



Sydney Metro West Eastern Creek Precast Facilities

Review of Environmental Factors

Volume 2 Technical Appendices B - F

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Appendix B

Preliminary Contaminated Site Investigation



Sydney Metro West Eastern Creek Precast Facilities

Preliminary contaminated site investigation

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Sydney Metro

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Sydney Metro West Eastern Creek Precast Facilities

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Appendix A. Lotsearch Report

Appendix B. Site Photographs

Executive Summary

Jacobs has undertaken a preliminary contaminated site investigation (PCSI) of the proposed precast facility sites located at Lenore Drive, Eastern Creek NSW (the proposal site) as part of key deliverables and scope to inform a Review of Environmental Factors (REF).

The PCSI has included a review of desktop information, a site walkover inspection, an assessment of potential areas and sources of on-site and off-site contamination, an assessment of the potential impacts to human health and the environment from exposure to contamination during construction / operation of the proposal site, potential mitigation / management measures, and recommendations for further works where necessary.

The findings of the PCSI have identified a moderate potential for on-site contamination (soil) as a result of historic filling activities, the former use of the proposal site (agricultural land use), potential for contaminated sediments within farm dams and the presence of fly tipped wastes.

On-site soil and groundwater contamination if exposed during construction activities and operation of the proposal site could impact upon human health and environmental receptors if appropriate management / remediation measures are not adopted in response to contamination risks.

To quantify the potential contamination impacts identified, the following mitigation measures would be implemented:

- For areas that have been identified as having moderate contamination impact potential, a further review of data would be performed
- Where data from the additional data review is insufficient to understand the impact of contamination, a Detailed Site Investigation would be carried out in accordance with the NEPM (2013) and other guidelines made or endorsed by the NSW EPA.

1. Introduction

1.1 Sydney Metro West Eastern Creek Precast Facilities

Sydney Metro propose to establish two precast facilities (the proposal) to support the construction of the proposed Sydney Metro West. The precast facilities which are the subject of this proposal would manufacture precast concrete segments for the purpose of lining the Sydney Metro West tunnels. A Review of Environmental Factors (REF) has been prepared for the proposal seeking approval under Part 5 of the Environmental Planning and Assessment 1979 (EP&A Act).

The proposal would comprise the following key features and activities:

- Site establishment at the proposal site at Eastern Creek including vegetation clearing, remediation, and earthworks
- The establishment and operation of two separate adjacent precast facilities on the proposal site, the northern and southern precast facilities. Each precast facility would include:
 - A precast yard including a shed for construction of precast concrete segments and storage laydown areas
 - Boiler, aggregate bins and consumables
 - Office facilities
 - On-site parking for up to 60 light vehicles
- Internal roads with entrances to each facility from the Western Access Road located between the northern and southern precast facilities (external roads would be subject to separate approvals)
- Ancillary supporting infrastructure, including utilities installation (power, water, sewerage, gas and communications), lighting, signage and landscaping.

The northern and southern precast facilities would operate concurrently, 24 hours a day, seven days a week for the majority of the lifespan of the project.

The proposed layout of the proposal is provided in Figure 1-1.

The future use of the site beyond the operation of the proposal would be determined by Sydney Metro and would be subject to separate approvals, as required. If no future use of the site is proposed at that time, the site would be placed into care and maintenance.

The proposal does not include the construction of the surrounding road network (upgrade and extension of Archbold Road), which would be undertaken by Transport for NSW under separate approval.

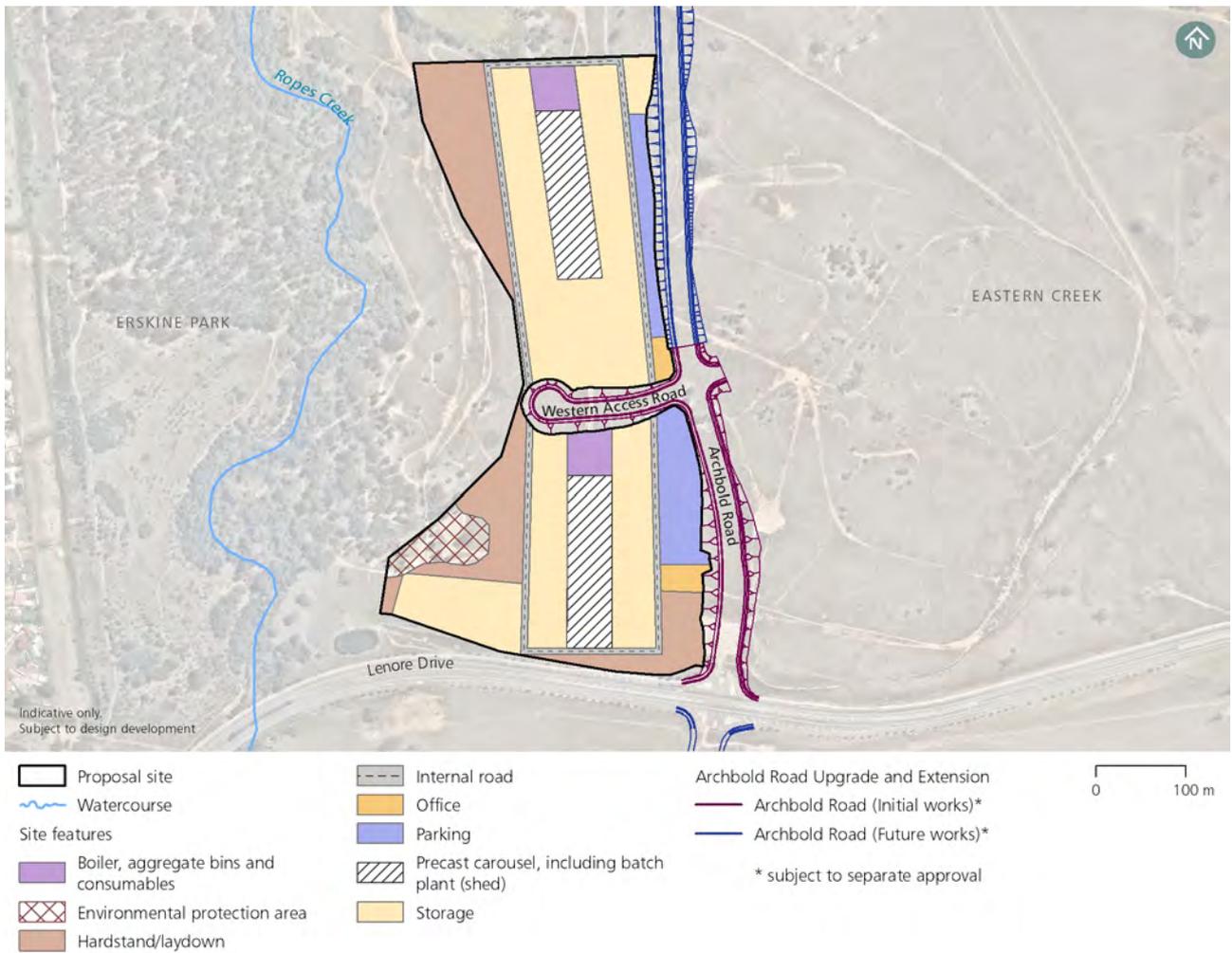


Figure 1-1 The proposal

1.2 Purpose and scope of this report

This technical paper is one of several technical papers that form part of a Review of Environmental Factors (REF). The purpose of this technical paper is to provide a Preliminary contaminated site investigation (PCSI) to assess the potential contamination impacts to construction and operation of the proposal associated with historical and current contaminating activities and/or operations undertaken and environmental receptors on or adjacent to the contamination study area (i.e. the proposal site and surrounding areas) for inclusion into the REF. The report presents factual information derived through desktop review of available information relevant to potential contamination issues, and the observations from a site walkover inspection.

1.3 Structure of this report

The remainder of this report is structured as follows:

- Chapter 2 provides the legislative and policy context relating to contamination
- Chapter 3 explains the assessment methodology including a method for assessing the potential contamination impacts to construction and operation of the proposal
- Chapter 4 details the existing environment
- Chapter 5 documents the contamination study area site history
- Chapter 6 describes the information reviewed for the contamination assessment
- Chapter 7 documents details of the observations made during the site inspection
- Chapter 8 identifies any potential contamination sources within the contamination study area
- Chapter 9 provides an assessment of the potential contamination impacts of the proposal during construction and operations
- Chapter 10 identifies mitigation and management measures.

2. Legislative and policy context

This section outlines the state and local strategies relevant to contamination assessment of the contamination study area.

2.1 Relevant contamination guidelines

In preparing this PCSI, the following guidelines were considered (where relevant):

- Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land (Department of Urban Affairs and Planning and Environment Protection Authority (EPA), 1998)
- Guidelines for Consultants Reporting on Contaminated Sites (NSW EPA, 2020)
- National Environment Protection (Assessment of Site Contamination) Measure 1999 (as revised 2013)
- PFAS National Environmental Management Plan ver. 2.0 (HEPA, January 2020).

Should further investigations, remediation work and validation be carried out, these activities would be carried out in accordance with the following guidelines or other appropriate/endorsed guidelines available at that time:

- Guidelines made or approved under section 105 of the *Contaminated Land Management 1997*, including
 - Contaminated Sites: Sampling Design Guidelines (EPA, 1995)
 - Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (3rd Edition) (EPA, 2017)
 - Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination (DEC, 2007)
 - Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997 Environment Protection Authority, 2015
- Australian Standard (AS 4482.1-2005) Guide to the sampling and investigation of potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds
- Australian Standard (AS 4482.2-1999) Guide to the sampling and investigation of potentially contaminated soils – Volatile substances
- Managing asbestos in or on soil (WorkCover NSW, 2014). [Online] Available at: http://www.safework.nsw.gov.au/_data/assets/pdf_file/0005/329171/Managing-asbestos-in-soil-guide.pdf
- Technical Note: Light Non-Aqueous Phase Liquid Assessment and Remediation (EPA, 2015)
- Information for the assessment of former gasworks sites (DEC, 2005)
- Vapour Intrusion: Technical Practice Note (DECW, 2010)
- Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases (EPA, 2012)
- Best Practice Note: Landfarming (EPA, 2014)
- Waste Classification Guidelines (EPA, 2014)
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ, 2018).

3. Methodology

This section provides an overview of the contamination study area and methodology for this PCSI.

3.1 Contamination Study Area

To account for potential soil, groundwater and vapour contamination that may be present as a result of historical and / or current activities carried out on and / or adjacent to the proposal site, the contamination study area for this investigation is defined as the construction/operational footprint (referred to herein after as the proposal site), and surrounding land within approximately one kilometre of the proposal site area Figure 3-1.

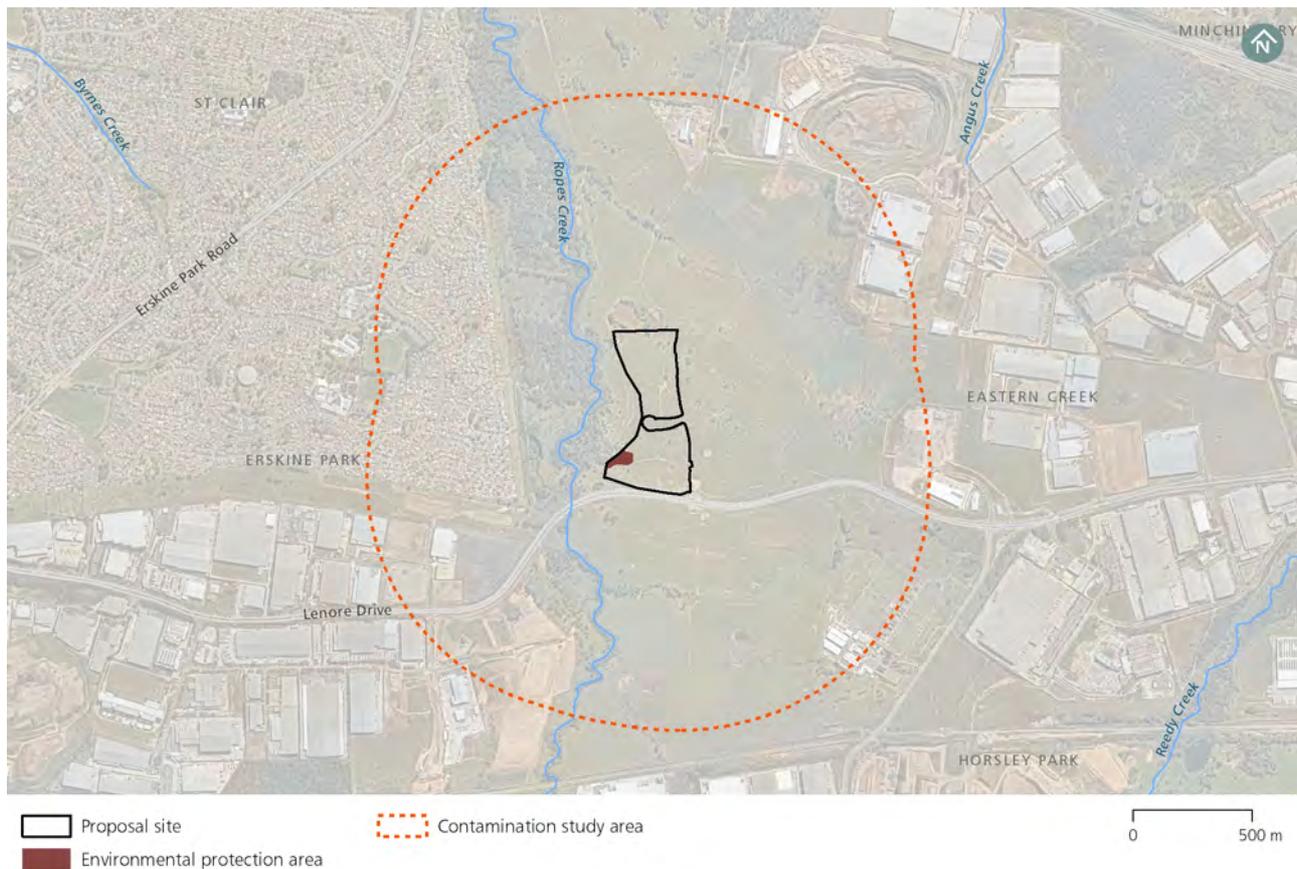


Figure 3-1 Contamination study area

3.2 Study methodology

The scope of works undertaken for the PCSI was as follows:

