act.

7.8.2 Existing Environment

7.8.2.1 Historic heritage

No State or Commonwealth heritage items were identified within the vicinity of the Site.

Local heritage items listed under the Palerang LEP occur within the Captains Flat Community. These items are shown on **Figure 7-2**. Items within 200 metres of the Sites are listed in **Table 7-18**.

Table 7-18: Local Heritage Items

Listed Local Heritage Item	Lot and DP	Proximity to the Project
Item I253 - Bills' Trough, including granite plaque and dog water bowl	Road reserve adjacent to Lot C DP 321861	Immediately southeast of playing fields within road reserve
Item I255 - Captains Flat Hotel, including bar	Lot 71 DP754870 Lot 117 DP754870	Approximately 190 m south of playing fields and flood berms, on the western boundary of the section of Foxlow Street that is subject to abatement
Item I256 - Captains Flat Community Centre	Lot 78 DP 754870	Approximately 150 m south of playing fields and flood berms on the western boundary of the

Listed Local Heritage Item	Lot and DP	Proximity to the Project
		section of Foxlow Street that is subject to abatement
Item I257 - Captains Flat Post Office (former)	Lot 2 DP585090	Approximately 130 m south of playing fields and flood berms on the western boundary of the section of Foxlow Street that is subject to abatement
Item I258 - Captains Flat Miners Memorial, including four dioramas and a Jenny wheel	Lot C DP321861	Immediately south of playing fields, east of flood berms
Item I259 - Shop	Lot 3 DP 786505	Approximately 180 m southeast of flood berms and playing fields and 250 m northeast of former preschool site Fronting the western boundary of the section of Foxlow Street that is subject to abatement
Item I260 – The Outsider	Lot B DP 396566	Approximately 160 m southeast of flood berms and playing fields and 250 m northeast of former preschool site Fronting the eastern boundary of the section of Foxlow Street that is subject to abatement
Item I262 - Captains Flat Police Station	Lot 3 DP667593	Approximately 45 m northeast of tennis courts on opposite side of Foxlow Street
Item I267 - Lake George Mine, including smelter site, mine processing sites, railway precinct, etc	Lot 1 DP714087 Lot 2 DP1033183 Lot 1 DP1142954 Lot 2 DP1033184	>50 m west of flood berms

7.8.2.2 Aboriginal heritage

A search of AHIMS was undertaken on 19 November 2021 for the Sites and surrounding vicinity (50 m buffer). No Aboriginal sites or places were identified to occur in or near the location. The search result is provided in **Appendix 7**.

No Native Title claims have been made over the Sites based on a review of the National Native Title Register.

Captains Flat is within the area administered by the Mogo LALC.

Figure 7-2: Heritage Items

7.8.3 Impact Assessment

7.8.3.1 Historic heritage

As noted in **Section 7.8.2.1** three local heritage items occur close to the Project:

- Item I253 Bills' Trough, including granite plaque and dog water bowl – located within the road reserve adjacent to Lot C DP 321861 immediately southeast of playing fields within road reserve
- Item I260 The Outsider – located at Lot B DP 396566 approximately fronting the eastern boundary of the section of Foxlow Street that is subject to abatement
- Item I258 Captains Flat Miners Memorial, including 4 dioramas and a jenny wheel – located at Lot C DP321861 immediately south of playing fields and east of flood berms.

The Project would not have direct impact on the heritage significance of any of the identified heritage items. Vibration impacts associated with the works are predicted to be small and would be unlikely to impact on the heritage items given their distance from the works.

As with any ground disturbing activity, there is potential for disturbance of previously unknown sites during the works.

7.8.3.2 Aboriginal heritage

The *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (Department of Environment, Climate Change and Water, 2010) sets out a process for individuals and organisations to follow to determine whether an Aboriginal object would be harmed by an activity, whether further investigation is needed, and whether the application to harm requires an Aboriginal heritage impact permit. The due diligence process is detailed in **Table 7-19** along with a response on the potential impacts of the Project.

Table 7-19: Generic Due Diligence Process

Due Diligence Process Step	Response
1. would the activity disturb the ground surface?	Yes, due to excavation of contaminated soils
2a. Search the AHIMS	Basic search completed 19 November 2021 No known Aboriginal heritage items located within or near the Site
2b. Activities in areas where landscape features indicate the presence of Aboriginal objects	An archaeologically sensitive landscape is an area that has the potential for archaeological material to be present within it. According to the <i>Due Diligence Code of Practice</i> (OEH 2010), archaeologically sensitive landscapes can include areas: <ul style="list-style-type: none"> • Within 200 m of waters • Located within a sand dune system • Located on a ridge top, ridge line, headland • Located within 200 m below or above a cliff face • Within 20 m of or in a cave, rock shelter, or a cave mouth • Is on land that is not disturbed land. Excavation for the flood berms and playing field would occur within 200 m of the river system (Molonglo River). The abatement works would be undertaken in a significantly disturbed area (historically placed fill) and confined to the public areas as defined on Figure 2-1 . Therefore, there is low risk for artefacts to occur

Due Diligence Process Step	Response
3. Can harm to Aboriginal objects listed on AHIMS or identified by other sources of information and/or can the carrying out of the activity at the relevant landscape features be avoided?	There are no objects listed on AHIMS within the Sites or within the surrounding area that would be harmed by the project. The abatement in the locations close to the Molonglo River cannot be avoided by the project.
Does a desktop assessment and visual inspection confirm that there are Aboriginal objects or that they are likely?	This step only applies if your activity is on land that is not disturbed land or contains known Aboriginal objects. There are no known Aboriginal objects within the site. The landform at this location is highly disturbed because of the historical mining activities including the nearby tailings dump, previous construction of a weir and a dam and most relevant to the site, the construction of the flood berms that are subject of the abatement activities of the project.
If as a result of completing the steps above, it is reasonable to conclude that there are no known Aboriginal objects or a low probability of objects occurring in the area of the proposed activity you can proceed with caution without applying for an AHIP	There are no known items of Aboriginal significance within the Site. The public spaces subject to abatement have previously been disturbed for the construction and maintenance of the infrastructure associated with flood berms and playing fields and previously the construction and operation of the mine and supporting activities. The Project can therefore proceed with caution and an AHIP is not require. As with any ground disturbing activity, there is potential for accidental disturbance of unknown sites during construction activities.

7.8.4 Management and Mitigation Measures

Table 7-20 describes the management and mitigation measures that have been identified for the Project in relation to heritage.

Table 7-20: Management and Mitigation Measures – Heritage

Management/Mitigation Control	Timing
The Mogo LALC would be briefed on the proposed works.	Pre-construction
An unexpected finds protocol would be developed for the Project and would be included in the EMP.	Pre-construction
In the event of the discovery of a potential heritage item within the Site, all work in the vicinity of the item would stop immediately and an archaeologist would be contacted to determine the significance of the object(s) and the appropriate management response. Any confirmed Aboriginal heritage items would be registered on the AHIMS database.	Construction

7.9 Social and Visual

7.9.1 Assessment methodology

The social and visual assessment included a desktop review of:

- Publicly available mapping (Google Maps, Google Earth, SIXMaps)
- Australian Bureau of Statistics (ABS) data
- Notes from the site inspection undertaken by Ramboll between 7 and 11 June 2021 (refer to **Section 2.7**).

7.9.2 Existing Environment

The Captains Flat township is generally flat within a valley. Steeper areas occur on the vegetated slopes to the east and the west. Alluvial flats are associated with the northern part of the Molonglo Valley further north of the Site.

The Sites are currently used as public open space for recreational uses. The old Lake George Mine (the former mine site) is located west of the Sites and includes the smelter site, mine processing sites and the railway precinct.

Residential development in Captains Flat is concentrated on the east side of Foxlow Street opposite the playing fields, swimming pool and tennis courts (refer to **Figure 2-1**). At the most recent census (2016) there were reportedly 610 people living in Captains Flat within 299 residential dwellings (Australian Bureau of Statistics, 2016).

The social and visual characteristics of each site is summarised in **Table 7-21**.]

Table 7-21: Social and Visual Characteristics of the Sites

Location	Social and visual characteristics
Foxlow Parklet	<ul style="list-style-type: none"> • Public open space and recreational use • The site comprises relatively flat children's playground situated in a valley within the township of Captains Flat with hills to the east and west • The site is bounded by Foxlow Street and Spring Street to the east and south respectively • Residential properties occur in all directions around the site >5 m • Molonglo River lies approximately 70 m east of the site on the opposite side of Foxlow Street separated by dwellings
Crown land parcel adjacent to preschool	<ul style="list-style-type: none"> • Public open space and recreational use • The site comprises relatively flat vacant land adjacent a moderately steep embankment to the west • The site is bounded by the former preschool to the east, vacant land to the south and the eastern embankment to the west and north. None of the site boundaries are currently fenced • The site is covered in sparse vegetation including native grasses and shrubs • Residences and the Community Hall and Bowling Club occur east of the site • Molonglo River traverses the northern portion of site
Southern end of Foxlow street	<ul style="list-style-type: none"> • Public open space / road reserve and kerb and gutter • Council footpaths either side for approximately 600 m • The site comprises relatively flat vacant land adjacent commercial and residential properties along Foxlow Street • The site is bounded by commercial and residential properties to the east and west, Molonglo River to the north and the southern smelter and Jerangle Road to the south • Forsters creek traverses the southern extent of site • The site is covered grass

Location	Social and visual characteristics
Tennis and basketball courts and swimming pool	<ul style="list-style-type: none"> Public open space and recreational use The site comprises relatively flat vacant land adjacent the swimming pool and basketball and tennis courts The site is bounded by Foxlow Street to the east and the playing fields to the north, south and west Residences are located east of the site Molonglo River is situated along the western and southern boundaries of the site Kerrs Creek traverses the site
Flood berms and playing fields	<ul style="list-style-type: none"> Public open space and recreational use The site comprises a flood berm running north – south adjacent to relatively flat playing fields to the east and a steep hill to the west of Molonglo River The site is not fenced and open to public access from the playing fields to the east The site is approximately 1.5 m higher than the Molonglo River to the west The site is covered in sparse vegetation including shrubs and mature eucalyptus Residences occur east and south of the site
Former Preschool	<ul style="list-style-type: none"> Former Preschool, currently vacant The site is flat and sits at the base of the valley within the Captains Flat township with the eastern embankment to the west The site is bounded by Foxlow Street to the east, vacant crown land to the south and west and residential properties to the north Molonglo River lies approximately 70 m east of the site on the opposite side of Foxlow Street separated by dwellings

7.9.3 Impact Assessment

Overall, the project would have a positive impact on the local community by reducing contamination impacts to neighbouring properties and by maintaining and improving the recreational value of the Site.

DRNSW has managed community relations through assessment and management of contamination at Captains Flat. DRNSW would continue to manage community relations through the abatement works according to a formalised community relations plan (refer to **Section 5.3** on future consultation for the Project).

During the abatement works, some residences may experience temporary reduced amenity impacts such as:

- Visual impacts from temporary fencing, site compound, machinery and from stockpiles and laydown areas during abatement activities
- Noise impacts from equipment and machinery (refer to **Section 7.2**)
- Dust impacts from vehicle movements (refer to **Section 7.6**)
- Increases in traffic (refer to **Section 7.4**).

These impacts are anticipated to be minor in nature and can be managed with the specified management and mitigation measures (**Section 7.5.4**).

During the abatement works, a geofabric marker layer would be placed on the top of the contaminated soil surface to act as a visual and physical barrier.

Temporary closure of the playing fields, tennis and basketball courts would result in reduced public recreational opportunities (children's playground already closed), however this impact would only be temporary during the abatement works and would be reinstated upon completion.

Following completion of the abatement works, the Sites would be reinstated to a suitable condition consistent with or similar to pre-construction conditions to minimise any permanent visual changes. This includes the removal of construction infrastructure and wastes and all areas where capping has been placed would be revegetated with suitable ground cover to stabilise soils and prevent erosion.

7.9.4 Management and Mitigation Measures

Table 7-22 describes the management and mitigation measures that have been identified for the Project in relation to social and visual impacts.

Table 7-22: Management and Mitigation Measures – Social and Visual

Management/Mitigation Control	Timing
Visual management measures would be included in the EMP.	Pre-construction
Notification would be provided to residents on the Project including anticipated commencement date and duration of works.	Construction
Temporary fencing would be erected and maintained, and the abatement site would be secured outside of construction hours.	Construction
The Sites would be maintained in a neat and tidy condition.	Construction
Vehicles would be inspected and cleaned if required to avoid tracking of dirt or mud onto public roads.	Construction
DRNSW would continue to manage community relations through the abatement works according to a formalised community relations plan.	Construction
Complaints would be managed in accordance with a complaints management protocol. All nearby residences would be informed of the complaints management protocol prior to commencement of works.	Construction
Following completion of the abatement works, the Sites would be reinstated to a suitable condition consistent with or similar to pre-construction conditions including removal of construction infrastructure and wastes and revegetating all areas where capping has been placed with suitable ground cover.	Completion of construction

7.10 Other Issues

7.10.1 Bushfire

Parts of the Sites are identified as Bushfire prone land. **Table 7-23** outlines the extent of Bushfire Prone Land mapping that applies to the Sites (NSW Rural Fire Service, 2022).

Table 7-23: Bushfire Prone Land mapping

Location	Bushfire prone land extent
Foxlow Parklet	Vegetation Buffer (all)
Crown land parcel adjacent to preschool	Vegetation Buffer
Southern end of Foxlow street	Part Vegetation Category 1 (southern portion), majority Vegetation Buffer
Tennis and basketball courts and swimming pool	Part Vegetation Buffer, majority not mapped
Flood berms and playing fields	Part Vegetation Category 1, majority Vegetation Buffer
Former Preschool	Vegetation Buffer

For the most part, the Sites are mapped as 'Vegetation Buffer' associated with the surrounding 'Vegetation Category 1' mapping. Parts of the site that are mapped as 'Vegetation Category 1' form the most western extent of the sites closest to the Molonglo River and the vegetation to the west, north and southwest of Captains Flat. 'Vegetation Category 1' consists of areas of forest, woodlands, heaths (tall and short), forested wetlands and timber plantations and considered to be the highest bush fire risk. This vegetation category has the highest combustibility and likelihood of forming fully developed fires including heavy ember production. The extent of the 'Vegetation Buffer' is 100 metres from the 'Vegetation Category 1' (NSW RFS, 2015).

In accordance with Section 4.14 of the EP&A Act, development on land that is identified as being bush fire prone must comply with the NSW Rural Fire Services' *Planning for Bushfire Protection 2019*. The Project is not specifically listed as a development type in *Planning for Bushfire Protection 2019*. Section 2.4 of *Planning for Bushfire Protection 2019* states that if a development of a type not specifically addressed in the document is proposed on Bushfire Prone Land, the development must meet the Aim and Objectives of *Planning for Bushfire Protection 2019* and the consent authority can refer the proposal to the NSW RFS for advice.

The aim of *Planning for Bushfire Protection 2019* is "to provide for the protection of human life and minimise impacts on property from the threat of bush fire, while having due regard to development potential, site characteristics and protection of the environment". The objectives of *Planning for Bushfire Protection 2019* are to:

- Afford buildings and their occupants protection from exposure to a bush fire
- Provide for a defensible space to be located around buildings
- Provide appropriate separation between a hazard and buildings which, in combination with
- Other measures, prevent the likely fire spread to buildings
- Ensure that appropriate operational access and egress for emergency service personnel and occupants is available
- Provide for ongoing management and maintenance of Bushfire Protection Measures
- Ensure that utility services are adequate to meet the needs of firefighters.

Whilst the objectives of *Planning for Bushfire Protection 2019* generally relate to developments where occupancy would occur and require development consent, the Project should have regard to bushfire protection during abatement activities to ensure the safety of workers. Further,

revegetation of the Sites as part of the Project should not increase risk of bushfire within the Captains Flat community.

7.10.2 Management and Mitigation Measures

Table 7-24 describes the management and mitigation measures that have been identified for the Project in relation to other issues.

Table 7-24: Management and Mitigation Measures – Other Issues

Management/Mitigation Control	Timing
Bushfire management measures would be included in the Work Health and Safety Plan developed for the Project during construction activities. The Safe Work Method Statement would include an Evacuation Plan in case of a bushfire emergency.	Pre-construction
Site access and egress would be maintained at all times during construction to ensure emergency vehicles have safe and easy access to the Sites in the case of a bushfire emergency.	Construction
Vegetation would be maintained by Council in accordance with a vegetation management plan.	Operation

7.11 Cumulative impacts

7.11.1 Existing environment

The areas surrounding the Sites are largely developed including residential developments, the former mine site, and transport infrastructure (refer to discussion in **Section 2.1**).

Current developments that are occurring or proposed in the area include the remediation and rehabilitation of the old Lake George mine site involving the construction of a containment cell and remediation of the old rail corridor. The eastern embankment site located west of the Sites would also be subject to a public place abatement program with works occurring concurrently.

7.11.2 Impact Assessment

Cumulative impacts for the Project relate to:

- Noise and vibration emissions from any concurrent construction activities across the Site, mine site and rail corridor site and from vehicles Foxlow Street and Captains Flat Road
- Air emissions including dust from any concurrent construction activities and vehicle emissions from construction vehicles and mine site rehabilitation activities
- Traffic volumes and movements on Foxlow Street and Captains Flat Road (refer to discussion in **Section 7.4**)
- Resource use and availability including construction materials and labour force availability within the community of Captains Flat and surrounding towns.

Given the scale and nature of the Project and the anticipated time frame for works, any cumulative impacts would be minimal and managed by the measures in the EMP.

7.11.3 Management and Mitigation Measures

No additional management and mitigation measures that have been identified for the Project in relation to cumulative impacts.

8. MANAGEMENT AND MITIGATION SUMMARY

Table 8-1 provides a summary of all the management and mitigation measures proposed for the Project.

Table 8-1: Summary of Management and Mitigation Measures

Proposed Management / Mitigation Measures	Timing
Soils and landform	
<p>The Principal Contractor would prepare and implement a Soil and Water Management Plan to manage soil and water during the works. The plan would include details of sediment and erosion control measures developed in accordance with <i>Managing Urban Stormwater: Soils and Construction</i> (Landcom 2004) (the 'Blue Book'). This would include the following measures:</p> <ul style="list-style-type: none"> • Erosion and sediment controls would be designed and implemented before ground disturbance work commences • Erosion and sediment controls would be inspected regularly, particularly after a rainfall event and maintained to ensure effective operation • Erosion and sediment control measures would remain in place until all surfaces have been fully restored and stabilised (minimum 70% groundcover) • Stockpiles being left for greater than 20 days would be stabilised using revegetation, wetting or geofabric • Any spoil material storage areas or stockpiles would more than 40 m from a watercourse or drainage depression and have appropriate erosion control devices installed to prevent erosion, control runoff and prevent sedimentation. 	Pre-construction and construction
Vehicles would use the designated access roads/tracks to prevent ground disturbance. Additional care would be undertaken near drainage lines.	Construction
Vehicles would be refuelled at either a service station, a designated refuelling location within the Site or mobile refuelling. If mobile refuelling is to occur, the appropriate spill protection, such as a spill tray, would be used.	Construction
Laydown areas would be underlain with a geofabric and capping material layer to minimise contamination risks and avoid disturbance of the existing soils.	Construction
Topsoil and landscaping material may be brought onto the Sites if it has been classified as VENM, ENM or under a resource recovery exemption prior to import. Documentation records would include volume, origin, description, photographs and classification. On import, visual verification including photographs would be completed to confirm that the verified material is consistent with the material received to the Site.	Construction
<p>Spoil would be stockpiled within the Sites and would be underlain with geofabric. The following general principles would apply to the management of spoil stockpiles:</p> <ul style="list-style-type: none"> • Stockpiles are to be placed on plastic sheeting and are to be located within the extent of abatement footprint 	Construction

Proposed Management / Mitigation Measures	Timing
<ul style="list-style-type: none"> Covering with plastic sheeting of all contaminated soil stockpiles remaining on the Site for more than 24 hours All stockpiles would be placed on a level area as a low elongated mound Erosion and sediment controls in accordance with the Soil and Water Management Plan are to be implemented to minimise disturbance and potential contamination. 	
Any hazardous chemicals to be used during construction would be stored and handled in a manner consistent with their Material Data Sheet to minimise spill risk. No potentially hazardous materials such as chemicals, fuels, and/or waste would be stored within or adjacent to drainage lines or unsealed surfaces.	Construction
A spill kit would be available on site. Personnel trained to respond to any spill incidences (should they occur) would always be available on site. Spills are to be cleaned up and the area remediated as soon as practicable. Any collected clean up material would be disposed of consistent with the material's waste classification.	Construction
If any previously unidentified potential contamination (such as visual observation of potentially asbestos containing material, discoloured soil, strong chemical odour, refuse or leachate) is discovered during works, works must halt in this area and not recommence until an appropriate management strategy has been developed.	Construction
A geofabric marker layer would be placed on the top of the contaminated soil surface to act as a visual and physical barrier.	Construction
All areas where capping has been placed would be revegetated with suitable ground cover to stabilise soils and prevent erosion.	Post-construction
Waste	
The waste management strategy for the Project is to be confirmed and the appropriately licenced landfill facility identified prior to lead abatement works commencing.	Pre-construction
Waste management measures would be included in the EMP.	Pre-construction
All construction personnel would be informed during the site induction of the waste management hierarchy and the measures to be implemented (avoid, reduce, reuse, recycle and dispose).	Construction
Wastes would be managed in accordance with the EPA <i>Waste Classification Guidelines</i> .	Construction
All material handled during excavation of lead impacted materials is to be tracked to verify appropriate movement and handling.	Construction

Proposed Management / Mitigation Measures	Timing
Wastes would be appropriately segregated, and waste storage areas must have sufficient capacity and protection to provide for the type and volume of waste generated.	Construction
Transportation of soils in accordance with its classification as either Restricted Solid Waste or Hazardous Solid Waste under the EPA <i>Waste Classification Guidelines</i> .	Construction
Contaminated spoil would be disposed of at a facility licenced to the material. The preferred facility would also be licenced and approved to undertake immobilisation of lead (and potentially other contaminants) contamination prior to disposal within landfill.	Construction
Any hazardous substances would be appropriately sealed, labelled and stored in bunded areas prior to removal from the site. Disposal would be at an appropriately licensed waste facility.	Construction
Trucks transporting waste materials from the Sites on public roads would be covered to minimise odour, spillage and spread of weeds.	Construction
Waste material is not to be left onsite once the works have been completed.	Post-construction
Surface water and groundwater	
The Principal Contractor would prepare and implement a Soil and Water Management Plan to manage soil and water during the works. The Principal Contractor must define and implement controls to prevent offsite contaminant migration above criteria protective of the receiving environment.	Pre-construction
Daily monitoring of local weather forecasts to pre-empt any significant rain event to allow sufficient time for implementation of measures to prevent offsite contamination migration	Construction
Water discharged from abatement areas during abatement works would be managed in accordance with the <i>Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000</i> (ANZECC Guidelines)	Construction
Erosion and sediment controls would be implemented as described in Section 7.1 to minimise/prevent sediment from entering waterways.	Construction
Surface ground levels within the Sites would be rehabilitated to pre-construction levels where appropriate or modified to improve site drainage and avoid unintentional waterlogging, so that adverse changes to surface water drainage patterns do not occur.	Construction
Spill kits would be readily available onsite and any spillage is to be immediately cleaned up.	Construction
Workers would be appropriately trained in the containment of spills on site.	Construction

