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CAPTAINS FLAT LEAD ABATEMENT PLAN – CROWN LAND EASTERN EMBANKMENT

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CONTENTS

| | |
|---|------------|
| Abbreviations | iii |
| Executive Summary | 1 |
| 1. INTRODUCTION | 3 |
| 1.1 Background | 3 |
| 1.2 Conceptual Site Model Summary | 3 |
| 1.3 Objectives | 4 |
| 2. SITE DESCRIPTION | 5 |
| 2.1 Site Identification | 5 |
| 2.2 Land Use | 5 |
| 2.3 Site Condition and Surrounding Environment | 5 |
| 3. Abatement CRITERIA | 7 |
| 4. SITE CHARACTERISATION | 8 |
| 5. ABATEMENT OPTIONS ASSESSMENT AND ABATEMENT STRATEGY | 9 |
| 5.1 Bill of Quantities for Preferred Abatement Option | 9 |
| 6. ABATEMENT WORKS PLAN | 11 |
| 6.1 Key Personnel | 11 |
| 6.2 Licenses and Approvals | 11 |
| 6.3 Community Relations | 12 |
| 6.4 Protection of Infrastructure, Heritage and Vegetation | 12 |
| 6.5 Site Establishment | 12 |
| 6.6 Management Plans | 12 |
| 6.7 Earthworks Management Plan | 13 |
| 6.8 Soil and Water Management Plan | 13 |
| 6.9 Noise Management Plan | 13 |
| 6.10 Dust Management Plan | 14 |
| 6.11 Material Tracking | 15 |
| 6.12 Survey | 15 |
| 6.13 Abatement Schedule | 15 |
| 6.14 Hours of Operation | 15 |
| 6.15 Contingency Plan | 15 |
| 6.16 Long Term Environmental Management Plan | 16 |
| 7. VALIDATION PLAN | 18 |
| 7.1 Validation Data Quality Objectives | 18 |
| 7.1.1 Step 1: State the Problem | 18 |
| 7.1.2 Step 2: Identify the Decisions | 18 |
| 7.1.3 Step 3: Identify Inputs to the Decision | 18 |
| 7.1.4 Step 4: Define the Study Boundary | 18 |
| 7.1.5 Step 5: Development of Decision Rules | 18 |
| 7.1.6 Step 6: Specify Performance Criteria | 18 |
| 7.1.7 Step 7: Optimise the Design for Obtaining Data | 21 |
| 8. CONCLUSIONS | 25 |
| 9. LIMITATIONS | 26 |
| 9.1 User Reliance | 26 |

10. REFERENCES 27

TABLE OF TABLES

| | |
|--|----|
| Table 2-1: Site Identification | 5 |
| Table 2-2: Site Condition and Surrounding Environment | 6 |
| Table 3-1: Soil Assessment Criteria (mg/kg) | 7 |
| Table 5-1: Bill of Quantities for Preferred Abatement Option | 10 |
| Table 6-1: Key Personnel roles and Responsibilities | 11 |
| Table 6-2: Remediation Schedule | 15 |
| Table 6-3: Contingency Plan | 16 |
| Table 7-1: Performance Criteria for Validation Sampling | 19 |
| Table 7-2: Validation Plan | 22 |

APPENDICES

Appendix 1

Figures

Appendix 2

Resilience and Hazards Sepp Notification Letter

ABBREVIATIONS

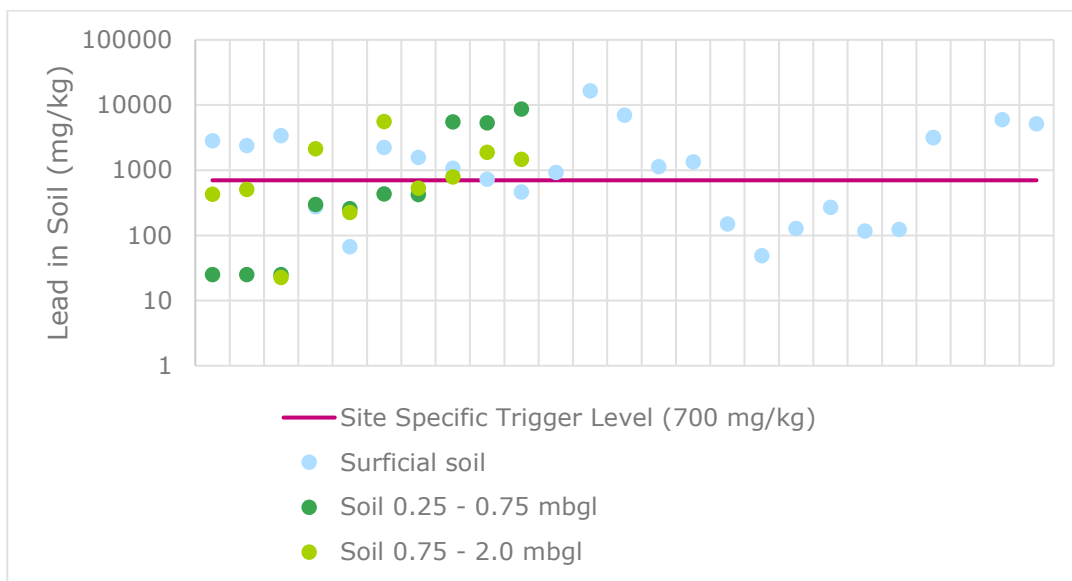
| Measures | Description |
|-----------|---|
| % | per cent |
| km | Kilometres |
| m | Metre |
| mAHD | Metres Australian Height Datum |
| mbgl | Metres below ground level |
| mg/kg | Milligrams per Kilogram |
| mg/L | Milligrams per Litre |
| ppm | Parts Per Million |
| AHD | Australian Height Datum |
| BoQ | Bill of Quantities |
| CEMP | Construction Environmental Management Plan |
| CLM Act | NSW Contaminated Land Management Act 1997 |
| COC | Chain of Custody |
| CSM | Conceptual Site Model |
| DP | Deposited Plan |
| DQI | Data Quality Indicator |
| DQO | Data Quality Objective |
| EIL | Ecological Investigation Level |
| EMP | Environmental Management Plan |
| ENM | Excavated Natural Material |
| Envirolab | Envirolab Services Pty Ltd |
| EPA | Environment Protection Authority (NSW) |
| ESL | Ecological Screening Level |
| HIL | Health Investigation Level |
| LAP | Lead Abatement Plan |
| LEP | Local Environment Plan |
| LMP | Lead Management Plan |
| LOR | Limit of Reporting |
| LTEMP | Long Term Environmental Management Plan |
| Mercury | Inorganic mercury unless noted otherwise |
| Metals | As: Arsenic, Cd: Cadmium, Cr: Chromium, Cu: Copper, Ni: Nickel, Pb: Lead, Zn: Zinc, Hg: Mercury |
| NATA | National Association of Testing Authorities |
| ND | Not Detected |
| NEPM | National Environment Protection Measure |
| NHMRC | National Health and Medical Research Council |
| NL | Non-Limiting |
| n | Number of Samples |
| pH | A measure of acidity, hydrogen ion activity |
| PQL | Practical Quantitation Limit |
| QA/QC | Quality Assurance/Quality Control |
| REF | Review of Environmental Factors |
| RPD | Relative Percent Difference |
| RRO/RRE | Resource Recovery Order/Exemption |

| Measures | Description |
|------------------------------------|---|
| SAQP | Sampling Analysis and Quality Plan |
| SEPP (Resilience and Hazards) 2021 | Former State Environmental Planning Policy 55 – Remediation of Land, Now Chapter 4 Remediation of Land in State Environmental Planning Policy (Resilience and Hazards) 2021 |
| SSTL | Site Specific Trigger Level |
| SWL | Standing Water Level |
| TCLP | Toxicity Characteristic Leaching Procedure |
| UCL | Upper Confidence Limit |
| USEPA | United States Environmental Protection Agency |
| VENM | virgin excavated natural material |
| - | On tables is "not calculated", "no criteria" or "not applicable" |

EXECUTIVE SUMMARY

Ramboll Australia Pty Ltd (Ramboll) was retained by the Department of Regional NSW (Regional NSW) to prepare this Lead Abatement Plan to address exposure risks from lead within the Crown Land – Eastern Embankment adjacent Miners Road in Captains Flat, New South Wales (NSW) (the site). The Lead Abatement Plan forms part of the Captains Flat Lead Management Plan.