- A review of available information relating to the physical environment within the contamination study area, including topography, geology, hydrogeology, soils and surface waters.
- A review of historical aerial photography and maps.
- A review of publicly available information including (but not limited to) NSW Environment Protection Authority (NSW EPA) databases and Department of Primary Industries, Office of Water licensed groundwater bore database.
- A review of recent and historic reports relevant to contamination and / or intrusive ground investigations undertaken within the contamination study area.
- Site walkover inspection

- Identification and description of Areas of Environmental Interest (AEI's)
- Conclusions and recommendations.

3.3 Desktop assessment

The desktop assessment involved a review of available information relevant to the contamination study area as detailed in the Lotsearch report LS011866 EP, Lenore Drive Eastern Creek dated 3 April 2020 (Appendix A) and other publicly available information sources to understand the existing environment and the potential for contamination sources to be present within the contamination study area. The review of information included:

- Review of existing land uses within the contamination study area and information on topography, drainage, geology, soils, hydrogeology and receiving environments
- Review of historical aerial photographs and maps as contained within the Lotsearch (April 2020) report
- Review of publicly available information as contained within the Lotsearch (April 2020) report
- Publicly available information available via general internet searches for the key words (contamination, remediation and site investigation) for suburbs and major projects within the contamination study area
- Review of information provided by Sydney Metro, including relevant design plans.

3.4 Site inspection

A site walkover inspection was conducted on 8 April 2020 by an environmental scientist.

3.5 High-level prioritisation exercise

A high-level prioritisation exercise was carried out to assist in assessing the potential impact from construction and operation to expose contamination to human and/or ecological receptors. The exercise considered source-pathway-receptor relationships consistent with a conceptual site model as defined by the National Environment Protection (Assessment of Site Contamination) Measure 1999, as revised 2013 (NEPM, 2013). The prioritisation exercise considered the following:

Contamination severity and extent

- Known or potential sources of contamination and likely potential contaminants of concern
- The type of potentially affected media (soil, sediment, groundwater, surface water, indoor and ambient air)
- Approximate spatial distribution of potential contamination, and proximity to the proposal site.

The nature of construction and operational activities proposed as part of the proposal (e.g. surface disturbance, cut-and-fill areas) and whether such activities would expose known or potential areas of contamination.

Pathways and receptors

- Assessment of potential pathways from a contamination source to a receptor without mitigation measures. Pathways were considered to include dust generation, vapour/gas emissions, excavation and disposal or reuse of soils, extraction and disposal or reuse of groundwater from dewatering or drainage, migration of groundwater via preferential pathways and surface water erosion. It was assumed that where construction or operational activities would expose known or potential areas of contamination, the exposure pathways to construction workers could be complete. Where construction or operational activities are located within and/or adjacent to sensitive environmental receptors, pathways could exist as a result of uncontrolled site discharges during construction
- Potential human and ecological receptors (including location, and potential for primary or secondary contact with contamination). Potential receptors were considered to comprise project construction workers and visitors, operational site users, the general public and nearby residents and commercial workers in the surrounding land use, intrusive maintenance workers, receiving water bodies and ecological receptors.

Exposure pathways to these receptors were considered to include direct dermal contact (der), ingestion (ing) or inhalation (inh) by human receptors and uptake by aquatic flora and intake by aquatic fauna.

Based on this prioritisation exercise, areas of environmental interest (AEI) were categorised into five categories of contamination potential (very low, low, moderate, high and very high) representing potential impacts during construction and operation without management and mitigation measures. The matrix used for categorising potential impacts from construction and operation is provided in Table 3-1.

The categories of potential contamination impact to construction or operational activities represent a qualitative assessment. Although not definitive, examples of the contamination status represented by the categories is provided below:

- *Very low to low impact* could represent smaller volumes of contaminated materials, likely to be limited to surface soils, with pathways readily managed with typical soil and water controls and personnel protective equipment (PPE), and readily remediated by standard construction methods and management measures
- *Moderate impact* could represent larger volumes of contaminated materials, with pathways readily managed with typical soil and water controls and PPE and readily remediated by standard construction methods or smaller volumes of more complex contamination which may require specialised remediation methods and specialised management measures for pathways and/or administrative controls during operation
- *High to very high impact* could represent more significant exposure risks, contaminated groundwater and gas/vapours, increased quantum of contaminated materials and wider contamination extent requiring remediation and specialised remediation methods. Pathways may require specialised management measures for example, positive pressure tents, odour control and/or engineering controls during operation.

Table 3-1: Contamination impact potential matrix

		Contamination severity and extent				
		SE1 Low potential for contamination to be present in the media of concern at concentrations above the relevant assessment criteria and limited in extent	SE2 Contamination possibly present in the media of concern at concentrations above the relevant assessment criteria and limited in extent	SE3 Contamination possibly present in the media of concern at concentrations above the relevant assessment criteria and potentially widespread	SE4 Known contamination present in the media of concern at concentrations above the relevant assessment criteria and limited in extent	SE5 Known contamination present in the media of concern at concentrations above the relevant assessment criteria and widespread
Pathways and receptors	PR1 Media of concern is unlikely to coincide with or otherwise impact on the project <i>AND/OR</i> No or unlikely exposure pathway for human or ecological receptor's during construction and/or operation	Very low	Low	Low	Moderate	Moderate
	PR2 Media of concern may intersect the project <i>AND</i> Exposure pathway for human or ecological receptors could be present and complete during construction and/or operation	Low	Moderate	Moderate	High	High
	PR3 Media of concern would intersect the project <i>AND</i> Exposure pathway for human or ecological receptors could be present and complete during construction and/or operation	Moderate	Moderate	High	High	Very high

4. Existing environment

This section includes a description of the existing environment, zoning, and land use characteristics and features across the contamination study area (i.e. proposal site and surrounding areas) for the purpose of informing conditions relevant to contamination assessment.

4.1 Site identification

The proposal site is irregular in shape and is located between Lenore Drive and the M4 Motorway in Erskine Park. The particulars of the contamination study area are identified in Table 4-1.

Table 4-1 Site details

Particulars	Description
Address	Lenore Drive, Erskine Park
Legal description	Part of Lot 10, deposited plan (DP) 1157491
Local government area	City of Blacktown
Site dimensions	Area: About 16 ha

4.2 Zoning and land use

At the time of preparing this PSCI, the proposal site was adjacent to a combination of land uses including:

- North: Open space (cleared grazing land)
- East: Open space (cleared grazing land)
- South: Lenore Drive, open space (cleared grazing land) and substation (Sydney West Substation)
- West: Ropes Creek and Erskine Park residential area (west of the creek).

A review of the Lotsearch (April 2020) report indicated that a number of environmental planning instruments (EPI) apply to the proposal site including:

- State Environmental Planning Policy (Western Sydney Employment Area) 2009 (WSEA SEPP)
- Blacktown Local Environment Plan Amendment (Western Sydney Employment Area) 2013
- Blacktown Local Environment Plan 2015 (BLEP 2015).

Based on the WSEA SEPP, the proposal site is wholly within IN1 – General industrial zoning.

4.3 Geology

Reference to the Penrith 1:100,000 surface geology mapping sheet indicates that the majority of the proposal site is underlain by Bringelly Shale of the Wianamatta Group. Areas adjacent to the western boundary of the proposal site are underlain by Quaternary alluvium (adjacent to Ropes Creek).

Descriptions of the surface geological units are summarised in Table 4-2.

Table 4-2 Summary of surface geology across the proposal site

Unit	Descriptions
Quaternary Alluvium	The surface geology comprises Quaternary alluvium consisting of fine-grained sand, silt and clay from Quaternary fluvial deposition.
Bringelly Shale	The Bringelly Shale is a complex formation composed of a variety of lithologies with highly ceramic properties. Its plasticity is variable but generally higher than that of the Ashfield Shale because of the generally lower siderite content. Lithologies which comprise the Bringelly shale are in order of decreasing volumetric significance: claystone and siltstone, laminate, sandstone, coal and highly carbonaceous claystone, and tuff (Cobbity Claystone Bed). Claystone and siltstone are dominant while thin laminate horizons occur throughout. Sandstone is minor and sporadic, forming prominent “benches” in outcrop. The lower 30 m of the Bringelly Shale is usually distinctive being relatively thinly bedded and containing the most carbonaceous sediments within the Wianamatta Group. Above this lower zone, claystone, siltstone and sandstone units are more thickly bedded.

4.4 Soils

A review of the Penrith 1:100,000 soil landscape mapping sheet indicates that the majority of the proposal site is underlain by the Blacktown Soil Landscape. Areas adjacent to the western boundary of the proposal site is underlain by the South Creek Soil Landscape (adjacent to Ropes Creek).

Descriptions of the soil landscape units are summarised in Table 4-3.

Table 4-3 Summary of soil landscapes across proposal site

Unit	Description
Blacktown	Are typically located on the flat to gently undulating terrain between creek channels and are described as shallow to moderately deep (<100cm) clays and silty clays derived from Bringelly Shale. The soil landscape typically comprises hard setting mottled texture contrast soils, red and brown podzolic soils on crests grading to yellow podzolic soils on lower slopes and in drainage lines. Limitations associated with this soil landscape include high erodibility, shrink-swell potential, salinity, low fertility and localised areas of permanently high water tables or seasonal waterlogging.
South Creek	Described as Quaternary alluvium derived from Wianamatta Group shales that comprise deep sandy, sandy clay and clay soils. The soil landscape often consists of very deep layered sediments over bedrock or relic soils and is typically a dynamic soil landscape with many areas of erosion and deposition. Limitations associated with this soil landscape include high erodibility, shrink-swell potential, salinity, low fertility and localised areas of permanently high-water tables or seasonal waterlogging.

4.5 Topography and drainage

Topography data presented by Lotsearch (April 2020) indicated that the proposal site generally slopes from east to west towards Ropes Creek. The steepest and most elevated topography is located along the eastern boundary of the proposal site. The elevation of the site varies between 44 m Australian Height Datum (AHD) adjacent to the western boundary in proximity to Ropes Creek to approximately 60m AHD along the eastern boundary of the proposal site.

The majority of the proposal site is unsealed and is covered by grassed and exposed earth.

Rainfall falling onto the proposal site is likely to infiltrate directly into the sub-soils within the site with run-off likely to occur as overland flows which would discharge directly into Ropes Creek and minor drainage lines / features present on proposal site.

Overall, site drainage is likely to be to the west towards Ropes Creek.

4.6 Groundwater bore database

The Lotsearch (April 2020) report search of the NSW Department of Primary Industries (DPI) – Office of Water registered groundwater bore database and the Bureau of Meteorology National Groundwater Information System indicated that there were no registered groundwater bores within 500 metres of the proposal site. This is considered to be an adequate buffer where proposed construction works are unlikely to impact upon the use of groundwater bores. No registered groundwater bores were identified to be located within the proposal site. The groundwater assessment (refer to Section 8.9 of the REF) states that changes to groundwater levels associated with the construction and operation of the proposal are likely to be minor, with potential changes unlikely to cause adverse environmental impacts or drawdown at existing licensed bores.

A full list of all registered bores identified within a two kilometre buffer of the proposal site is provided in the Lotsearch (April 2020) report.