Proposed Management / Mitigation Measures	Timing
When planning the location of facilities, plant lay-down areas, refuelling areas, stockpiles or chemical storage, areas that drain directly towards surface water or stormwater systems must be avoided in order to minimise risk of pollution.	Construction
Vehicles would be refuelled at either a service station, a designated refuelling location within the Site, or mobile refuelling. If mobile refuelling is to occur, the appropriate spill protection, such as a spill tray, would be used.	Construction
Scheduled surface and groundwater quality monitoring would occur to understand effectiveness of the abatement works and identify potential remnant or new contaminant pathways.	Post-construction
Traffic, transport and access	
A Traffic Management Plan would be prepared in consultation with QPRC prior to commencement of construction.	Pre-construction
<p>The Traffic Management Plan would address the potential impacts relating to the Sites including:</p> <ul style="list-style-type: none"> • Road closures requirements and alternative routes • Vehicle movement paths or access routes to be followed • Traffic staging due to peak traffic times ie school pick up and drop off • Sight distance requirements for heavy vehicles 	Pre-construction
A survey of the local road network condition would be undertaken prior to construction commencing.	Pre-construction
Local residents would be informed of any changes to the local road network and alternative routes.	Pre-construction and construction
Trucks would enter/exit the Sites via designated access points.	Construction
The size of the truck is to be appropriate for the width of the local road network especially in relation to the Foxlow Parklet site where truck and dog may be too large for Foxlow Street.	Pre-construction and Construction
Appropriate exclusion barriers, signage and site supervision is to be employed to ensure that the construction footprint is controlled, and that unauthorised vehicles and pedestrians are excluded from the works area.	Construction
All traffic control devices are to be in accordance with <i>AS 1742.3-2009 – Manual of uniform traffic control devices Part 3: Traffic control for works on roads</i> and the Roads and Maritime Services (RMS) <i>Traffic control at work sites (TCAWS)</i> manual.	Construction

Proposed Management / Mitigation Measures	Timing
A dilapidation survey of the local road network would be undertaken post construction. Correction of impacts to the condition of the local road network would be discussed with QPRC.	Post construction
Noise and vibration	
A Noise and Vibration Management Plan (NVMP) would be prepared as part of the EMP prior to the commencement of works and implemented through all phases of the proposed construction works. The NVMP would provide the framework for the management of all potential noise impacts resulting from the construction works and would detail the environmental mitigation measures to be implemented throughout the construction works.	Pre-construction
Affected neighbours would be advised in advance of the proposed construction period at least one week prior to the commencement of works.	Pre-construction
All site workers (including subcontractors and temporary workforce) would be informed via a site induction and regular toolbox meetings of the potential for noise impacts upon residents and encouraged to take practical and reasonable measures to minimise noise during their activities.	Construction
The constructor or site supervisor (as appropriate) would provide a community liaison phone number and permanent site contact so that the noise related complaints, if any, can be received and addressed in a timely manner.	Construction
The constructor (as appropriate) would establish contact with the residents and communicate, particularly when noisy activities are planned.	Construction
Construction works would adopt Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA) practices as addressed in the ICNG. BMP includes factors discussed within this report and encouragement of a project objective to reduce noise emissions. BATEA practices involve incorporating the most advanced and affordable technology to minimise noise emissions.	Construction
All construction works would be scheduled for standard construction hours and would comply with the start and finish time.	Construction
Where practical, simultaneous operation of dominant noise generating plant would be managed to reduce noise impacts, such as operating at different times or increase the distance between plant and the nearest identified receptor.	Construction
High noise generating activities such as jack hammering would only be carried out in continuous blocks, not exceeding three hours each, with a minimum respite period of one hour between each block.	Construction
Where possible, reversing beepers on mobile equipment would be replaced with low-pitch tonal beepers (quackers). Alternatives to reversing beepers include the use of spotters and designing the site to reduce the need for reversing may assist in minimising the use of reversing beepers.	Construction
Equipment which is used intermittently would be shut down when not in use.	Construction

Proposed Management / Mitigation Measures	Timing
All engine covers would be kept close while equipment is operating.	Construction
The construction site would be arranged to minimise noise impacts by locating potentially noisy activities away from the nearest receivers wherever possible.	Construction
To minimise heavy equipment handling noise, material stockpiles would be located as far as possible from receptors.	Construction
Loading and unloading areas would be located as far as possible from receptors.	Construction
Where possible, trucks associated with the work area would not be left standing with their engine operating in a street adjacent to a residential area.	Construction
All vehicular movements to and from the site would comply with the appropriate regulatory authority requirement for such activities.	Construction
Noise and vibration monitoring would be undertaken upon receipt of a complaint where an investigation has identified a works activity as source of excessive noise, to identify and quantify the issue and determine options to minimise impacts.	Construction
If valid noise and/or vibration data for an activity is available for the complainant property, from works of a similar severity and location, it is not expected that monitoring would be repeated upon receipt of repeated complaints for these activities, except where vibration levels are believed to be potentially damaging to the building.	Construction
Any noise and/or vibration monitoring would be undertaken by a qualified professional and with consideration to the relevant standards and guidelines. Attended noise and/or vibration monitoring would be undertaken upon receipt of a noise and/or vibration complaint. Monitoring would be undertaken and reported within a timely manner (three to five working days). If exceedance is detected, the situation would be reviewed to identify means to reduce the impact to acceptable levels.	Construction
Air quality	
The Principal contractor would prepare a dust management plan to manage dust during the works. The plan would define and implement dust controls to prevent offsite contaminant migration above criteria protective of the receiving environment.	Pre-Construction
Residents immediately adjacent to the Sites would be notified of the proposed program.	Pre-Construction and Construction
Roads would be maintained where deposited dust or spillage is visible.	Construction
Vehicles would avoid the unnecessary use of and access to unsealed surfaces.	Construction

Proposed Management / Mitigation Measures	Timing
Vehicle and mobile plant speeds would be limited within the work area e.g. 10 km/h.	Construction
Operations would be modified or ceased during adverse meteorological or dust generating conditions.	Construction
Dust levels would be visually observed and operations adapted where excessive amount of dust is being generated.	Construction
Wind breaks or shielding would be erected around materials and/or stockpiles where required to minimise dust generation.	Construction
Stockpiles would be maintained at a defined height, where the lowest practicable height is preferable.	Construction
Double-handling of materials would be avoided and to limit time stockpiled or handled.	Construction
All loads would be securely covered when transporting materials.	Construction
Sufficient resources would be allocated to the Project to manage dust risks.	Construction
Training and tool-box-talks would be undertaken with Project personnel addressing air quality management objectives, hazards, risks, controls, behaviours and consequences for inappropriate behaviour.	Construction
All contaminated soil stockpiles remaining onsite for more than 24 hours would be covered with plastic sheeting.	Construction
Where possible vehicles and machinery would be turned off or throttled down when not in use.	Construction
Project vehicles and machinery would be maintained in accordance with manufacturer's requirements.	Construction
As soon as practical after completion of abatement works soils are to be topsoiled and seeded with appropriate grass species for residential property to minimise erosion. Water and/ or other applications (such as hydromulching) may be required to ensure establishment of the grass once seed is distributed.	Construction
Should a complaint be received regarding dust or odour during the works, the source of the dust or odour would be identified, and appropriate control measures identified and implemented where applicable.	Construction
Three months of continuous air quality monitoring would be completed post abatement to assess the effectiveness of the abatement works.	Post construction

Proposed Management / Mitigation Measures	Timing
Biodiversity	
Biodiversity management measures would be included in the EMP.	Pre-construction
Management measures would be included in the SWMP to prevent additional sediment run-off into the Molonglo River.	Pre-construction
Removal of native vegetation would be avoided and minimised through detailed design, specifically minimising clearing of riparian vegetation adjacent to the Molonglo River.	Pre-construction
Clearing limits and exclusion zones would be established and maintained for the works.	Construction
Cleared areas would be revegetated following completion of the works to minimise erosion and prevent runoff.	Construction
Bank stabilisation measures would be implemented to minimise changes to hydrology.	Construction
Hygiene controls would be implemented for all plant and people working in the Sites to prevent the spread of weeds, seeds, pathogens, fungi and exotic species. This would include washing machinery prior to bringing them onsite.	Construction
All weed and soil material would be transported as hazardous waste to an immobilisation facility and once treated would be transported to disposal facility / landfill.	Construction
Heritage	
The Mogo LALC would be briefed on the proposed works.	Pre-construction
An unexpected finds protocol would be developed for the Project and would be included in the EMP.	Pre-construction
In the event of the discovery of a potential heritage item within the Site, all work in the vicinity of the item would stop immediately and an archaeologist would be contacted to determine the significance of the object(s) and the appropriate management response. Any confirmed Aboriginal heritage items would be registered on the AHIMS database.	Construction
Social and visual	
Visual management measures would be included in the EMP.	Pre-construction
Notification would be provided to residents on the Project including anticipated commencement date and duration of works.	Construction

Proposed Management / Mitigation Measures	Timing
Temporary fencing would be erected and maintained, and the abatement site would be secured outside of construction hours.	Construction
The Sites would be maintained in a neat and tidy condition.	Construction
Vehicles would be inspected and cleaned if required to avoid tracking of dirt or mud onto public roads.	Construction
A geofabric marker layer would be placed on the top of the contaminated soil surface to act as a visual and physical barrier.	Construction
DRNSW would continue to manage community relations through the abatement works according to a formalised community relations plan.	Construction
Complaints would be managed in accordance with a complaints management protocol. All nearby residences would be informed of the complaints management protocol prior to commencement of works.	Construction
Following completion of the abatement works, the Sites would be reinstated to a suitable condition consistent with or similar to pre-construction conditions including removal of construction infrastructure and wastes and revegetating all areas where capping has been placed with suitable ground cover.	Completion of construction
Bushfire	
Bushfire management measures would be included in the Work Health and Safety Plan developed for the Project during construction activities. The Safe Work Method Statement would include an Evacuation Plan in case of a bushfire emergency.	Pre-construction
Site access and egress would be maintained at all times during construction to ensure emergency vehicles have safe and easy access to the Sites in the case of a bushfire emergency.	Construction
Vegetation would be maintained by Council in accordance with a vegetation management plan.	Operation

9. CONCLUSION

The Project is required to remediate the lead contaminated soils in public spaces within the Captains Flat Community and make safe the sites for public use and potential future redevelopment. The Project is necessary to maintain the safety of the affected community and to prevent harmful exposure to lead contaminated soils.

This Review has been prepared in accordance with Part 5 of the EP&A Act and Clause 228 of the EP&A Regulation. It is concluded that the Project is unlikely to have a significant effect on the environment with implementation of the management and mitigation measures described in **Section 8**.

Ramboll considers that this document provides Council with the information required to facilitate approval of the Project.

10. REFERENCES

- Australian Bureau of Statistics. (2016). *Captains Flat*. Retrieved from 2016 Census QuickStats: [https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/SSC10804#:~:text=People%20%E2%80%94%20demographics%20%26%20education&text=In%20the%202016%20Census%2C%20there,up%203.6%25%20of%20the%20population.&text=The%20median%](https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/SSC10804#:~:text=People%20%E2%80%94%20demographics%20%26%20education&text=In%20the%202016%20Census%2C%20there,up%203.6%25%20of%20the%20population.&text=The%20median%20)
- BOM. (2021). *Climate statistics for Australian locations*. Retrieved from Australian Government Bureau of Meteorology: <http://www.bom.gov.au/climate/averages/tables>
- C&R. (2021). *Literature Review – Nature and extent of contamination in the Captains Flat Region, NSW*.
- Cardno. (2015). *Captains Flat Floodplain Risk Management Study and Plan*.
- CSIRO. (2001). *Atlas of Australian Acid Sulfate Soils*. Retrieved from Australian Soil Resource Information System: <https://www.asris.csiro.au/index.html>
- Department of Environment, Climate Change and Water. (2010). *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*.
- Department of Planning, Industry and Environment. (2022). *Palerang Local Environmental Plan 2014 - Flood Planning Map*. Retrieved from NSW Planning Portal: <https://www.planningportal.nsw.gov.au/publications/environmental-planning-instruments/palerang-local-environmental-plan-2014>
- Dobos and Associates. (2002). *Risk Assessment and Remedial Action Plan Deelict Lake George Mine Captains Flat*.
- GHD. (2018). *Assessment of Remediation Options. Lake George Captains Flat Mine Review*.
- NSW EPA. (2021). *Captains Flat surface soil testing report*.
- NSW Government. (2022). *SEED Map*. Retrieved from The Central Resource for Sharing and Enabling Environmental Data in NSW: https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU
- NSW RFS. (2015). *Guide for Bushfire Prone Land Mapping*.
- NSW Rural Fire Service. (2022). *NSW Bushfire Prone Land Mapping*. Retrieved from NSW Government SEED - The Central Resource for Sharing and Enabling Environmental Data in NSW: <https://datasets.seed.nsw.gov.au/dataset/bush-fire-prone-land>
- Ramboll. (2021a). *Captains Flat Air Quality Monitoring Report June to October 2021*.
- Ramboll. (2021b). *Captains Flat Lead Management Plan, Conceptual Site Model*.
- Ramboll. (2021c). *Captains Flat Lead Management Plan, Abatement Options Assessment*.
- Ramboll. (2021c). *Captains Flat Lead Management Plan, Abatement Options Assessment*.
- Ramboll. (2021d). *Captains Flat Lead Management Plan*.
- Ramboll. (2021e). *Sampling and Analysis Quality Plan*.
- Ramboll. (2022). *Traffic Impact Assessment Technical Memo*.
- WaterNSW. (2021). *Real Time Data*. Retrieved from <https://realtimedata.waternsw.com.au/>

11. LIMITATIONS

Ramboll Australia Pty Ltd (Ramboll) prepared this report in accordance with the scope of work as outlined in our proposal to DRNSW dated 23 April 2021 and in accordance with our understanding and interpretation of current regulatory standards.

Site conditions may change over time. This report is based on conditions encountered at the site at the time of the report and Ramboll disclaims responsibility for any changes that may have occurred after this time.

The conclusions presented in this report represent Ramboll's professional judgment based on information made available during the course of this assignment and are true and correct to the best of Ramboll's knowledge as at the date of the assessment.

Ramboll did not independently verify all of the written or oral information provided to Ramboll during the course of this investigation. While Ramboll has no reason to doubt the accuracy of the information provided to it, the report is complete and accurate only to the extent that the information provided to Ramboll was itself complete and accurate.

This report does not purport to give legal advice. This advice can only be given by qualified legal advisors.

11.1 User Reliance

This report has been prepared exclusively for DRNSW and may not be relied upon by any other person or entity without Ramboll's express written permission.

**APPENDIX 1
ABATEMENT PLANS**

APPENDIX 2
ENVIRONMENTAL MANAGEMENT PLAN

**APPENDIX 3
CONSIDERATION OF CLAUSE 171(2) FACTORS AND MNES**

REVIEW OF ENVIRONMENTAL FACTORS

Table 1: Clause 171(2) Factors

Factor	Risk of Impact? Yes/No	Comment	Degree and Duration of Impact	Mitigation Measures Reference in Review
(a) Any environmental impact on a community?	Yes	<p>The Project would result in minor environmental impacts to the community during construction activities such as noise, air quality, visual, traffic and social and visual impacts as described in Section 7.2, Section 7.6 and Section 7.4, and Section 7.9 of the Review respectively.</p> <p>The removal of contaminated soils would provide long-term environmental benefits for the community.</p>	Minor, temporary	<p>Section 7.2 (noise and vibration)</p> <p>Section 7.6 (air quality)</p> <p>Section 7.4 (traffic and transport)</p> <p>Section 7.9 (social and visual)</p>
(b) Any transformation of a locality? (increased traffic, visitation)	Yes	<p>The Project involves minor transformation of a locality during temporary construction activities due to increase visitation of Project personnel and construction machinery and equipment. The landform of the flood berms would be permanently altered to improve stability and reduce erosion impacts.</p>	Minor, temporary	<p>Section 7.2 (noise and vibration)</p> <p>Section 7.4 (traffic and transport)</p> <p>Section 7.9 (social and visual)</p>
(c) Any environmental impact on the ecosystems of the locality?	Yes	<p>The Project would have a minor impact on the local ecosystem during construction activities such noise, air quality, visual, traffic and social and visual impacts as described in Section 7.2, Section 7.6 and Section 7.4, and Section 7.9 of the Review respectively.</p> <p>The removal of contaminated soils would provide long-term environmental benefits for the community.</p>	Minor, temporary	<p>Section 7.2 (noise and vibration)</p> <p>Section 7.1 (soils and landform)</p> <p>Section 7.6 (air quality)</p> <p>Section 7.3 (surface water and groundwater)</p> <p>Section 7.7 (biodiversity)</p> <p>Section 7.4 (traffic and transport)</p> <p>Section 7.9 (social and visual)</p>

Factor	Risk of Impact? Yes/No	Comment	Degree and Duration of Impact	Mitigation Measures Reference in Review
(d) Any reduction in the aesthetic, recreational, scientific or other environmental quality or value of a locality?	Yes	Temporary closure of the playing fields, tennis and basketball courts would result in reduced public recreational opportunities (children's playground already closed), however this impact would only be temporary during the abatement works and would be reinstated upon completion.	Minor, temporary	Section 7.9 (social and visual)
(e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?	No	The Site does not have any significant aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value. The Project would not change the existing land use of the locality.	No impact	N/A
(f) Any impact on the habitat of protected fauna (within the meaning of the <i>National Parks & Wildlife Act 1974</i>)?	Yes	Up to 0.32 hectares of PCT 1102 (Ribbon Gum - tea-tree - River Tussock riparian scrub along tablelands streambanks, South East Corner Bioregion (low condition)) is proposed to be cleared for the Project. PCT 1102 provides marginal habitat for the threatened fauna species identified in Section 7.7.2.2 .	Minor, permanent	Section 7.7 (biodiversity)
(g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?	No	The Project would not endanger any threatened species (refer to Section 7.7).	No impact	Section 7.7 (biodiversity)
(h) Any long-term effects on the environment?	No	The long-term effects of the Project would improve environmental quality by reducing contamination within Captains Flat and improving landform stability of the flood berms.	Long-term (positive)	N/A

Factor	Risk of Impact? Yes/No	Comment	Degree and Duration of Impact	Mitigation Measures Reference in Review
(i) Any degradation of the quality of the environment?	Yes	<p>The impacts associated with the Project identified and assessed in the Review would result in only minor, localised and temporary degradation of the quality of the environment such as:</p> <ul style="list-style-type: none"> • Temporary amenity impacts (noise, air, visual, traffic) • Erosion and sedimentation impact from activities such as excavations, earthworks, vehicle movements and general ground disturbance • Potential contamination of soils or water sources. <p>These impacts would be minimised through the implementation of the management and management measures described in this Review.</p>	Minor, temporary	<p>Section 7.2 (noise and vibration) Section 7.1 (soils and landform) Section 7.6 (air quality) Section 7.3 (surface water and groundwater) Section 7.7 (biodiversity) Section 7.4 (traffic and transport) Section 7.9 (social and visual)</p>
(j) Any risk to the safety of the environment?	Yes	<p>There is a risk that the Project could result in the spread of contamination to soils and water resources from handling of the contaminated materials and from construction sources such as chemicals, fuels and hydrocarbons. This risk is considered low when considering the proposed management and mitigation measures described in the Review and the long-term benefits of removing the contaminated materials from the Sites.</p>	Minor, temporary	<p>Section 7.1 (soils and landform) Section 7.3 (surface water and groundwater)</p>
(k) Any reduction in the range of beneficial uses of the environment?	Yes	<p>The Project would not change the existing land use of the locality once completed. Temporary closure of the playing fields, tennis and basketball courts would result in reduced public recreational opportunities (children's playground already closed), however this impact would only be temporary during the abatement works and would be reinstated upon completion.</p>	Minor, temporary	N/A

Factor	Risk of Impact? Yes/No	Comment	Degree and Duration of Impact	Mitigation Measures Reference in Review
(l) Any pollution of the environment?	Yes	<p>Pollution to the environment may arise from the following activities:</p> <ul style="list-style-type: none"> • Air emissions from vehicles and machinery or ground disturbance works • Operational noise from vehicles and machinery • Potential spread of contamination. <p>The risk of pollution is considered low with the implementation of the mitigation/management measures described in the Review.</p> <p>The abatement works would reduce the potential for further spreading of contamination.</p>	Minor, temporary	<p>Section 7.2 (noise and vibration)</p> <p>Section 7.1 (soils and landform)</p> <p>Section 7.6 (air quality)</p> <p>Section 7.3 (surface water and groundwater)</p>
(m) Any environmental problems associated with the disposal of waste?	Yes	<p>The management of wastes is considered in Section 7.2 of the Review. The waste management strategy is to excavate the contaminated spoil, transport to an offsite location, chemically immobilise the lead (and potentially other contaminants which are to be appropriately assessed) and dispose of the spoil as immobilised GSW at an appropriately licensed landfill. No environmental problems would arise with the implementation of the mitigation/management measures described in the Review.</p>	Minor, temporary	Section 7.2 (waste)
(n) Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?	No	No resources likely to become in short supply are required for the Project.	No impact	N/A
(o) Any cumulative environmental effect with other existing or likely future activities?	No	No cumulative impacts have been identified that are not able to be adequately managed such as noise, air and traffic impacts (refer to discussion in Section 7.11).	No impact	N/A

Factor	Risk of Impact? Yes/No	Comment	Degree and Duration of Impact	Mitigation Measures Reference in Review
(p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?	No	The Site is located is not located within a coastal management area as defined in the Clause 6 of <i>State Environmental Planning Policy (Coastal Management) 2018</i> and shown on the State Environmental Planning Policy (Coastal Management) 2018 Interactive Map.	No impact	N/A
(q) Any impact on applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1.	No	Consistency with the Palerang LEP is considered in Section 6.1.1 . The abatements works are consistent with the objectives of the LEP.	No impact	N/A
(r) Any impact on other relevant environmental factors?	No	No other relevant environmental factors have been identified.	N/A	N/A

Table 2: Matters of National Environmental Significance

Factor	Risk of Impact? Yes/No	Comment	Degree and Duration of Impact	Mitigation Measures Reference in Review
(a) Any impact on a World Heritage property?	No	There are no World Heritage Areas located within proximity to the Site.	No impact	N/A
(b) Any impact on a National Heritage place?	No	There are no National Heritage Places located within proximity to the Site.	No impact	N/A
(c) Any impact on a wetland of international importance?	No	There are no wetlands of national importance within proximity to the Site.	Minor, temporary	N/A
(d) Any impact on a listed threatened species or communities?	No	The Project would not result in significant impacts to any listed species (refer to discussion in Section 7.7).	No impact	N/A
(e) Any impacts on listed migratory species?	No	The Project would not result in significant impacts to any migratory species (refer to discussion in Section 7.7).	No impact	N/A
(f) Any impact on Commonwealth marine areas?	No	No Commonwealth Marine Areas are in proximity to the Project.	No impact	N/A
(g) Any impact on the Great Barrier Reef Marine Park?	No	The Project is not within the vicinity of the Great Barrier Reef Marine Park.	No impact	N/A
(h) Does the Project involve a nuclear action (including uranium mining)?	No	The Project does not involve a nuclear action.	No impact	N/A
Additionally, any impact (direct or indirect) on <u>a water resource, in relation to coal seam gas development and large coal mining development</u>	No	The Project does not relate to coal seam gas development or a large coal mining development.	No impact	N/A

APPENDIX 4
TRAFFIC TRANSPORT AND ACCESS ASSESSMENT REPORT

TRAFFIC IMPACT ASSESSMENT TECHNICAL MEMO

Project name **Traffic Impact Assessment (TIA) for Captains Flat Abatement**

Project no. **318001193**

Client **Department of Regional NSW**

Memo no. **1**

Version **1**

To **Clare Butterfield**

Date 22/02/2022

From **Utkarsh Sood**

Copy to **Shaun Taylor, Ian McCarthy**

Prepared by **Utkarsh Sood**

Checked by **Ian McCarthy**

Approved by **Ian McCarthy**

Ramboll
Level 3
100 Pacific Highway
PO Box 560
North Sydney
NSW 2060
Australia

T +61 2 9954 8100
F +61 2 9954 8150
<https://ramboll.com>

Contents

1 Assumptions	3
2 The Project	4
2.1 The Project Site	4
2.2 Outline of Key Roads	5
2.3 Proposed Vehicles	7
2.4 Soil Movement.....	8
2.5 Hours of Operation.....	8
2.6 Traffic Generation	8
3 Assessment of traffic impacts	10
3.1 Route Choice	10
3.1.1 Recommended Routes for Eastern Embankment (Site 3)	10
3.1.2 Recommended Routes for Other Sites.....	13
3.2 Swept Paths	15
3.3 Recommendations.....	18

1 Assumptions

The assumptions made in this Traffic Impact Assessment (TIA) are as follows:

- Truck and dogs are assumed to have a capacity of 30 tonnes. In practice, they may have the ability to carry slightly more or less.
- Truck and dog widths are 2.5 metres based on the NSW heavy vehicles chart for general access vehicles.
- It is assumed that the roads available for use around Captains Flat are of an acceptable camber and gradient for truck and dog usage.
- One cubic metre of soil equates to 1.5 tonnes of soil.
- Public holidays have not been considered when calculating the expected daily trucks.
- The total hours available for cut and fill have been split at the same proportion to the volume of cut and fill soil.
- Cut and fill trucks will not be moving in tandem but in sequence. This means that cut trucks will complete their roles before fill trucks are sent to the sites.