Potential for human health risks from exposure to lead in soil was identified as moderate or high in seven areas of Captains Flat. Risks were generally limited to the southern part of Captains Flat and public land near the northern bank of the Molonglo River though also included Foxlow Parklet. Assessment of lead concentrations on the eastern embankment of the former Lake George mine (the Eastern Embankment) against a site-specific trigger level (SSTL) protective of human health is summarised in **Graph 1**.



Graph 1: Lead in soil at the Crown Land - Eastern Embankment

Most of the sampling was completed in surficial soils where lead concentrations above the SSTL were consistently observed. Lead above the SSTL was also observed at multiple locations from 0.25 to 2.0 metres below ground level and at multiple locations where the maximum depth of assessment was 0.25 m.

The objectives of this abatement plan are:

- To define an abatement strategy to reduce community exposure risks
- To provide a detailed design including a separable bill of quantities and relevant drawings to allow abatement to be approved and implemented
- To provide an abatement works plans to guide execution of the nominated strategy

The preferred abatement strategy includes excavation to an average depth of 0.3 metres to allow capping and reinstatement of the existing landform. The capping layer shall integrate a cellular geotechnical stabilisation product (Geoweb or similar), a VENM/ENM clay material of low permeability and landscape products appropriately certified as suitable for use at the site to facilitate revegetation with species to be nominated by Crown Lands. It is noted that a detailed civil design is required for the abatement plan. The civil design should specify final surface gradients and may support reduced excavation.

The contaminated soil will remain at a depth of at least 0.3 m below the final capped surface and remnant contamination will be managed under a long-term environmental management plan (LTEMP).

The effectiveness of remediation at mitigating exposure risks associated with site contamination in the receiving environment will be assessed through validation of the cap construction.

It is anticipated that the proposed abatement strategy will appropriately mitigate risks associated with site contamination and that the LTEMP will effectively manage risk from residual contamination.

1. INTRODUCTION

Ramboll Australia Pty Ltd (Ramboll) was retained by the Department of Regional NSW (Regional NSW) to prepare this Lead Abatement Plan to address exposure risks from lead within the Crown Land – Eastern Embankment adjacent Miners Road, Captains Flat, New South Wales (NSW) (the site).

1.1 Background

This Lead Abatement Plan forms part of the Captains Flat Lead Management Plan (LMP) and the site is located within the Captains Flat Lead Management Precinct (the Precinct). The Precinct was defined in the Conceptual Site Model (Ramboll 2022a) and encompasses 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 km downstream of the mine. The Precinct includes roads accessing Captains Flat (to a distance of at least 400 m), the rail corridor (to a distance of 1 km) and bushland areas at the perimeters of the community.

The Precinct boundary and site locality are presented on **Figure 1, Appendix 1**. A site features plan is presented as **Figure 2, Appendix 1**.

1.2 Conceptual Site Model Summary

Potential human health risks for lead in soil are considered to be **high** in the following areas:

- The Old Mine Site and rail corridor
- Public spaces south of the Molonglo River including the former preschool, Foxlow Street and the eastern embankment of the Old Mine Site
- Areas where fill appears to have been applied north of the Molonglo River including flood berms adjacent the River and embankments beneath the tennis courts as well as Foxlow Parklet

Potential human health risks for lead in soil are considered to be **moderate** in the following areas:

- The Southern Smelter Area and Keatings Collapse
- Beneath the southern playing field off Foxlow Street
- The southern end of the school playing fields including the new preschool

Potential human health risks for lead in soil are considered to be **low** in the following areas:

- In natural soil to depths of greater than five metres beneath the northern end of Foxlow Street
- In shallow soils in bushland hillside east of the Molonglo River near the southern end of town
- At several other locations in surface soils north of the Molonglo River at concentrations which marginally exceed the health investigation levels

Interim water use guidelines have been developed and define measures to mitigate risks from public water related to exposure to contaminants from historical mining at Captains Flat. The interim guidelines integrate information on current usage based on a survey completed by Regional NSW and it is anticipated they will be reviewed after mine site rehabilitation and abatement measures proposed for public lands within Captains Flat. The potential risk to human health due to environmental impacts in groundwater is relatively low based on the water use survey where no groundwater users were identified.

1.3 Objectives

This abatement plan has been prepared specifically for Crown Land – Eastern Embankment. The objectives are:

- To define an abatement strategy to reduce community exposure risks
- To provide a detailed design including a separable bill of quantities and relevant drawings to allow abatement to be approved and implemented
- To provide an abatement works plan to guide execution of the nominated strategy

Public Space abatement plans target remediation of lead in soil in areas where potential risks to human health are considered to be moderate or high however it is noted that elevated concentrations of other metals are co-located with lead and present potential risks particularly to ecology. Implementation of the abatement plan could be expected to mitigate risks from other metals and the scope of long-term monitoring in receiving environments is intended to inform evaluation of management outcomes related to ecological risk.

2. SITE DESCRIPTION

2.1 Site Identification

The site layout and locality are shown in **Figure 1, Appendix 1.**

The site details are presented in **Table 2-1.**

Table 2-1: Site Identification

| Information | Description |
|--------------------|---|
| Street Address: | Crown Land – Eastern Embankment adjacent to Miners Road Captains Flat, NSW |
| Identifier: | Part Lot 7317 DP1141049 |
| Site Area: | Approximately 1.3 Ha |
| Local Government: | Queanbeyan-Palerang Regional Council (QPRC) |
| County and Parish: | County of Murray, Parish of Ballallaba |
| Owner: | Crown Land |
| Leased by: | - |
| Site boundaries: | The site is bounded by Miners Road to the west and south, residential properties and Crown Land behind the former pre-school to the east and Crown Land to the north. |
| Current Site Use: | Public open space and recreational use. |

2.2 Land Use

The site is currently vacant and is a constructed embankment from Miner’s Road down to the township of Captains Flat.

2.3 Site Condition and Surrounding Environment

Site details observed during the site inspection during February 2021 are outlined in **Table 2-2.**

Table 2-2: Site Condition and Surrounding Environment

| Site | Description |
|---|---|
| Topography | The site comprises a moderately steep embankment sloping down west to east. |
| Conditions at Site Boundary | The site is bounded by Miners Road to the west and south, residential properties and Crown Land behind the former pre-school to the east and Crown Land to the north. |
| Visible Signs of Contamination | The site has been filled with mining waste from the operation of the lake George Legacy Mine. |
| Visible Signs of Plant Stress | During the site inspection, the site was observed to be covered in sparse vegetation consisting of shrubs and some mature trees at the toe of the embankment. Notable bare patches were observed throughout the embankment and likely due to erosion and contamination. |
| Presence of Drums, Wastes and Fill Material | The site comprises fill comprising waste rock from mining overlying the natural steep hill. No presence of other anthropogenic waste material was observed at the site. |
| Odours | No odours were noted onsite during the inspection |

3. ABATEMENT CRITERIA

Site specific trigger levels (SSTLs) protective of human health were developed for lead in soil. The bio-accessibility of lead assumed in Health Investigation Levels (HIL) generically applicable in Australia was replaced with site specific bio-accessibility determined through representative sampling and analyses of Captains Flat soils. All other parameters used in the HIL models were retained. The resulting lead in soil concentrations were adopted as SSTLs for human health risk assessment across the land use scenarios that occur in public spaces of Captains Flat. A technical note describing the development of these SSTLs is presented in the CSM report (Ramboll, 2022a). The SSTL technical note was reviewed and approved by the Captains Flat LMP Taskforce integrating the NSW EPA and NSW Department of Planning, Industry and Environment (DPIE) Contaminants and Risks Team.