4.7 Sensitive receptors

A number of sensitive receiving environments have been identified on and/or adjacent to the proposal site through the desktop assessment, including:

- Remnants of Cumberland Plain vegetation including Shale Plains Woodland, Alluvial Woodland, Shale Hills Woodland and Shale/Gravel Transition Forest – located on proposal site and within the contamination study area
- Ropes Creek – located approximately 150 metres to the west of the proposal site and within the contamination study area
- Terrestrial groundwater dependent ecosystems (high potential) – adjacent to the south western proposal site boundary (outside of the proposal site) and in the vicinity of Ropes Creek. Based on information from the Biodiversity Assessment Report (Jacobs, 2020), a small area of ponded water in an offshoot of Ropes Creek within the north-west of the ecological study area (outside of the proposal site) may qualify as a GDE, however these wetlands are man-made and exist due to damming of a small catchment of rain and ponding of stormwater next to Lenore Drive. No other GDEs have been identified in or around the proposal site however the biodiversity study area has only assessed a 50m buffer area.
- Terrestrial groundwater dependent ecosystems (moderate to low potential) – approximately 500 metres east of the proposal site
- Terrestrial inflow dependent ecosystems - adjacent to the south western site boundary and approximately 500 metres east of the proposal site.

5. Site History

5.1 Historical Aerial Imagery

Aerial imagery was reviewed for the years 1956, 1961, 1965, 1970, 1982, 1991, 2000, 2007, 2009, 2014 and 2019 to assess land use and changes in general conditions within and adjacent to the proposal site. The findings of the aerial imagery review are summarised in Table 5-1. Historical aerial imagery is presented in the Lotsearch (April 2020) report provided in Appendix A.

Table 5-1 Summary of historical aerial imagery

Years	Proposal site	Surrounding Area
1956	<p>The proposal site is largely open space (possible grazing land) with some scattered trees.</p> <p>A large dam is present partially within the northern portion of the proposal site.</p> <p>Drainage lines are visible within the northern and southern portions of the proposal site (southern drainage lines are less defined).</p>	<p>Areas surrounding the proposal site comprise open space (possible grazing land) with scattered trees.</p> <p>Areas surrounding Ropes Creek are well vegetated.</p> <p>There are a number of structures (nominal three) located to the north of the proposal site (possible residential dwellings and outbuildings).</p> <p>A quarry is present to the north east of the proposal site.</p> <p>Archbold Road is evident to the north east of the proposal site.</p>
1961	<p>The proposal site is generally unchanged from the 1956 imagery with the exception of a small dam possibly constructed within the southern drainage line.</p>	<p>Areas surrounding the proposal site are generally unchanged from the 1956 imagery with the exception of the following:</p> <ul style="list-style-type: none"> ▪ an additional structure (possible shed) present to the north east of the proposal site ▪ a number of small dams have been constructed adjacent to drainage lines to the north and east of the proposal site ▪ vegetation clearing on a property to the west of the proposal site ▪ increased quarrying operations to the north east of the proposal site.
1965	<p>The proposal site is generally unchanged from the 1961 imagery.</p>	<p>Areas surrounding the proposal site are generally unchanged from the 1961 imagery with the exception of the following:</p> <ul style="list-style-type: none"> ▪ high voltage transmission towers (possible four sets of three towers) have been constructed to the east of the proposal site. ▪ increased quarrying operations including stockpiling to the north east of the proposal site.
1970	<p>The proposal site is generally unchanged from the 1965 imagery.</p>	<p>Areas surrounding the site are generally unchanged from the 1965 imagery with the exception of the following:</p> <ul style="list-style-type: none"> ▪ additional high voltage transmission towers (possible seven sets of two towers) have been constructed to the east of the proposal site. ▪ possible race track to the west of the proposal site

Years	Proposal site	Surrounding Area
		<ul style="list-style-type: none"> ▪ substation has been constructed to the south east of the proposal site ▪ increased quarrying operations including stockpiling to the north east of the proposal site.
1982	<p>The proposal site is generally unchanged from the 1970 imagery with the exception of darkened areas (possible grass fire) observed across the central portion of the proposal site.</p>	<p>Areas surrounding the proposal site are generally unchanged from the 1970 imagery with the exception of the following:</p> <ul style="list-style-type: none"> ▪ darkened areas (possible grass fire) observed extending to the east of the proposal site ▪ increased quarrying operations including stockpiling to the north east of the proposal site.
1991	<p>The proposal site is generally unchanged from the 1982 imagery.</p>	<p>Areas surrounding the proposal site are generally unchanged from the 1982 imagery with the exception of the following:</p> <ul style="list-style-type: none"> ▪ a number of objects / structures (possible truck parking / sheds) are located to the north of the proposal site ▪ Erskine Park (to the west of the proposal site) has been developed for residential purposes ▪ increased quarrying operations including stockpiling to the north east of the proposal site.
2000	<p>The proposal site is generally unchanged from the 1991 imagery.</p>	<p>Areas surrounding the proposal site are generally unchanged from the 1991 imagery with the exception of the following:</p> <ul style="list-style-type: none"> ▪ increased quarrying operations including stockpiling to the north east of the proposal site.
2007	<p>The proposal site is generally unchanged from the 2000 imagery with the exception of increased tracks evident throughout the northern portion of the proposal site.</p>	<p>Areas surrounding the proposal site are generally unchanged from the 2000 imagery with the exception of the following:</p> <ul style="list-style-type: none"> ▪ a portion of the drainage line to the north east of the proposal site has been redirected and the drainage lined filled. ▪ increased quarrying operations including stockpiling to the north east of the proposal site.
2014	<p>The proposal site is generally unchanged from the 2007 imagery with the exception of increased tracks evident throughout the proposal site.</p>	<p>Areas surrounding the site are generally unchanged from the 2007 imagery with the exception of the following:</p> <ul style="list-style-type: none"> ▪ the majority of the structures (residential dwellings / sheds) previously present to the north of the proposal site have been demolished / removed ▪ Lenore Drive has been constructed ▪ increased quarrying operations including stockpiling to the north east of the proposal site.

Years	Proposal site	Surrounding Area
2019	The proposal site is generally unchanged from the 2014 imagery.	<p>Areas surrounding the proposal site are generally unchanged from the 2014 imagery with the exception of the following:</p> <ul style="list-style-type: none"> a number of commercial premises have been constructed to the east of the proposal site increased quarrying operations including stockpiling to the north east of the proposal site.

5.2 Historical maps

Historical topographical maps were reviewed for the years 1929, 1942, 1975 and 2015 to assess land use and changes in general conditions within and adjacent to the proposal site. The findings of the historical map review are summarised in Table 5-2. Historical maps are presented in the Lotsearch (April 2020) report provided in Appendix A.

Table 5-2 Summary of historical topographic maps

Years	Proposal site	Surrounding Area
1929	<p>The proposal site is largely open space.</p> <p>The map indicates that a structure may have been present on site on the western boundary of the proposal site.</p>	<p>Areas surrounding the proposal site generally comprise open space with scattered structures.</p> <p>The Great Western Road is present to the north of the proposal site.</p> <p>A vineyard is present to the north east of the proposal site.</p> <p>A quarry is present to the east of the proposal site.</p> <p>Ropes Creek is present to the west of the proposal site.</p> <p>A drainage line is visible to the north of the proposal site.</p> <p>Archbold Road is an unsealed road to the north east of the proposal site.</p> <p>Increased development (more structures and roads) are present in areas to the north west of the proposal site.</p>
1942	The proposal site is generally unchanged from the 1929 map with the exception of the single structure identified on the 1929 map appears to be located to the west of the proposal site boundary.	Areas surrounding the proposal site are generally unchanged from the 1929 map.
1975	The proposal site is generally unchanged from the 1942 map with the exception of a dam present partially within the northern portion of the proposal site.	<p>Areas surrounding the proposal site are generally unchanged from the 1942 map with the exception of the following:</p> <ul style="list-style-type: none"> transmission lines are present to the north, east, east and south of the proposal site the single structure to the west of the proposal area is not present structures are present to the north and north east of the proposal site the Great Western Highway is present to the north of the proposal site

Years	Proposal site	Surrounding Area
		<ul style="list-style-type: none"> ▪ overburden is present to the north and east of the proposal site ▪ a substation is present to the south of the proposal site ▪ a dam and increased structures are present to the west of the proposal site.
2015	<p>The proposal site is generally unchanged from the 1975 map with the exception of the following:</p> <ul style="list-style-type: none"> ▪ a small water feature (possible dam) is present within the south western portion of the proposal site ▪ a drainage line is present within the north eastern portion of the proposal site. 	<p>Areas surrounding the proposal site are generally unchanged from the 1942 map with the exception of the following:</p> <ul style="list-style-type: none"> ▪ a structure is present to the north east of the proposal site ▪ a drainage line is present to the north and north east of the proposal site ▪ the M4 Motorway is present to the north of the proposal site ▪ a number of dams are present to the east of the proposal site ▪ residential development to the west of the proposal site.

Review of the historic aerial imagery and topographic maps has identified a number of potential sources of contamination and and/or adjacent to the proposal site, including:

- The degradation and potentially inappropriate demolition of structures within the contamination study area (including transmission towers) containing hazardous building materials – located to the north, east and south of proposal site.
- Sediments within on-site dams (potential contaminant sink) – northern portion of the proposal site. Based on topographical information, the dam located within the northern portion of the proposal site is likely to receive surface water flows from commercial/industrial areas to the east of the proposal site. The dam located within the southern portion of the site is likely to only receive localised surface water flows from undeveloped areas located to the east and south east of the proposal site.
- General agricultural use including localised contamination associated with chemical use / storage and waste disposal and more diffuse contamination associated with pesticide / herbicide use – within and adjacent to the proposal site.
- Substation operations including transformer oils and the use / storage of Aqueous Film Forming Foam (AFFF) – located to the south east of the proposal site.
- Potential use of overburden (material of unknown quality) – located to the north and east of the proposal site.

6. Information review

6.1 NSW EPA contaminated sites register

A search of the NSW EPA Contaminated Sites Record of Notices (under section 58 of the *Contaminated Land Management Act 1997*) and the list of contaminated sites notified to the NSW EPA (under section 60 of the *Contaminated Land Management Act 1997*) as detailed in the Lotsearch (April 2020) report indicated that there was one site registered with the NSW EPA within one kilometre of the proposal site that was either regulated, formerly regulated or had been notified. The site is summarised in Table 6-1.

Table 6-1: NSW EPA regulated / formerly regulated / notified sites within 1 km of the proposal site

Site	Site address	Regulated / formerly regulated / notified	Site activity	Location relative to proposal site (approx.)	Contamination status
Fulton Hogan Industries (formerly Pioneer Road Services)	Honeycomb Drive, Eastern Creek	Notified	Other industry	750 m (east)	Regulation under CLM Act not required

Based on the review of the NSW EPA contaminated sites register, considering that the NSW EPA does not require contamination from the Fulton Hogan Industries site to be regulated, the potential for contamination from the Fulton Hogan Industries site to impact upon construction and/or operation of the proposal is likely to be low.

6.2 Environmental Protection Licences

A search of the NSW EPA Protection of the Environment Operations (POEO) Act public register (under section 308 of the *POEO Act 1997*) as detailed in the Lotsearch (April 2020) report indicated there were three sites (based on property addresses) within one kilometre of the proposal site that have current environmental protection licences (EPL). The sites are summarised in Table 6-2.

Table 6-2: Sites with current EPL within 1 km of the proposal site

Organisation	Site address	Licence holder	Activity	Location relative to proposal site (approx.)
NSW Electricity Networks Operations Pty Ltd	200 Old Wallgrove Road, Eastern Creek	Transgrid	Waste storage - hazardous, restricted solid, liquid, clinical and related waste and asbestos waste	700 m (south east)
Dial-A-Dump Pty Ltd	Honeycomb Drive, Eastern Creek	Genesis Facility	Waste disposal by application to land	1 km (north east)
Dial-A-Dump Pty Ltd	Honeycomb Drive, Eastern Creek	Genesis Facility	Waste storage - other types of waste	1 km (north east)
Dial-A-Dump Pty Ltd	Honeycomb Drive, Eastern Creek	Genesis Recycling Facility	Composting	1 km (north east)
Dial-A-Dump Pty Ltd	Honeycomb Drive, Eastern Creek	Genesis Recycling Facility	Recovery of general waste	1 km (north east)

Organisation	Site address	Licence holder	Activity	Location relative to proposal site (approx.)
Dial-A-Dump Pty Ltd	Honeycomb Drive, Eastern Creek	Genesis Recycling Facility	Waste storage - other types of waste	1 km (north east)
Fulton Hogan Industries Pty Ltd	Honeycomb Drive, Eastern Creek	Fulton Hogan Industries Pty Ltd	Recovery of general waste; Waste storage - other types of waste	750 m (east)

A search of the POEO Act public register (under section 308 of the *POEO Act 1997*) as detailed in the Lotsearch (April 2020) report indicated there were three sites (based on property addresses) within one kilometre of the proposal site that had EPLs no longer in force or that had been surrendered. The sites are summarised in Table 6-3.