2 The Project

2.1 The Project Site

Captains Flat is a regional township with 233 occupied dwellings and a total of 219 registered motor vehicles (ABS, 2016). Access to the town is provided through Jerangle Road from the south and Captains Flat Road from the north and south.

When accessing the town from the south, Captains Flat Road converts into Braidwood Road which intersects with Foxlow Street. Similarly, Jerangle Road, when entering the town from the south, turns into Foxlow Street which intersects with Captains Flat Road.

Most dwellings and public spaces are located north of the intersection of Foxlow Street and Braidwood Road, indicating that residential movements are likely to take place along Foxlow Street. Captains Flat also has an access road to the decommissioned mine site through Miners Road which is accessible via the eastern embankment from Foxlow Street.

As part of the project, there are a total of eight abatement areas. These areas are described in more details in the main report, and are labelled as follows:

1. Foxlow Parklet (Lot 1 DP 251188)
2. Crown Parcel Land Behind Preschool (Crown Road Reserve 1084055075)
3. Crown Parcel Land Behind Preschool (Eastern Embankment) (Part Lot 7317 DP1141049)
4. Southern end of Foxlow Street (Road Reserve)
5. Tennis court, basketball court and swimming pool (Part Lot 7004 DP1020764 and Part Lot 166 DP754866)
6. Flood berms (Part Lot 7004 DP1020764 and waterway area)
7. Playing fields (Part Lot 7004 DP1020764)
8. Captains Flat Pre-School (Lot 101 DP754870 and Lot 107 DP754870)

The local road network is shown in Figure 1, and key roads are described in more detail in Section 2.2.

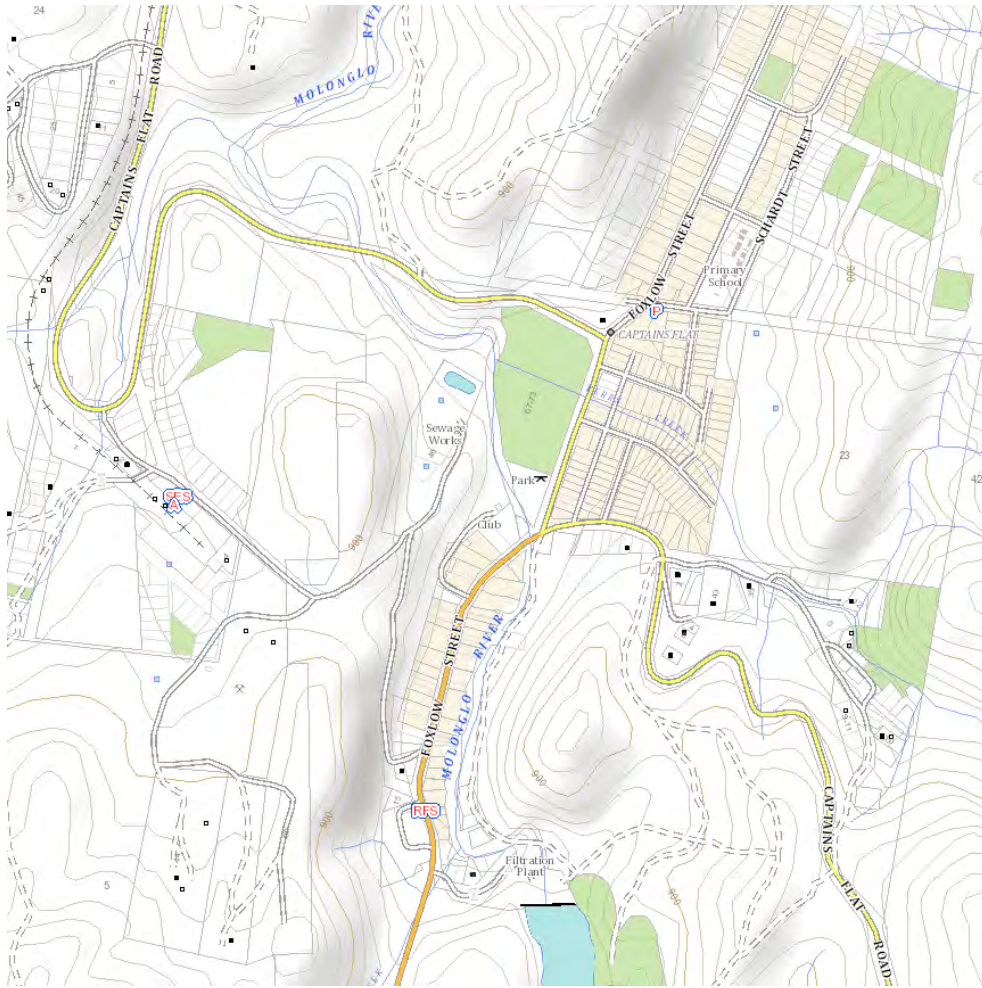


Figure 1: Road map of Captains Flat (SIX Maps)

2.2 Outline of Key Roads

Foxlow Street

Foxlow Street is a north-south road carrying two-way traffic through Captains Flat. It is a fully sealed road with a speed limit of 50km/hr and varies in width from five metres when travelling northbound from Jerangle Road to 13 metres between Braidwood Road and Captains Flat Road. The width of Foxlow Street throughout Captains Flat is outlined in Table 1 below.

Foxlow Street crosses the Molonglo River to a T-junction with Foxlow Street and Braidwood Road. When crossing the Molonglo River, vehicles need to pass over Foxlow Street Bridge with a road width of approximately six metres. This bridge was recently upgraded, with construction completed in November 2021, removing load limits that were previously present (confirmed by Queanbeyan-Palerang Regional Council).

There are no survey counts along Foxlow Street to determine average daily traffic (ADT) flows. It is expected that Foxlow Street is primarily used by residents and vehicles passing through the town moving along Captains Flat Road and as such should have sufficient existing capacity.

Table 1: Road widths along Foxlow Street

Section of Foxlow Street	Approximate road width
Jerangle Road to Miners Road	5-8 metres
Miners Road to Molonglo River Bridge	12 metres
Foxlow Street Bridge	6 metres
Braidwood Road to Captains Flat Road	13 metres
Captains Flat Road to Blatchford Street	10 metres
Blatchford Street to Spring Street	5 metres
Spring Street to Beazley Street	3-5 metres

Captains Flat Road

Captains Flat Road provides access to Captains Flat from the north and south but moves through the town in an east-west direction. When entering the town from the south, it turns into Braidwood Road, eventually intersecting with Foxlow Street. Captains Flat Road then continues north of the tennis courts on Foxlow Street in a westbound direction, north of Captains Flat mine, and eventually in a northbound direction out of the Captains Flat area.

Captains Flat Road is a two-way road with varying road conditions and a speed limit of 80km/hr. However, on Captains Flat Road, to the north and south of the town, the road is winding on approach to the town, requiring vehicles to slow down to manoeuvre some of the turns.

When entering or exiting from Captains Flat Road south of the town, there is approximately 1.25 kilometres of sealed road from the T-junction of Braidwood Road and Foxlow Street before the road is unsealed, the interface of which is shown in Figure 2.

When entering or exiting from Captains Flat Road north of the town, there is a bridge over the Molonglo River located approximately 450 metres from the intersection of Captains Flat Road and Foxlow Street which has been upgraded from a one lane 60km/hr bridge to a two lane 80km/hr bridge. Captains Flat Road north of the town is fully sealed as it is a key route for people to move between Captains Flat towards Quenbeyan and Canberra.

Miners Road

Miners Road is a sealed publicly accessible two-way road that provides a route through the decommissioned Captains Flat mine site with entry and exit points on the northern side through Captains Flat Road and on the southern side through Foxlow Street. The entrance to Miners Road from Foxlow Street is an upwards gradient towards a hairpin turn at the top as well as an access road to the Captains Flat Sewage Treatment Plant. The road width of Miners Road varies from 4-6 metres and it has a speed limit of 50km/hr.



Figure 2: Interface between sealed and unsealed sections of Captains Flat Road located on the southern approach to Captains Flat.

2.3 Proposed Vehicles

The vehicles that have been proposed for use in this project are truck and dog combinations. As per the NSW Heavy Vehicles Chart, truck and dog combinations have a maximum length of 19 metres. For this project, the carrying capacity of the truck and dog combination it is conservatively estimated at 30 tonnes. Further information on these truck types can be seen in Figure 3.

6 axle Truck and Dog Combination Length: 19.0 metres	6 axle Truck and Dog Combination Length: 19.0 metres	7 axle Truck and Dog Combination Length: 19.0 metres
16.5t 9.0t 16.5t 6.0t ¹ GML Total Combination Mass: 42.5t¹ 17.0t 9.0t 17.0t 6.0t ¹ CML Total Combination Mass: 43.5t^{1,2} Access: GML/CML: General Access under HVNL	16.5t 9.0t 16.5t 6.0t ¹ GML Total Combination Mass: 48.0t¹ Access: GML: National Class 3 Truck and DogTrailer Mass Exemption Notice 2018	16.5t 16.5t 16.5t 6.0t ¹ GML Total Combination Mass: 50.0t¹ Access: GML: National Class 3 Truck and Dog Trailer Mass Exemption Notice 2018

Figure 3: Variations and traits of truck and dog combinations (NSW Heavy Vehicle Chart)

2.4 Soil Movement

The approximate amount of soil expected to be moved in and out of the eight sites in Captains Flat is 10900 cubic metres of cut soil and 14700 cubic metres of fill soil. Of this, the approximate cut and fill by site is:

- The Eastern Embankment (Site 3) is 6200 cubic metres of cut soil and 6200 cubic metres of fill soil.
- All other sites are 4700 cubic metres of cut soil and 8500 cubic of fill soil.

Based on the assumption that one cubic metre of soil weighs 1.5 tonnes, this equates to:

- A total of 9300 tonnes of cut soil and 9300 tonnes of fill soil for the Eastern Embankment.
- A total of 7050 tonnes of cut soil and 12750 tonnes of fill soil for all other sites.
- A project total of 16350 tonnes of cut soil and 22050 tonnes of fill soil.

2.5 Hours of Operation

The full project is expected to be completed in approximately 71 weeks with the Eastern Embankment (Site 3) taking up the first 30 weeks and the remaining sites requiring the other 41 weeks.

The hours of operation during this schedule are expected to be as follows:

- Monday to Friday: 7:00am to 6:00pm (11 hours)
- Saturday: 7:00am to 1:00pm (6 hours)
- Sunday and Public Holidays: No construction work

In total this equates to 61 hours of abatement works per week. This means that the total available time for cut and fill by site and based on the amount of soil to be cut and filled is:

- Eastern Embankment (Site 3) – 915 hours for cut and 915 hours for fill (1830 hours in total).
- All other sites – 891 hours for cut and 1610 hours for fill (2501 hours in total).

2.6 Traffic Generation

Given that all the time will not be used for truck movements, calculations for traffic generation have been done for 75% of abatement works time and 50% of abatement works time.

The number of daily trucks expected at 75% of abatement works time and 50% of abatement works time, using truck and dog combination trucks with a carrying capacity of 30 tonnes is summarised in Table 2 and Table 3 respectively.

Table 2: Daily expected truck and dog combination volumes (75% of abatement works time)

Timeline	Location	Cut trucks (daily)		Fill trucks (daily)	
		Weekday	Saturday	Weekday	Saturday
Week 1 to 31	Eastern Embankment (Site 1)	5-6	2-3	5-6	2-3
Week 31 to 71	All other sites	3-4	2-3	3-4	2-3

Table 3: Daily expected truck and dog combination volumes (50% of abatement works time)

Timeline	Location	Cut trucks (daily)		Fill trucks (daily)	
		Weekday	Saturday	Weekday	Saturday
Week 1 to 31	Eastern Embankment (Site 1)	7-8	4-5	7-8	4-5
Week 31 to 71	All other sites	5-6	3-4	5-6	3-4

Based on Table 2 and Table 3, it is not expected that there will be significant impacts to the existing conditions within the township of Captains Flat. Additionally, it is still possible to increase the number of trucks operating throughout the town with minimal impact to the existing conditions.

3 Assessment of traffic impacts

3.1 Route Choice

There are several options for route choices through Captains Flat and for the eight sites that have been provided. The most recommended route choice for each of the sites is covered in this section, but the Eastern Embankment (Site 3) was assessed with four route choices to cater for different options.

3.1.1 Recommended Routes for Eastern Embankment (Site 3)

In total there are four route options that can be proposed for heavy vehicles to move through the Eastern Embankment (Site 3):

1. Clockwise loop (recommended choice)
2. Anticlockwise loop
3. Entry and exit through Miners Road north
4. Entry and exit through Miners Road south

3.1.1.1 Clockwise Loop (recommended choice)

The clockwise loop would require vehicles to enter Captains Flat via Captains Flat Road eastbound, move through Foxlow Street southbound and turn onto Miners Road to then move northbound to the hairpin turn and follow Miners Road northbound to then exit on Captains Flat Road northbound.

There are several advantages and manageable limitations for this route choice, which is why this is a preferred route. A map of this recommended route is provided in Figure 4.

Some advantages of this route choice include:

- Unloaded trucks would be passing through the town meaning that noise and road impact would be minimised.
- Because it is a loop route, this minimises the possibility of two-way truck traffic on narrower sections of the roads.
- Because Miner Road is being used as the exit point, trucks loaded with contaminated soil are not traversing through the main town area.

Some limitations of this route choice include:

- Trucks need to turn left from Miners Road to Captains Flat Road westbound. Captains Flat Road is an 80km/hr road, and the intersection is located on a bend. There may be a need to check that there is sufficient sight distance for loaded trucks to see through the bend and for other vehicles to see trucks that may be accelerating to speed on Captains Flat Road.
- The Miners Road approach to the hairpin turn is an uphill gradient and there would need to be considerations in place on how to load the trucks and move them if they are required to stop on the incline.
- The existing Miners Road hairpin turn can be conducted at a speed of 5km/hr when turning left as per the swept path analysis in Section 0, however it may need to be trialled and tested for suitability.
- As Miners Road is a public road, considerations would need to be made on how to appropriately and safely manage public vehicles.
- There is the potential of multiple projects occurring in the area that may require the use of Miners Road that would need to be taken into consideration.

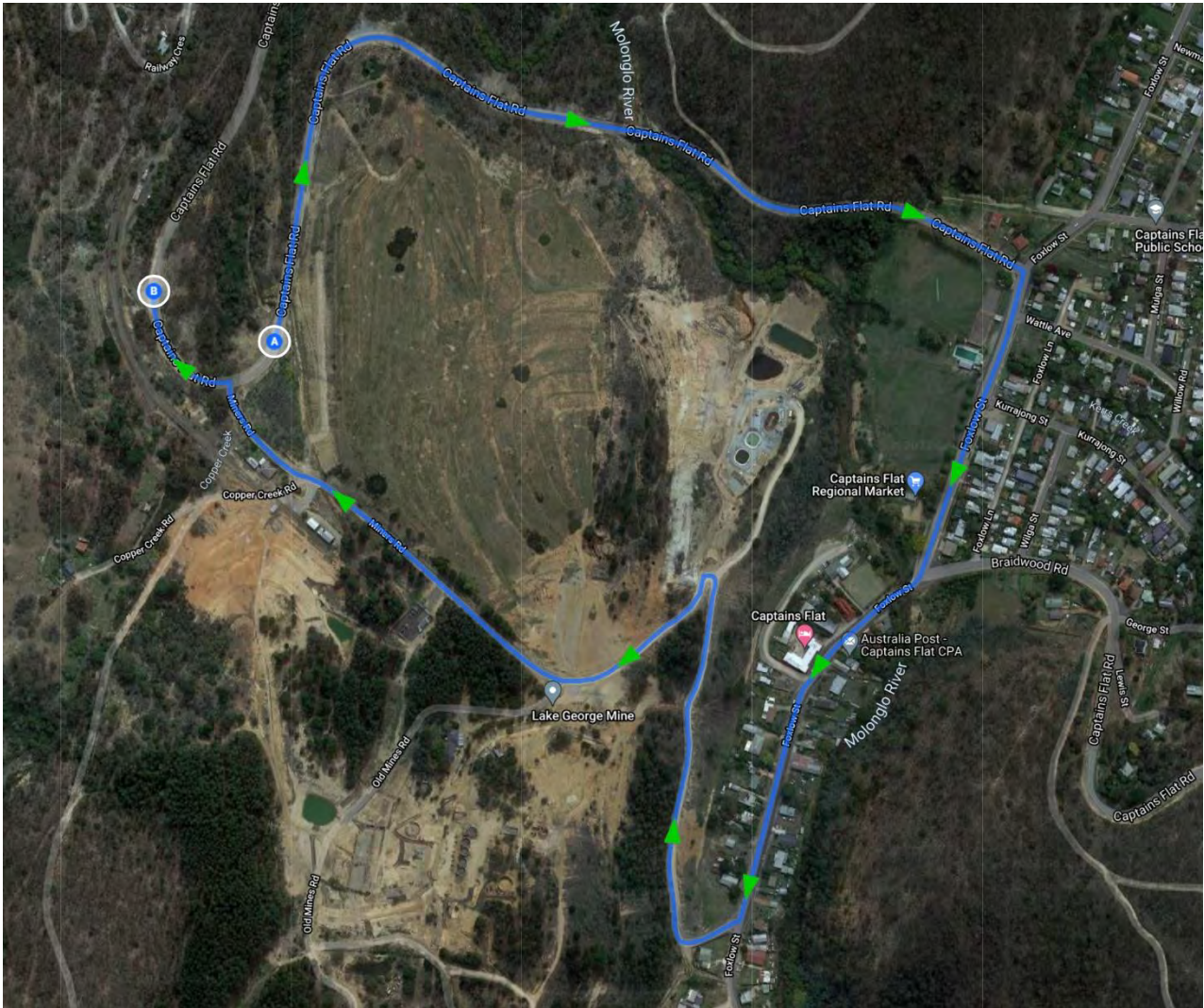


Figure 4: Recommended clockwise loop through Captains Flat

3.1.1.2 Anticlockwise Loop

The anticlockwise loop would require vehicles to enter Captains Flat via Miners Road southbound from Captains Flat Road, move towards the hairpin turn on Miners Road and head southbound before turning onto Foxlow Street northbound and turning on to Captains Flat Road westbound to exit the area.

Some advantages of this route choice include:

- As trucks will be exiting via Captains Flat Road, they have more time to accelerate and safely get to the speed limit, rather than doing so at a bend.
- Because it is a loop route, this minimises the possibility of two-way truck traffic on narrower sections of the roads.

Some limitations of this route include:

- Trucks will need to turn right from the 80km/hr Captains Flat Road to Miners Road, the intersection of which is located around a bend. Trucks would therefore be slowing down around a bend and would be required to turn across the oncoming lane. Sight distance may need to be evaluated to see if this can be safely done and to see if other vehicles can see stopped trucks that may be waiting to turn into Miners Road.
- Loaded vehicles would be following a downhill gradient when moving southbound on Miners Road.
- Loaded vehicles would be passing through the main town area carrying contaminated soil and so increased contamination and acoustic management would be needed.
- Considerations of where trucks can be stopped to be loaded will need to be made.
- The existing Miners Road hairpin turn cannot be conducted at speeds of 5km/hr as per the swept path analysis in Section 0 when turning right on the hairpin, however it may be possible with the truck turning on the spot, but this can cause more wear to the vehicles.
- As Miners Road is a public road, considerations would need to be made on how to appropriately and safely manage public vehicles.
- There is the potential of multiple projects occurring in the area that may require the use of Miners Road that would need to be taken into consideration.

3.1.1.3 Entry and exit through Miners Road north

Entry and exit through Miners Road north would require vehicles to enter and exit the Eastern Embankment (Site 3) via Miners Road north by turning right from Captains Flat Road. They would then move towards the hairpin turn on Miners Road, turn back and return along the same route to then turn left from Miners Road and exit through Captains Flat Road to exit the area.

Some advantages of this route choice include:

- Trucks would have minimal impact on the town area as they would not be near the town. This would minimise chances of cross contamination and minimise noise.
- It may be worth considering closing off Miners Road for the works, thereby creating a private road for the trucks to use which would allow for more logistical capability.
- Steep gradients are minimised for the trucks as they do not have to move up or down the gradient on Miners Road near Foxlow Street.

Some limitations of this route include:

- Trucks need to turn right in and left out from or to Miners Road. Captains Flat Road is an 80km/hr road, and the intersection is located on a bend. When entering from Captains Flat Road, sight distance for trucks that may be waiting to turn needs to be checked. When exiting

on to Captains Flat Road, sight distance for loaded trucks to see through the bend and for other vehicles to see trucks that may be accelerating to speed on Captains Flat Road also needs to be considered.

- There is the possibility of two-way traffic on Miners Road with vehicles having to pass by trucks. This will need to be appropriately managed.
- Considerations of where trucks can be stopped to be loaded and where they can turn around will need to be made in order to return back via Miners Road.
- As Miners Road is a public road, considerations would need to be made on how to appropriately and safely manage public vehicles.
- There is the potential of multiple projects occurring in the area that may require the use of Miners Road that would need to be taken into consideration.

3.1.1.4 Entry and exit through Miners Road south

Entry and exit through Miners Road south would require vehicles to enter and exit the Eastern Embankment (Site 3) via Miners Road from Foxlow Street. They would then move towards the hairpin turn on Miners Road and then turn back and return along the same route to then turn left from Miners Road, on to Foxlow Street northbound then eventually exit via Captains Flat Road by turning right and heading westbound.

Some advantages of this route choice include:

- As trucks will be exiting via Captains Flat Road, they have more time to accelerate and safely get to the speed limit, rather than doing so at a bend.
- It may be worth considering closing off Miners Road for the works, thereby creating a private road for the trucks to use which would allow for more logistical capability.

Some limitations of this route include:

- Miners Road is on an incline on the southern side and will not allow for two-way traffic. Logistical considerations will need to be made.
- Considerations of where trucks can be stopped to be loaded and where they can turn around will need to be made in order to return back via Miners Road and Foxlow Street.
- As Miners Road is a public road, considerations would need to be made on how to appropriately and safely manage public vehicles.
- There is the potential of multiple projects occurring in the area that may require the use of Miners Road that would need to be taken into consideration.
- Loaded vehicles would be following a downhill gradient when moving southbound on Miners Road.
- Loaded vehicles would be passing through the main town area carrying contaminated soil and so increased contamination and acoustic management would be needed.
- The Miners Road hairpin turn can be conducted at a speed of 5km/hr as per the swept path analysis in Section 0, however it may need to be trialled and tested for suitability.

3.1.2 Recommended Routes for Other Sites

For all other sites there are not as many options. As such the recommend routes are summarised in Table 4.

Table 4: Recommended routes for other sites and considerations

Site	Recommended Route	Considerations
Site 1: Foxlow Parklet (Lot 1 DP 251188)	Enter and exit through Captains Flat Road north using Foxlow Street to move to and from the site.	Truck and dog combination may not be too big for this area. Rigid trucks would be more appropriate and manoeuvrable.
Site 2: Crown Parcel Land Behind Preschool (Crown Road Reserve 1084055075)	Can use the clockwise loop or enter and exit via Captains Flat Road north and move through Foxlow Street to and from the site.	N/A
Site 4: Southern end of Foxlow Street (Road Reserve)	Enter and exit through Captains Flat Road north using Foxlow Street to move to and from the site.	Will likely need to use the shoulders of the road as loading areas so may need appropriate traffic management in place.
Site 5: Tennis court, basketball court and swimming pool (Part Lot 7004 DP1020764 and Part Lot 166 DP754866)	Enter and exit through Captains Flat Road north using Foxlow Street to move to and from the site.	Will likely need to use the shoulders of the road as loading areas so may need appropriate traffic management in place.
Site 6: Flood berms (Part Lot 7004 DP1020764 and waterway area)	Enter and exit through Captains Flat Road north using Foxlow Street to move to and from the site.	Will need to create and access way through Site 7 to reach Site 6. Appropriate turning paths should be provided for the trucks as well as sufficient space to turn back around. Will also need to consider the softness of the field soil for the weight of the trucks.
Site 7: Playing fields (Part Lot 7004 DP1020764)	Enter and exit through Captains Flat Road north using Foxlow Street to move to and from the site.	Appropriate turning paths should be provided for the trucks to enter site, as well as sufficient space to turn back around. Will also need to consider the softness of the field soil for the weight of the trucks.
Site 8: Captains Flat Pre-School (Lot 101 DP754870 and Lot 107 DP754870)	Can use the clockwise loop or enter and exit via Captains Flat Road north and move through Foxlow Street to and from the site.	Will likely need to use the shoulders of the road as loading areas so may need appropriate traffic management in place.