The adopted abatement criteria for the site are presented in **Table 3-1**.

Table 3-1: Soil Assessment Criteria (mg/kg)

| Contaminant | Human Health SSTL (C) |
|-------------|-----------------------|
| Lead | 700 |

The 95% upper confidence limit of the arithmetic mean lead reading (as measured by fpXRF in the field) will be assessed against the criteria nominated in **Table 3-1** where the following conditions are met:

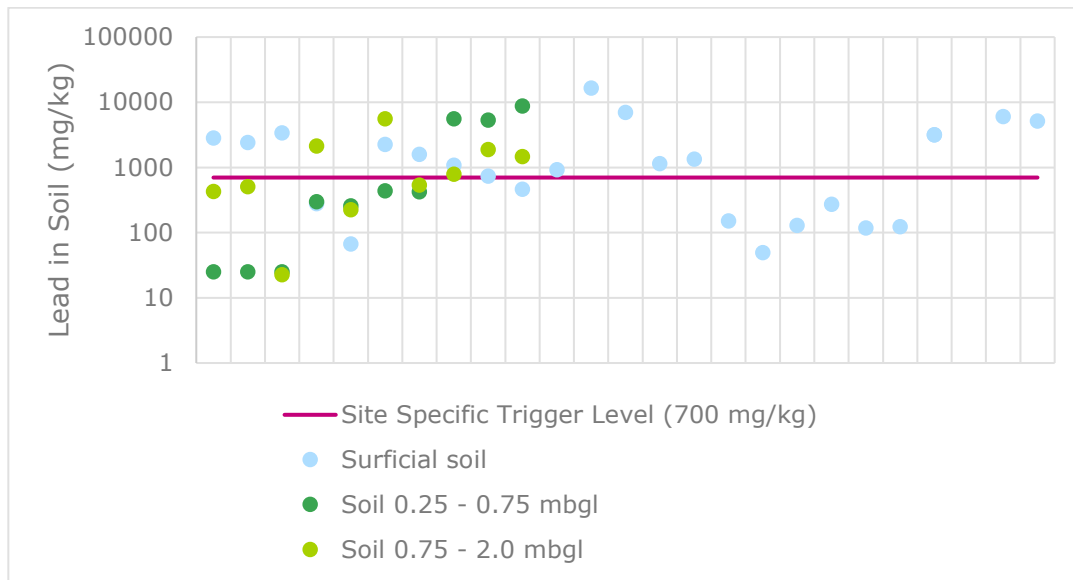
- the standard deviation of the results is less than 50% of the criteria, and
- no single value should exceed 250% of the criteria.

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

4. SITE CHARACTERISATION

Soil descriptions from the recent investigations (Ramboll, 2022a) indicate the site is underlain by fill comprising sand, clay and gravel overlying natural clay.

Assessment of lead concentrations on the eastern embankment of the former Lake George mine (the Eastern Embankment) against a SSTL protective of human health is summarised in Graph 2.



Graph 2: Lead in soil at Crown Land – Eastern Embankment

Most of the sampling was completed in surficial soils where lead concentrations above the SSTL were consistently observed. Lead above the SSTL was also observed at multiple locations from 0.25 to 2.0 m below ground level and at multiple locations where the maximum depth of assessment was 0.25 m.

The extent of lead concentrations exceeding adopted assessment criteria and requiring remediation is presented on **Figure 2, Appendix 1**.

5. ABATEMENT OPTIONS ASSESSMENT AND ABATEMENT STRATEGY

An abatement options assessment was prepared in consultation with the Captains Flat LMP Taskforce to identify preferred strategies for public spaces identified as having moderate or high potential human health exposure risks from lead in soil (Ramboll 2022).

The preferred abatement strategy for the site is to excavate upper soils for offsite disposal at either the mine site containment cell or to an appropriately licensed waste facility (subject to Principal confirmation). This will be followed by construction of surface water drainage and a stabilised cap to mitigate exposure risks of remnant contamination. A detailed design is required and will inform the depth of excavation required to achieve a stabilised final landform that integrates with surrounding topography and mitigates contaminant exposure risks. The core elements of this strategy are:

- Excavation of the upper approximately 0.3 m of soil in the Eastern Embankment and disposal to either the mine site containment cell or to an appropriately licensed waste facility (subject to Principal confirmation)
- Survey of the site prior to capping to obtain the base level for the capping layer
- 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. It is noted that a detailed civil design is required for the abatement plan. The civil design should specify final surface gradients and may support reduced excavation.
- The capping layer shall integrate a cellular geotechnical stabilisation product (Geoweb or similar), a VENM/ENM clay material of low permeability and landscape products appropriately certified as suitable for use at the site
- 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. Vegetation species are to be confirmed by Crown Lands

5.1 Bill of Quantities for Preferred Abatement Option

A bill of quantities (BoQ) for the preferred abatement option for the site was prepared and summarised in **Table 5-1**.

Table 5-1: Bill of Quantities for Preferred Abatement Option

| Description | Unit | Estimated Qty |
|---|----------------|----------------------|
| Preliminaries and Management Plans | Item | 1 |
| Mobilisation and site establishment | Item | 1 |
| Project Management | Week | 6 |
| Detailed Landform / Drainage Design | Item | 1 |
| Bench-scale trial and obtain SIA | Item | 1 |
| Loading impacted material into truck and dogs and transport to local landfill | m ³ | 6,150 |
| Earthworks and drainage to achieve design / drainage objectives | Item | 1 |
| Immobilisation of impacted material | Tonne | 11,070 |
| Disposal of immobilised material as GSW at landfill (TBC) | Tonne | 11,070 |
| Supply and placement of geofabric | m ² | 20,500 |
| Supply and install cellular confinement system (Presto 0.3m Geoweb™ or similar) | m ² | 20,500 |
| Supply and place 0.2m sub-soil layer | m ³ | 4,100 |
| Supply and place 0.1m topsoil layer | m ³ | 2,050 |
| Revegetation – species TBC by Crown Lands | m ² | 20,500 |
| Demobilisation | Item | 1 |
| Validation | Item | 1 |
| Financial Assurance | Item | 1 |

Notes:

Areas are estimates based on information provided by DRNSW checked by Ramboll through review of Spatial Information Exchange

Excavation masses estimated based on volume to mass ratio of 1 m³:1.8 tonnes.

6. ABATEMENT WORKS PLAN

6.1 Key Personnel

All site personnel have the responsibility of protecting human health and the environment. Key personnel and their roles and responsibilities are outlined in **Table 6-1**.

Table 6-1: Key Personnel roles and Responsibilities

| Personnel | Name and Contact Details | Role / Responsibility |
|---|--------------------------|---|
| Principal | Crown Lands | Responsible for implementing the lead abatement plan (LAP). |
| Principal's Environmental Representative | TBC | Personnel employed by Crown Lands or sub-contracted to Crown Lands to oversee / provide technical advice on remediation works and ensure works are completed in accordance with relevant guidelines. |
| Contractor | TBA | Company contracted to undertake remediation works. Responsible for supplying all plant and personnel to conduct the works as outlined in this LAP and as required under local, state and federal legislation. |
| Contractor's Supervisor or Project Manager | TBA | Responsible person appointed by contractor to supervise / coordinate all aspects of remedial works on behalf of the contractor. The primary point of contact for the project. |

6.2 Licenses and Approvals

As a precursor to licensing and approvals specific to remediation, Land Owner Consent (LOC) will be required as will an assessment of Native Title.

SEPP (Resilience and Hazards) 2021 defines a framework for management of contamination in NSW. It defines requirements for engagement with consent authorities and local councils according to whether remediation is considered Category 1 (requiring development consent) or Category 2 (requiring notification 30 days before remediation). Ramboll consider the long-term management of contamination associated with the Eastern Embankment to be Category 2 remediation. Category 2 remediation work is deemed remediation work that is not Category 1 remediation as described in Clause 9 of (Resilience and Hazards) 2021.