Table 6-3: Sites with former EPL within 1 km of the proposal site

Organisation	Site address	Issued date	Activity	Location relative to proposal site (approx.)
Luhrmann Environment Management Pty Ltd	Waterways throughout NSW	6 September 2000	Other Activities / Non Scheduled Activity - Application of Herbicides	On-site (northern portion of proposal site) and close proximity to western boundary
Robert Orchard	Various waterways throughout NSW	7 September 2000	Other Activities / Non Scheduled Activity - Application of Herbicides	On-site (northern portion of proposal site) and close proximity to western boundary
Sydney Weed and Pest Management Pty Ltd	Waterways throughout NSW	9 November 2000	Other Activities / Non Scheduled Activity - Application of Herbicides	On-site (northern portion of proposal site) and close proximity to western boundary
Hanson Construction Materials Pty Ltd	Wallgrove Road, Eastern Creek	2 November 2000	Concrete works	750 m (east)
Hanson Construction Materials Pty Ltd	Wallgrove Road, Eastern Creek	2 November 2000	Crushing, grinding or separating	750 m (east)
Hanson Construction Materials Pty Ltd	Wallgrove Road, Eastern Creek	2 November 2000	Land-based extractive activity	750 m (east)
Hanson Construction Materials Pty Ltd	Wallgrove Road, Eastern Creek	2 November 2000	Recovery of general waste	750 m (east)
Hanson Construction Materials Pty Ltd	Wallgrove Road, Eastern Creek	2 November 2000	Waste storage – other types of waste	750 m (east)

Organisation	Site address	Issued date	Activity	Location relative to proposal site (approx.)
Nace Civil Engineering Pty Ltd	Erskine Park Link Road, Erskine Park	11 March 2011	Road construction	Adjacent to southern site boundary

The EPLs issued (historic and current) to activities within one kilometre of the proposal site are associated with waste management, herbicide application to waterways, quarrying, cement related operations and road construction. EPLs generally detail requirements for the management of pollution risks associated with the licenced activities. As such, if activities are operating in accordance with their respective EPL, the risk of those activities causing contamination would be reduced. Potential contamination impacts to construction and / or operation would likely be associated with those licenced activities relating to waste management and which store/use chemicals which could cause groundwater contamination (bulk chemical storage/use and liquid waste management) and generate landfill gas and vapours adjacent to the proposal site.

6.3 Other NSW EPA information

6.3.1 EPA sites with other contamination issues

A search of NSW EPA sites with other contamination issues (i.e. James Hardie asbestos manufacturing and waste disposal sites, radiological investigation sites in Hunters Hill and Pasminco lead abatement strategy area) as detailed in the Lotsearch (April 2020) report indicated no records within the site, or within one kilometre of the proposal site.

6.3.2 Former gasworks

A search of former gasworks sites as detailed in the Lotsearch (April 2020) report indicated no records within the proposal site, or within one kilometre of the proposal site.

6.3.3 EPA PFAS investigation program

A search of EPA PFAS investigation program as detailed in the Lotsearch (April 2020) report indicated no records within the proposal site, or within one kilometre of the proposal site.

6.4 Waste management and liquid fuel facilities

A search of waste management and liquid fuel facilities sites as detailed in the Lotsearch (April 2020) report indicated one record listed on the National Waste Management Site Database within one kilometre of the proposal site. The proposal site is summarised in Table 6-4.

Table 6-4: Waste management and liquid fuel facilities within one kilometre of the proposal site

Site	Site address	Facility type	Facility class	Location relative to proposal site (approx.)
Genesis Xero Waste – Landfilling and Recycling	Honeycomb Drive, Eastern Creek	Waste management	Reprocessing	1 km (north east)

Potential contamination issues associated with the recorded waste management facilities could include potential impacts to groundwater and/or surface water as a result of offsite migration of chemicals (via infiltration into underlying groundwater or surface water discharge) and generation of landfill gas. Contaminants of potential concern include volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), organic contaminants, hydrocarbons, heavy metals, PFAS compounds and methane.

6.5 Department of Defence

A search of Defence sites subject to the PFAS investigation program, PFAS management program and/or three year regional contamination investigation program as detailed in the Lotsearch (April 2020) report indicated no records within the proposal site, or within one kilometre of the proposal site.

6.6 Airservices Australia

A search of Airservices Australia sites subject to the national PFAS management program as detailed in the Lotsearch (April 2020) report indicated no records within the proposal site, or within one kilometre of the proposal site.

6.7 Business directory search

A search of business directory listing between the years 1950 to 1991 as detailed in the Lotsearch (April 2020) was undertaken.

Businesses with potential contaminating activities are based on those industries detailed in the Australian Standard *Guide to the sampling and investigation of potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds* (AS 4482.1-2005).

- Agricultural / horticultural activities
- Airports
- Asbestos production and disposal
- Battery manufacture and recycling
- Breweries / distilleries
- Chemicals manufacture and use
- Defence works
- Drum reconditioning
- Dry cleaning
- Electrical
- Engine works
- Foundries
- Gas works
- Iron and steel works
- Landfill sites
- Marinas
- Metal treatments
- Mining and extractive industries
- Power stations
- Printing shops
- Railway yards
- Scrap yards
- Service stations and fuel storage facilities
- Sheep and cattle dips
- Smelting and refining
- Tanning and associated trades
- Water and sewerage treatment plant
- Wood preservation.

The business directory search indicated no records (including motor garages) within the proposal site, or within one kilometre of the proposal site.

6.8 Previous contamination site investigations

A search of internet resources was carried out for previous contamination investigations and/or general contamination information for sites which were located within and/or adjacent (within one kilometre of the proposal site) to the proposal site. The internet search used the key words "contamination", "remediation" and "site investigation" in the suburbs of Eastern Creek, Erskine Park, Horsley Park and Minchinbury.

The following publicly available investigations and contamination information was reviewed:

- *Preliminary Site (Contamination) Investigation. Oakdale East Industrial Estate. 224-398 Burley Road, Horsley Park* (Douglas Partners, September 2018) (https://s3.ap-southeast-2.amazonaws.com/dpe-files-production/s3fs-public/dpp/303475/Attachment%20G_Contamination%20Report.PDF)
- *Land Capability, Salinity and Contamination Assessment, Ropes Creek, NSW (WSP / Parsons Brinkerhoff, October, 2016)* (<https://majorprojects.accelo.com/public/74094338fc944a2c8067876259f1ffec/Ropes%20Creek%20Land%20Capability.%20Salinity%20and%20Contamination%20Assessment.pdf>)
- *Assessment of Soil and Water Impacts: Proposed Energy from Waste Facility, Eastern Creek* (Edson Environmental & Engineering, 12 April 2015) (https://www.planning.nsw.gov.au/Assess-and-Regulate/Projects/Eastern-Creek-Energy-from-Waste/~/_media/814AEFB44BB74B32B3AD1B466ECF2873.ashx)
- *Phase 1 Preliminary Site Investigation. Honeycomb Drive, Eastern Creek NSW* (ADE Consulting Group, 13 June 2014) (<https://www.tngnsw.com.au/media/1099/appendix-v1-phase-1-preliminary-site-investigation.pdf>)

The following provides a summary of the information from the available investigations and contamination information in relation to the proposal site. Full copies of the available investigations and contamination information reviewed are available in the links above.

Preliminary Site (Contamination) Investigation. Oakdale East Industrial Estate. 224-398 Burley Road, Horsley Park (Douglas Partners, September 2018)

The location of the site subject of this report (the investigation site) is approximately one kilometre south of the proposal site.

Douglas Partners undertook a preliminary site investigation (PSI) as part of the Oakdale East Estate Development Control Plan (DCP) and to assist project planning. The historical data review completed as part of the PSI identified a number of potential contamination issues associated with historical operations and current conditions within the investigation site. These included the potential for hazardous building materials, chemical use and filling.

The potential for contamination (if present) identified in the Douglas Partners (September 2018) investigation to impact the proposal site is likely to be low, based on the following:

- Transport/migration of contamination to the proposal site is unlikely due to the lateral separation (investigation site located approximately one kilometre south of the proposal site)
- The regional topography surrounding the proposal site indicates that the investigation site is located down gradient.

Land Capability, Salinity and Contamination Assessment – Ropes Creek, NSW (WSP / Parsons Brinkerhoff, October 2016)

The location of the site subject of this report (the investigation site) includes the proposal site as well as a larger area to the east and north of the proposal site.

WSP Environmental Pty Ltd (WSP) was commissioned by the New South Wales Government, Department of Planning and Environment (DPE) to provide a Land Capability, Salinity and Contamination Assessment for the Ropes Creek proposed development area (i.e. the investigation site).

With respect to contamination, the following information was detailed in the report:

- Soil sampling undertaken did not identify elevated concentrations of contamination

- Historical and current agricultural activities could have contaminated the investigation site with pesticides and heavy metals (although these were not identified by the soil and groundwater sampling)
- Concentrations of some heavy metals (cadmium, copper, nickel and zinc) were reported to be present in groundwater and some surface waters exceeding the adopted investigation criteria. It was considered that, in the absence of elevated heavy metal concentrations in the soil above the investigation criteria and no obvious sources of heavy metals observed at the investigation site, the concentrations reported are likely to be indicative of natural slightly elevated metal concentrations in groundwater regionally and not directly attributed to historical and current activities on the subject site. Elevated heavy metals detected in surface water may have been attributable to the highly turbid nature of the surface water sampled.
- Based on the historical and current land uses and the limited analysis undertaken, widespread contamination across the investigation site was not evident.
- Prior to redevelopment of the investigation site, soil and surface remediation works will likely be limited to the removal of all infrastructure associated with the former agricultural land use activities and remediation of soils and deeper fill (if encountered). Illegally dumped wastes will require removal.

The potential for contamination (if present) identified in the WSP / Parsons Brinkerhoff (October 2016) investigation to impact the proposal site is possible based on the following:

- The proposal site is located wholly within the investigation site
- Potential contamination sources were identified including infrastructure associated with the former agricultural land use activities, fill materials (if encountered) and illegally dumped wastes.

Assessment of Soil and Water Impacts: Proposed Energy from Waste Facility, Eastern Creek (Edson Environmental & Engineering, 12 April 2015)

The location of the site subject of this report (the investigation site) is approximately one kilometre north east of the proposal site.

The report was commissioned to address the requirements listed by the Director General of Planning NSW with respect to potential soil and water impacts of the proposed project.

With respect to contamination, the following information was detailed in the report:

- The investigation site is an engineered landfill facility
- The presence of a deep quarry and associated dewatering for over 40 years followed by construction of an engineered landfill site and pumping of leachate from a basal drainage system has resulted in substantial depressurisation of the local groundwater systems and a hydraulic gradient into the quarry within the investigation site
- Stage 1 Environmental Site Assessments (ESAs) have been undertaken on broader parcels of land which encompassed the investigation site in 1995 and 2004, neither of which reported any indication of past industrial activity on the investigation site (i.e. low potential for contamination)
- A number of intrusive investigations have been undertaken on portions of the investigation site. The investigations involved the collection and laboratory analysis of soil, sediment, surface water and groundwater. The actual locations of all samples collected from the investigation site could not be ascertained based on the information provided. Contamination from the investigation site and adjoining sites were not reported in the information provided.

The potential for contamination (if present) identified in the Edson Environmental & Engineering (April 2015) assessment to impact the proposal site is likely to be low based on the following:

- Transport/migration of contamination to the proposal site is unlikely due to the lateral separation (investigation site located approximately one kilometre north east of the proposal site)
- Contamination has not been identified on the investigation site

- There is a reported hydraulic gradient towards the investigation site. This would reduce the potential for contaminated groundwater (if present) to migrate from the landfill located on the investigation site to the proposal site.

Phase 1 Preliminary Site Investigation. Honeycomb Drive, Eastern Creek NSW (ADE Consulting Group, 13 June 2014)

The location of the site subject of this report (the investigation site) is approximately 300 metres north east of the proposal site.

A. D. Envirotech Australia Pty Ltd (ADE) was engaged by Urbis on behalf of The Next Generation NSW Pty Ltd (TNG NSW) to undertake a Phase I Preliminary Site Contamination Investigation (PSI) to assess the potential for contamination on the investigation site located off Honeycomb Drive, Eastern Creek NSW.

With respect to contamination, the following information was detailed in the report:

- The investigation site has been utilised as grazing land as far back as records indicate
- An asphalt plant and associated waste water overflow dam has been present adjacent the investigation site since at least 1978
- Due to the proximity of the asphalt plant and the potential for overflow from adjacent waste water dam, contaminated fill and the deposition of airborne dust, there was the potential for contamination to be present on the investigation site.

The potential for contamination (if present) identified in the ADE Consulting Group (June 2014) investigation to impact the proposal site is possible based on the following:

- Overflows from the asphalt plant and waste water overflow could be discharged to the drainage lines within the northern portion of the proposal site.

7. Site inspection

A site inspection was undertaken by a Jacobs Environmental Scientist on 8 April 2020. Photographs taken during the inspection are provided in Appendix B.

The purpose of the site inspection was to make observations of the current site conditions and adjacent site land uses with respect to contamination.

For the purpose of this assessment the site has been sub-divided into two (2) areas representative of the proposal site including (refer to Figure 1-1):

- Area 1 – Southern precast site
- Area 2 – Northern precast site

Table 7-1 and Table 7-2 provides a summary of the observations made during the site inspection of Area 1 and Area 2.