3.2 Swept Paths

Swept paths have been conducted at the following locations:

- Miners Road hairpin turn (left) at 5km/hr – Figure 5
- Miners Road hairpin turn (right) at 5km/hr – Figure 6
- T-junction of Foxlow Street and Miners Road at 10km/hr – Figure 7
- T-junction of Captains Flat Road and Foxlow Street at 15km/hr – Figure 8

Based on the swept paths, truck and dog combination vehicles can conduct all movements at the tested speed except for the Miners Road hairpin turn (right) at 5km/hr (Figure 6). This is also a downhill gradient which is not considered in the swept path. It may be possible to conduct this turn if a turn on spot manoeuvre is conducted or if local modifications are made to the road in this location to accommodate the movement.



Figure 5: Swept path analysis - Miners Road hairpin turn (left) at 5km/hr (truck and dog combination)



Figure 6: Swept path analysis - Miners Road hairpin turn (right) at 5km/hr (truck and dog combination)



Figure 7: Swept path analysis - Foxlow Street to Miners Road (right turn) at 10km/hr (truck and dog combination)



Figure 8: Swept path analysis - Foxlow Street at Captains Flat Road (right and left turns) at 15km/hr (truck and dog combination)

3.3 Recommendations

- The size of some key roads, such as Miners Road and sections of Foxlow Street, may limit the flow of two-way traffic. Appropriate operational traffic management plans will need to be put in place.
- There may be a need for a Traffic Management Plan if there are any required road closures, especially if along the main section of Foxlow Street between Captains Flat Road and Braidwood Road. Local residents would need to be informed of any changes and alternative routes (such as internal routes through Foxlow Avenue) may need to be assessed.
- The clockwise loop route (Section 3.1.1.1) is recommended for the Eastern Embankment (Site 3) but testing of the hairpin turn and loading locations will need to be tested and identified.
- At the Foxlow Parklet site (Site 1), it may not be feasible to send truck and dog combination vehicles as it is a smaller site, and the road width of Foxlow Street is reduced in the area. A rigid truck may be a better choice for this site as they will be more manoeuvrable and will allow for a three point turn back on to Foxlow Street.

**APPENDIX 5
NOISE AND VIBRATION ASSESSMENT REPORT**



RAPT
CONSULTING

Construction Noise and Vibration Assessment – Captains Flat Abatement Works

Prepared for
Ramboll

February 2022

Relationships Attention Professional Trust

Document Details

Construction Noise and Vibration Assessment – Captains Flat Abatement Works

Prepared For:

Ramboll

50 Glebe Road

The Junction, NSW 2291

Prepared By:

RAPT Consulting

18&19 / 10 Kenrick Street

The Junction, NSW 2291

ABN: 30330220290

www.raptconsulting.com.au

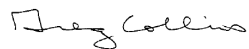
Document ID	Rev No.	Date	Author
2220244_210328	0	22 February 2022	Gregory Collins-MAAS 

Table of Contents

1. INTRODUCTION	6
1.1 Background	6
1.2 Assessment Objectives	10
1.3 Scope	10
1.4 Relevant Guidelines	10
1.5 Limitations	11
2. EXISTING ENVIRONMENT	12
3. NOISE AND VIBRATION OBJECTIVES	19
3.1 Construction Noise	19
3.2 Road Noise	20
3.3 Vibration Guidelines	21
3.3.1 Human Exposure	21
3.3.2 Building Damage	23
4. ASSESSMENT OF POTENTIAL IMPACTS	26
4.1 Construction Noise	26
4.2 Construction Vibration	38
4.3 Construction Noise and Vibration Management Plan	41
4.3.1 Planning and design of construction works	41
5. CONCLUSION	43
GLOSSARY OF ACOUSTIC TERMS	44

Table Index

Table 2-1 Noise Monitoring Results	18
Table 3-1 ICNG Recommended Construction Hours	19
Table 3-2 ICNG Noise Guidelines at Receivers	19
Table 3-3 ICNG Noise Trigger Levels Leq(15min) dB(A)	20
Table 3-4 Road Noise Goals	20
Table 3-5 Daily expected truck and dog combination volumes (75% of abatement works time)	21
Table 3-6 Daily expected truck and dog combination volumes (50% of abatement works time)	21
Table 3-7 Preferred and Maximum Levels for Human Comfort	23
Table 3-8 Acceptable Vibration Dose Values for Intermittent Vibration (m/s ^{1.75})	23
Table 3-9 DIN 4150-3 Guideline values for vibration velocity to be used when evaluating the effects of short-term vibration on structures	24
Table 3-10 BS7385.2 Transient Vibration Guideline Values for Potential building - Cosmetic Damage	24
Table 4-1 Proposed Abatement Strategies	26
Table 4-2 Typical Construction Item Sound Power Levels	29
Table 4-3 Recommended Minimum Safe Working Distances for Vibration Intensive Plant from Sensitive Receiver	39

Figure Index

Figure 1-1 Abatement Works Area B (Source: Ramboll)	7
Figure 1-2 Abatement Works Area C (Source: Ramboll)	8
Figure 1-3 Abatement Works Area D (Source: Ramboll)	9
Figure 2-1 Abatement Works Area 1 Foxlow Parklet	13
Figure 2-2 Abatement Works Areas 5 - 7	14
Figure 2-3 Abatement Works Area 4	15
Figure 2-4 Abatement Works Areas 2 & 8	16
Figure 2-5 Abatement Works Area 3	17
Figure 4-1 Example of Differing Work Areas	30
Figure 4-2 Cumulative Abatement Works dB(A) Leq(15min)	31
Figure 4-3 Abatement Works Location 1 dB(A) Leq(15min)	32
Figure 4-4 Abatement Works Location 2 & 8 dB(A) Leq(15min)	33
Figure 4-5 Abatement Works Location 3 dB(A) Leq(15min)	34
Figure 4-6 Abatement Works Location 4 Leq(15min)	35
Figure 4-7 Abatement Works Location 5 dB(A) Leq(15min)	36
Figure 4-8 Abatement Works Location 6 dB(A) Leq(15min)	37

1. Introduction

1.1 Background

RAPT Consulting has been engaged to undertake a construction noise and vibration impact assessment (CNVIA) for Ramboll to inform a Review of Environmental Factors (REF) for the planned abatement works at Captains Flat, NSW.

Based on information provided, it is understood the abatement of contamination from the Lake George Mine are planned at 7 locations within the community of Captains Flat.

The project site and surrounding area is provided in Figure 1.1 – 1-3.



Figure 1-1 Abatement Works Area B (Source: Ramboll)



Figure 1-3 Abatement Works Area D (Source: Ramboll)

1.2 Assessment Objectives

This CNVIA assesses the potential impacts from the construction of the Captains Flat Abatement Works. The purpose of this CNVIA is to assess potential noise and vibration from its construction and to recommend mitigation measures where required.

The outcomes of this assessment include recommendations for potential noise and vibration mitigation and management measures designed to achieve an acceptable noise amenity for residential (dwelling) occupants and other potentially sensitive receivers surrounding the study area.

1.3 Scope

The CNVIA scope of work included

- Initial desk top review to identify key environmental noise catchment areas and noise sensitive receptors from aerial photography
- Undertake a series of attended noise measurements along the proposed abatement works areas in the vicinity of potentially sensitive receivers
- Establish project noise and vibration goals for the construction of the project
- Identify the likely principal noise sources during construction and their potential impacts on noise receptors
- assessment of potential noise, vibration impacts associated with construction, of the project
- provide recommendations for feasible and reasonable noise and vibration mitigation and management measures, where noise or vibration objectives may be exceeded

1.4 Relevant Guidelines

The relevant policies and guidelines for noise and vibration assessments in NSW that have been considered during the preparation of this CNVIA include:

- Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change, 2009
- Assessing Vibration: A Technical Guideline, Department of Environment and Conservation (DEC), 2006
- British Standard BS7385.2 - 1993 *Evaluation and Measurement for Vibration in Buildings*, Part 2 - Guide to damage levels from ground borne vibration 1993
- DIN 4150: Part 3-1999 Structural vibration – Effects of vibration on structures 1999
- NSW Road Noise Policy (RNP), Department of Environment, Climate Change and Water (DECCW), 2011
- Noise Policy for Industry (NPfI), Environment Protection Authority (EPA), 2017.

1.5 Limitations

The purpose of this report is to provide an independent noise and vibration assessment for the project.

It is not the intention of the assessment to cover every element of the acoustic environment, but rather to conduct the assessment with consideration to the prescribed work scope.

The findings of the noise assessment represent the findings apparent at the date and time of the assessment undertaken. It is the nature of environmental assessments that all variations in environmental conditions cannot be assessed and all uncertainty concerning the conditions of the ambient environment cannot be eliminated. Professional judgement must be exercised in the investigation and interpretation of observations.

In conducting this assessment and preparing the report, current guidelines for noise were referred to. This work has been conducted in good faith with RAPT Consulting's understanding of the client's brief and the generally accepted consulting practice.

No other warranty, expressed or implied, is made as to the information and professional advice included in this report. It is not intended for other parties or other uses.

2. Existing Environment

To establish background noise levels, attended measurements to collect background and ambient noise levels were conducted in the vicinity of the abatement works areas on 15 February 2022 to quantify the acoustic environment. The locations selected were considered indicative of the local ambient noise environment.

Measurements were conducted using a RION NL-42 Sound Level Meter with Type 2 Precision. 15-minute measurements were undertaken for the Daytime time Periods as it is understood the construction will be undertaken during standard construction hours. The attended noise surveys were conducted with consideration to the procedures described in Australian Standard AS 1055:2018, “Acoustics – Description and Measurement of Environmental Noise” and the NSW Noise Policy for Industry (NPfI). Calibration was checked before and after each measurement and no significant drift occurred. The acoustic instrumentation used carries current NATA calibration and complies with AS/NZS IEC 61672.1-2019-Electroacoustics – Sound level meters – Specifications.

During site visits it was noted that existing road traffic, distant road traffic, and natural wildlife primarily described the ambient noise environment and is indicative of a sub-urban noise environment. The attended measurements were undertaken during calm conditions.

The following figures show the attended monitoring locations.



Figure 2-1 Abatement Works Area 1 Foxlow Parklet



Figure 2-2 Abatement Works Areas 5 - 7



Figure 2-3 Abatement Works Area 4



Figure 2-4 Abatement Works Areas 2 & 8



Figure 2-5 Abatement Works Area 3

The LA90 descriptor is used to measure the background noise level. This descriptor represents the noise level that is exceeded for 90 per cent of the time over a relevant period of measurement. The LA90 descriptor is used to establish the Rating Background Noise Level (RBL). The RBL has been calculated, according to the procedures described in the EPA's NPfl and by following the procedures and guidelines detailed in Australian Standard AS1055-1997, "Acoustics - Description and Measurement of Environmental Noise, Part 1 General Procedures." The LAeq is the equivalent continuous noise level which would have the same total acoustic energy over the measurement period as the varying noise actually measured, so it is in effect an energy average.

Logged data was reviewed and filtered to exclude any extraneous data results during the monitoring period. The Rating Background Levels (RBL) and ambient levels (LAeq) are provided in Table 2.1.

Table 2-1 Noise Monitoring Results

Abatement Location	Noise Period	Noise Level dB(A)		Noise Sources
		L _{Aeq}	L _{A90}	
1	15/02/2022 12:30pm – 12:45pm	40	36	road traffic, wildlife noise
8 & 2	15/02/2022 1:00pm – 1:15pm	47	39	road traffic, wildlife noise
4	15/02/2022 1:30pm – 1:45pm	44	39	road traffic, wildlife noise
3	15/02/2022 2:00pm – 2:15pm	47	39	road traffic, wildlife noise
5, 6, 7	15/02/2022 2:30pm – 2:45pm	48	39	road traffic, wildlife noise

3. Noise and Vibration Objectives

3.1 Construction Noise

Construction noise is assessed with consideration to DECCW *Interim Construction Noise Guidelines* (ICNG) (July 2009). The ICNG is a non-mandatory guideline that is usually referred to by local councils and other NSW government entities when construction / demolition works require development approval. The ICNG recommend standard hours for construction activity as detailed in Table 3-1.

Table 3-1 ICNG Recommended Construction Hours

Work type	Recommended standard hours of work
Normal construction	Monday to Friday: 7 am to 6 pm. Saturday: 8 am to 1 pm. No work on Sundays or Public Holidays.
Blasting	Monday to Friday: 9 am to 5 pm. Saturday: 9 am to 1 pm. No work on Sundays or Public Holidays.

The ICNG provides noise management levels for construction noise at residential and other potentially sensitive receivers. These management levels are to be calculated based on the adopted rating background level (RBL) at nearby locations, as shown in Table 3.3.

Table 3-2 ICNG Noise Guidelines at Receivers

Period	Management Level $L_{Aeq(15\ min)}$
Residential Recommended standard hours	Noise affected level: RBL + 10 Highly noise affected level: 75 dB(A)
Residential Outside recommended standard hours	Noise affected level: RBL + 5
Classrooms at schools and other educational institutions	Internal Noise Level 45 dB(A) (applies when properties are being used)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	65 dB(A)
Offices, retail outlets (external)	70 dB(A)
industrial premises (external)	75 dB(A)

The above levels apply at the boundary of the most affected residences / offices or within 30 m from the residence where the property boundary is more than 30 m from the residence.

The *noise affected level* represents the point above which there may be some community reaction to noise. Where the *noise affected level* is exceeded all feasible and reasonable work practices to minimise noise should be applied and all potentially impacted residents should be informed of the nature of the works, expected noise levels, duration of works and a method of contact. The *noise affected level* is the background noise level plus 10 dB(A) during recommended standard hours and the background noise level plus 5 dB(A) outside of recommended standard hours.

The *highly noise affected level* represents the point above which there may be strong community reaction to noise and is set at 75 dB(A). Where noise is above this level, the relevant authority may require respite periods by restricting the hours when the subject noisy activities can occur, considering:

- Times identified by the community when they are less sensitive to noise (such as mid-morning or mid-afternoon for works near residences).
- If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

It is understood construction is planned for standard hours. Based on the above and the RBL's determined from site monitoring, construction noise management levels have been derived, as shown in Table 3.3.

Table 3-3 ICNG Noise Trigger Levels Leq(15min) dB(A)

Residential Abatement Works Areas	Within Recommended Standard Hours
1	46
2 - 8	49

3.2 Road Noise

The NSW Road Noise Policy (RNP) recommends various criteria for different road developments and uses. Based on the definitions in the RNP, Foxlow Street is considered a local road. Table 3 of the RNP provides guidance for establishing road traffic noise assessment criteria for residential land uses.

Road noise goals based on Table 3 of the NSW Road Noise Policy are provided in Table 3.4 below.

Table 3-4 Road Noise Goals

Situation	Day 7 am to 10 pm	Night 10 pm to 7 am
Land use development with potential to create additional traffic on Local Roads (external)	55 LAeq(1 hour)	50 LAeq (1 hour)

The number of daily trucks expected at 75% of abatement works time and 50% of abatement works time, using truck and dog combination trucks with a carrying capacity of 30 tonnes is summarised in Table 3-5 and Table 3-6 respectively.

Table 3-5 Daily expected truck and dog combination volumes (75% of abatement works time)

Timeline	Location	Cut Trucks Daily		Fill Trucks Daily	
		Weekday	Saturday	Weekday	Saturday
Week 1-31	Eastern Embankment (Site 1)	5-6	2-3	5-6	2-3
Week 31-71	All Other Sites	3-4	2-3	3-4	2-3

Table 3-6 Daily expected truck and dog combination volumes (50% of abatement works time)

Timeline	Location	Cut Trucks Daily		Fill Trucks Daily	
		Weekday	Saturday	Weekday	Saturday
Week 1-31	Eastern Embankment (Site 1)	7-8	4-5	7-8	4-5
Week 31-71	All Other Sites	5-6	3-4	5-6	3-4

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by construction activities and or land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'. Site construction traffic will have blended in with local traffic by the time it goes past the nearest sensitive receivers. To increase noise levels by 2dB(A) one would have to increase the cumulative traffic volume by 60%. The amount of additional construction traffic on the road network is negligible and will not increase overall traffic noise levels on the surrounding road network. Therefore, compliance is expected and not considered further in this report.

3.3 Vibration Guidelines

3.3.1 Human Exposure

Vibration goals were sourced from the DECCW's *Assessing Vibration: a technical guideline*, which is based on guidelines contained in British Standard (BS) 6472-1992, *Evaluation of human exposure to vibration in buildings (1-80 Hz)*.

Vibration, at levels high enough, has the potential to cause damage to structures and disrupt human comfort. Vibration and its associated effects are usually classified as continuous, impulsive or intermittent as follows:

- continuous vibration continues uninterrupted for a defined period and includes sources such as machinery and continuous construction activities
- impulsive vibration is a rapid build up to a peak followed by a damped decay. It may consist of several cycles at around the same amplitude, with durations of typically less than two seconds and no more than three occurrences in an assessment period. This may include occasional dropping of heavy equipment or loading activities
- intermittent vibration occurs where there are interrupted periods of continuous vibration, repeated periods of impulsive vibration or continuous vibration that varies significantly in magnitude. This may include intermittent construction activity, impact pile driving, jack hammers.

The preferred and maximum values for continuous and impulsive vibration are defined in Table 2.2 of the guideline and are reproduced in Table 3.7 for the applicable receivers.

Table 3-7 Preferred and Maximum Levels for Human Comfort

Location	Assessment Period ¹	Preferred Values		Maximum Values	
		z axis	x and y axis	z axis	x and y axis
Continuous vibration (weighted RMS acceleration, m/s ² , 1-80Hz)					
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Impulsive vibration (weighted RMS acceleration, m/s ² , 1-80Hz)					
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14

Note 1 Daytime is 7:00am to 10:00pm and Night-time is 10:00pm to 7:00am

The acceptable vibration dose values (VDV) for intermittent vibration are defined in Table 2.4 of the guideline and are reproduced in Table 3-8 for the applicable receiver type.

Table 3-8 Acceptable Vibration Dose Values for Intermittent Vibration (m/s^{1.75})

Location	Daytime ²		Night time ²	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas ³	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Note 2 Daytime is 7:00 to 22:00 and night-time is 22:00 to 7:00: and

Note 3 Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be needed to assess intermittent values against the continuous or impulsive criteria for critical areas.

3.3.2 Building Damage

Currently, there is no Australian Standard that sets the criteria for the assessment of building damage caused by vibration. Guidance of limiting vibration values is attained from reference to the following International Standards and Guidelines:

- British Standard BS7385.2 - 1993 *Evaluation and Measurement for Vibration in Buildings*, Part 2 - Guide to damage levels from ground borne vibration
- German Standard DIN 4150-3: 1999-02 Structural Vibration – Part 3: *Effects of vibration on structures*.

The recommended Peak Particle Velocity (PPV) guidelines for the possibility of vibration induced building damage are derived from the minimum vibration levels above which any damage may occur are presented in Table 3.9 for DIN 4150-3: 1999-02 and Table 3.10 for BS7385.2 – 1993.

Table 3-9 DIN 4150-3 Guideline values for vibration velocity to be used when evaluating the effects of short-term vibration on structures

Type of Structure	Peak Component Particle Velocity, mm/s			
	Vibration at the foundation at a frequency of			Vibration of horizontal plane of highest floor at all frequencies
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz*	
Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20	20-40	40-50	40
Dwellings and buildings of similar design and/or occupancy	5	5-15	15-20	15
Structures that, because of their sensitivity to vibration, do not correspond to those listed in lines 1 and 2 of table 5-7 and are of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

Note 4 At frequencies above 100Hz, the values given in this column may be used as minimum values

Table 3-10 BS7385.2 Transient Vibration Guideline Values for Potential building - Cosmetic Damage

Building Type ⁶	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz ⁵	15 Hz and above ⁵
Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
Unreinforced or light framed structures. Residential or light commercial type buildings.	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Note 5 Values referred to are at the base of the building; and

Note 6 For transient vibration effecting unreinforced or light framed structures at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.

Unlike noise which travels through air, the transmission of vibration is highly dependent on substratum conditions between the source/s and receiver. Also dissimilar to noise travelling through air, vibration levels diminish quickly over distance, thus an adverse impact from vibration on the broader community is not typically expected. Vibration during works is considered an intermittent source associated with two main types of impact: disturbance at

receivers and potential architectural/structural damage to buildings. Generally, if disturbance issues are controlled, there is limited potential for structural damage to buildings.

4. Assessment of Potential Impacts

4.1 Construction Noise

Construction can occur in the vicinity of residences or other sensitive land uses and be variable in times of occurrence. These aspects of construction can exacerbate noise levels and their effects. Construction noise by its nature is temporary, may not be amenable to purpose-built noise control measures applied to industrial processes, and may move as construction progresses. With these constraints in mind, The ICNG was developed to focus on applying a range of work practices most suited to minimise construction noise impacts, rather than focusing only on achieving numeric noise levels. While some noise from construction sites is inevitable, the aim of the Guideline is to protect much of residences and other sensitive land uses from noise pollution most of the time.

Abatement Works Details

Table 4-1 provides the details of abatement works for the various different work areas.

Table 4-1 Proposed Abatement Strategies

Plan Reference	Location	Lot references	Current site use	Proposed Abatement strategy
1	Foxlow Parklet at 12 Spring Street Captains Flat	Lot 1 DP251188.	Public open space and recreational use.	<p>Excavation of the upper 0.5-1.0 m of contaminated soil</p> <p>A water truck used to mitigate dust migration offsite during removal.</p> <p>Removal offsite to the landfill using covered trucks to minimise dust migration.</p> <p>Placement of a clean backfill layer to the original surface level.</p> <p>Revegetation of the final capped surface to minimise soil erosion.</p>
2	Crown land parcel adjacent to preschool at 27 Foxlow Street Captains Flat	Crown reserve 1084055075	Public open space and recreational use.	<p>No Excavation</p> <p>Placement of a geofabric marker layer on the top of the contaminated soil surface to act as a visual and physical barrier.</p> <p>Placement of a clean capping layer with a minimum of 0.3 m thickness over the extent of the site.</p> <p>Revegetation of the final capped surface to minimise soil erosion and damage to the capping layer.</p>

Plan Reference	Location	Lot references	Current site use	Proposed Abatement strategy
4	Southern end of Foxlow street (Council footpaths either side) for approximately 600 metres	Road reserve	Public open space / road reserve and kerb and gutter	<p>Excavation of the top 0.3 m of soil within the footpath of Foxlow Street where there is no hardstand existing.</p> <p>Placement of a geofabric marker layer on the top of the contaminated soil surface to act as a visual and physical barrier.</p> <p>Placement of a clean capping layer with a minimum of 0.3 m thickness over the extent of the site.</p> <p>Revegetation of the final capped surface to minimise soil erosion and damage to the capping layer.</p>
6	Flood berms and playing fields	Part Lot 7004 DP1020764 and waterway area	Public open space and recreational use.	<p>Re-contouring the currently eroded flood berms.</p> <p>Placement of a geofabric marker layer on the top of the contaminated soil surface to act as a visual and physical barrier.</p> <p>Placement of a clean capping layer with a minimum of 0.5 m thickness over the extent of the flood berms.</p> <p>Revegetation of the final capped surface to minimise soil erosion and damage to the capping layer.</p>
5	Tennis and Basketball Courts at 67-73 Foxlow Street	Part Lot 166 DP 754866 and part Lot 7004 DP 1020764	Public open space and recreational use.	<p>Placement of a geofabric marker layer on the top of the contaminated soil surface to act as a visual and physical barrier.</p> <p>Placement of a clean capping layer with a minimum of 0.3 m thickness over the extent of the site.</p> <p>Revegetation of the final capped surface to minimise soil erosion and damage to the capping layer.</p>
8	Existing Preschool at 27 Foxlow Street Captains Flat	Lots 101 and 107 DP 754870	Former Preschool, currently vacant and public open space.	<p>Excavation of the top 0.3 m of soil in open areas around the Preschool.</p> <p>Removal of the contaminated soils offsite for landfill disposal.</p>

Plan Reference	Location	Lot references	Current site use	Proposed Abatement strategy
				<p>Placement of a geofabric marker layer on the top of the contaminated soil surface to act as a visual and physical barrier.</p> <p>Placement of a clean capping layer with a minimum of 0.3 m thickness over the extent of the site.</p> <p>Revegetation of the final capped surface to minimise soil erosion and damage to the capping layer.</p>
3	Eastern Embankment (crown land behind dwellings, community hall and preschool)	Part Lot 7317 DP1141049	Public open space and recreational use.	<p>Excavation of the upper 0.3m of soil</p> <p>Placement of a geofabric marker layer on the top of the contaminated soil surface to act as a visual and physical barrier.</p> <p>Placement of a clean capping layer with a minimum of 0.3 m thickness over the extent of the site.</p> <p>Revegetation of the final capped surface to minimise soil erosion and damage to the capping layer.</p>

Noise Generating Equipment

It is understood any construction activities would be undertaken during standard hours. Plant and equipment needed for the proposal would be determined during the construction planning phase. Likely equipment including typical sound levels are summarised in Table 4.1. Noise level data has been obtained from AS2436, the RMS Construction Noise Estimator and RAPT Consulting internal database. Other equipment may be used however it is anticipated that they would produce similar noise emissions.