The proposed remediation works do not trigger the criteria in clause 4.8 (a) – (f) and the proposed remediation works are not ancillary to any other current development requiring Development Consent. Based upon the above information and criteria the remediation works are deemed to be Category 2 works under SEPP (Resilience and Hazards) 2021. The Notification Letter included in **Appendix 2** must be provided to QPRC a minimum of 30 days before commencement of remediation.

Abatement includes offsite chemical immobilisation 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 (where lead concentrations warrant treatment) as a precursor to disposal as GSW. This pathway would include:

- Assessment of other potential contaminants of potential concern in the projected waste streams which may affect waste classification
- 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 a suitable interim location
- 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

6.3 Community Relations

Crown Lands will manage community relations through abatement at the Eastern Embankment according to a formalised community relations plan.

6.4 Protection of Infrastructure, Heritage and Vegetation

The Contractor's methodology will include measures to ensure the protection of surrounding infrastructure, heritage and vegetation immediately surrounding the site.

The Principal will provide current service plans covering proposed areas of excavation. The Contractor will make provision for onsite location of services and measures to ensure services are not disturbed. Notification should be given to any service providers to ensure the excavation or capping does not disturb service assets.

6.5 Site Establishment

The Contractor will be responsible site establishment including:

- notification to WorkSafe NSW of lead risk work before mobilisation to site
- communication of the requirements of the LMP to all workers. This requirement must be embedded in commercial agreements with the Contractor and in Contractor management plans
- establishment of site access restrictions and ancillary provisions for site access such as traffic control
- mobilisation and management of all Contractor personnel and plant that are required

Site boundaries are presented on **Figure 2, Appendix 1**.

6.6 Management Plans

Prior to commencing works at the site management plans are required to be developed and approved by the Principal. A Construction Environment Management Plan (CEMP) has been prepared that describes minimum requirements for management of environmental impacts expected during abatement. The CEMP shall be supplemented by the contractor with sub-plans specific to the construction schedule and methodology. As a minimum sub-plans shall include those outlined in **Section 6.7 to 6.11**.

A worker health and safety plan specific to the construction methodology must also be prepared by the contractor.

Plans are to be reviewed and approved by the Principal prior to the commencement of abatement works.

6.7 Earthworks Management Plan

The contractor will prepare an earthworks management plan to describe the systems, equipment and methodologies that will be utilised to implement the abatement plan. It is anticipated that this will describe direct excavation of contaminated soils to trucks for transport to an offsite immobilisation compound. It is noted that the constrained site area and adjacency to surrounding residential properties limit capacity for stockpiling on site. At a minimum the earthworks management plan will satisfy the following requirements:

- All earthworks shall be completed in accordance with AS3798-2007
- Remnant surfaces after excavation of contaminated soils shall be finished to provide a uniform surface free of defects that may adversely affect the overlying layers
- The lower 0.2 m fill layer shall be constructed with specific regard for provisions described within AS3978-2007 Section 6.2 including compaction of fill as a systematic construction operation using plant that is specifically assigned to the compaction task and which tracks progressively across the surface of the fill. All other provisions for construction of fill described within AS3978-2007 must also be followed
- Fill material shall not contain:
 - Contaminated material harmful to the receiving environment
 - Silts or materials that adversely affect capacity to achieve compliance with AS3798-2007
 - Deleterious material that limits geotechnical or aesthetic suitability, or that is not compliance with assessment criteria for imported material described elsewhere in this abatement plan
 - Actual or potential acid sulphate soils
- Topsoil shall be spread evenly in one lift and compacted lightly so that the finished surface is smooth and free of lumpy material such as stones, wood or other vegetative matter
- Placement and establishment of vegetation shall be in accordance with Principal specifications

6.8 Soil and Water Management Plan

The Contractor will prepare a Soil and Water Management Plan to manage soil and water during the works. The Contractor must define and implement controls to prevent offsite contaminant migration above criteria protective of the receiving environment.

6.9 Noise Management Plan

The Contractor will prepare a noise management plan to manage noise during the works. The following noise control measures should be considered:

- Construction vehicles and machinery would be selected with consideration of noise emissions. Equipment should be fitted with appropriate silencers (where applicable) and be maintained in accordance with manufacturer's requirements. Machines found to produce excessive noise compared to typical noise levels should be removed and replaced or repaired or modified prior to recommencing works
- Where possible construction vehicles and machinery would be turned off or throttled down when not in use
- All site personnel would be informed of their obligations to minimise potential noise impacts on residents during the site induction and need to take reasonable and practical measures to minimise noise
- Hours of operation described in **Section 6.14** must be observed

6.10 Dust Management Plan

The Contractor will prepare a dust management plan to manage dust during the works. The Contractor must define and implement dust controls to prevent offsite contaminant migration above criteria protective of the receiving environment. Controls will prevent offsite migration of dust. The following dust control measures should be considered:

- Regularly water vehicle routes and work areas with a watercart
- Maintain and sweep roads where deposited dust or spillage is visible
- Avoid unnecessary use of and access to unsealed surfaces
- Limit vehicle and mobile plant speeds within the work area e.g. 10 km/h
- Modify or cease operations during adverse meteorological or dust generating conditions
- Consider use of wind breaks or shielding around material and/or stockpiles
- Maintain stockpiles at defined height, where the lowest practicable height is preferable
- Avoid double-handling of material and optimise transfers to limit time stockpiled or handled
- Visually observe dust levels to adapt operations
- Cover all loads when transporting material
- Identify and allocate sufficient resources to manage dust risks
- Facilitate training and tool-box-talks addressing air quality management objectives, hazards, risks, controls, behaviours and consequences for inappropriate behaviour

The Dust Management Plan should include onsite air quality monitoring specific to the Contractor's methodology. There is no available method to measure deposited dust or lead in TSP in real-time so monitoring will include sampling of airborne dust at the site boundaries. The monitoring equipment should be capable of measuring TSP, PM₁₀ and PM_{2.5} continuously. The equipment should be capable of alerting to trigger values through telemetry and software that allows alerting at averaged set-points to email and/or SMS. The instrumentation should be maintained in accordance with the manufacturers specifications and hold a current factory calibration certificate.

A three-level air quality alert system is proposed. The trigger levels should be based on real-time monitoring from the Precinct collected prior to abatement. The alert values should be based on the 98%, 99.9% and 100% percentile of the 15-minute averages of measurements over a minimum 12-month period. These values are considered appropriate when considering what is acceptable in the community, the low airborne lead measured in absence of abatement and when considered against the air quality criteria at longer averaging periods. Trigger values should be reviewed following the first month of data and potentially revised with consideration of the air quality criteria, monitoring technique and positioning of monitors:

- Alert Level:
 - Elevated levels of dust measured for one 15-minute averaging period.
 - Initial trigger values set at 98 percentile 15-minute average
 - Observe the operation to identify dust generating activities. Consider further action to minimise dust generation or continue to observe closely.
- Action Level 1:
 - Elevated levels of dust measured for two consecutive 15-minute averaging periods.
 - Initial trigger values set at 99.9 percentile 15-minute average
 - Immediately action additional dust mitigation measures and communicate requirement to reduce dust levels to all operational staff
- Action Level 2:
 - Elevated levels of dust measured for three consecutive 15-minute averaging periods.
 - Initial trigger values set at 100 percentile 15-minute average
 - Cease operation and prioritise dust mitigation measures. Operation can recommence once subsequent alert levels are at Action Level 1 or below.

The Dust Management Plan is to consider historical activities completed in the Captains Flat area and the sensitivities of neighbouring properties to impacts from dust.

6.11 Material Tracking

All material handled during excavation of lead impacted materials is to be tracked to verify appropriate movement and handling. The system will track materials from cradle-to-grave, and will provide detailed information on the origin, quantity and fate of all materials excavated during abatement. Records will be maintained by Contractor site personnel defining chainage of origin, material types loaded, and material fate.