Table 7-1: Summary of site features and observations – Area 1

Feature	Observation	Reference Photo Plate
Site surfacing	Grass and unsealed tracks	1-5,16,29
Site structures	No on-site structures present	-
Site services	No above ground services were observed during site inspection, except for maintenance hole covers for sewer infrastructure.	31
Topography / gradient	Undulating hills of variable height and gradient, generally sloping to the west towards Ropes Creek.	1,2,3,5
Site drainage	Sheet flow and concentrated flows via land drains discharging into on-site retention ponds. Surplus drainage from concentrated flows and overland flows discharge to Ropes Creek.	18,14
Fill materials	Earthen embankment adjacent to Lenore Drive is grassed, but likely to comprise fill material due to artificial profile and gradient.	7,8,9,11,12
Waste(s)	<p>Numerous waste materials observed adjacent to Lenore Drive along the southernmost portion of the southern precast site along proposed internal road, including:</p> <ul style="list-style-type: none"> ▪ Small stockpiles of construction and demolition waste (bricks, cement, sand, asphalt, ceramic, metal, timber, PVC tubing) ▪ Uncontrolled waste from illegal dumping, including electrical appliances, computer parts, household furniture, vehicle parts, tyres, gypsum board, plastics, timber, mattresses, glass and potential asbestos containing materials. <p>Uncontrolled waste materials within proposed storage area in southernmost portion of the southern precast site, upgradient of on-site retention pond, including:</p> <ul style="list-style-type: none"> ▪ Stockpiles of timber, plastic, fabric, occasional vehicle parts, metal and potential asbestos containing materials. <p>Uncontrolled waste materials within / adjacent to the environmental protection area east of the southern precast site, including:</p> <ul style="list-style-type: none"> ▪ Household furniture, electrical goods, timber, plastic, metal, gypsum board, fabric, potential asbestos containing materials, asphalt, vehicle parts, containers of paint, motor oils, wood oils, lubricants, emulsifiers and flammable liquids. 	8-15,17,20-25

Preliminary contaminated site investigation

Feature	Observation	Reference Photo Plate
Above ground / underground storage tanks	No above ground storage tanks observed during site inspection. No evidence of underground storage tanks observed during site inspection.	-
Asbestos	Potential asbestos containing materials were observed during site inspection, in several areas of the site, as detailed above.	8-15,17,21
Chemical and other hazard material storage	None observed during site inspection.	-
Phytotoxicity	None observed during site inspection.	-
Staining and odours	None observed during site inspection.	-
Incidents and complaints	None recorded during site inspection.	-
Evidence of previous investigations	None observed during site inspection.	-
Additional observations	Evidence of dispersive soils with high erosion risk observed during site inspection. Significant washout and gullyng of access tracks and unsealed areas observed.	16

Table 7-2: Summary of site features and observations – Area 2

Feature	Observation	Reference Photo Plate
Site surfacing	Grass and unsealed tracks	28
Site structures	No on-site structures present	-
Site services	No above ground services were observed during site inspection, except for maintenance hole covers for sewer infrastructure.	32
Topography / gradient	Broadly flat, shallow gradient sloping to the west towards Ropes Creek.	30
Site drainage	Sheet flow and concentrated flows via land drains discharging into on-site retention ponds. Surplus drainage from concentrated flows and overland flows discharge to Ropes Creek.	26, 28,29,
Fill materials	Fill materials possibly present forming bund of stormwater retention pond.	26-29
Waste(s)	An isolated area of waste materials observed during the archaeological assessment (Artefact, 2020) within the northern portion of the site. Waste materials observed included: <ul style="list-style-type: none"> ▪ Metal and brick debris, remains of a metal refrigerator, fence posts and star pickets. 	-
Above ground / underground storage tanks	No above ground storage tanks observed during site inspection. No evidence of underground storage tanks observed during site inspection.	-
Asbestos	None observed during site inspection.	-
Chemical and other hazard material storage	None observed during site inspection.	-
Phytotoxicity	None observed during site inspection.	-
Staining and odours	None observed during site inspection.	-
Incidents and complaints	None recorded during site inspection.	-
Evidence of previous investigations	None observed during site inspection.	-

Feature	Observation	Reference Photo Plate
Additional observations	None observed during site inspection.	-

Based on the observations made during the site inspection, there were a number of potential contamination sources identified on the proposal site. These included potential filling of the earthen embankment adjacent to Lenore Drive and the bund of the stormwater retention pond and isolated occurrences of fly tipped waste materials (mainly with the southern portion of the proposal site).

8. Areas of environmental interest

Based on the findings of the desktop review and observation from the site inspection, a number of potential contamination sources have been identified within and/or adjacent to the proposal site.

To understand the potential interaction of construction activities and operation of the proposal site with potential contamination, areas have been categorised into five categories of potential contamination impact (very low, low, moderate, high and very high) based on the impact prioritisation methodology in Section 3.5. The results of this exercise are presented in Table 8-1.

A number of areas have been identified as having a moderate potential for contamination to impact upon construction and operation of the proposal site (refer to Figure 8-1).

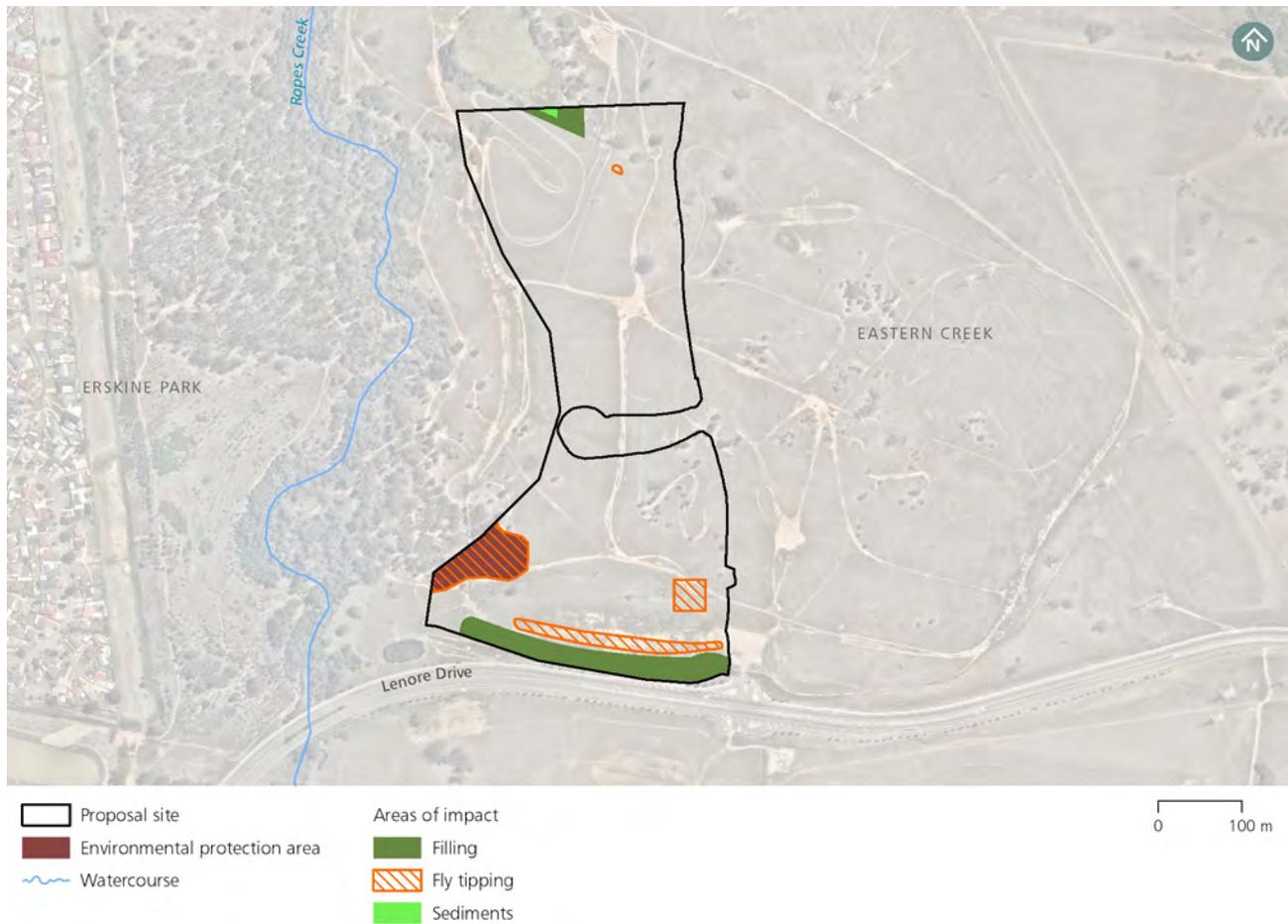


Figure 8-1 Moderate potential contamination impact areas

Table 8-1: High-level contamination prioritisation

Areas of interest	Contamination severity and extent assessment			Pathways and receptors Assessment of relationship to construction and operational footprint and scope				Potential contamination impact
	Media and COPCs	Contamination status	Reference to Table 3-1 criteria	Location relative to proposal site	Potential for contamination to be intersected	Exposure pathways (der – direct contact, ing – ingestion or inh – inhalation)	Reference to Table 3-1 criteria	
Filling (material of unknown quality) - Earthen embankment adjacent to Lenore Drive (southern precast site) and the bund of the stormwater retention pond (northern precast site).	Soils (to the depth of filling) Heavy metals, hydrocarbons (TRH, BTEX, PAH), pesticides, phenols, asbestos	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent	SE2	Within the northern and southern precast sites	Soils would be exposed during construction Contaminated deeper soils (if present) may remain below the site during operation	Construction workers and site users could be exposed to contamination via contact (der, ing, inh) with contaminated soils and dust Adjacent site users could be exposed to contamination via dust emissions (inh), namely asbestos	PR3	Moderate
	Groundwater Heavy metals, nutrients, hydrocarbons (TRH, BTEX, PAH)	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent. Any groundwater contamination from fill areas would be limited to the northern and southern extents of the proposal footprint	SE2		Contaminated groundwater (if present) from overlying fill material could be intersected during construction. If encountered, is likely to represent relatively small volumes. Contaminated groundwater (if present) may remain below the proposal site during operation	Construction workers and site users could be exposed to contamination via contact (der, ing) with contaminated groundwater	PR2	Low
Historical /current land use (incl. agricultural land use) – Inappropriate chemical storage and use, miscellaneous waste disposal etc.	Surface soil Heavy metals, hydrocarbons (TRH, BTEX, PAH), pesticides, herbicides, asbestos	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent	SE2	Within the northern and southern precast sites	Soils would be exposed during construction No residual contaminated surface soils likely to be present during operation	Construction workers could be exposed to contamination via contact (der, ing, inh) with contaminated soils and dust Adjacent site users could be exposed to contamination via dust emissions (inh), namely asbestos	PR3	Moderate
Former and existing structures – Hazardous building materials within or from buildings / structures (including transmission towers) within the contamination study area, demolition wastes	Surface soil Heavy metals, hydrocarbons (TRH, PAH), pesticides, asbestos	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent	SE2	Minimum of 100m north, east and south	Surficial contamination (if present) from adjoining structures unlikely to migrate and be exposed during construction or operation	Contamination unlikely to be exposed during construction and/or operation and therefore unlikely to impact upon human and environmental receptors	PR1	Low
Sediments within on-site dam / stormwater retention pond (potential contaminant sink)	Sediments Heavy metals, hydrocarbons (TRH, PAH), pesticides, microbiological, nutrients	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent	SE2	Within the northern precast site	Sediments would be exposed during construction No sediments likely to be present during operation	Construction workers could be exposed to contamination via contact (der, ing, inh) with contaminated sediments	PR3	Moderate
Fly tipping ('illegal dumping') of wastes	Wastes and surface soils Heavy metals, hydrocarbons (TRH, BTEX, PAH), pesticides, phenols, asbestos	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent	SE2	Within the northern and southern precast sites	Wastes and soils would be exposed during construction No residual fly tipped wastes likely to be present during operation	Construction workers could be exposed to contamination via contact (der, ing, inh) with contaminated soils and dust Adjacent site users could be exposed to contamination via dust emissions (inh), namely asbestos	PR3	Moderate