Table 4-2 Typical Construction Item Sound Power Levels

Plant and Equipment	Estimated % of use in 15 minutes ¹	Typical Sound Power Level dB(A)
Construction Operations		
Excavator	50	110
Front End Loader	50	112
Light Vehicles	50	103
Smooth Drum Roller	50	107
Backhoe	50	111
Compactor	50	106
Dump Truck	50	110
Water Truck	50	103

Note 7 The sound power levels for the individual plant items are worst-case levels representative of the equipment operating at maximum capacity. In practice, not all plant items would operate at maximum capacity at the same time and therefore the estimated usage has been adjusted to reflect this. This adjustment is consistent with RAPT Consulting experience on similar projects.

Construction Operations

Acoustic modelling was undertaken using Bruel and Kjaer's "Predictor" to predict the effects of construction noise. Predictor is a computer program for the calculation, assessment and prognosis of noise propagation. Predictor calculates environmental noise propagation according to ISO 9613-2, "Acoustics – Attenuation of sound during propagation outdoors". Terrain topography, ground absorption, atmospheric absorption and relevant shielding objects are taken into account in the calculations.

Construction noise levels have been predicted based on the potential construction noise levels provided in Table 4.2. These noise levels represent different equipment noise levels and give an idea how noise levels may change across the proposal area with different activities being undertaken.

The magnitude of off-site noise impact associated with construction would be dependent upon several factors:

- The intensity of construction activities
- The location of construction activities
- The type of equipment used
- Intervening terrain, and
- The prevailing weather conditions.

In addition, construction machinery would likely move about the study area, variously altering the directivity of the noise source with respect to individual receivers and their distances.

Noise levels at sensitive receivers can be significantly lower than the worst-case scenario when the construction works move to a more distant location in the work area. An example of this is shown in Figure 4.1.

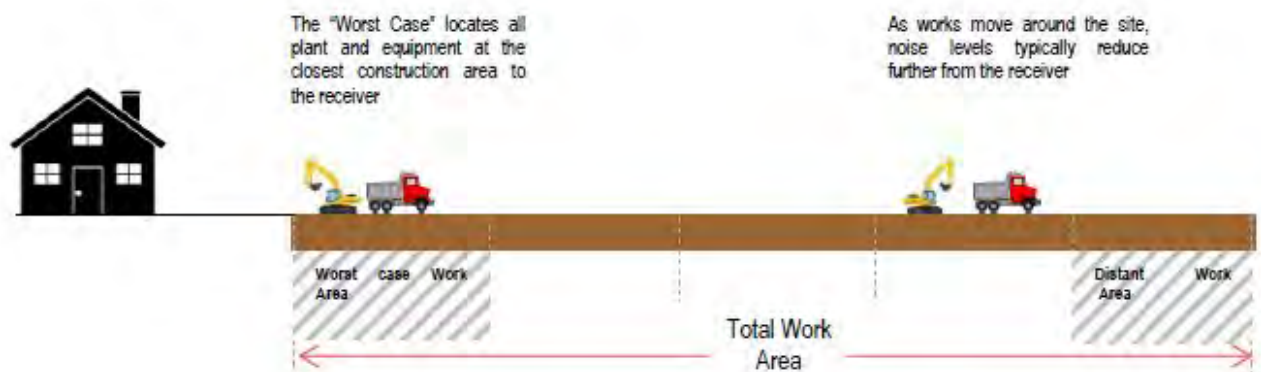


Figure 4-1 Example of Differing Work Areas

During any given period, the machinery items to be used in the study area would operate at maximum sound power levels for only brief stages. At other times, the machinery may produce lower sound levels while carrying out activities not requiring full power. It is highly unlikely that all construction equipment would be operating at their maximum sound power levels at any one time. Finally, certain types of construction machinery would be present in the study area for only brief periods during construction. Therefore, the modelled construction noise results are considered to represent a worst-case scenario. Seven scenarios were assessed:

- Cumulative abatement works occurring at all locations
- Abatement area 1
- Abatement area 2 & 8
- Abatement area 3
- Abatement area 4
- Abatement area 5
- Abatement area 6.

These scenarios also demonstrate how received noise levels can change due to location of construction activity.

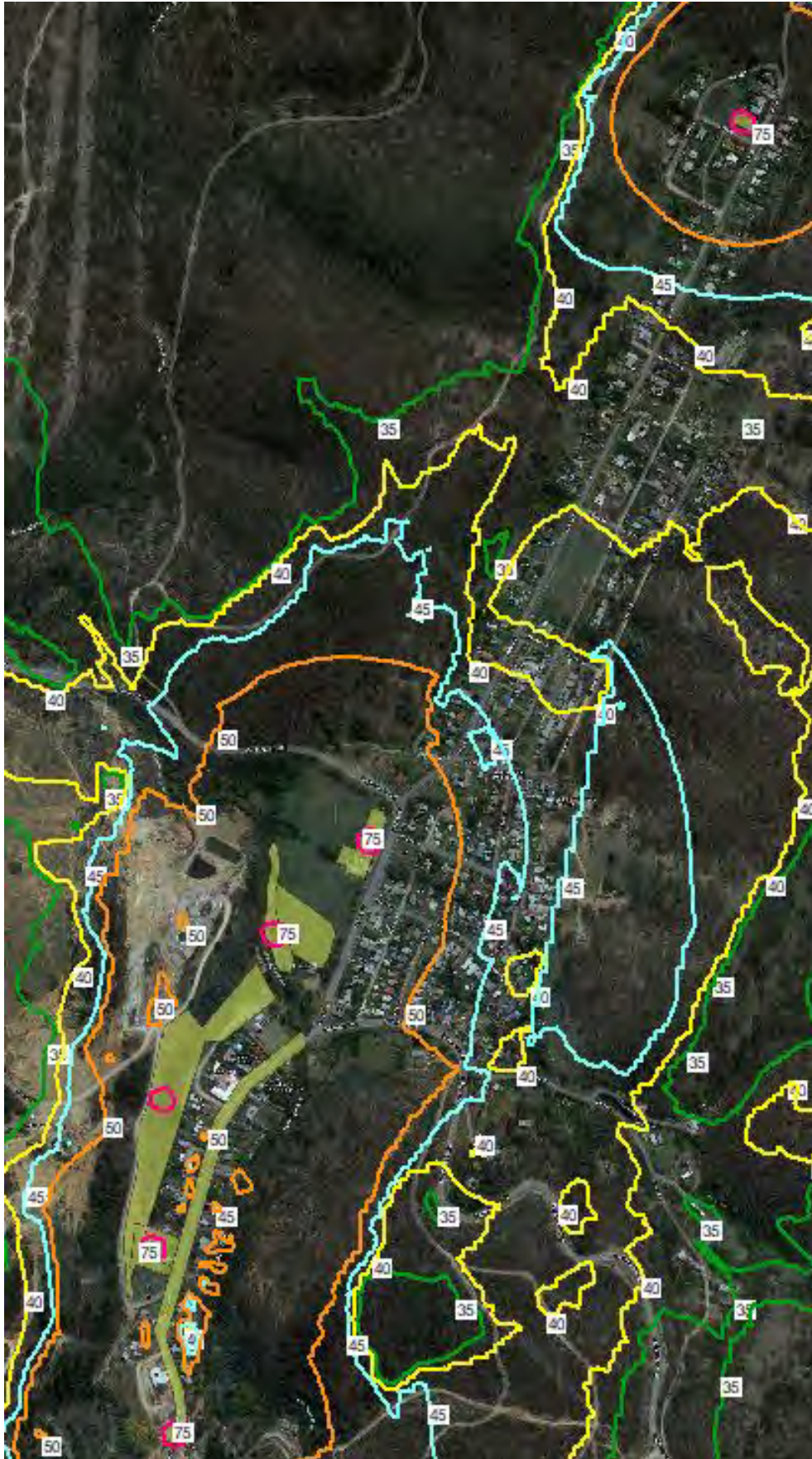


Figure 4-2 Cumulative Abatement Works dB(A) Leq(15min)

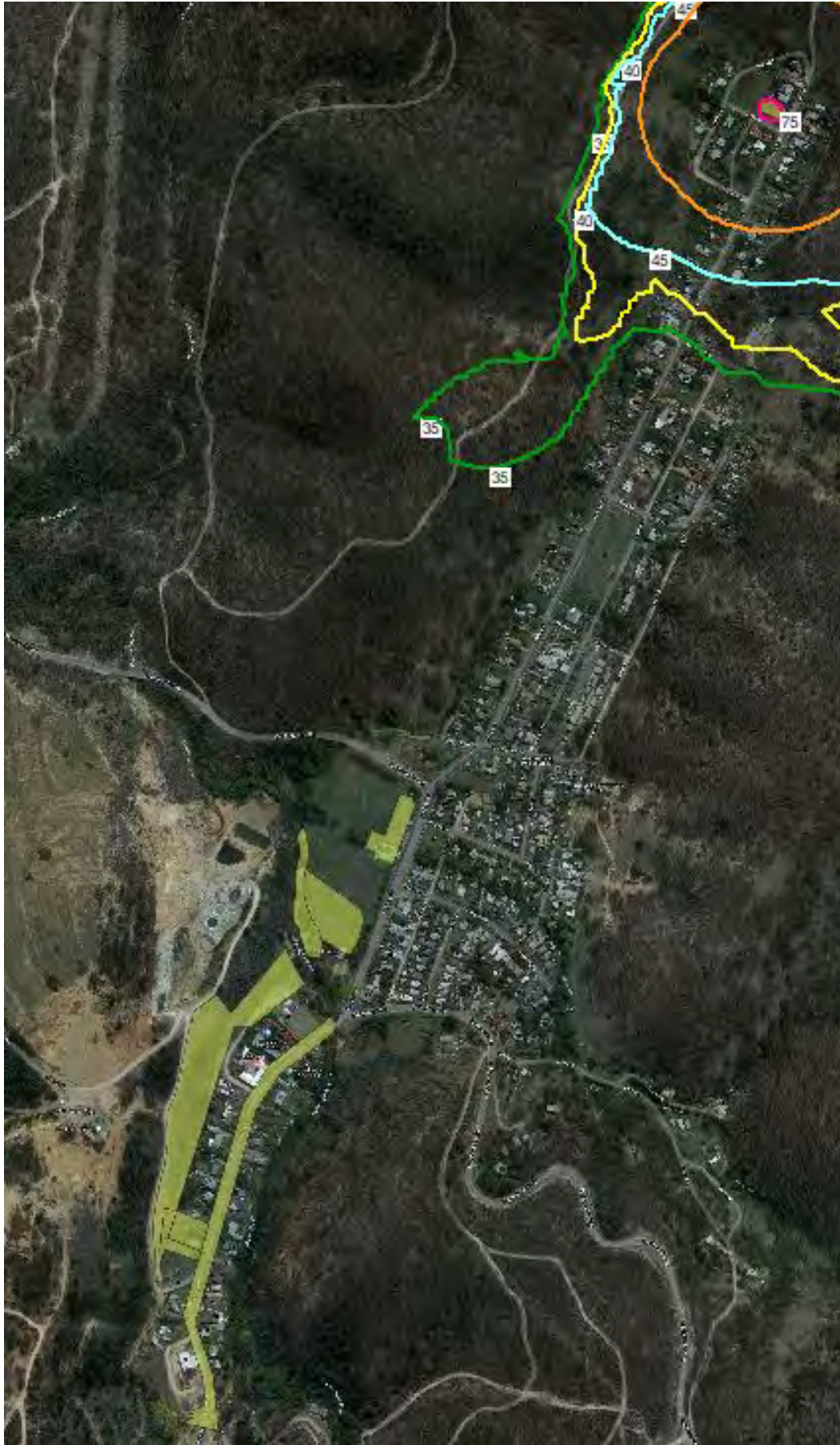


Figure 4-3 Abatement Works Location 1 dB(A) Leq(15min)

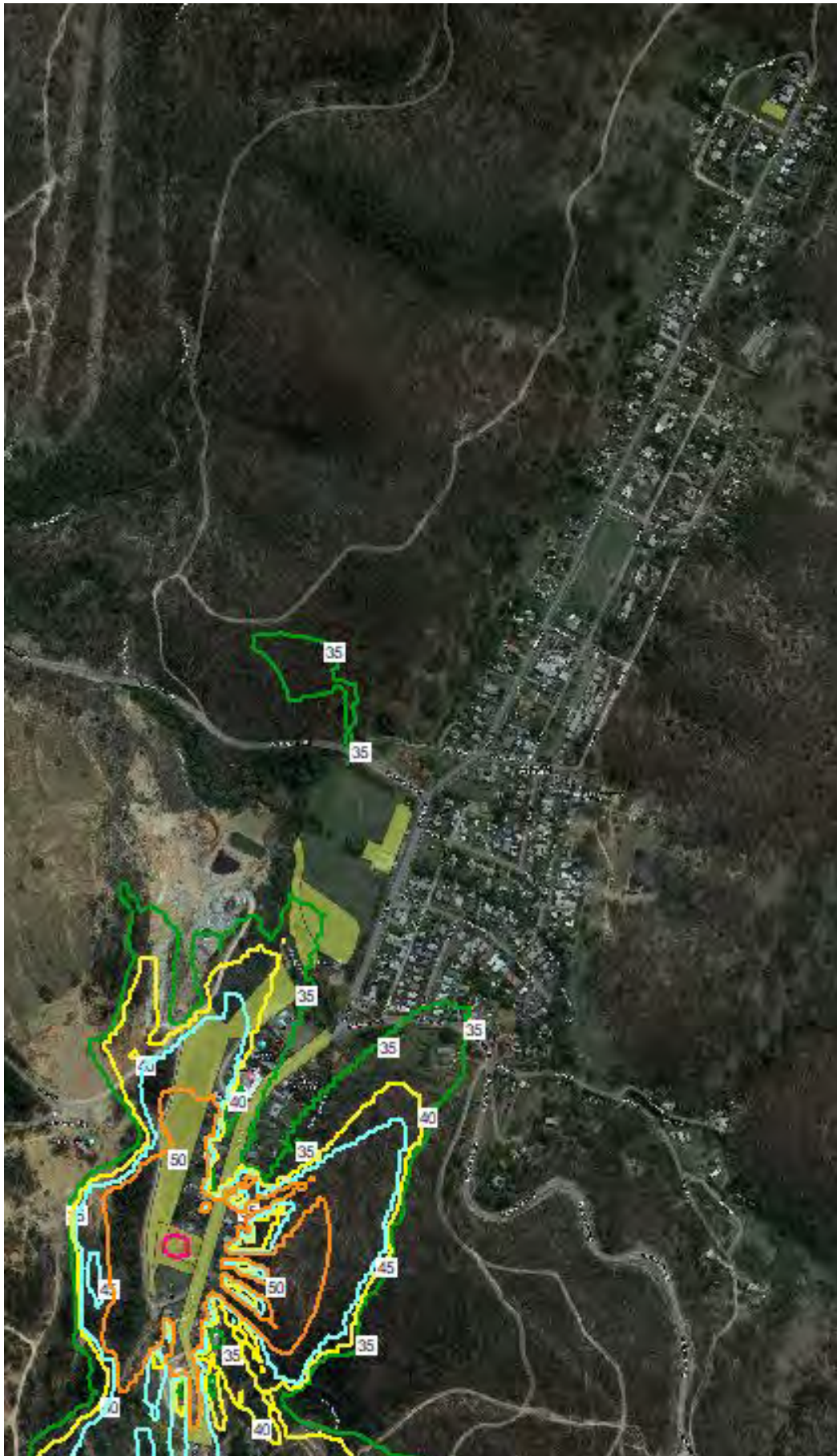


Figure 4-4 Abatement Works Location 2 & 8 dB(A) Leq(15min)

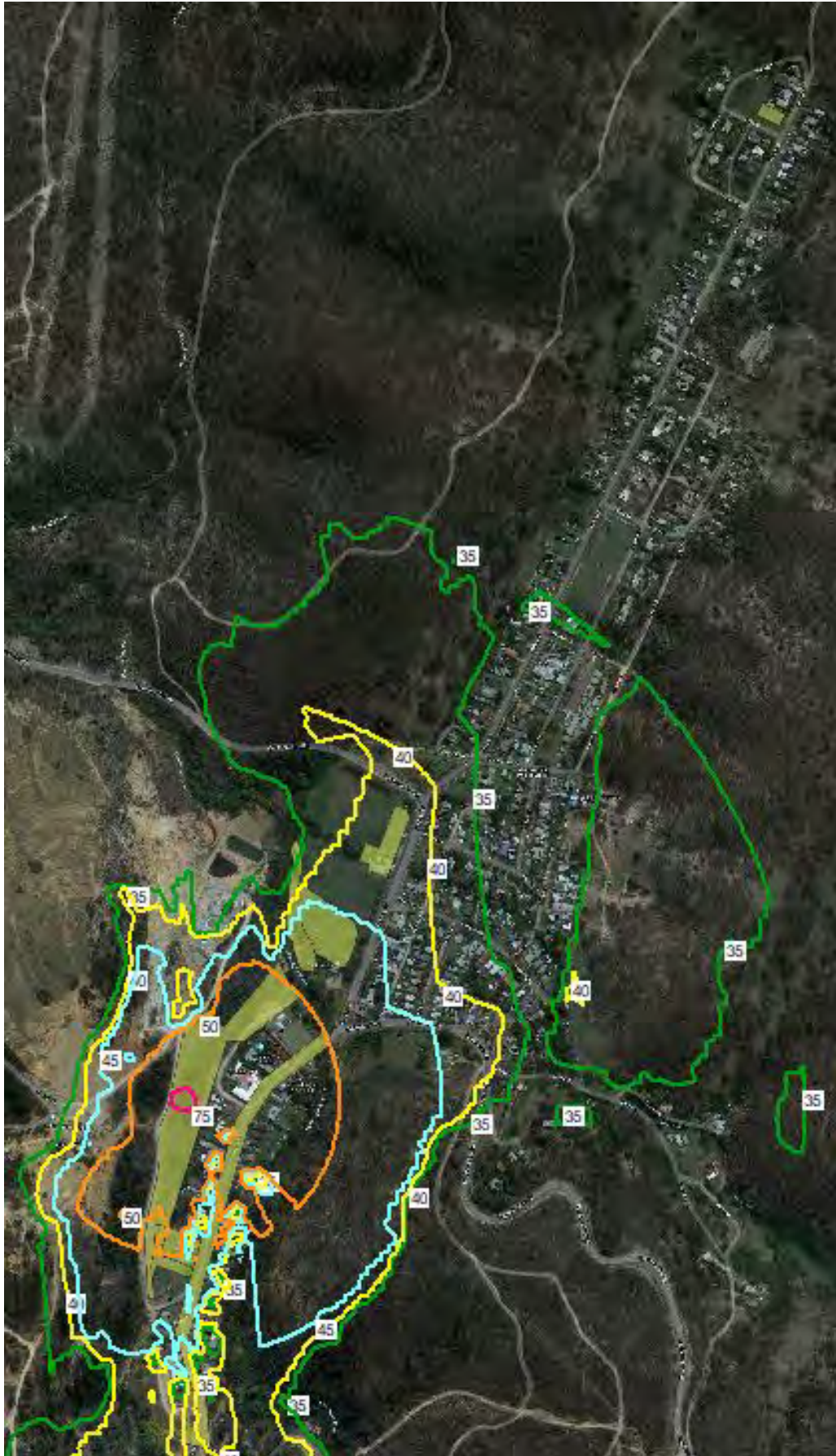


Figure 4-5 Abatement Works Location 3 dB(A) Leq(15min)

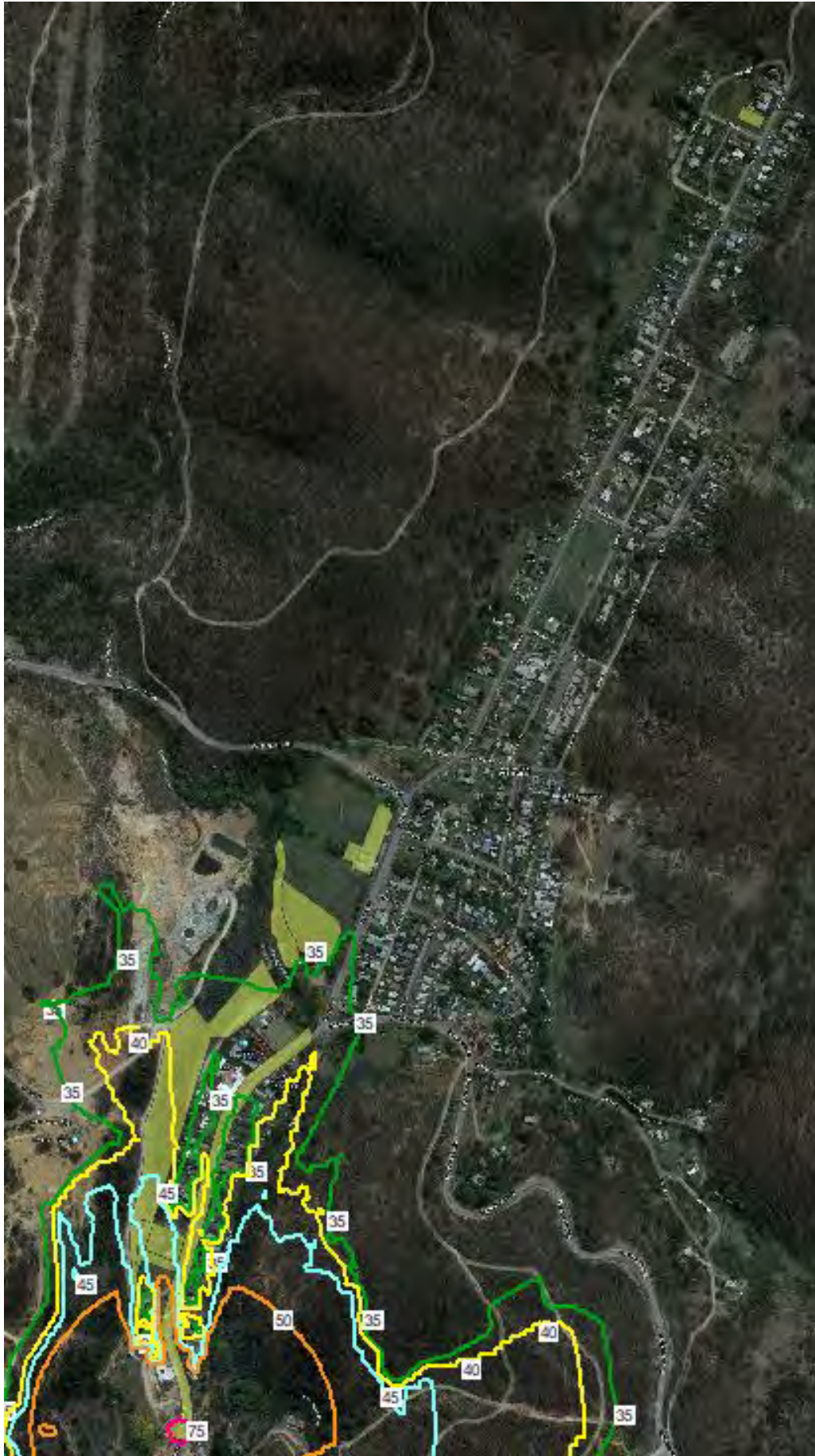


Figure 4-6 Abatement Works Location 4 Leq(15min)