Material will be disposed of offsite at either mine containment cell or to an appropriately licensed waste facility.

6.12 Survey

The Contractor will co-ordinate survey to ensure all capped areas and remnant contamination is accurately defined.

This survey forms part of the validation requirements described in **Table 7-2**.

6.13 Abatement Schedule

The final remediation schedule will be discussed with the Contractor. A proposed indicative schedule up to the completion of a draft validation report is outlined in **Table 6-2**.

Table 6-2: Remediation Schedule

| Task | Estimated Duration |
|--|--------------------|
| Planning, engagement of Remediation Contractor and receiving facility | 12 – 24 weeks |
| Establishment of Site | 1 week |
| Excavation, capping and revegetation | 4 – 6 weeks |
| Total Duration | 17 – 31 weeks |

6.14 Hours of Operation

The Remediation Contractor shall only undertake works associated with validation works that may generate an audible noise at the closest residential receptors (19 and 27-47 Foxlow Street) during the following hours, unless under direction from relevant authority for safety reasons or in the event of an emergency:

- 7:00 am to 6:00 pm Monday to Friday
- 8:00 am to 6:00 pm Saturdays
- At no time on Sundays or public holidays

6.15 Contingency Plan

The contingencies presented in **Table 6-3** are to be implemented where unexpected site conditions or circumstances occur.

Table 6-3: Contingency Plan

| Contingency Event | Contingency Action | Personnel Responsible |
|---|---|---|
| Receival of a dust complaint | <p>Stop Work</p> <p>Identify dust source and review control measures.</p> <p>Assess requirements for additional monitoring or investigation of impact.</p> <p>Review trigger alert system to determine if unacceptable impact measured at site boundary.</p> | <p>Contractor responsible for receiving complaint and informing Principal and Principal’s Environmental Representative. Contractor responsible for stop work and review working environment.</p> <p>Principal and Principal’s Environmental Representative responsible for responding to complaint.</p> <p>This will be completed in accordance with the Community Relations Plan</p> |
| Exceedance of dust trigger levels (defined in Section 6.9) | <p>Alert level trigger received – observe the operation to identify dust generating activities. Consider further action to minimise dust generation or continue to observe closely.</p> <p>Action Level 1 – Immediately action additional dust mitigation measures and communicate requirement to reduce dust levels to all operational staff.</p> <p>Action Level 2 - Cease operation and prioritise dust mitigation measures. Operation can recommence once subsequent alert levels are at Action Level 1 or below.</p> | <p>Contractor responsible for receiving complaint and informing Principal and Principal’s Environmental Representative. Contractor responsible for stop work and review working environment.</p> <p>Principal and Principal’s Environmental Representative responsible for responding to complaint.</p> <p>This will be completed in accordance with the Community Relations Plan</p> |
| Discovery of unexpected materials | <p>Contact the Principal’s representative, sort materials into a segregated stockpile and discuss possible disposal options with the Principal or the Principal’s Representative</p> | <p>Principal, following notification from the Contractor.</p> |
| Receival of a noise complaint | <p>Identify noise source and implement noise control measures</p> | <p>Contractor responsible for receiving complaint and informing Principal and Principal’s Environmental Representative. Contractor responsible for stop work and review working environment.</p> <p>Principal and Principal’s Environmental Representative responsible for responding to complaint.</p> <p>This will be completed in accordance with the Community Relations Plan</p> |

6.16 Long Term Environmental Management Plan

A Long-Term Environmental Management Plan (LTEMP) will be required to provide guidance for ongoing maintenance of remnant contamination. The LTEMP will include survey of landform prior and post capping. A legal requirement to implement the LTEMP should be defined through a covenant to the land title.

The report should include the following headings as a minimum:

- Title
- Purpose
- Background
- Description of existing/residual contamination
- Management activities
- Inspection, maintenance, environmental sampling, analysis and reporting
- Monitor and review of environmental management plan
- Communications and notifications

7. VALIDATION PLAN

The following validation Sampling and Analysis Quality plan (SAQP) is to be implemented to validate that the remedial objective has been achieved for the site.

7.1 Validation Data Quality Objectives

Specific Data Quality Objectives (DQOs) have been developed for the validation of field and analytical data obtained during the remediation. The DQO process is a systemic, seven step process that defines the criteria that the validation sampling should satisfy in accordance with the requirements of NSW EPA (2017) *Guidelines for the NSW Site Auditor Scheme* (3rd Edition). The DQOs are as follows:

7.1.1 Step 1: State the Problem

Lead impacted soil exists at the site. Remediation is required to mitigate potential exposure risks into the future and validation is required to demonstrate that abatement works have been successfully completed.

7.1.2 Step 2: Identify the Decisions

The validation SAQP is to ensure that abatement of the site occurs such that remnant lead concentrations are isolated from the potential future receptors. The decisions that are required to address the problem include:

- Has the contamination been isolated such that it doesn't present an exposure risk to current and future occupants of the site?

7.1.3 Step 3: Identify Inputs to the Decision

The following inputs into the decision-making process are required:

- Validation sampling of capping material to confirm suitability for placement onsite
- Survey of final landform to define contaminated soils remaining onsite

7.1.4 Step 4: Define the Study Boundary

The study boundary includes the Crown Land – Eastern Embankment adjacent to Miners Road, Captains Flat, NSW as defined in **Figure 1**.

7.1.5 Step 5: Development of Decision Rules

Data will be considered reliable if it satisfies the limits of decision error defined in **Section 7.1.6**.

Potential for offsite contaminant migration after remediation will be considered to be satisfactorily low if the required capping thickness is achieved and the capping material meets the definition of VENM/ENM or another RRO.

Environmental monitoring during construction including the dust monitoring program will assess the effectiveness of the strategies to reduce contaminant migration from the site.

7.1.6 Step 6: Specify Performance Criteria

Validation performance criteria are defined to assess potential for a false positive or false negative in validation data. Performance criteria for laboratory analyses of soil and airborne dust are presented in **Table 7-1** below.

Table 7-1: Performance Criteria for Validation Sampling

| Category | Performance Criteria | |
|---|--|--|
| | Soil XRF Sampling | Sampling of Capping Material |
| <p>Accuracy: Accuracy in the collection of field data will be controlled by:</p> | <p>Appropriate sampling methodologies will be utilised and complied with. Works to be completed in accordance with US EPA 2007, <i>Method 6200, Field Portable X-Ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment</i>. These will include:</p> <ul style="list-style-type: none"> • Daily system checks and internal calibration as recommended by the instrument manual. • Measurement of blank reference material (silicon dioxide, SiO₂) – this will be done at the start of the day and repeated every 10 samples. This will mitigate potential inaccuracies associated with cross-contamination of samples. The analyser window will also be cleaned regularly to prevent cross-contamination. • Certified reference materials will be measured to check instrument response and calibration. This will be conducted every 20 samples. <p>Adopting a dwell time appropriate for measurement of contaminants of potential concern (CoPC).. A dwell of 60 seconds is considered to provide sufficient precision for the sampling program.</p> | <p>Soil sampling for laboratory analyses will occur in general accordance with <i>AS 4482.1-2005 Guide to the investigation and sampling of sites with potentially contaminated soil - Non-volatile and semi-volatile compounds</i> and <i>AS 1141.3.1 – 2012 Methods for Sampling and Testing Aggregates, Method 3.1: Sampling – Aggregates</i></p> |
| <p>Precision: The degree to which data generated from replicate or repetitive measurements differ from one another due to random errors. Precision of field data will be maintained by:</p> | <ul style="list-style-type: none"> • XRF readings will be collected by an experienced scientist holding a NSW EPA radiation users license as required for field based XRF testing • XRF readings will be collected from soil in-situ and measurements will be taken by placing the XRF directly on the ground surface. • The soil surface to be measured will be cleared of debris and grass prior to taking the measurement to ensure that there is no obstruction, that the analyser window is protected and that contact with the sample surface is maintained during measurements. • As moisture is known to affect measured concentrations, visually dry surfaces will be chosen for measurement. • Soil sampling for confirmatory laboratory analyses will occur at a frequency of 5% covering the observed distribution of concentrations in general accordance with <i>AS 4482.1-2005 Guide to</i> | <p>In the field, precision will be maintained by:</p> <ul style="list-style-type: none"> • Using standard operating procedures for the collection of soil samples. • Collection of soil samples by suitably experienced environmental scientists. • Use of disposable nitrile rubber gloves between sampling locations. • Placement of samples directly into designated single use sampling containers. • Collection of intra-laboratory and inter-laboratory duplicate samples at a rate of 1 in 20 primary samples. • Collection of one rinsate sample on reusable sampling equipment at the end of each day. • Recording of sample identification and analytical requirements on chain of custody documents. |