Areas of interest	Contamination severity and extent assessment			Pathways and receptors Assessment of relationship to construction and operational footprint and scope				Potential contamination impact
	Media and COPCs	Contamination status	Reference to Table 3-1 criteria	Location relative to proposal site	Potential for contamination to be intersected	Exposure pathways (der – direct contact, ing – ingestion or inh – inhalation)	Reference to Table 3-1 criteria	
Waste management facility - offsite migration of chemicals (via infiltration into underlying groundwater or surface water discharge)	Surface water and groundwater Heavy metals, hydrocarbons (TRH, BTEX, PAH), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), organic contaminants, PFAS	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent	SE2	Approx. 1km north east	Contaminated groundwater (if present) from the landfill is unlikely to be present beneath the proposal site because of the spatial separation, the quarry void is not filled and current void would acts a groundwater sink – groundwater would flow towards and not away from the void, cross gradient locations and geological conditions. Groundwater is unlikely to be exposed during operation Surface water could be intersected during construction (potentially during dewatering of on-site stormwater retention pond)	Contamination unlikely to be exposed during construction and/or operation and therefore unlikely to impact upon human and environmental receptors	PR1	Low
	Landfill gas Methane, hydrogen sulphide, carbon dioxide	Low potential for contamination to be present at concentrations above the relevant assessment criteria and limited in extent	SE1		Landfill gas only likely to be an issue following completion of landfilling activities			
Historical commercial / industrial use within locality – Inappropriate chemical storage and use, industrial operations, waste disposal and management etc.	Surface soil Heavy metals, hydrocarbons (TRH, BTEX, PAH)	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent	SE2	Minimum of 300m north east	Surficial contamination (if present) from adjoining source sites unlikely to migrate and be exposed during construction or operation	Contamination unlikely to be exposed during construction and/or operation and therefore unlikely to impact upon human and environmental receptors	PR1	Low
	Groundwater Heavy metals, hydrocarbons (TRH, BTEX, PAH), VOC	Contamination possibly present at concentrations above the relevant assessment criteria and widespread	SE3		Contaminated groundwater (if present) from these land uses is unlikely to be present beneath the proposal site because of the spatial separation and geological conditions. Groundwater is unlikely to be exposed during operation Contaminated groundwater (if present) may remain below the site during operation	Contamination unlikely to be exposed during construction and/or operation and therefore unlikely to impact upon human and environmental receptors		
Substation – Transformer oils and potential firefighting activities	Surface soils Polychlorinated biphenyls (PCB) and PFAS	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent	SE2	Approx. 700 m south east	Surficial contamination (if present) from adjoining source site unlikely to migrate and be exposed during construction or operation	Contamination unlikely to be exposed during construction and/or operation and therefore unlikely to impact upon human and environmental receptors	PR1	Low
	Groundwater PFAS	Contamination possibly present at concentrations above the relevant assessment criteria and widespread	SE3		Contaminated groundwater (if present) from the substation are unlikely to be exposed during construction or operation (site is likely to be cross-gradient with groundwater flows for the substation)	Contamination unlikely to be exposed during construction and/or operation and therefore unlikely to impact upon human and environmental receptors		

9. Potential impacts

The following information details potential impacts to the site from contamination identified as part of this PCSI.

9.1 Construction

9.1.1 Contamination – soil

The results of this assessment have identified areas across the proposal site which have moderate potential for contamination impact as a result of historic filling activities, the former use of the proposal site and surrounding areas (agricultural land use), potential for contaminated sediments within farm dams and the presence of fly tipped wastes ('illegal dumping'). Further review of information and/or investigation would be required to quantify the contamination risks associated with on-site fill, soil and sediment materials. If contamination risks are not quantified in these areas and appropriately managed, construction activities may expose workers, the public, and the environmental receptors to contaminated fill materials, soil and sediment.

Potential impacts as a result of disturbance of contaminated wastes/fill/soil/sediment without appropriate management and/or remediation may include:

- Contaminant exposure risk to construction personnel and the general public
- Contaminant exposure to environmental receptors
- Cross contamination associated with the incorrect handling or disposal of spoil/unexpected finds
- Contamination of previously clean areas.

Should contaminated wastes/fill/soil/sediment be identified, these materials can be managed with the implementation of appropriate management measures and/or remediation.

Higher risks and increased management and/or remediation effort during construction could be associated where materials have the potential to:

- Contain dispersible fibres (e.g. asbestos)
- Generate vapours (e.g. hydrocarbons and volatile organic compounds)
- Contain concentrations of contaminants or constituents that categorise the material at a higher waste classification (e.g. restricted waste, special waste, hazardous waste).

The appropriate management measures and/or remediation can only be determined based on the results of additional information reviews and investigations, which would be completed prior to the commencement of construction.

Any fill materials and/or soils disturbed as part of site construction activities have the potential to become mobilised into stormwater drainage networks during rainfall events if not appropriately managed. As such there is potential for on-site fill materials and/or soils disturbed as part of construction to migrate and impact off site receiving environments.

Potential management and mitigation measures during the construction of the proposal site with respect to soil contamination are discussed in Section 10.

9.1.2 Contamination – groundwater

Contaminated groundwater may be encountered during the construction activities, principally during excavation / excavation dewatering. It is anticipated that the quantum of groundwater required to be managed as part of construction activities would be minimal. If groundwater contamination is not appropriately managed,

construction activities may expose workers, the public and environmental receptors to contaminated groundwater via direct contact or discharge to surface waters.

Potential impacts as a result of contact with or discharge of contaminated groundwater may include:

- Contaminant exposure risk to project personnel and the general public
- Contaminant exposure to environmental receptors
- Degradation of aquatic ecosystems.

All potential groundwater contamination identified can be managed subject to the implementation of appropriate management and mitigation measures such as collection and off-site disposal and treatment. The appropriate management measures should be detailed in an appropriate Construction Environmental Management Plan (CEMP).

Sources of potential groundwater contamination could include leachate generated from on-site fill materials.

Potential management and mitigation measures during the construction of the proposal site with respect to groundwater contamination are discussed in Section 10.

9.2 Operation

9.2.1 Contamination – soil

The results of this assessment have identified that filling across the proposal site (mainly fill embankments adjacent to Lenore Drive) has a moderate potential for contamination impact as a result of historic filling activities and the unknown nature of these underlying fill materials. These materials have the potential to impact site users, site staff and local ecology through direct exposure if they remain on-site or have migrated from the site as part of operation if appropriate management / mitigation measures are not adopted as part of the design, construction and ongoing operation.

The proposal site is proposed to be operated as two precast facilities. The operation of the proposal site would potentially require the storage and use of chemicals and generate wastes. The chemicals used and waste generated could result in the contamination of soil if not appropriately managed.

Potential management and mitigation measures for the operation of the proposal site with respect to soil contamination are discussed in Section 10.

9.2.2 Contamination – groundwater

Impacts to groundwater as a result of operation of the site may include leaks / spills of fuels / chemical additives / wastes to groundwater from on-site storage and use.

The potential impacts to groundwater from these sources of contamination include deterioration of groundwater quality and impacts to local creeks (Ropes Creek) through baseflow – interflow pathways.

Potential impacts from on-site groundwater to operation of the proposal site could occur if contaminated groundwater (if present) is exposed during future subsurface maintenance activities.

Potential mitigation and management measures for operation of the proposal site with respect to groundwater contamination are discussed in Section 10.

10. Mitigation and management measures

Potential contamination impacts would be managed in accordance with Sydney Metro’s Construction Environmental Management Framework. Of relevance, the Construction Environmental Framework includes contamination management objectives to avoid or minimise potential contamination impacts.

10.1 Construction

Based on the assessed level of potential contamination impact to construction detailed in Sections 8 and 9, a range of mitigation and management measures have been developed in order to manage potential contamination during construction (refer to Table 10-1). These have been termed mitigation measures C1 to C5.

The Construction Environmental Management Framework includes a requirement to prepare a Soil and Water Management Plan which would include management measures for contaminated material (soils, water and building materials) and a contingency plan in the case of unanticipated discovery of contaminated material. For AEs that have been assessed to have a moderate contamination impact potential, additional measures would be implemented. These additional mitigation and management measures would be dependent on the outcomes from further investigations, noting:

- A Remedial Action Plan would typically be prepared where there is more significant, widespread contamination that requires detailed remedial planning, followed by implementation of standard construction practices such as excavation and off-site disposal or capping and containment
- Involvement of an accredited Site Auditor, and issue of a Site Audit Statement and Site Audit Report would occur where contamination is highly complex, such as significant groundwater contamination; contamination associated with vapour; contamination that requires specialised remediation techniques; or contamination that requires ongoing active management during and beyond construction.

Table 10-1: Summary of mitigation and management measures for potential construction impacts

Ref	Impact	Mitigation measure
C1	Management of low risk contamination	<p>For areas that have been identified as having moderate contamination impact potential, a further review of data would be performed.</p> <p>Should the additional data review confirm that contamination is likely to have a very low or low impact potential, the areas would then be managed in accordance with the Soil and Water Management Plan. This would typically occur where there is minor, isolated contamination that can be readily remediated through standard construction practices such as excavation and off-site disposal.</p>
C2	Detailed Site Investigation	<p>Where data from the additional data review (mitigation measure C1) is insufficient to understand the impact of contamination, a Detailed Site Investigation would be carried out in accordance with the NEPM (2013) and other guidelines made or endorsed by the NSW EPA.</p> <p>The areas requiring Detailed Site Investigation would be confirmed following the additional data review (mitigation measure C1), however on the basis of the PSCI, it is anticipated that a Detailed Site Investigation would be required to characterise fill materials, and sediment from dam / retention pond for on-site reuse and/or off-site disposal. Fly tipped wastes and deposited wastes (from former land use) would need to be characterised for off-site disposal.</p>

Ref	Impact	Mitigation measure
C3	Remediation	<p>Where data from additional data review (mitigation measure C1) or the Detailed Site Investigation (mitigation measure C2) confirms that contamination would have a moderate to very high risk, a Remedial Action Plan (RAP) would be developed for the area of the construction footprint.</p> <p>The RAP would detail the remediation works required to mitigate impacts from contamination throughout and following completion of construction. The RAP would be prepared in accordance with relevant NSW EPA guidelines and where applicable, detail remediation methodologies in accordance with Australian Standards and other relevant government guidelines and codes of practice.</p> <p>Remediation would be performed as an integrated component of construction and to a standard commensurate with the proposed end use of the land.</p> <p>The requirements for a RAP and remediation would be confirmed following the additional data review (mitigation measure C1) and Detailed Site Investigation (mitigation measure C2).</p>
C4	Site Audit Statement	<p>Where contamination is highly complex, such as significant groundwater contamination; contamination associated with vapour; contamination that requires specialised remediation techniques; or contamination that requires ongoing active management during and beyond construction, an accredited Site Auditor would review and approve the RAP, and would develop a Site Audit Statement and Site Audit Report upon completion of remediation.</p> <p>The requirement for a Site Audit Statement would be confirmed following the preparation of the Remediation Action Plan (mitigation measure C3).</p>
C5	Residual contamination following construction	Ongoing management and monitoring measures would be documented in an appropriate form and implemented for any areas where minor, residual contamination remains following construction.

It should be noted that the appropriate management and mitigation measures and/or remediation for soil and groundwater as part of construction of the proposal site can only be determined based on the results of additional information reviews and investigations, which would be completed to inform the design and the commencement of construction.

10.2 Operation

Operational management and mitigation measures should address potential risks from contamination and to the contamination status within the site and surrounding area. Operational management and mitigation measures will depend on the outcome of further investigations that should also be used to inform potential impacts associated with construction. The operational management and mitigation measures should also be considered as part of the detailed design for the proposal site.

Potential management and mitigation measures for operation of the proposal site are discussed in Table 10-2.

Table 10-2: Summary of mitigation and management measures for potential operation impacts

Ref	Impact	Mitigation measure
C6	Accidental leaks or spills	The operational environmental management plan (OEMP) for the proposal would include an Emergency Response Plan (or equivalent) which would specify the procedure to be followed in the event of a spill, including the notification requirements and use of absorbent material to contain the spill.

Ref	Impact	Mitigation measure
C7	Contaminated soil	Where contaminated soils are to remain on-site, an appropriate OEMP would be prepared and implemented. The OEMP would include relevant ongoing management requirements developed in accordance with the NEPM (2013) and relevant guidelines made or approved by the NSW EPA. Measures may include but are not limited to procedures for excavation works, inspections and audits.
C8	Contaminated groundwater	<p>Potential impacts from existing groundwater contamination (if present) during operation of the proposal would be managed through management and mitigation measures:</p> <ul style="list-style-type: none"> ▪ Emplacement of appropriate topographic / drainage controls to minimise seepage and ponding of water across the site ▪ Drainage from sealed areas would be directed to stormwater drains (e.g. pipes, swales) via gross pollutant traps and sediment basins (if necessary) to mitigate potential impacts from sediments or wastes on receiving environments.

11. Conclusions and recommendations

Jacobs has undertaken a preliminary contaminated site investigation (PCSI) of the proposed precast facility sites (the proposal site) located at Lenore Drive, Eastern Creek NSW as part of key deliverables and scope to inform a Review of Environmental Factors (REF).

The PCSI has included a review of desktop information, a site walkover inspection, an assessment of potential areas and sources of on-site and off-site contamination, an assessment of the potential impacts to human health and the environment from exposure to contamination during construction / operation of the proposal site, potential management and mitigation measures, and recommendations for further works where necessary.