Figure 4-7 Abatement Works Location 5 dB(A) Leq(15min)

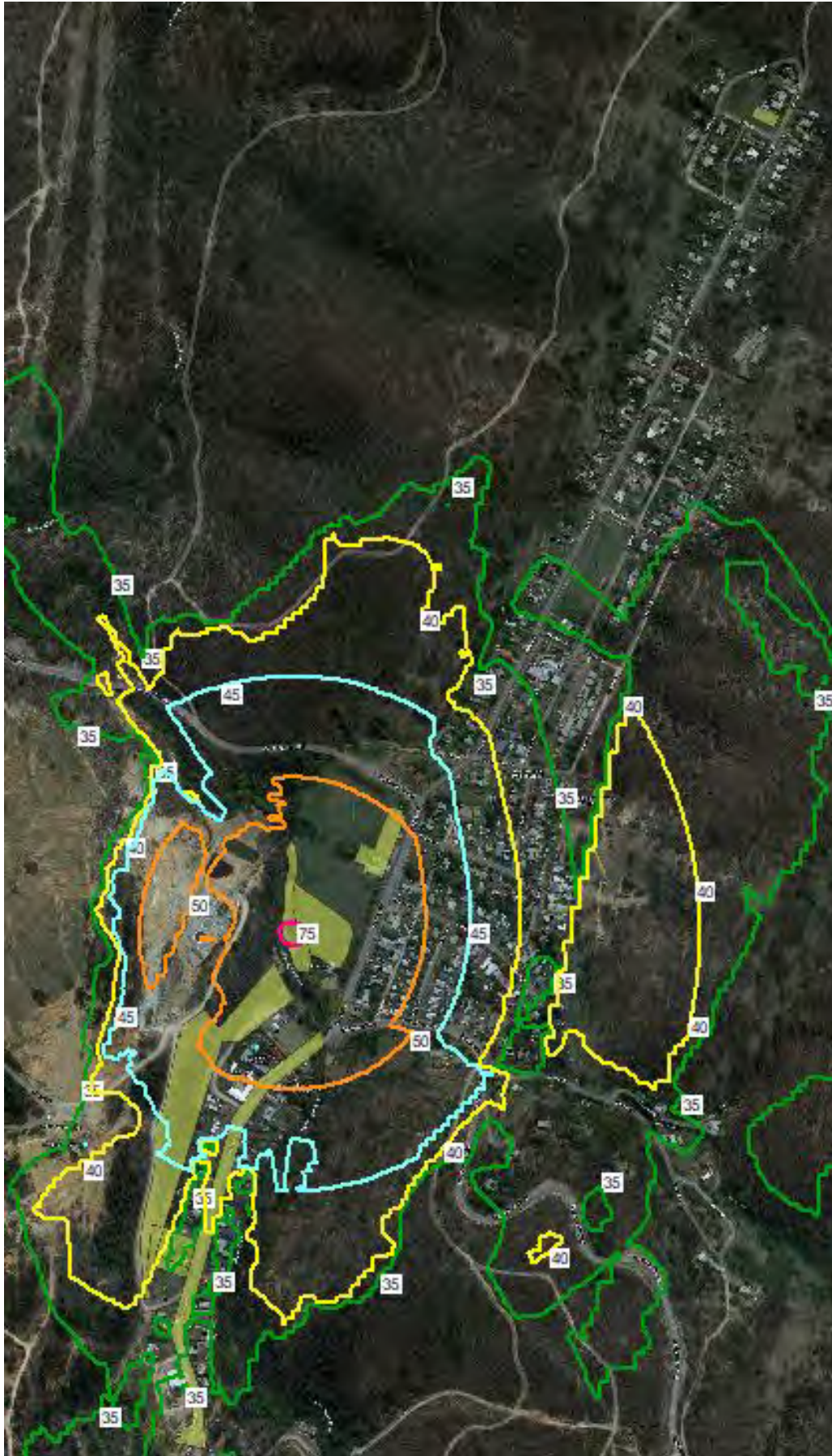


Figure 4-8 Abatement Works Location 6 dB(A) Leq(15min)

Discussion

The results of the construction assessment indicate NML's can be met in many situations however, there is the potential to be exceeded particularly for when construction activities are taking place in close proximity to residences. However, the highly affected noise level is expected to be complied with in all situations.

If abatement works are generally only taking place in one works area, exceedances of NML's are generally expected to only be potentially exceeded in locations in close proximity to those work areas. It is generally expected proposed works would not occur all at once across the abatement sites and would instead occur in isolated locations throughout the works areas. This means that although a number of receivers are predicted to exceed the NMLs, it would primarily only occur when the works are being undertaken in close proximity to these receivers, while receivers located further away would expect to experience noise levels that would comply with NML's.

Additionally, NML's for offices and retail outlets and other industries is expected to be complied with. While NML's can be achieved in most cases for residential, office and retail outlets, and industrial receivers, there is a risk for NML's to be exceeded depending on work activities and locations. With this in mind it is recommended a construction noise and vibration management plan be implemented as part of the proposal to minimise the risk of adverse noise emanating upon the community.

4.2 Construction Vibration

The relationship between vibration and the probability of causing human annoyance or damage to structures is complex. This complexity is mostly due to the magnitude of the vibration source, the particular ground conditions between the source and receiver, the foundation-to-footing interaction and the large range of structures that exist in terms of design (e.g. dimensions, materials, type and quality of construction and footing conditions). The intensity, duration, frequency content and number of occurrences of vibration, are all important aspects in both the annoyances caused and the strains induced in structures.

Energy from construction equipment is transmitted into the ground and transformed into vibrations, which attenuates with distance. The magnitude and attenuation of ground vibration is dependent on the following:

- The efficiency of the energy transfer mechanism of the equipment (i.e. impulsive, reciprocating, rolling or rotating equipment).
- The Frequency content.
- The impact medium stiffness.
- The type of wave (surface or body).
- The ground type and topography.

Due to the above factors, there is inherent variability in ground vibration predictions without site-specific measurement data.

Based on information provided, piling or hammering is not expected. However, if this is to occur, it is recommended this activity does not exceed the small hydraulic hammer

specification. Additionally, vibratory rolling is recommended to not exceed the <50 kN (1-2 tonne) specification when in close proximity to the nearest residences. .

Ground Vibration – Minimum Working Distances from Sensitive Receivers

The Transport for NSW CNVS provides guidance for minimum working distances. As a guide, minimum working distances from sensitive receivers for typical items of vibration intensive plant are listed in Table 4-2. The minimum distances are quoted for both “cosmetic” damage (refer BS 7385) and human comfort (refer DECC’s Assessing Vibration - a technical guideline). DIN 4150 has criteria of particular reference for heritage structures. The minimum working distances are indicative and will vary depending on the particular item of plant and local geotechnical conditions. They apply to cosmetic damage of typical buildings under typical geotechnical conditions.

Table 4-3 Recommended Minimum Safe Working Distances for Vibration Intensive Plant from Sensitive Receiver

Plant Item	Rating / Description	Minimum Distance		Minimum Distance Human Response (NSW EPA Guideline)
		Cosmetic Damage		
		Residential and Light Commercial (BS 7385)	Heritage Items (DIN 4150, Group 3)	
Vibratory Roller	<50 kN (1-2 tonne)	5m	11m	15m to 20m
	<100 kN (2-4 tonne)	6m	13m	20m
	<200 kN (4-6 tonne)	12m	15m	40m
	<300kN (7-13 tonne)	15m	31m	100m
	>300kN (13-18 tonne)	20m	40m	100m
	>300kN (>18 tonne)	25m	50m	100m
Small Hydraulic Hammer	300kg (5 to 12 t excavator)	2m	5m	7m
Medium Hydraulic Hammer	900kg (12 to 18 t excavator)	7m	15m	23m
Large Hydraulic Hammer	1600kg (18 to 34 t excavator)	22m	44m	73m
Vibratory Pile Driver	Sheet Piles	2m to 20m	5m to 40m	20m

Plant Item	Rating / Description	Minimum Distance Cosmetic Damage		Minimum Distance Human Response (NSW EPA Guideline)
		Residential and Light Commercial (BS 7385)	Heritage Items (DIN 4150, Group 3)	
Pile Boring	≤ 800mm	2m (nominal)	5m	4m
Jack Hammer	Hand Held	1m (nominal)	3m	2m

Given the proximity of nearest residential receptors from the proposal, where vibratory rollers are proposed it is recommended <50 kN (1-2 tonne) be utilised. Additionally, if hydraulic hammering were to occur, it is recommended no larger than small 300kg (5 to 12t excavator) be utilised.

4.3 Construction Noise and Vibration Management Plan

A Construction Noise and Vibration Management Plan (CNVMP) could be prepared prior to the commencement of works and implemented through all phases of the proposed construction works. The CNVMP would provide the framework for the management of all potential noise impacts resulting from the construction works and would detail the environmental mitigation measures to be implemented throughout the construction works.

4.3.1 Planning and design of construction works

During the detailed planning, scheduling and design of the construction works the following noise management and mitigation measures should be investigated and, as required, implemented prior to the commencement of noise generating works.

Notification before and during construction

- Affected neighbours to the construction works would be advised in advance of the proposed construction period at least 1 week prior to the commencement of works.
- Consultation and communication between the site and neighbours to the site would assist in minimising uncertainty, misconceptions and adverse reactions to noise.
- All site workers (including subcontractors and temporary workforce) should be familiar with the potential for noise impacts upon residents and encouraged to take all practical and reasonable measures to minimise noise during their activities.
- The constructor or site supervisor (as appropriate) should provide a community liaison phone number and permanent site contact so that the noise related complaints, if any, can be received and addressed in a timely manner.
- The constructor (as appropriate) should establish contact with the residents and communicate, particularly when noisy activities are planned.

Best practice measures when operating on construction site

- Construction works should adopt Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA) practices as addressed in the ICNG. BMP includes factors discussed within this report and encouragement of a project objective to reduce noise emissions. BATEA practices involve incorporating the most advanced and affordable technology to minimise noise emissions.
- Ensure that all construction works scheduled for standard construction hours comply with the start and finish time.
- Where practical, simultaneous operation of dominant noise generating plant should be managed to reduce noise impacts, such as operating at different times or increase the distance between plant and the nearest identified receiver.
- High noise generating activities such as jack hammering should only be carried out in continuous blocks, not exceeding 3 hours each, with a minimum respite period of one hour between each block.
- Where possible, reversing beepers on mobile equipment would be replaced with low-pitch tonal beepers (quackers). Alternatives to reversing beepers include the use of

spotters and designing the site to reduce the need for reversing may assist in minimising the use of reversing beepers.

- Equipment which is used intermittently should be shut down when not in use.
- All engine covers should be kept close while equipment is operating.
- The construction site would be arranged to minimise noise impacts by locating potentially noisy activities away from the nearest receivers wherever possible.
- To minimise heavy equipment handling noise, material stockpiles should be located as far as possible from the nearest receptors
- Loading and unloading areas should be located as far as possible from the nearest receptors.
- Where possible, trucks associated with the work area should not be left standing with their engine operating in a street adjacent to a residential area.
- All vehicular movements to and from the site should comply with the appropriate regulatory authority requirement for such activities.

Complaints handling

Noise and vibration monitoring should be undertaken upon receipt of a complaint to identify and quantify the issue and determine options to minimise impacts.

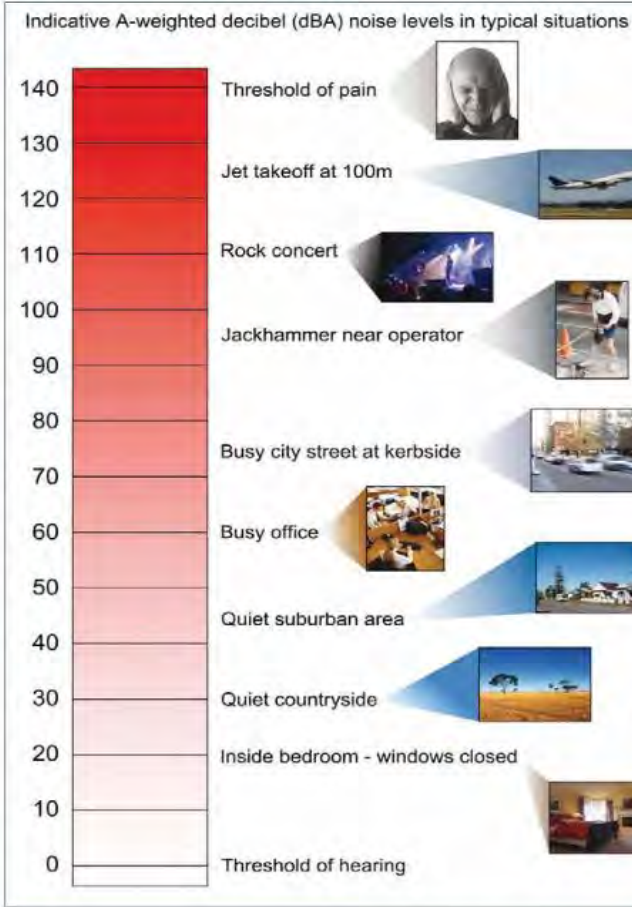
- If valid noise and/or vibration data for an activity is available for the complainant property, from works of a similar severity and location, it is not expected that monitoring will be repeated upon receipt of repeated complaints for these activities, except where vibration levels are believed to be potentially damaging to the building.
- Any noise and/or vibration monitoring should be undertaken by a qualified professional and with consideration to the relevant standards and guidelines. Attended noise and/or vibration monitoring should be undertaken upon receipt of a noise and/or vibration complaint. Monitoring should be undertaken and reported within a timely manner (say 3 to 5 working days). If exceedance is detected, the situation should be reviewed to identify means to reduce the impact to acceptable levels.

5. Conclusion

This CNVIA assessment has been undertaken by RAPT Consulting for Ramboll to inform a Review of Environmental Factors (REF) for the planned abatement works at Captains Flat, NSW.

Given the distance to nearest receptors, the assumptions made in the assessment and the nature of the construction works, it is expected that construction noise can comply with adopted noise NML's in many situations. However, there are circumstances where NML's have the potential to be exceeded particularly when abatement works are being undertaken in close proximity to residences. Therefore, a standard set of construction noise management measures has been provided to deal with the unlikely event of any noise issues. It is believed through the implementation of a CNVMP unlikely noise issues can be managed and mitigated to ensure construction noise is minimised to achieve noise management levels for the proposal.

Glossary of Acoustic Terms

Term	Definition
dB	<p>Decibel is the unit used for expressing the sound pressure level (SPL) or power level (SWL) in acoustics. The picture below indicates typical noise levels from common noise sources.</p>  <p>The chart shows a vertical scale from 0 to 140 dB(A) with corresponding noise sources: Threshold of hearing (0), Inside bedroom - windows closed (15), Quiet countryside (30), Quiet suburban area (45), Busy office (60), Busy city street at kerbside (70), Jackhammer near operator (95), Rock concert (110), Jet takeoff at 100m (125), and Threshold of pain (140).</p>
dB(A)	<p>Frequency weighting filter used to measure 'A-weighted' sound pressure levels, which conforms approximately to the human ear response, as our hearing is less sensitive at very low and very high frequencies.</p>
$L_{Aeq(period)}$	<p>Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.</p>
$L_{A10(period)}$	<p>The sound pressure level that is exceeded for 10% of the measurement period.</p>
$L_{A90(period)}$	<p>The sound pressure level that is exceeded for 90% of the measurement period.</p>
L_{Amax}	<p>The maximum sound level recorded during the measurement period.</p>
Noise sensitive receiver	<ul style="list-style-type: none"> ▶ An area or place potentially affected by noise which includes: ▶ A residential dwelling.

	<ul style="list-style-type: none"> ▶ An educational institution, library, childcare centre or kindergarten. ▶ A hospital, surgery or other medical institution. ▶ An active (e.g. sports field, golf course) or passive (e.g. national park) recreational area. ▶ Commercial or industrial premises. ▶ A place of worship.
Rating Background Level (RBL)	The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period.
Feasible and Reasonable (Noise Policy for Industry Definition)	<p>Feasible mitigation measure is a noise mitigation measure that can be engineered and is practical to build and/or implement, given project constraints such as safety, maintenance and reliability requirements.</p> <p>Selecting Reasonable measures from those that are feasible involves judging whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the mitigation measure. To make a judgement, consider the following:</p> <ul style="list-style-type: none"> ▶ Noise impacts ▶ Noise mitigation benefits ▶ Cost effectiveness of noise mitigation ▶ Community views.
Sound power level (SWL)	The sound power level of a noise source is the sound energy emitted by the source. Notated as SWL, sound power levels are typically presented in dB(A).

**APPENDIX 6
BIODIVERSITY ASSESSMENT REPORT**



Inspired People.
Dedicated Team.
Quality Outcomes.

Briefing Note

To: Clare Butterfield

Cc: Shaun Taylor

From: Joel Callaghan

Date: 18/02/2022

Subject: Captains Flat Biodiversity Assessment

Purpose

This report details the outcomes of the biodiversity assessment conducted to inform the Review of Environmental Factors (REFs) for the contamination abatement works at Captains Flat.

Outcomes/Key messages

Two plant community types (PCTs) were mapped (PCT 1100 and PCT 1102), none of which conform to a threatened ecological community (TEC) listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) or federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

No threatened fauna species were recorded however both PCT 1100 and 1102 were assessed as supporting marginal feeding habitat for eight threatened fauna species. No threatened flora species or habitat was recorded.

**Umwelt (Australia)
Pty Limited**

ABN 18 059 519 041

T | 1300 793 267
E | info@umwelt.com.au

www.umwelt.com.au

Contents

1.0	Background	3
1.1	Proposed works	3
2.0	Assessment methodology	6
2.1	Desktop assessment	6
2.2	Vegetation mapping	6
2.3	Site visit	6
3.0	Results	8
3.1	Landscape	8
3.2	Vegetation communities	8
3.3	Threatened species	12
4.0	Potential impacts	18
4.1	Direct impacts	18
4.2	Indirect impacts	19
5.0	Mitigation measures	21
6.0	Offsetting	Error! Bookmark not defined.
7.0	Conclusion	23
8.0	References	24
9.0	Appendices	25

1.0 Background

Ramboll has been commissioned by Regional NSW to prepare Review of Environmental Factors (REFs) for the abatement of contamination from the Lake George Mine at eight public properties within the town of Captains Flat. The abatement works (the Proposal) are expected to impact upon the biodiversity of the surrounding area. To inform the REFs, Ramboll has engaged Umwelt (Australia) Pty Limited (Umwelt) to assess impacts to biodiversity as a result of the Proposal.

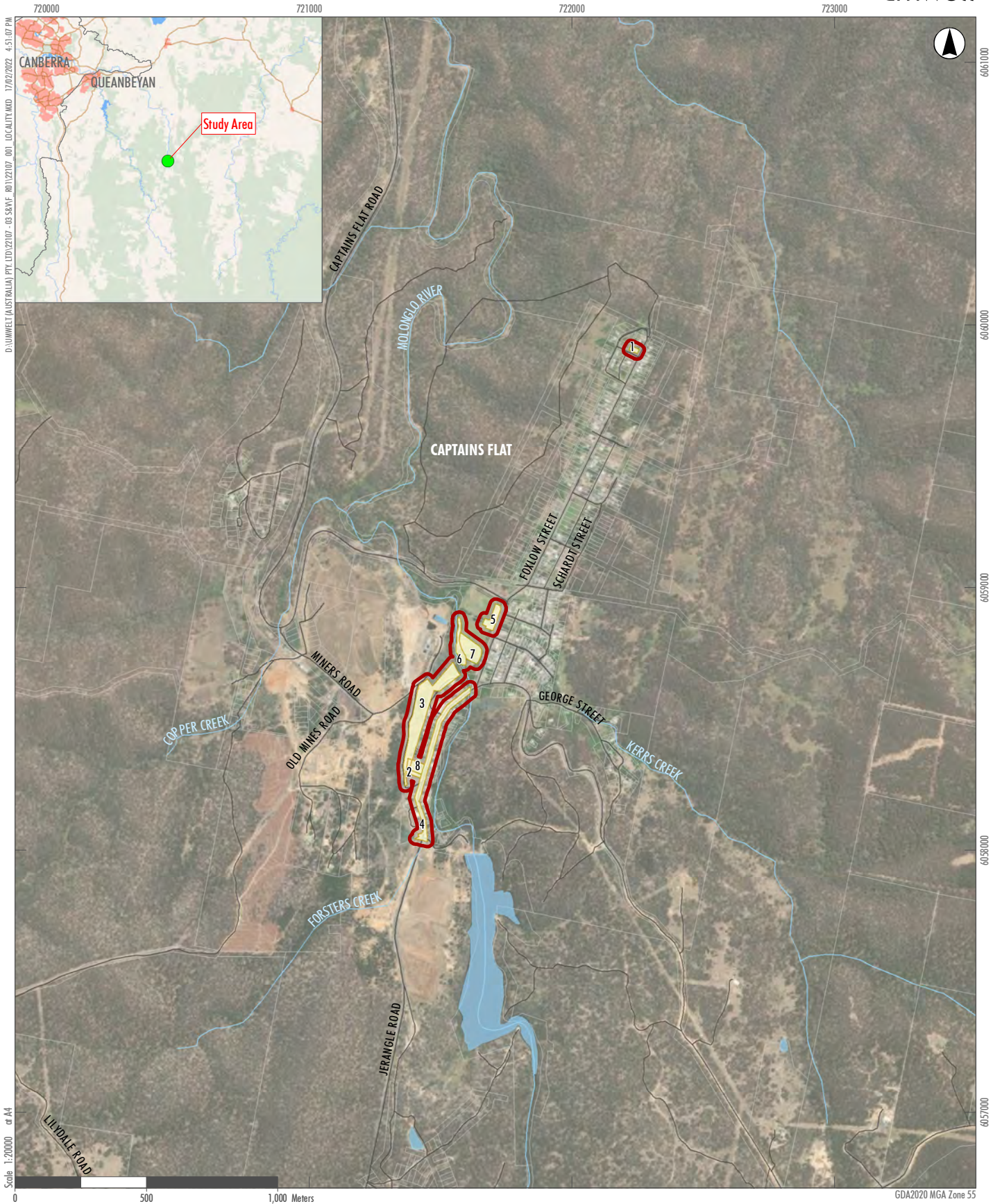
1.1 Proposed works

The abatement works will occur over eight properties within the township of Captains Flat (**Figure 1-1**). The works are summarised in **Table 1-1**. For the purpose of the assessment, Umwelt has assumed a worst-case scenario whereby all vegetation is removed from each of the eight abatement areas.

Table 1-1 The proposed works

Abatement area	Location	Proposed strategy
1	Foxlow Parklet at 12 Spring Street Captains Flat	<ul style="list-style-type: none"> Excavation of the upper 0.5-1.0 metres (m) of contaminated soil A water truck used to mitigate dust migration offsite during removal. Removal offsite to the landfill using covered trucks to minimise dust migration. Placement of a clean backfill layer to the original surface level. Revegetation of the final capped surface to minimise soil erosion.
2	Crown land parcel adjacent to preschool at 27 Foxlow Street Captains Flat	<ul style="list-style-type: none"> No Excavation Placement of a geofabric marker layer on the top of the contaminated soil surface to act as a visual and physical barrier. Placement of a clean capping layer with a minimum of 0.3 m thickness over the extent of the site. Revegetation of the final capped surface to minimise soil erosion and damage to the capping layer.
3	Eastern Embankment (crown land behind dwellings, community hall and preschool)	<ul style="list-style-type: none"> Excavation of the upper 0.3m of soil Placement of a geofabric marker layer on the top of the contaminated soil surface to act as a visual and physical barrier. Placement of a clean capping layer with a minimum of 0.3 m thickness over the extent of the site. Revegetation of the final capped surface to minimise soil erosion and damage to the capping layer.