| Category | Performance Criteria | |
|--|--|---|
| | <p style="text-align: center;">Soil XRF Sampling</p> | <p style="text-align: center;">Sampling of Capping Material</p> |
| | <p>the investigation and sampling of sites with potentially contaminated soil - Non-volatile and semi-volatile compounds. This will include:</p> <ul style="list-style-type: none"> ○ Collection of samples by a suitably experienced environmental scientist ○ Use of disposable nitrile rubber gloves between locations ○ Soil samples will be placed immediately into laboratory supplied and appropriately preserved sampling vessels. <ul style="list-style-type: none"> • Sample numbers, preservation and analytical requirements are to be recorded on chain of custody documents. | <ul style="list-style-type: none"> • Samples transported to the laboratory under chain of custody conditions to a laboratory with NATA accreditation for the analytical methods prescribed. <p>In the laboratory, precision will be assessed using blind duplicate samples and split duplicates.</p> |
| <p>Completeness: The completeness of the data set shall be judged by:</p> | <ul style="list-style-type: none"> • All locations sampled as outlined in Section 7.1.7. • Sampling completed by experienced personnel • Field documentation completed correctly | <ul style="list-style-type: none"> • All locations sampled as outlined in Section 7.1.7. • Sampling completed by experienced personnel • Field documentation completed correctly |
| <p>Representativeness: The representativeness of the field data will be judged by:</p> | <ul style="list-style-type: none"> • Non-disposable sampling equipment, such as the hand auger, will be thoroughly decontaminated between locations using Decon 90 solution and deionised rinsate water. • At each location, a pair of disposable nitrile gloves will be worn while sampling and handling the sample; gloves will be replaced between each successive sample. • Soil analytical samples will be collected directly into the sampling vessels. | <ul style="list-style-type: none"> • Non-disposable sampling equipment, such as the hand auger, will be thoroughly decontaminated between locations using Decon@90 solution and deionised rinsate water. • At each location, a pair of disposable nitrile gloves will be worn while sampling and handling the sample; gloves will be replaced between each successive sample. • Soil analytical samples will be collected directly into the sampling containers. |
| <p>Comparability: Comparability to existing field data will be maintained by:</p> | <ul style="list-style-type: none"> • Use of the same appropriate sampling methodologies • Same sampling depths will be used (i.e.: 0-0.05 mbgl) • Analytical samples will be collected for submission to the laboratory to establish a correlation between fpXRF and laboratory results • Photographs will be taken of sampling location conditions at the time of sampling. | <ul style="list-style-type: none"> • Use of the same appropriate sampling methodologies • Same sampling depths will be used (where practical) • Analytical samples will be collected for submission to the laboratory • Photographs will be taken of sampling location conditions at the time of sampling. |

Performance criteria for analyses of soil duplicates are defined as follows:

- Data will be analysed adopting RPD control limits of +/- 30%. Where concentration levels are less than two times the Practical Quantitation Limit (PQL), the Absolute Difference (AD) shall be calculated. Data will be considered acceptable if: $AD < 2.5 \times PQL$. Any data which does not conform to these acceptance criteria will be examined for determination of suitability
- Blank samples will be submitted with the analytical samples and analysed for the contaminants of concern: One Field Blank will be collected each day

The laboratory will additionally undertake a method blank with each analytical batch of samples. Laboratory method blank analyses are to be below the PQLs. Positive results may be acceptable if sample analyte concentrations are significantly greater than the amount reported in the blank (ten times for laboratory reagents such as methylene chloride, chloroform, and acetone etc., and five times for all other analytes). Alternatively, the laboratory PQL may be raised to accommodate blank anomalies provided that regulatory guidelines are not compromised by any adjustment made to the PQL.

Decision Error Protocol

If the data received is not in accordance with the defined acceptable limits outlined in Steps 5 and 6, it may be considered to be an estimate or be rejected. Determination of whether this data may be used or if re-sampling is required will be based on the following considerations:

- Closeness of the result to the site-specific trigger levels
- Specific contaminant of concern (e.g. response to carcinogens may be more conservative)
- The area of site and the potential lateral and vertical extent of questionable information
- Whether the uncertainty can be effectively incorporated into site management controls

Rectifying Non-conformances

If any of the validation procedures or criteria identified are not followed or met, this will constitute a non-conformance. The significance of the non-conformance will determine if rectification is required and should be assessed by the Landowner's Environmental Representative.

7.1.7 Step 7: Optimise the Design for Obtaining Data

All validation samples are to be collected in accordance with the DQOs outlined in this Section.

Validation samples, frequency of collection, the analysis required, and justification is presented in **Table 7-2**.

Table 7-2: Validation Plan

| Validation Method | Validation Requirements | Measurement / Analyses |
|---|--|--|
| Validation of extent of capping | <p>A fpXRF will be used onsite to measure lead concentrations on the surface at the site and determine the area required to be capped. fpXRF measurements shall be collected from excavation faces at a rate of 1 / 100 m².</p> <p>Where surfaces are visibly wet samples will be collected and submitted for laboratory analyses instead of fpXRF.</p> | <p>fpXRF measurements in surface soils.</p> <p>Laboratory analyses of 5% fpXRF measurements for QA/QC purposes.</p> |
| Validation of soils immobilised offsite for offsite disposal | <p>Immobilised soils will be considered suitable for disposal as immobilised GSW if the 95% UCL of lead leachate (TCLP) is less than the limit for lead leachate in GSW defined in the NSW EPA Waste Classification Guidelines (TCLP1 – 5 mg/L).</p> <p>Validation sampling of immobilised soil stockpiles will be completed by the Principal’s environmental representative.</p> <p>Sampling will occur to achieve a density of 1/25 m³ with a minimum of three samples.</p> | <p>Laboratory analyses of immobilised soils for total lead and immobilised fines for lead leachate (TCLP).</p> |
| Validation of capping/backfill material | <p>Capping/backfill material will be considered suitable if it meets the definition of VENM or ENM or an RRO/RRE.</p> <p>Samples should be tested at a frequency of 1 sample per 25 m³ or in accordance with the relevant RRO.</p> | <p>Certification of the suitability of backfill materials for proposed use (eg: VENM/ENM or similar for topsoil certifying compliance with the NSW EPA Resource Recovery framework described in the POEO (Waste) Regulation).</p> <p>Laboratory analyses of capping/backfill material for COPC including those specified in the ENM Order or other resource recovery order or at a minimum TRH, BTEXN, PAH, OCP, OPP, heavy metals and asbestos as well as any other potential contaminants of concern from the materials origin site.</p> |

| Validation Method | Validation Requirements | Measurement / Analyses |
|--------------------------------|--|--|
| Validation of cap construction | Cap construction including preparation of remnant soils after excavation will be considered suitable if compliant with all relevant provisions under AS3978-2007 | Contractor records demonstrating compliance with earthworks specifications. The Contractor must provide as built drawings demonstrating cap construction in accordance with all specifications defined in this plan. |

7.1.7.1 Validation Reporting

A validation report will be prepared in general accordance with the relevant sections of NSW EPA (2020) *Contaminated Land Guidelines: Guidelines for Consultants Reporting on Contaminated Land* and the NSW EPA (2017) *Guidelines for the NSW Site Auditor Scheme (3rd Edition)*. The Validation Report will include:

- Executive summary
- Scope of work
- Site Description
- Summary of site history and previous investigations
- Remediation activities undertaken, including the extent of the excavation works (survey information) and observations made during excavation works
- Supporting factual evidence of the abatement work including photographic and field records and materials tracking data
- Validation sampling and analysis results
- Quality assurance/ quality control (QA/QC) protocols for field work and laboratory analysis and
- A statement indicating the adequacy of the abatement completed, degree to which lead impacts have been removed and if / where impacts remain

7.1.7.2 Long Term Environmental Management Plan

A long term EMP will be prepared to define the location of remnant contamination and management measures required to mitigate risks associated with future disturbance of these areas. The Long Term EMP will be prepared in accordance with NSW EPA (2020) *Contaminated Land Guidelines: Consultants Reporting on Contaminated Land – Contaminated Land Guidelines* and will include:

- Purpose
- Background
- Definition of remnant contamination integrating survey data presented on site plans
- Management activities
- Monitoring and inspection requirements
- Triggers for review of the LTEMP
- Mechanism for enforceability

Site Auditor is to prepare a Site Audit Report and Site Audit Statement for all remediation and validation works.