The findings of the PCSI have identified a moderate potential for on-site contamination (soil) as a result of historic filling activities, the former use of the proposal site (agricultural land use), potential for contaminated sediments within farm dams (northern portion of proposal site) and the presence of fly tipped wastes.

On-site soil and groundwater contamination if exposed during construction activities and operation of the site could impact upon human health and environmental receptors if appropriate management / remediation measures are not adopted in response to contamination risks.

To quantify the potential contamination impacts identified, the following is recommended:

- For areas that have been identified as having moderate contamination impact potential, a further review of data would be performed
- Where data from the additional data review is insufficient to understand the impact of contamination, a Detailed Site Investigation would be carried out in accordance with the NEPM (2013) and other guidelines made or endorsed by the NSW EPA.

12. References

- ADE Consulting Group (13 June 2014) Phase 1 Preliminary Site Investigation. Honeycomb Drive, Eastern Creek NSW
- Artefact (2020) Statement of Heritage Impact
- Aurecon (23 October 2019) Development Application. Preliminary Site Investigation for Contamination Risks. 10 Eastern Creek Drive, Eastern Creek NSW
- Australian Standard (AS 4482.1-2005) Guide to the sampling and investigation of potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds
- Australian Standard (AS 4482.2-1999) Guide to the sampling and investigation of potentially contaminated soils – Volatile substances
- ANZG (2018): Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ, 2018)
- DEC (2005): Information for the assessment of former gasworks sites. Department of Environment and Conservation, 2005
- DEC (2007): Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination. Department of Environment and Conservation, 2007
- Department of Urban Affairs and Planning & Environment Protection Authority (1998) Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land
- Douglas Partners (September 2018) Preliminary Site (Contamination) Investigation. Oakdale East Industrial Estate. 224-398 Burley Road, Horsley Park
- Edson Environmental & Engineering (12 April 2015) Assessment of Soil and Water Impacts: Proposed Energy from Waste Facility, Eastern Creek
- HEPA (2020) PFAS National Environmental Management Plan Ver. 2.0. Heads of Environment Protection Agency, 2020
- Lotsearch (2020): LS011112 EP – Lenore Drive, Eastern Creek, NSW, 2766. 3 April 2020
- Managing asbestos in or on soil (WorkCover NSW, 2014). [Online] Available at: http://www.safework.nsw.gov.au/_data/assets/pdf_file/0005/329171/Managing-asbestos-in-soil-guide.pdf
- National Environment Protection (Assessment of Site Contamination) Measure 1999 (as revised 2013)
- NSW EPA (1995): Contaminated Sites: Sampling Design Guidelines. NSW Environment Protection Agency, 1995
- NSW EPA (1997): Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (3rd Edition). NSW Environment Protection Agency, 2017
- NSW EPA (2012): Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases New South Wales Environment Protection Agency, 2012
- NSW EPA (2014): Waste Classification Guidelines. NSW Environment Protection Agency, 2014
- NSW EPA (2015): Technical Note: Light Non-Aqueous Phase Liquid Assessment and Remediation. New South Wales Environment Protection Agency, 2015
- NSW OEH (2011): Guidelines for Consultants Reporting on Contaminated Sites. New South Wales Office of Environment and Heritage, 2011.
- WSP / Parsons Brinkerhoff (October, 2016) Land Capability, Salinity and Contamination Assessment, Ropes Creek, NSW

Appendix A. Lotsearch Report



LOTSEARCH

LOTSEARCH ENVIRO PROFESSIONAL

Date: 03 Apr 2020 09:36:13

Reference: LS011866 EP

Address: Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Disclaimer:

The purpose of this report is to provide an overview of some of the site history, environmental risk and planning information available, affecting an individual address or geographical area in which the property is located. It is not a substitute for an on-site inspection or review of other available reports and records. It is not intended to be, and should not be taken to be, a rating or assessment of the desirability or market value of the property or its features.

You should obtain independent advice before you make any decision based on the information within the report.

The detailed terms applicable to use of this report are set out at the end of this report.

Dataset Listing

Datasets contained within this report, detailing their source and data currency:

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features Onsite	No. Features within 100m	No. Features within Buffer
Cadastre Boundaries	NSW Department of Finance, Services & Innovation	13/02/2020	13/02/2020	Quarterly	-	-	-	-
Topographic Data	NSW Department of Finance, Services & Innovation	25/06/2019	25/06/2019	As required	-	-	-	-
List of NSW contaminated sites notified to EPA	Environment Protection Authority	16/03/2020	16/03/2020	Monthly	1000	0	0	1
Contaminated Land Records of Notice	Environment Protection Authority	17/03/2020	17/03/2020	Monthly	1000	0	0	0
Former Gasworks	Environment Protection Authority	16/03/2020	11/10/2017	Monthly	1000	0	0	0
National Waste Management Facilities Database	Geoscience Australia	12/02/2020	07/03/2017	Quarterly	1000	0	0	1
National Liquid Fuel Facilities	Geoscience Australia	05/02/2020	13/07/2012	Quarterly	1000	0	0	0
EPA PFAS Investigation Program	Environment Protection Authority	18/03/2020	18/03/2020	Monthly	2000	0	0	0
Defence PFAS Investigation & Management Program – Investigation Sites	Department of Defence	12/02/2020	12/02/2020	Monthly	2000	0	0	0
Defence PFAS Investigation & Management Program – Management Sites	Department of Defence	12/02/2020	12/02/2020	Monthly	2000	0	0	0
Airservices Australia National PFAS Management Program	Airservices Australia	20/03/2020	20/03/2020	Monthly	2000	0	0	0
Defence 3 Year Regional Contamination Investigation Program	Department of Defence	04/03/2020	04/03/2020	Monthly	2000	0	0	0
EPA Other Sites with Contamination Issues	Environment Protection Authority	04/02/2020	13/12/2018	Annually	1000	0	0	0
Licensed Activities under the POEO Act 1997	Environment Protection Authority	11/03/2020	11/03/2020	Monthly	1000	0	0	7
Delicensed POEO Activities still regulated by the EPA	Environment Protection Authority	13/03/2020	13/03/2020	Monthly	1000	0	0	0
Former POEO Licensed Activities now revoked or surrendered	Environment Protection Authority	13/03/2020	13/03/2020	Monthly	1000	3	9	10
UBD Business Directories (Premise & Intersection Matches)	Hardie Grant			Not required	150	0	0	0
UBD Business Directories (Road & Area Matches)	Hardie Grant			Not required	150	-	0	0
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Premise & Intersection Matches)	Hardie Grant			Not required	500	0	0	0
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Road & Area Matches)	Hardie Grant			Not required	500	-	0	0
Points of Interest	NSW Department of Finance, Services & Innovation	18/10/2019	18/10/2019	Quarterly	1000	0	0	29
Tanks (Areas)	NSW Department of Customer Service - Spatial Services	18/10/2019	18/10/2019	Quarterly	1000	0	0	0
Tanks (Points)	NSW Department of Customer Service - Spatial Services	18/10/2019	18/10/2019	Quarterly	1000	0	0	0
Major Easements	NSW Department of Finance, Services & Innovation	18/10/2019	18/10/2019	Quarterly	1000	1	1	12
State Forest	Forestry Corporation of NSW	18/01/2018	18/01/2018	As required	1000	0	0	0
NSW National Parks and Wildlife Service Reserves	NSW Office of Environment & Heritage	21/01/2020	30/09/2019	Annually	1000	0	0	0
Hydrogeology Map of Australia	Commonwealth of Australia (Geoscience Australia)	08/10/2014	17/03/2000	As required	1000	1	1	1
Botany Groundwater Management Zones	NSW Department of Planning, Industry and Environment	15/03/2018	01/10/2005	As required	1000	0	0	0

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features Onsite	No. Features within 100m	No. Features within Buffer
Groundwater Boreholes	NSW Dept. of Primary Industries - Water NSW; Commonwealth of Australia (Bureau of Meteorology)	24/07/2018	23/07/2018	Annually	2000	0	0	20
Geological Units 1:100,000	NSW Department of Planning, Industry and Environment	20/08/2014		None planned	1000	2	-	3
Geological Structures 1:100,000	NSW Department of Planning, Industry and Environment	20/08/2014		None planned	1000	0	-	1
Naturally Occurring Asbestos Potential	NSW Dept. of Industry, Resources & Energy	04/12/2015	24/09/2015	Unknown	1000	0	0	0
Atlas of Australian Soils	Australian Bureau of Agriculture and Resource Economics and Sciences (ABARES)	19/05/2017	17/02/2011	As required	1000	2	2	3
Soil Landscapes	NSW Department of Planning, Industry and Environment	12/08/2014		None planned	1000	2	-	3
Environmental Planning Instrument Acid Sulfate Soils	NSW Department of Planning, Industry and Environment	26/03/2020	28/02/2020	Monthly	500	0	-	-
Atlas of Australian Acid Sulfate Soils	CSIRO	19/01/2017	21/02/2013	As required	1000	1	1	1
Dryland Salinity - National Assessment	National Land and Water Resources Audit	18/07/2014	12/05/2013	None planned	1000	1	1	2
Dryland Salinity Potential of Western Sydney	NSW Department of Planning, Industry and Environment	12/05/2017	01/01/2002	None planned	1000	2	5	8
Mining Subsidence Districts	NSW Department of Customer Service - Subsidence Advisory NSW	18/10/2019	18/10/2019	Quarterly	1000	0	0	0
Environmental Planning Instrument SEPP State Significant Precincts	NSW Department of Planning, Industry and Environment	26/03/2020	07/12/2018	Monthly	1000	0	0	0
Environmental Planning Instrument Land Zoning	NSW Department of Planning, Industry and Environment	26/03/2020	13/03/2020	Monthly	1000	4	9	52
Commonwealth Heritage List	Australian Government Department of the Agriculture, Water and the Environment	04/02/2020	31/07/2018	Quarterly	1000	0	0	0
National Heritage List	Australian Government Department of the Agriculture, Water and the Environment	04/02/2020	20/11/2019	Quarterly	1000	0	0	0
State Heritage Register - Curtilages	NSW Department of Planning, Industry and Environment	12/02/2020	09/11/2018	Quarterly	1000	0	0	0
Environmental Planning Instrument Heritage	NSW Department of Planning, Industry and Environment	26/03/2020	28/02/2020	Monthly	1000	0	0	0
Bush Fire Prone Land	NSW Rural Fire Service	04/02/2020	14/12/2019	Quarterly	1000	1	3	3
Remnant Vegetation of the Cumberland Plain	NSW Office of Environment & Heritage	07/10/2014	04/08/2011	Unknown	1000	6	6	10
Ramsar Wetlands of Australia	Department of the Agriculture, Water and the Environment	08/10/2014	24/06/2011	As required	1000	0	0	0
Groundwater Dependent Ecosystems	Bureau of Meteorology	14/08/2017	15/05/2017	Unknown	1000	2	2	4
Inflow Dependent Ecosystems Likelihood	Bureau of Meteorology	14/08/2017	15/05/2017	Unknown	1000	2	3	5
NSW BioNet Species Sightings	NSW Office of Environment & Heritage	26/03/2020	26/03/2020	Weekly	10000	-	-	-

Site Diagram

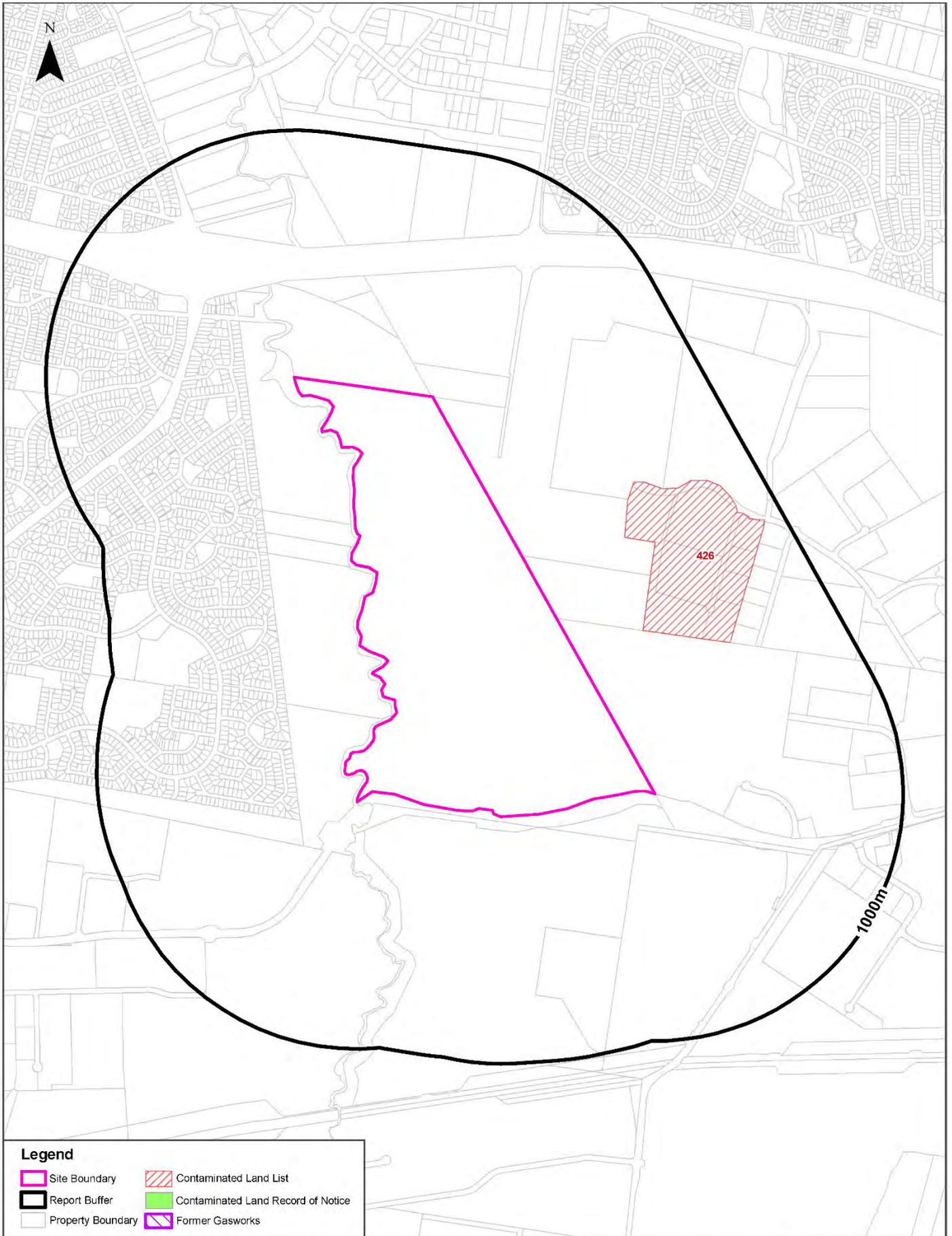
Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