Abatement area	Location	Proposed strategy
4	Southern end of Foxlow street (Council footpaths either side) for approximately 600 metres	<ul style="list-style-type: none"> • Excavation of the top 0.3 m of soil within the footpath of Foxlow Street where there is no existing hardstand. • Placement of a geofabric marker layer on the top of the contaminated soil surface to act as a visual and physical barrier. • Placement of a clean capping layer with a minimum of 0.3 m thickness over the extent of the site. • Revegetation of the final capped surface to minimise soil erosion and damage to the capping layer.
5 and 7	Playing Fields, Tennis and Basketball Courts at 67-73 Foxlow Street	<ul style="list-style-type: none"> • Placement of a geofabric marker layer on the top of the contaminated soil surface to act as a visual and physical barrier. • Placement of a clean capping layer with a minimum of 0.3 m thickness over the extent of the site. • Revegetation of the final capped surface to minimise soil erosion and damage to the capping layer.
6	Flood berms	<ul style="list-style-type: none"> • Re-contouring the currently eroded flood berms. • Placement of a geofabric marker layer on the top of the contaminated soil surface to act as a visual and physical barrier. • Placement of a clean capping layer with a minimum of 0.5 m thickness over the extent of the flood berms. • Revegetation of the final capped surface to minimise soil erosion and damage to the capping layer.
8	Existing Preschool at 27 Foxlow Street Captains Flat	<ul style="list-style-type: none"> • Excavation of the top 0.3 m of soil in open areas around the Preschool. • Removal of the contaminated soils offsite for landfill disposal. • Placement of a geofabric marker layer on the top of the contaminated soil surface to act as a visual and physical barrier. • Placement of a clean capping layer with a minimum of 0.3 m thickness over the extent of the site. • Revegetation of the final capped surface to minimise soil erosion and damage to the capping layer.



Legend

- Study Area
- Abatement Areas
- Property Boundaries
- Watercourses
- Roads

FIGURE 1.1

Location

2.0 Assessment methodology

A study area was determined to capture all potential direct and indirect impacts caused by the Proposal. The study area was produced by buffering the approximate location of the proposed works by 20 metres in all directions.

2.1 Desktop assessment

A review of relevant public databases and literature was undertaken to identify threatened and migratory species, endangered populations, threatened ecological communities (TECs) and their habitats that have previously been recorded within the locality (a 10-kilometre radius around the study area). Threatened species, migratory species, endangered populations and TECs listed under the *Biodiversity Conservation Act 2016* (BC Act), *NSW Fisheries Management Act 1994* (FM Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) that have the potential to occur within the locality were also considered based on the type of habitat present and the NSW bioregion within which the study area occurs.

Databases and literature reviewed as part of this ecological assessment include:

- a search of the Department of Planning, Industry, and Environment (DPIE) BioNet Atlas based on a 10-kilometre radius around the proposed works
- a search of the Commonwealth Department of Agriculture, Water, and the Environment (DAWE) Protected Matters Search Tool (PMST) based on a 10-kilometre radius around the proposed works
- BioNet Threatened Biodiversity Data Collection (TBDC)
- BioNet Vegetation Classification
- the Biodiversity Values Map Threshold Tool (BVMTT)
- a search of the National Flying-fox monitoring viewer accessed by the DAWE Interactive Flying-fox Web Viewer.
- searches of the Department of Primary Industries' (DPI) threatened fish distributions.

2.2 Vegetation mapping

Two sets of broadscale vegetation mapping were considered to inform the assessment of the vegetation communities present within the study area:

- Southeast NSW Native Vegetation Classification and Mapping – SCIVI. VIS_ID 2230.
- Forest Ecosystems: Vegetation of the Southern Forests. VIS ID 3858

Neither vegetation map identified vegetation communities to plant community types (PCTs) however, Forest Ecosystems: Vegetation of the Southern Forests was considered more accurate and had superior coverage compared to Southeast NSW Native Vegetation Classification and Mapping. The SCIVI mapping was subsequently used as baseline mapping.

2.3 Site visit

The site visit was conducted on 23 December 2021. An Umwelt ecologist inspected the study area to record observations of any threatened and/or migratory species, endangered populations, TECs and any other

ecological features that had the potential to be impacted. All investigations were limited to the extent of the study area.

Rapid data assessments to record the flora species occurring in the proposed abatement areas were conducted at points using random meanders as described by Cropper (1993). Seven rapid data assessments were undertaken to capture the structural variation in vegetation communities, the variation in species diversity across the study area and to define changes in abiotic conditions (the occurrence of creek lines and past disturbances). The rapid data assessments recorded the dominant species present, the frequency of their occurrence (common, uncommon or rare) and their status as either threatened, native or non-native (to the Monaro IBRA subregion).

The presence of fauna habitat within the study area was also assessed. Specific attention was paid to the potential occurrence of tree hollows and man-made structures with the potential to support bat roosts. A qualitative assessment of the aquatic habitat supported by the Molonglo River in the study area was also conducted. The width of the river, the presence of any large debris, and the presence of any fringing and in-stream vegetation was assessed.

3.0 Results

3.1 Landscape

Captains Flat is located within the South Eastern Highlands Bioregion and within the Monaro IBRA subregion. The Captains Flat township sits within a valley created by the Molonglo River, a river running through the study area before joining Lake Burley Griffin about 45 kilometres to the north-west. Dry sclerophyll forest, riparian forest and planted exotics dominate the vegetation within and adjacent to Captains Flat. Lake George Mine is located adjacent to the township. Tailings and leaching from the mine have entered the Molonglo River and settled in the riparian area and its surrounds in the area adjacent to Captains Flat.

3.1.1 Soil landscapes

The following two soil landscapes occur within the locality:

- Disturbed Terrain
- Bennison landscape - comprised of Silurian volcanics of the Hoskinstown Group including interbedded shale, tuffs, rhyolite, dacite, thin basalt, siltstone, sandstone, and slate.

3.1.2 Biodiversity Values Map and Threshold Tool

The Molonglo River is identified in the Biodiversity Values Map and Threshold Tool as Protected Riparian Land (**Figure 3-1**).

3.2 Vegetation communities

The vegetation occurring within the study area has been classified into the following PCTs (**Figure 3-2**):

- PCT 1100: Ribbon Gum - Snow Gum grassy forest on damp flats, eastern South Eastern Highlands Bioregion (low condition) (**Photo 3.1**)
- PCT 1102: Ribbon Gum - tea-tree - River Tussock riparian scrub along tablelands streambanks, South East Corner Bioregion (low condition) (**Photo 3.2**)
- Urban exotics and remnant natives (**Photo 3.3**)
- Exotic grassland / cleared (**Photo 3.4**)

Note, for the urban exotics and remnant natives community, a native tree has been assessed as remnant if there is no obvious evidence that it has been planted and the next closest native tree is over 30 metres away.

Both PCT 1100 and PCT 1102 can conform to TECs listed under the BC Act (**Table 3-1**). However, the occurrence of both these PCTs did not meet the descriptions of any TECs as per their respective scientific determinations (**Sections 3.2.1 to 3.2.3**).



Photo 3.1 PCT 1100: Ribbon Gum - Snow Gum grassy forest on damp flats, eastern South Eastern Highlands Bioregion (low condition)



Photo 3.2 PCT 1102: Ribbon Gum - tea-tree - River Tussock riparian scrub along tablelands streambanks, South East Corner Bioregion (low condition)



Photo 3.3 Urban exotics and remnant natives



Photo 3.4 Exotic grassland / cleared

Table 3.1 Vegetation communities mapped in the study area

Vegetation community	BC Act listing	EPBC Act listing
PCT 1100: Ribbon Gum - Snow Gum grassy forest on damp flats, eastern South Eastern Highlands Bioregion (low condition)	Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions (vegetation in the study area does not meet the final determination for this community) Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion (vegetation in the study area does not meet the final determination for this community) Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions (vegetation in the study area does not meet the final determination for this community)	NA
PCT 1102: Ribbon Gum - tea-tree - River Tussock riparian scrub along tablelands streambanks, South East Corner Bioregion (low condition)	Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions (vegetation in the study area does not meet the scientific determination for this community)	Not listed
Urban exotics and remnant natives	Not listed	Not listed
Exotic grassland / cleared	Not listed	Not listed

3.2.1 Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions (BC Act)

PCT 1100 and PCT 1102 can conform to the TEC Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions (BC Act). Within the study area, neither PCT matched the description of the TEC provided in the Scientific Committee’s final determination (DPIE 2019a). This TEC has subsequently not been assessed as occurring within the study area. A justification for this assessment is provided below:

- PCT 1100 is missing a dense groundcover of native grasses, herbs, and forbs
- most canopy species throughout both PCTs are the exotic *Pinus* spp (Pines) and *Populus alba* (White Poplar). Small isolated occurrences of *Eucalyptus viminalis* (Ribbon Gum) were recorded outside of the impact boundary.
- the dominant native groundcover species in PCT 1102 is riparian (*Typha orientalis*) and not identified as characteristic of the TEC
- the dominant native shrub species in PCT 1102 (*Leptospermum* spp.) is not identified as characteristic of the TEC.

3.2.2 Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion

PCT 1100 can conform to the TEC Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion (BC Act). Within the study area PCT 1100 did not match the description of the TEC provided in the Scientific Committee’s final determination (DPIE 2019b). This TEC has subsequently not been assessed as occurring within the study area. A justification for this assessment is provided below:

- The dominant canopy species recorded were the exotic *Pinus* spp and *Populus alba* - not *Eucalyptus pauciflora* (Snow Gum) as specified in the final determination
- PCT 1100 is missing a groundcover dominated by native grasses, herbs, and forbs.

3.2.3 Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions

PCT 1100 can conform to the TEC Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions (BC Act). Within the study area PCT 1100 did not match the description of the TEC provided in the Scientific Committee’s final determination (DPIE 2019c). This TEC has subsequently not been assessed as occurring within the study area. A justification for this assessment is provided below:

- The dominant canopy species recorded were the exotic *Pinus* spp and *Populus alba* - not *Eucalyptus pauciflora* or *E. rubida* (Candlebark) as specified in the final determination
- PCT 1100 is missing a groundcover dominated by native grasses, herbs, and forbs.

3.3 Threatened species

3.3.1 Threatened flora

The desktop assessment identified two threatened flora species with a moderate or higher likelihood of occurring in the study area (**Table 3-2**). None of the listed species were recorded during the site investigation.

Table 3-2 Threatened flora species identified with a moderate or higher likelihood of occurring

Species name	Common name	Status (BC Act)	Status (EPBC Act)
<i>Eucalyptus aggregata</i>	Black Gum	Vulnerable	Vulnerable
<i>Leucochrysum albicans</i> subsp. <i>tricolor</i>	Hoary Sunray	Not listed	Endangered

3.3.2 Threatened fauna

The desktop assessment identified six threatened bird species and four threatened mammals with a moderate or higher likelihood of occurring in the study area (**Table 3-3**). None of the listed species were incidentally recorded during the site investigation. Habitat for these species was however identified and has also been outlined in **Table 3-3**.

Table 3-3 Threatened fauna assessed as potentially occurring in the study area

Species name	Common name	Status (BC Act)	Status (EPBC Act)	Habitat
Birds				
<i>Anthochaera phrygia</i>	Regent Honeyeater	Critically endangered	Critically endangered	Remnant eucalypts provide marginal feeding habitat.
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	Vulnerable	Not listed	Air space over the study area.

Species name	Common name	Status (BC Act)	Status (EPBC Act)	Habitat
<i>Hirundapus caudacutus</i>	White-throated Needletail	Not listed	Vulnerable	Air space over the study area.
<i>Ninox strenua</i>	Powerful Owl	Vulnerable	Not listed	Marginal feeding habitat throughout vegetated areas.
<i>Petroica boodang</i>	Scarlet Robin	Vulnerable	Not listed	Marginal feeding habitat throughout vegetated areas.
<i>Petroica phoenicea</i>	Flame Robin	Vulnerable	Not listed	Marginal feeding habitat throughout vegetated areas.
Mammals				
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Vulnerable	Vulnerable	Marginal feeding habitat throughout vegetated areas
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	Vulnerable	Not listed	Marginal feeding habitat throughout vegetated areas
<i>Myotis macropus</i>	Southern Myotis	Vulnerable	Not listed	Marginal feeding habitat along Molonglo River
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Vulnerable	Vulnerable	Marginal feeding habitat throughout vegetated areas

Tree hollows and log habitat

No large tree hollows or large hollow logs (with openings greater than 20 centimetres across) were recorded within the study area. Small tree hollows (openings less 20 centimetres across) and smaller logs have been assumed to occur.

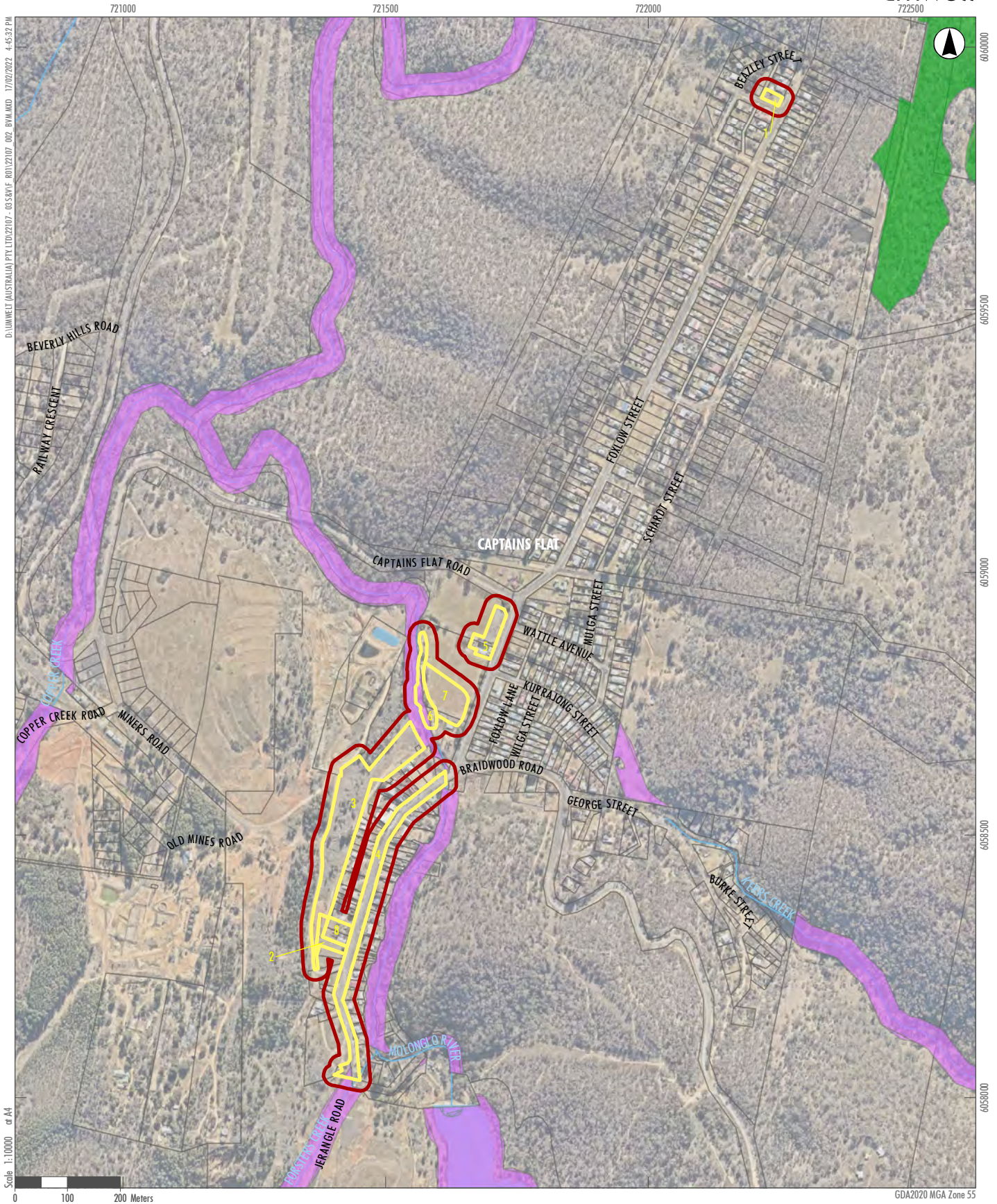
Koala habitat

Koalas were assessed with a low likelihood of occurring; however the study area is located in the Central and Southern Tablelands Koala Management Area as identified by *State Environmental Planning Policy (Koala Habitat Protection) 2021*. A determination as to whether the study area supports core koala habitat needs to be undertaken. The following justification has been provided as why the study area does not support core koala habitat:

- The occurrences of *Eucalyptus blakelyi*, *E. mannifera*, *E. melliodora* and *E. viminalis* (koala use trees as identified in Schedule 2 of SEPP (Koala Habitat Protection) 2021)) in the study area all occur as individual trees covering less than 15% of the total area.
- The occurrences of *Eucalyptus blakelyi*, *E. mannifera*, *E. melliodora* and *E. viminalis* consist of less than 15% of the total abundance of trees occurring in the study area.
- No records of koalas have been made from within the township of Captains Flat. The nearest records are 2 and 11 kilometres away from areas surrounded by intact native vegetation. Given the study area is located within Captains Flat it is likely a koala would have been detected if it occurred.

3.3.3 Threatened fish

No threatened fish distributions have been mapped within the section of the Molonglo River occurring in the study area. However, the distribution of the Eel-tailed Catfish (*Tandanus tandanus*) occurs in the Molonglo River starting at Lake Burley Griffin and the distribution of the Macquarie Perch (*Macquaria australasica*) occurs in the Molonglo River starting near Queanbeyan (**Figure 3-3**). Both are downstream of the study area.



Legend

- Study Area
- Abatement Areas
- Property Boundaries
- Watercourses
- Roads

Biodiversity Values Map

- Identified Old Growth Forest
- Protected Riparian Land

FIGURE 3.1

Biodiversity Values Map and Threshold Tool

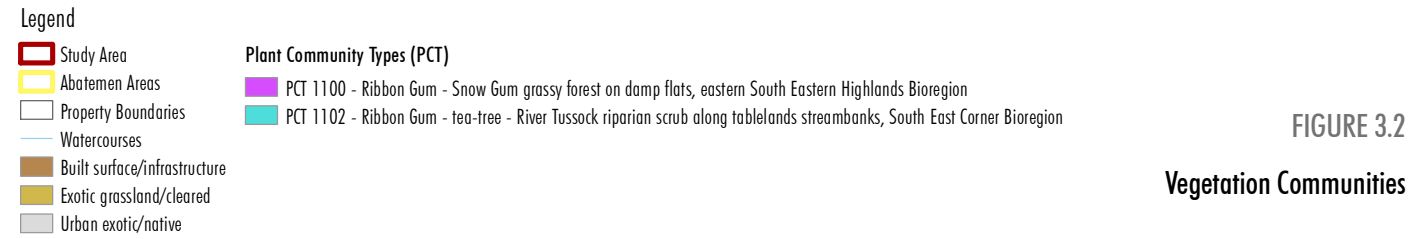
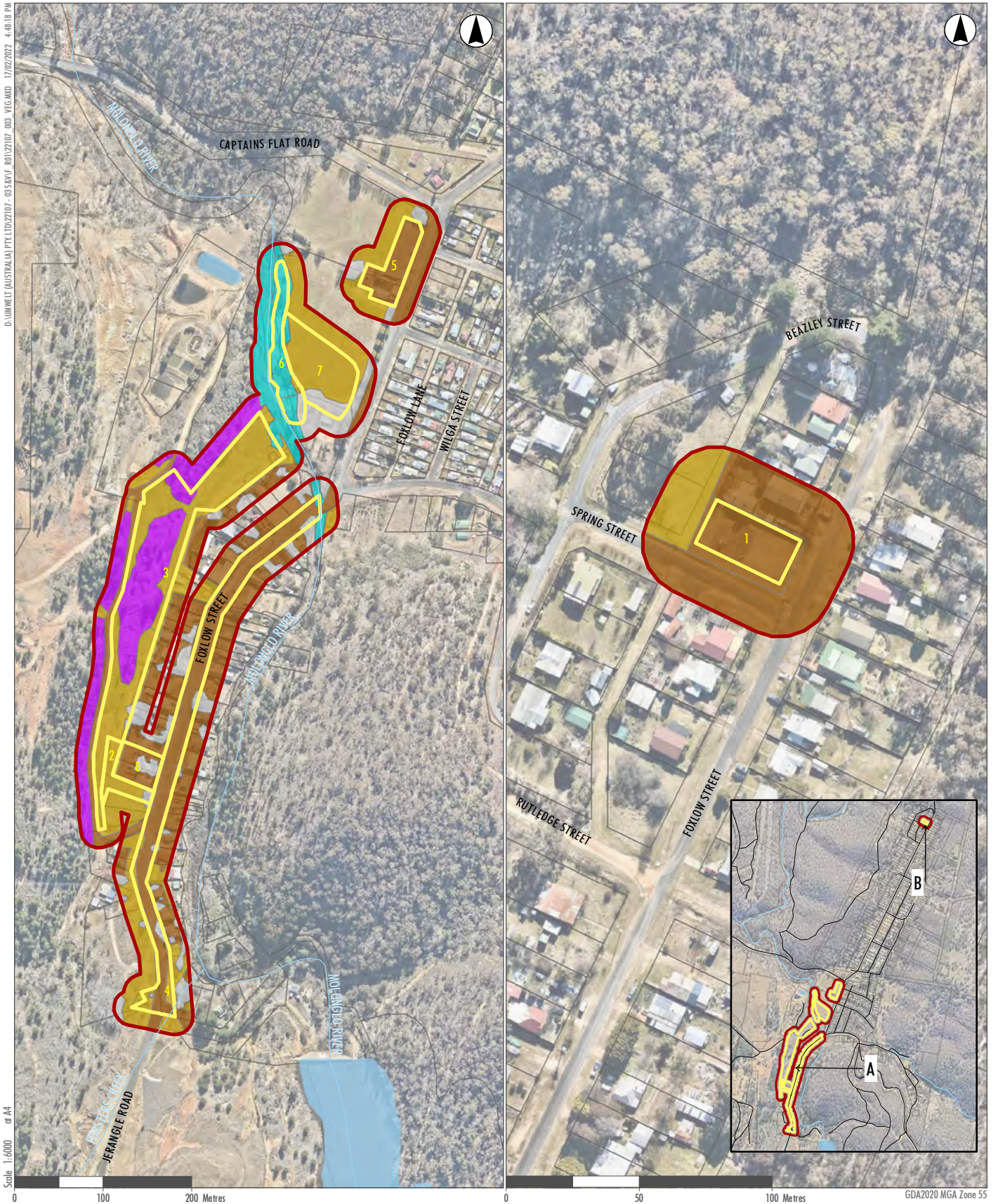


FIGURE 3.2

Vegetation Communities

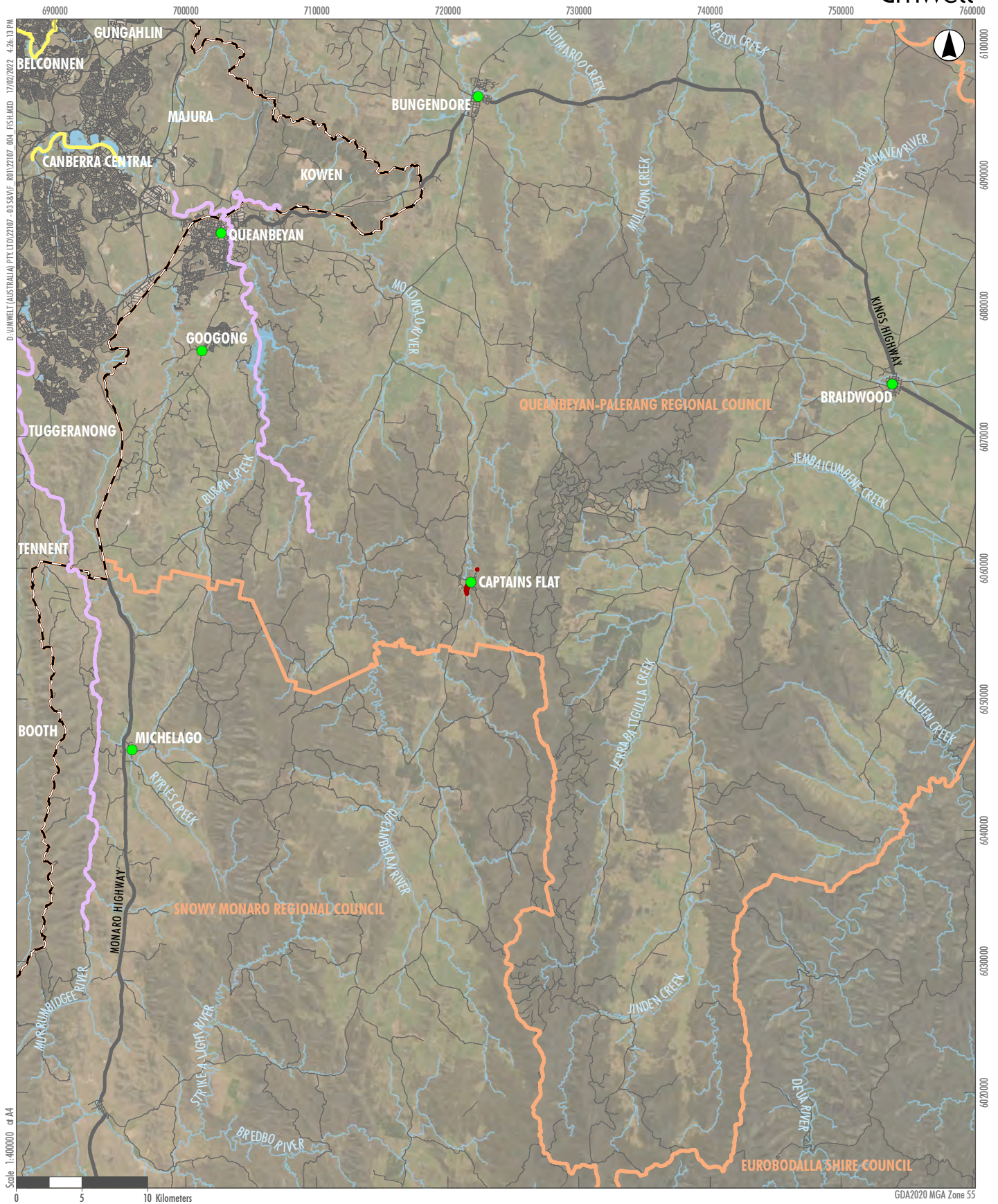


FIGURE 3.2

Threatened Fish Distributions

4.0 Potential impacts

4.1 Direct impacts

4.1.1 Direct impacts to vegetation communities

Up to 0.71 hectares of PCT 1100 and 0.32 hectares of PCT 1102 is proposed to be cleared. PCT 1100 is proposed to be cleared in abatement area 3. PCT 1102 is proposed to be cleared at abatement areas 4, 6 and 7. The urban exotics and remnant natives community and exotic grassland/cleared community are also expected to be directly impacted. Direct impacts to all vegetation communities have been summaries in **Table 4-1**.