8. CONCLUSIONS

The preferred abatement strategy includes excavation of the cap thickness and capping the site to minimise exposure to future users of the land and further erosion to the embankment.

The contaminated soil will remain at a depth of at least 0.3 m below the final capped surface and remnant contamination will be managed under a LTEMP. It is noted that a detailed civil design is required for the abatement plan. The civil design should specify final surface gradients and may support reduced excavation.

The effectiveness of remediation at mitigating exposure risks associated with site contamination in the receiving environment will be assessed through validation of the cap construction.

It is anticipated that the proposed abatement strategy will appropriately mitigate risks associated with site contamination and that the LTEMP will effectively manage risk from residual contamination.

9. LIMITATIONS

Ramboll Australia Pty Ltd (Ramboll) prepared this report in accordance with the scope of work as outlined in our proposal to Department of Regional NSW and in accordance with our understanding and interpretation of current regulatory standards.

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.

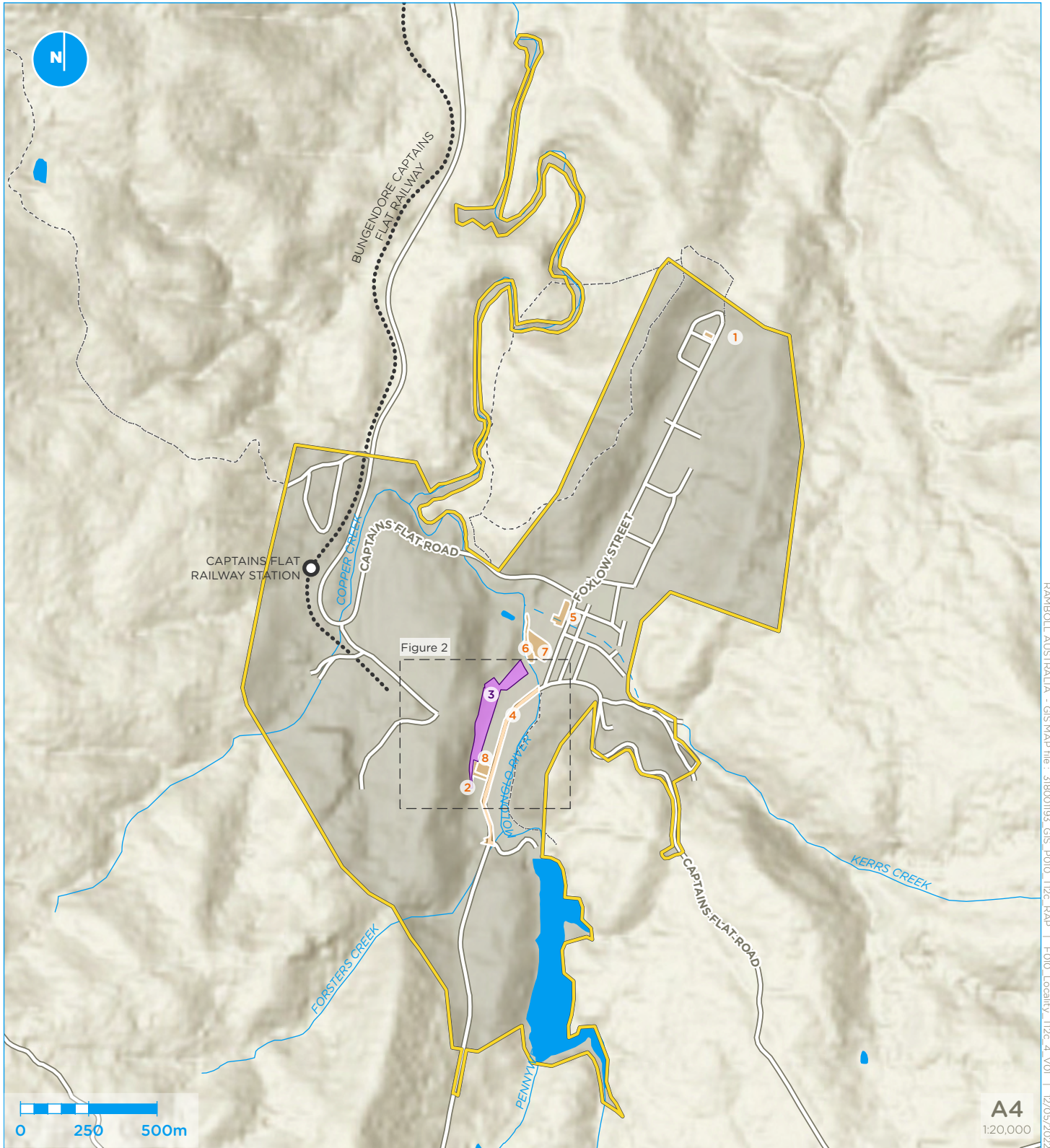
9.1 User Reliance

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

10. REFERENCES

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APPENDIX 1 FIGURES



Esri, Geoscience Australia, NASA, NGA, USGS, Esri, HERE, Garmin, FAO, NOAA, USGS, Esri, USGS

RAMBOLL AUSTRALIA - GISMAP file : 31800193_GIS_P010_T12c_RAP | F010_Locality_T12c_A_V01 | 12/05/2022

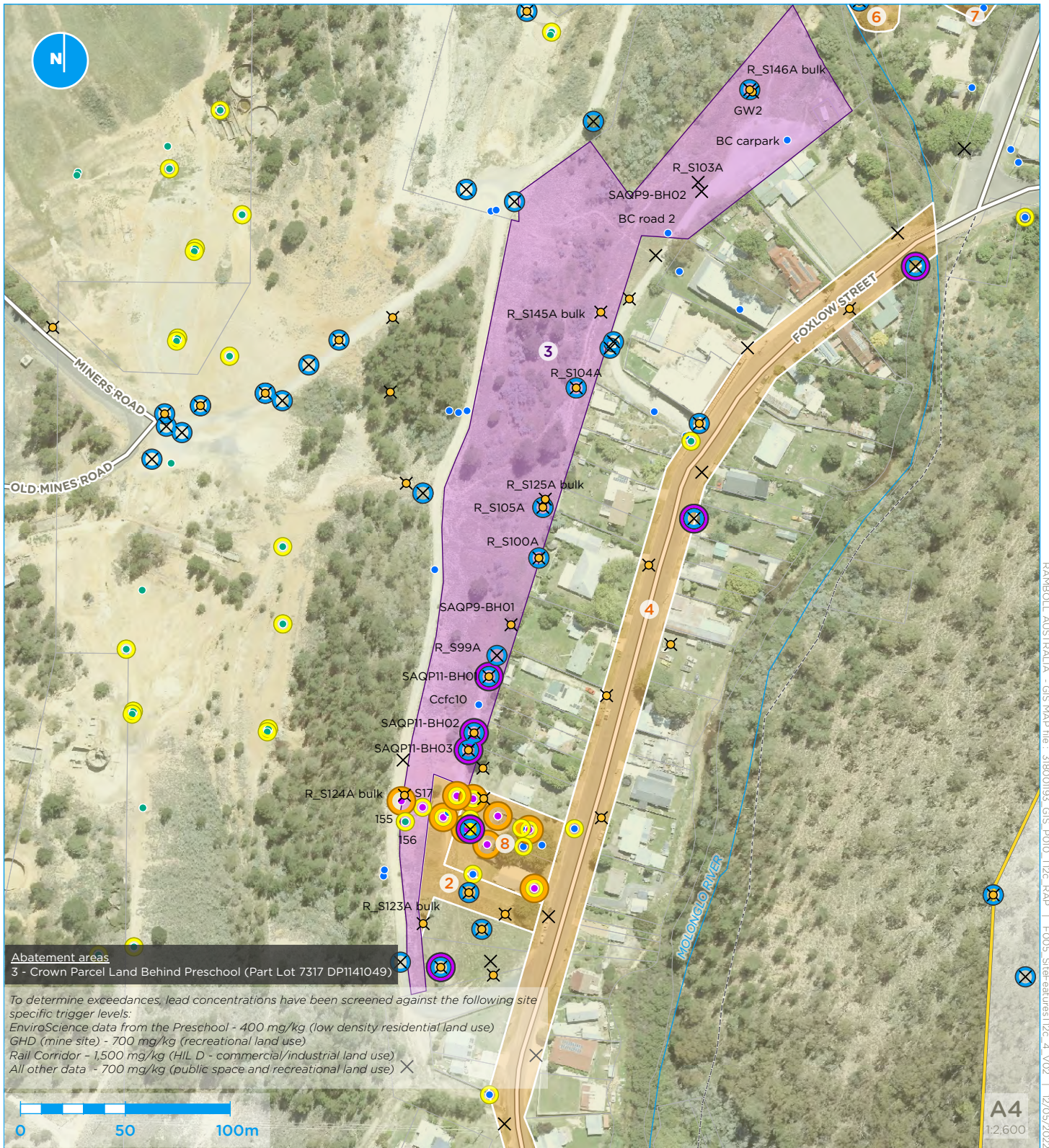
Legend

- Precinct boundary
- Crown Land (Eastern Embankment)
- Abatement areas



Figure 1 : Site location

Captains Flat Lead Management Plan - Lead Abatement Plan - Crown Land (Eastern Embankment)



Legend

- | | | | | | |
|--|---------------------------------|--|--------------------------|--|--------------------------|
| | Crown Land (Eastern Embankment) | | Samples (Ramboll 2021) | | Previous soil samples |
| | Abatement areas | | Soil sample | | EnviroScience (2021) |
| | | | Lead exceedance at depth | | GHD (2017) |
| | | | Surface (<0.05 m) | | EPA |
| | | | 0.05 m-0.5 m | | Lead exceedance at depth |
| | | | >0.5 m | | Surface |
| | | | | | 0.4-0.5 m |

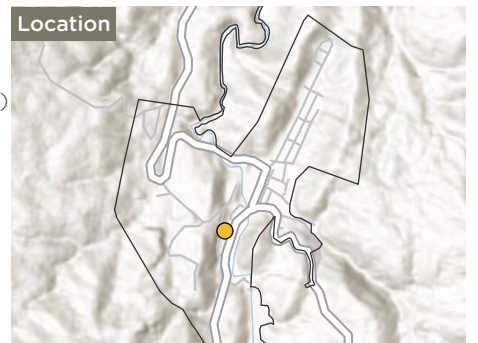


Figure 2 : Site features plan

Captains Flat Lead Management Plan - Lead Abatement Plan - Crown Land (Eastern Embankment)

APPENDIX 2 RESILIENCE AND HAZARDS SEPP NOTIFICATION LETTER

Queanbeyan-Palerang Regional Council
PO Box 90
Queanbeyan NSW 2620
Attention: The General Manager

Date XX/XX/XXXX

EASTERN EMBANKMENT OF THE FORMER LAKE GEORGE MINE NOTIFICATION OF CATEGORY 2 REMEDIATION WORKS

INTRODUCTION

Ramboll Australia Pty Ltd (Ramboll) was retained by Department of Regional NSW (DRNSW) on behalf of the landowner to prepare a Lead Abatement Plan (LAP) for contamination identified at the eastern embankment of the former Lake George mine at Captains Flat. This area is presented on **Figure 1**, **Appendix 1** and is here-in referred to as the site.

Queanbeyan-Palerang Regional Council (QPRC) respectfully notify QPRC of planned Category 2 remediation works, as defined by *State Environmental Planning Policy (Resilience and Hazards) 2021* that will occur at the site.

REMEDIATION WORK

The preferred remedial strategy comprises recontouring application of a clean cap across the site to mitigate contaminant exposure risks.

CATEGORY 2 REMEDIATION WORKS

This project is deemed to be Category 2 remediation work in accordance with the Resilience and Hazards SEPP. Category 2 remediation work is deemed remediation work that is not Category 1 remediation as described in Clause 4.8 of the Resilience and Hazards SEPP. The triggers for Category 1 remediation work are evaluated in **Table 1**.

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Table 1: Evaluation of Category 1 Triggers

| Clause 4.8 Trigger | Evaluation |
|---|---|
| <p>a) Designated development</p> | <p>The project is not designated development. Schedule 3 Clause 15 of the <i>Environmental Planning and Assessment Regulation 2000</i> describes conditions under which contaminated soil treatment works are deemed designated development. Of specific relevance to this project:</p> <ul style="list-style-type: none"> • The volume of contaminated material falls below 30,000m³ (estimated at < 1000m³) <p>The area of contaminated soil to be disturbed is less than 3 hectares.</p> |
| <p>b) carried out or to be carried out on land declared to be a critical habitat, or</p> | <p>The project would not be carried out on land declared to be a critical habitat.</p> |
| <p>c) likely to have a significant effect on a critical habitat or a threatened species, population or ecological community, or</p> | <p>The site is used as flood berms and playing fields and is void of any native vegetation or wildlife. It will not require disturbance of critical habitat or a threatened species, population or ecological community.</p> |
| <p>d) development for which another State environmental planning policy or a regional environmental plan requires development consent, or</p> | <p>No State Environmental Planning Policy or Regional Environmental Plan identifies the proposed remediation as an activity requiring development consent.</p> |
| <p>e) carried out or to be carried out in an area or zone to which any classifications to the following effect apply under an environmental planning instrument:</p> <ul style="list-style-type: none"> (i) coastal protection, (ii) conservation or heritage conservation, (iii) habitat area, habitat protection area, habitat or wildlife corridor, (iv) environment protection, (v) escarpment, escarpment protection or escarpment preservation, (vi) floodway, (vii) littoral rainforest, (viii) nature reserve, (ix) scenic area or scenic protection, (x) wetland, or | <p>The project is located on land zoned RE1 Public Recreation under the <i>Queanbeyan Local Environment Plan 2012</i>. No other environmental planning instrument prescribes the project site as one of the areas listed in point (e).</p> |
| <p>f) carried out or to be carried out on any land in a manner that does not comply with a policy made under the contaminated land planning guidelines by the council for any local government area in which the land is situated (or if the land is within the unincorporated area, the Western Lands Commissioner).</p> | <p>The <i>Queanbeyan Development Control Plan 2012</i> includes guidance that applies to Contaminated Land. The proposed remediation complies with the guidance.</p> |

The proposed remediation works do not trigger the criteria in clause 4.8 (a) – (f) as outlined in **Table 1**, and the proposed remediation works are not ancillary to any other current development requiring Development Consent. Based upon the above information and criteria the remediation works are deemed to be Category 2 works under the Resilience and Hazards SEPP.

It is anticipated that remediation of the activities associated with Lead Abatement at the eastern embankment of the former Lake George mine would commence in late and be completed

Yours sincerely