Table 4-1 Direct impacts to vegetation communities

Vegetation community	BC Act listing	EPBC Act listing	Extent in study area (ha)	Extent directly impacted (ha)
PCT 1100: Ribbon Gum - Snow Gum grassy forest on damp flats, eastern South Eastern Highlands Bioregion (low condition)	NA	NA	1.50	0.71
PCT 1102: Ribbon Gum - tea-tree - River Tussock riparian scrub along tablelands streambanks, South East Corner Bioregion (low condition)	NA	NA	0.90	0.32
Urban exotics and remnant natives	Not listed	Not listed	0.80	0.28
Exotic grassland / cleared	Not listed	Not listed	2.83	2.09
Total			6.03	3.40

4.1.2 Direct impacts to threatened flora

No threatened flora species were recorded within the vegetation expected to be cleared by the proposed works.

4.1.3 Direct impacts to threatened fauna

No threatened fauna species were recorded within the vegetation expected to be cleared by the proposed works. Marginal habitat for the threatened fauna species identified in **Section 3.3.2** will however be cleared. **Table 4-2** outlines the impacts to the marginal threatened fauna habitat.

Table 4-2 Direct impacts to threatened fauna habitat

Species	BC Act	EPBC Act	Impacted habitat
Birds			
Regent Honeyeater (<i>Anthochaera phrygia</i>)	Critically endangered	Critically endangered	Marginal feeding habitat (PCT 1100 and PCT 1102)

Species	BC Act	EPBC Act	Impacted habitat
Gang-gang Cockatoo (<i>Callocephalon fimbriatum</i>)	Vulnerable	Not listed	Airspace above the study area (not impacted)
White-throated Needletail (<i>Hirundapus caudacutus</i>)	Not listed	Vulnerable	Airspace above the study area (not impacted)
Powerful Owl (<i>Ninox strenua</i>)	Vulnerable	Not listed	Marginal feeding habitat (PCT 1100 and PCT 1102)
Scarlet Robin (<i>Petroica boodang</i>)	Vulnerable	Not listed	Marginal feeding habitat (PCT 1100 and PCT 1102)
Flame Robin (<i>Petroica phoenicea</i>)	Vulnerable	Not listed	Marginal feeding habitat (PCT 1100 and PCT 1102)
Mammals			
Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>)	Vulnerable	Vulnerable	Marginal feeding habitat (PCT 1100 and PCT 1102)
Eastern False Pipistrelle (<i>Falsistrellus tasmaniensis</i>)	Vulnerable	Not listed	Marginal feeding habitat (PCT 1100 and PCT 1102)
Southern Myotis (<i>Myotis macropus</i>)	Vulnerable	Not listed	Marginal feeding habitat (Riparian vegetation)
Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>)	Vulnerable	Vulnerable	Marginal feeding habitat (PCT 1100 and PCT 1102)

4.1.4 Direct impacts to threatened fish

Habitat for the eel-tailed catfish (*Tandanus tandanus*) and the Macquarie perch (*Macquaria australasica*) will not be directly impacted by the proposed works.

4.2 Indirect impacts

The Proposal has the potential to indirectly impact the biodiversity occurring with the study area. These indirect impacts and a description of how they may impact the biodiversity present in the study area is outlined in **Table 4-3**.

Table 4-3 Indirect impacts to biodiversity

Indirect impact	Explanation	Affected biodiversity
Erosion	Removal of vegetation may lead to erosion adjacent to cleared areas.	<ul style="list-style-type: none"> • Aquatic habitat

Indirect impact	Explanation	Affected biodiversity
Mobilisation of heavy metals and other mine contaminants	The soils within the abatement areas likely contains heavy metals that have come from the adjacent Lake George Mine. Clearing vegetation and moving soil may mobilise these contaminants into the Molonglo River and the adjacent riparian areas.	<ul style="list-style-type: none"> • Aquatic habitat
Changes to hydrology	<p>The proposed works may increase the area of impervious watershed subsequently increasing runoff into existing drainage lines.</p> <p>Impeding the Molonglo River may reduce habitat connectivity along the watercourse and surrounding vegetation.</p>	<ul style="list-style-type: none"> • Aquatic habitat
Spread of weeds and exotic species	<p>Exotic weeds are common throughout the study area. The movement of machinery, soils and people have the potential to spread these weeds.</p> <p>Clearing of existing vegetation also has the potential to provide new areas for weed colonisation.</p>	<ul style="list-style-type: none"> • PCT 1100 • PCT 1102
Spread of pathogens and disease	Soil borne pathogens with the potential to infect plants e.g., <i>Phytophthora cinnamomi</i> , may be mobilised by the proposed works.	<ul style="list-style-type: none"> • PCT 1100 • PCT 1102
Edge effects	Edge effects relate to where ecological processes and interactions are altered along the boundary of two or more different adjoining habitats. Clearing reduces the resilience of native vegetation and changes predator-prey relationships.	<ul style="list-style-type: none"> • PCT 1100 • PCT 1102

5.0 Mitigation measures

Mitigation measure and safeguards to avoid and minimize the impacts of the Proposal on the biodiversity values identified in the study area are detailed in **Table 5-1**.

Table 5-1 Mitigation measures

Impact	Mitigation measure	Timing
Removal of native vegetation	Avoided and minimised through detailed design, specifically minimising clearing of riparian vegetation adjacent to the Molonglo River.	Detailed design
	Establishment and maintenance of clearing limits and exclusion zones	Prior to and during works
Erosion	Establishment and maintenance of clearing limits and exclusion zones	Prior to and during works
	Revegetation of cleared areas	Post works
	Sediment control and monitoring plan	Prior to and during works
Mobilisation of heavy metals and other mine contaminants	Measures to prevent additional sediment run-off into the Molonglo River.	During works
	Revegetation of cleared areas to control run-off after finalisation of works.	During works
	Sediment control and monitoring plan.	Prior to works
	All soil material is to be transported as hazardous waste to an immobilization facility and once treated will be transported to disposal facility / landfill.	During works
Changes to hydrology	Bank stabilisation measures	During works and post works
	Revegetation of cleared areas to control run-off after finalisation of works	During works
Spread of weeds and exotic species	Hygiene controls for all plant and people working in the study area.	During works
	Establishment and maintenance of clearing limits and exclusion zones	Prior to and during works
	Machinery will be washed following best practice hygiene protocols prior to being brought to site to prevent the spread of weeds, seeds, pathogens and fungi	Prior to works, during works and post works
	All weed material is to be transported as hazardous waste to an immobilization facility and once treated will be transported to disposal facility / landfill.	During works

Impact	Mitigation measure	Timing
Spread of pathogens and disease	Hygiene controls for all plant and people working in the study area	During works
	All weed and soil material is to be transported as hazardous waste to an immobilization facility and once treated will be transported to disposal facility / landfill	During works
	Machinery will be washed following best practice hygiene protocols prior to being brought to site to prevent the spread of weeds, seeds, pathogens and fungi	Prior to works and post works
Edge effects	Establishment and maintenance of clearing limits and exclusion zones	Prior to and during works
	Minimised through detailed design, specifically minimising clearing of riparian vegetation adjacent to the Molonglo River	Prior to works

6.0 Conclusion

This assessment was conducted to determine the impacts to biodiversity caused by the abatement of contamination from the Lake George Mine in the township of Captains Flat. Within the area expected to be impacted by the abatement works (the study area) the following biodiversity values were identified:

- PCT 1100: Ribbon Gum - Snow Gum grassy forest on damp flats, eastern South Eastern Highlands Bioregion
- PCT 1102: Ribbon Gum - tea-tree - River Tussock riparian scrub along tablelands streambanks, South East Corner Bioregion
- Marginal feeding habitat for;
 - Regent Honeyeater (*Anthochaera phrygia*)
 - Powerful Owl (*Ninox strenua*)
 - Scarlet Robin (*Petroica boodang*)
 - Flame Robin (*Petroica phoenicea*)
 - Grey-headed Flying-fox (*Pteropus poliocephalus*)
 - Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
 - Southern Myotis (*Myotis macropus*)
 - Large-eared Pied Bat (*Chalinolobus dwyeri*).
- Protected Riparian Land as per the Biodiversity Values Map and Threshold Tool.

Neither PCT was found to conform to a TEC listed under the BC Act or EPBC Act.

The proposed works will clear up to 0.71 hectares of PCT 1100 and 0.32 hectares of PCT 1102, together corresponding to the marginal feeding habitat for the threatened species listed above. Given the abundance of better feeding habitat immediately adjacent to the study area it is unlikely that any of these threatened species occupy or rely upon habitats in the study area. Accordingly, no tests and assessments of significance under Section 7.3 of the BC Act or under the EPBC Act are required. Offsetting these impacts is at the discretion of the Department of Regional NSW.

Despite the minor vegetation clearing proposed, the associated impacts have the potential to become exacerbated if the mitigation measures proposed in **Section 5** are not implemented. Of particular importance are preventing excess contaminated sediments from entering the Molonglo River along with stabilizing and revegetating the river's banks.

7.0 References

Cropper, S. C. (1993). *Management of endangered plants*. CSIRO, East Melbourne.

NSW and Department of Planning, Industry and Environment (DPIE) (2011). *Forest Ecosystems: Vegetation of the Southern Forests*. VIS ID 3858

NSW and Department of Planning, Industry and Environment (DPIE) (2019a). *Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions - Determination to make a minor amendment to Part 3 of Schedule 1 of the Threatened Species Conservation Act – NSW Scientific Committee Final Determination*.

NSW and Department of Planning, Industry and Environment (DPIE) (2019b). *Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion – NSW Scientific Committee Final Determination*.

NSW and Department of Planning, Industry and Environment (DPIE) (2019c). *Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions - NSW Scientific Committee Final Determination*.

8.0 Appendices

Appendix A. Rapid Flora Assessment Results

Species name	Common name	Status	Occurrence
Northern playground			
<i>Brassica</i> spp.	-	Non-native	Common
<i>Bromus hordeaceus</i>	Soft Broome	Non-native	Common
<i>Cirsium vulgare</i>	Spear Thistle	Non-native	Common
<i>Eucalyptus viminalis</i>	Ribbon Gum	Native	Uncommon
<i>Geranium solanderi</i>	Native Geranium	Native	Common
<i>Hypochaeris radicata</i>	Catsear	Non-native	Common
<i>Medicago</i> spp.	-	Non-native	Common
<i>Plantago lanceolata</i>	Lamb's Tongues	Non-native	Common
<i>Quercus</i> spp.	Oak	Non-native	Uncommon
<i>Rosa ?rubiginosa</i>	Sweet briar	Non-native	Uncommon
<i>Rubus fruticosus</i> spp. agg.	Blackberry	Non-native	Common
<i>Rumex acetosella</i>	Sheep Sorrel	Non-native	Common
<i>Vicia ?sativa</i>	Vetch	Non-native	Uncommon

Species name	Common name	Status	Occurrence
Pool			
<i>Cupressus</i> spp.	Cypress	Non-native	Common
<i>Eucalyptus fibrosa</i>	Red Ironbark	Native	Rare

Species name	Common name	Status	
Field			
<i>Cenchrus clandestinus</i>	Kikuyu	Non-native	Common
<i>Plantago lanceolata</i>	Lamb's Tongues	Non-native	Common
<i>Trifolium</i> spp	-	Non-native	Common

Species name	Common name	Status	Occurrence
Creekside - north			
<i>Acacia melanoxylon</i>	Mooneyang	Native	Rare
<i>Amelichloa</i> spp.	-	Non-native	Uncommon
<i>Dactylis glomerata</i>	Cocksfoot	Non-native	Common
<i>Eucalyptus blakelyi</i>	Blakely's Red Gum	Native	Rare
<i>Eucalyptus mannifera</i>	Brittle Gum	Native	Rare
<i>Eucalyptus melliodora</i>	Yellow Box	Native	Rare
<i>Grevillea juniperina</i>	-	Native	Rare
<i>Holcus lanatus</i>	Yorkshire Fog	Non-native	Common
<i>Juncus ? australis</i>	-	Native	Uncommon
<i>Leptospermum ? grandifolium</i>	Woolly Teatree	Native	Common
<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Non-native	Uncommon
<i>Medicago</i> spp.	-	Non-native	Common
<i>Phalaris aquatica</i>	Phalaris	Non-native	Uncommon
<i>Pinus</i> spp.	-	Non-native	Common
<i>Plantago lanceolata</i>	Lamb's Tongues	Non-native	Common
<i>Populus ? alba</i>	White Poplar	Non-native	Common
<i>Prunus</i> spp.	-	Non-native	Uncommon
<i>Quercus</i> spp.	Oak	Non-native	Uncommon
<i>Rubus fruticosus</i> spp. agg.	Blackberry	Non-native	Common
<i>Wahlenbergia gracilis</i>	Australian Bluebell	Native	Common

Species name	Common name	Status	Occurrence
Creek line			
<i>Juncus australis</i>	-	Native	Uncommon
<i>Typha orientalis</i>	Broadleaf Cumbungi	Native	Common

Species name	Common name	Status	Occurrence
Preschool			
<i>Bromus hordeaceus</i>	Soft Broome	Non-native	Common
<i>Cenchrus clandestinus</i>	Kikuyu	Non-native	Common
<i>Eragrostis curvula</i>	African Lovegrass	Non-native	Common
<i>Holcus lanatus</i>	Yorkshire Fog	Non-native	Uncommon
<i>Ligustrum sinense</i>	Small-leaved Privet	Non-native	Uncommon
<i>Plantago lanceolata</i>	Lamb's Tongues	Non-native	Common
<i>Quercus</i> spp.	Oak	Non-native	Rare
<i>Rubus fruticosus</i> spp. agg.	Blackberry	Non-native	Uncommon

Species name	Common name	Status	Occurrence
Western slope			
<i>Acacia dealbata</i>	Silver Wattle	Native	Common
<i>Acer palmatum</i>	Japanese Maple	Non-native	Uncommon
<i>Amyema</i> spp.	Mistletoe	Native	Rare
<i>Aristida ramosa</i>	Purple Wiregrass	Native	Uncommon
<i>Cassinia longifolia</i>	-	Native	Rare
<i>Cirsium vulgare</i>	Spear Thistle	Non-native	Uncommon
<i>Conyza bonariensis</i>	Flaxleaf Fleabane	Non-native	Common
<i>Dactylis glomerata</i>	Cocksfoot	Non-native	Uncommon
<i>Dianella longifolia</i>	Blue Flax-Lily	Native	Uncommon
<i>Eragrostis curvula</i>	African Lovegrass	Non-native	Common
<i>Eucalyptus bicostata</i>	Southern Blue Gum	Native	Rare
<i>Eucalyptus viminalis</i>	Ribbon Gum	Native	Rare
<i>Hypochaeris radicata</i>	Catsear	Non-native	Common
<i>Pinus</i> spp.	-	Non-native	Common
<i>Plantago lanceolata</i>	Lamb's Tongues	Non-native	Common
<i>Populus ? alba</i>	White Poplar	Non-native	Common
<i>Rubus fruticosus</i> spp. agg.	Blackberry	Non-native	Common

Species name	Common name	Status	Occurrence
<i>Rumex acetosella</i>	Sheep Sorrel	Non-native	Common
<i>Rytidosperma</i> spp.	-	Native	Common
<i>Stylidium graminifolium</i>	Grass Trigger Plant	Native	Rare
<i>Wahlenbergia gracilis</i>	Australian Bluebell	Native	Uncommon



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 10-Jan-2022

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar)	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	41
Listed Migratory Species:	12

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	18
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	5
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	4
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [[Resource Information](#)]

Ramsar Site Name	Proximity	Buffer Status
Banrock station wetland complex	800 - 900km upstream from Ramsar site	In feature area
Hattah-kulkyne lakes	600 - 700km upstream from Ramsar site	In feature area
Riverland	700 - 800km upstream from Ramsar site	In feature area
The coorong, and lakes alexandrina and albert wetland	800 - 900km upstream from Ramsar site	In feature area

Listed Threatened Ecological Communities [[Resource Information](#)]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Natural Temperate Grassland of the South Eastern Highlands	Critically Endangered	Community likely to occur within area	In feature area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area	In buffer area only
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area	In feature area

Listed Threatened Species [[Resource Information](#)]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.

Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
FISH			
Maccullochella macquariensis Trout Cod [26171]	Endangered	Species or species habitat may occur within area	In feature area
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area	In feature area
FROG			
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Litoria castanea Yellow-spotted Tree Frog, Yellow-spotted Bell Frog [1848]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Litoria raniformis Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat may occur within area	In buffer area only
INSECT			
Synemon plana Golden Sun Moth [25234]	Vulnerable	Species or species habitat likely to occur within area	In feature area
MAMMAL			
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area	In feature area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area	In feature area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<u>Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)</u>			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area	In feature area
<u>Potorous tridactylus tridactylus</u>			
Long-nosed Potoroo (SE Mainland) [66645]	Vulnerable	Species or species habitat may occur within area	In feature area
<u>Pteropus poliocephalus</u>			
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
PLANT			
<u>Baloskion longipes</u>			
Dense Cord-rush [68511]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
<u>Calotis glandulosa</u>			
Mauve Burr-daisy [7842]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<u>Diuris ochroma</u>			
Pale Golden Moths [64565]	Vulnerable	Species or species habitat may occur within area	In buffer area only
<u>Dodonaea procumbens</u>			
Trailing Hop-bush [12149]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<u>Eucalyptus aggregata</u>			
Black Gum [20890]	Vulnerable	Species or species habitat known to occur within area	In feature area
<u>Lepidium hyssopifolium</u>			
Basalt Pepper-cress, Peppergrass, Rubble Pepper-cress, Pepperweed [16542]	Endangered	Species or species habitat likely to occur within area	In buffer area only
<u>Leucochrysum albicans subsp. tricolor</u>			
Hoary Sunray, Grassland Paper-daisy [89104]	Endangered	Species or species habitat known to occur within area	In feature area
<u>Pomaderris pallida</u>			
Pale Pomaderris [13684]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Prasophyllum petilum Tarengo Leek Orchid [55144]	Endangered	Species or species habitat known to occur within area	In feature area
Rutidosia leptorhynchoides Button Wrinklewort [67251]	Endangered	Species or species habitat known to occur within area	In buffer area only
Senecio macrocarpus Large-fruit Fireweed, Large-fruit Groundsel [16333]	Vulnerable	Species or species habitat may occur within area	In feature area
Swainsona recta Small Purple-pea, Mountain Swainson-pea, Small Purple Pea [7580]	Endangered	Species or species habitat may occur within area	In feature area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Xerochrysum palustre Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat likely to occur within area	In feature area

REPTILE

Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Delma impar Striped Legless Lizard, Striped Snake-lizard [1649]	Vulnerable	Species or species habitat may occur within area	In feature area

Listed Migratory Species

[[Resource Information](#)]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding known to occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands

[\[Resource Information \]](#)

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name

State

Buffer Status

Communications, Information Technology and the Arts - Telstra Corporation Limited

Commonwealth Land - Australian Telecommunications Commission [12334]NSW

In feature area

Listed Marine Species

[\[Resource Information \]](#)

Scientific Name

Threatened Category

Presence Text

Buffer Status

Bird

[Actitis hypoleucos](#)

Common Sandpiper [59309]

Species or species habitat may occur within area

In feature area

[Apus pacificus](#)

Fork-tailed Swift [678]

Species or species habitat likely to occur within area overfly marine area

In feature area

[Bubulcus ibis as Ardea ibis](#)

Cattle Egret [66521]

Species or species habitat may occur within area overfly marine area

In feature area

[Calidris acuminata](#)

Sharp-tailed Sandpiper [874]

Species or species habitat may occur within area

In feature area

[Calidris ferruginea](#)

Curlew Sandpiper [856]

Critically Endangered

Species or species habitat may occur within area overfly marine area

In feature area

[Calidris melanotos](#)

Pectoral Sandpiper [858]

Species or species habitat may occur within area overfly marine area

In feature area

[Gallinago hardwickii](#)

Latham's Snipe, Japanese Snipe [863]

Species or species habitat likely to occur within area overfly marine area

In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding known to occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rostratula australis as Rostratula benghalensis (sensu lato)			
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area

Extra Information

State and Territory Reserves [\[Resource Information \]](#)

Protected Area Name	Reserve Type	State	Buffer Status
Tallaganda	National Park	NSW	In buffer area only
Tinderry	Nature Reserve	NSW	In buffer area only
Yanununbeyan	Nature Reserve	NSW	In buffer area only
Yanununbeyan	National Park	NSW	In buffer area only
Yanununbeyan	State Conservation Area	NSW	In buffer area only

Regional Forest Agreements [\[Resource Information \]](#)

Note that all areas with completed RFAs have been included.

RFA Name	State	Buffer Status
Southern RFA	New South Wales	In feature area

EPBC Act Referrals [\[Resource Information \]](#)

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Not controlled action (particular manner)				
Aerial baiting for wild dog control	2006/2713	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

APPENDIX 7
AHIMS SEARCH RESULTS

Clare Butterfield
50 Glebe Road
The Junction New South Wales 2291
Attention: Clare Butterfield
Email: cbutterfield@ramboll.com

Date: 19 November 2021

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -35.6, 149.43 - Lat, Long To : -35.58, 149.46, conducted by Clare Butterfield on 19 November 2021.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the [NSW Government Gazette \(https://www.legislation.nsw.gov.au/gazette\)](https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not to be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.