Legend Site Boundary Internal Parcel Boundaries	Total Area: 1.25km ² Total Perimeter: 6133m	Scale:
	Disclaimers: Measurements are approximate only and may have been simplified or smaller lengths removed for readability. Parcels that make up a small percentage of the total site area have not been labelled for increased legibility.	Data Sources: Aerial Imagery: © Aerometrex Pty Ltd
	Coordinate System: GDA 1994 MGA Zone 56	Date: 03 April 2020

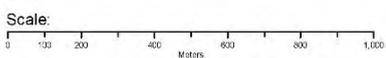
Contaminated Land

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



Legend

- Site Boundary
- Report Buffer
- Property Boundary
- Contaminated Land List
- Contaminated Land Record of Notice
- Former Gasworks



Data Sources: Property Boundaries & Topographic Data:
© Department Finance, Services & Innovation 2020

Coordinate System:
GDA 1994 MGA Zone 56

Date: 03 April 2020

Contaminated Land

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

List of NSW contaminated sites notified to EPA

Records from the NSW EPA Contaminated Land list within the dataset buffer:

Map Id	Site	Address	Suburb	Activity	Management Class	Status	Location Confidence	Dist (m)	Direction
426	Fulton Hogan Industries (formerly Pioneer Road Services)	Honeycomb Drive	Eastern Creek	Other Industry	Regulation under CLM Act not required	Current EPA List	Premise Match	280m	East

The values within the EPA site management class in the table above, are given more detailed explanations in the table below:

EPA site management class	Explanation
Contamination being managed via the planning process (EP&A Act)	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation. The contamination of this site is managed by the consent authority under the Environmental Planning and Assessment Act 1979 (EP&A Act) planning approval process, with EPA involvement as necessary to ensure significant contamination is adequately addressed. The consent authority is typically a local council or the Department of Planning and Environment.
Contamination currently regulated under CLM Act	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation under the Contaminated Land Management Act 1997 (CLM Act). Management of the contamination is regulated by the EPA under the CLM Act. Regulatory notices are available on the EPA's Contaminated Land Public Record of Notices.
Contamination currently regulated under POEO Act	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation. Management of the contamination is regulated under the Protection of the Environment Operations Act 1997 (POEO Act). The EPA's regulatory actions under the POEO Act are available on the POEO public register.
Contamination formerly regulated under the CLM Act	The EPA has determined that the contamination is no longer significant enough to warrant regulation under the Contaminated Land Management Act 1997 (CLM Act). The contamination was addressed under the CLM Act.
Contamination formerly regulated under the POEO Act	The EPA has determined that the contamination is no longer significant enough to warrant regulation. The contamination was addressed under the Protection of the Environment Operations Act 1997 (POEO Act).
Contamination was addressed via the planning process (EP&A Act)	The EPA has determined that the contamination is no longer significant enough to warrant regulation. The contamination was addressed by the appropriate consent authority via the planning process under the Environmental Planning and Assessment Act 1979 (EP&A Act).
Ongoing maintenance required to manage residual contamination (CLM Act)	The EPA has determined that ongoing maintenance, under the Contaminated Land Management Act 1997 (CLM Act), is required to manage the residual contamination. Regulatory notices under the CLM Act are available on the EPA's Contaminated Land Public Record of Notices.
Regulation being finalised	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation under the Contaminated Land Management Act 1997. A regulatory approach is being finalised.
Regulation under the CLM Act not required	The EPA has completed an assessment of the contamination and decided that regulation under the Contaminated Land Management Act 1997 is not required.
Under assessment	The contamination is being assessed by the EPA to determine whether regulation is required. The EPA may require further information to complete the assessment. For example, the completion of management actions regulated under the planning process or Protection of the Environment Operations Act 1997. Alternatively, the EPA may require information via a notice issued under s77 of the Contaminated Land Management Act 1997 or issue a Preliminary Investigation Order.

NSW EPA Contaminated Land List Data Source: Environment Protection Authority

© State of New South Wales through the Environment Protection Authority

Contaminated Land

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Contaminated Land: Records of Notice

Record of Notices within the dataset buffer:

Map Id	Name	Address	Suburb	Notices	Area No	Location Confidence	Distance	Direction
N/A	No records in buffer							

Contaminated Land Records of Notice Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority
Terms of use and disclaimer for Contaminated Land: Record of Notices, please visit
<http://www.epa.nsw.gov.au/clm/clmdisclaimer.htm>

Former Gasworks

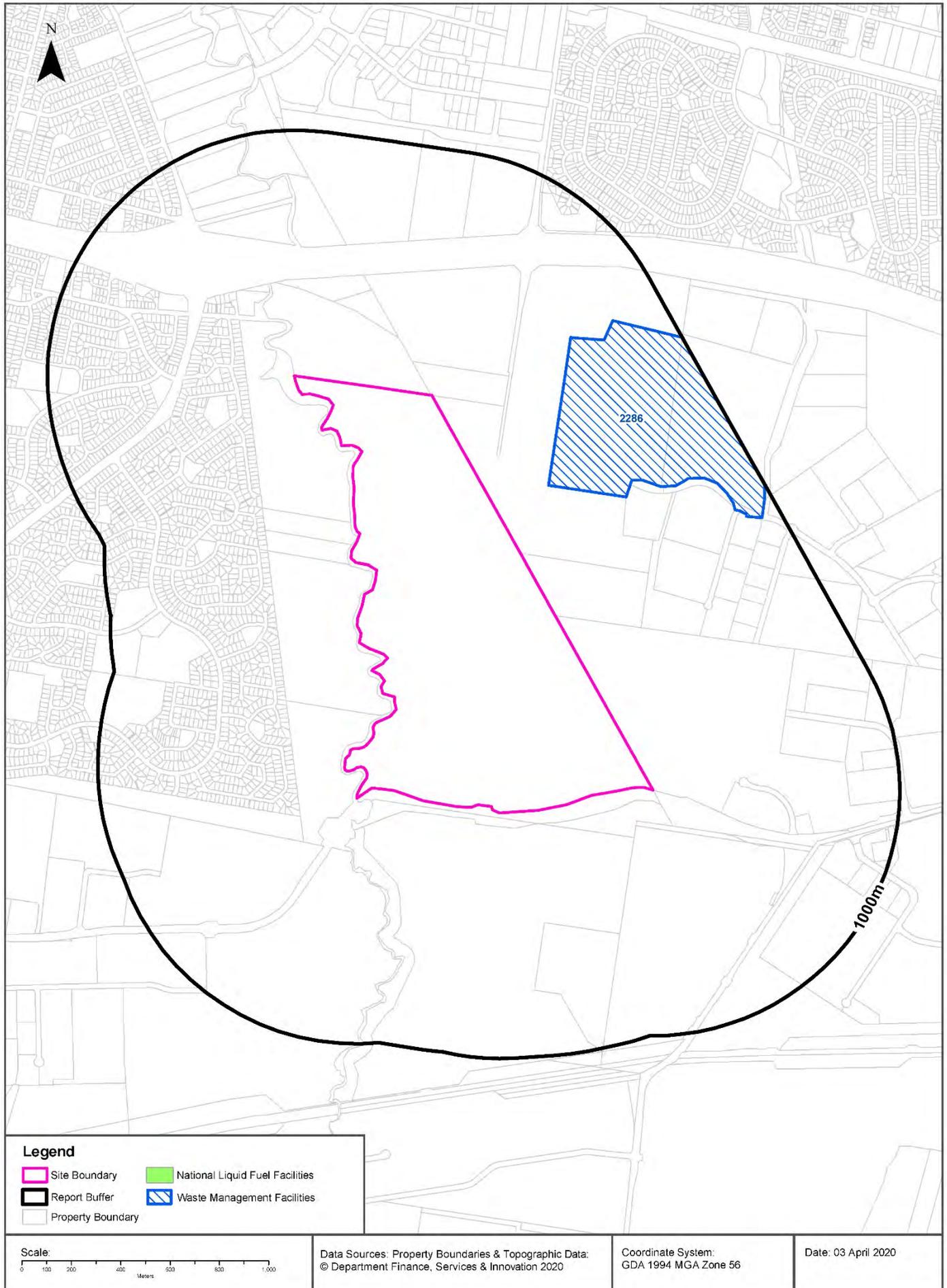
Former Gasworks within the dataset buffer:

Map Id	Location	Council	Further Info	Location Confidence	Distance	Direction
N/A	No records in buffer					

Former Gasworks Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Waste Management & Liquid Fuel Facilities

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



Waste Management & Liquid Fuel Facilities

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

National Waste Management Site Database

Sites on the National Waste Management Site Database within the dataset buffer:

Site Id	Owner	Name	Address	Suburb	Class	Landfil	Reprocess	Transfer	Comments	Loc Conf	Dist (m)	Direction
2286	Genesis	Genesis Xero Waste – Landfill and Recycling	Honeycomb Dr	Eastern Creek	Reprocessing		<Null>			Premise Match	234 m	North East

Waste Management Facilities Data Source: Geoscience Australia
Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

National Liquid Fuel Facilities

National Liquid Fuel Facilities within the dataset buffer:

Map Id	Owner	Name	Address	Suburb	Class	Operational Status	Operator	Revision Date	Loc Conf	Dist (m)	Direction
N/A	No records in buffer										

National Liquid Fuel Facilities Data Source: Geoscience Australia
Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

PFAS Investigation & Management Programs

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

EPA PFAS Investigation Program

Sites that are part of the EPA PFAS investigation program, within the dataset buffer:

Id	Site	Address	Loc Conf	Dist	Dir
N/A	No records in buffer				

EPA PFAS Investigation Program: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Defence PFAS Investigation Program

Sites being investigated by the Department of Defence for PFAS contamination within the dataset buffer:

Map ID	Base Name	Address	Loc Conf	Dist	Dir
N/A	No records in buffer				

Defence PFAS Investigation Program Data Custodian: Department of Defence, Australian Government

Defence PFAS Management Program

Sites being managed by the Department of Defence for PFAS contamination within the dataset buffer:

Map ID	Base Name	Address	Loc Conf	Dist	Dir
N/A	No records in buffer				

Defence PFAS Management Program Data Custodian: Department of Defence, Australian Government

Airservices Australia National PFAS Management Program

Sites being investigated or managed by Airservices Australia for PFAS contamination within the dataset buffer:

Map ID	Site Name	Impacts	Loc Conf	Dist	Dir
N/A	No records in buffer				

Airservices Australia National PFAS Management Program Data Custodian: Airservices Australia

Defence Sites

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Defence 3 Year Regional Contamination Investigation Program

Sites which have been assessed as part of the Defence 3 Year Regional Contamination Investigation Program within the dataset buffer:

Property ID	Base Name	Address	Known Contamination	Loc Conf	Dist	Dir
N/A	No records in buffer					

Defence 3 Year Regional Contamination Investigation Program, Data Custodian: Department of Defence, Australian Government

EPA Other Sites with Contamination Issues

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

EPA Other Sites with Contamination Issues

This dataset contains other sites identified on the EPA website as having contamination issues. This dataset currently includes:

- James Hardie asbestos manufacturing and waste disposal sites
- Radiological investigation sites in Hunter's Hill
- Pasmenco Lead Abatement Strategy Area

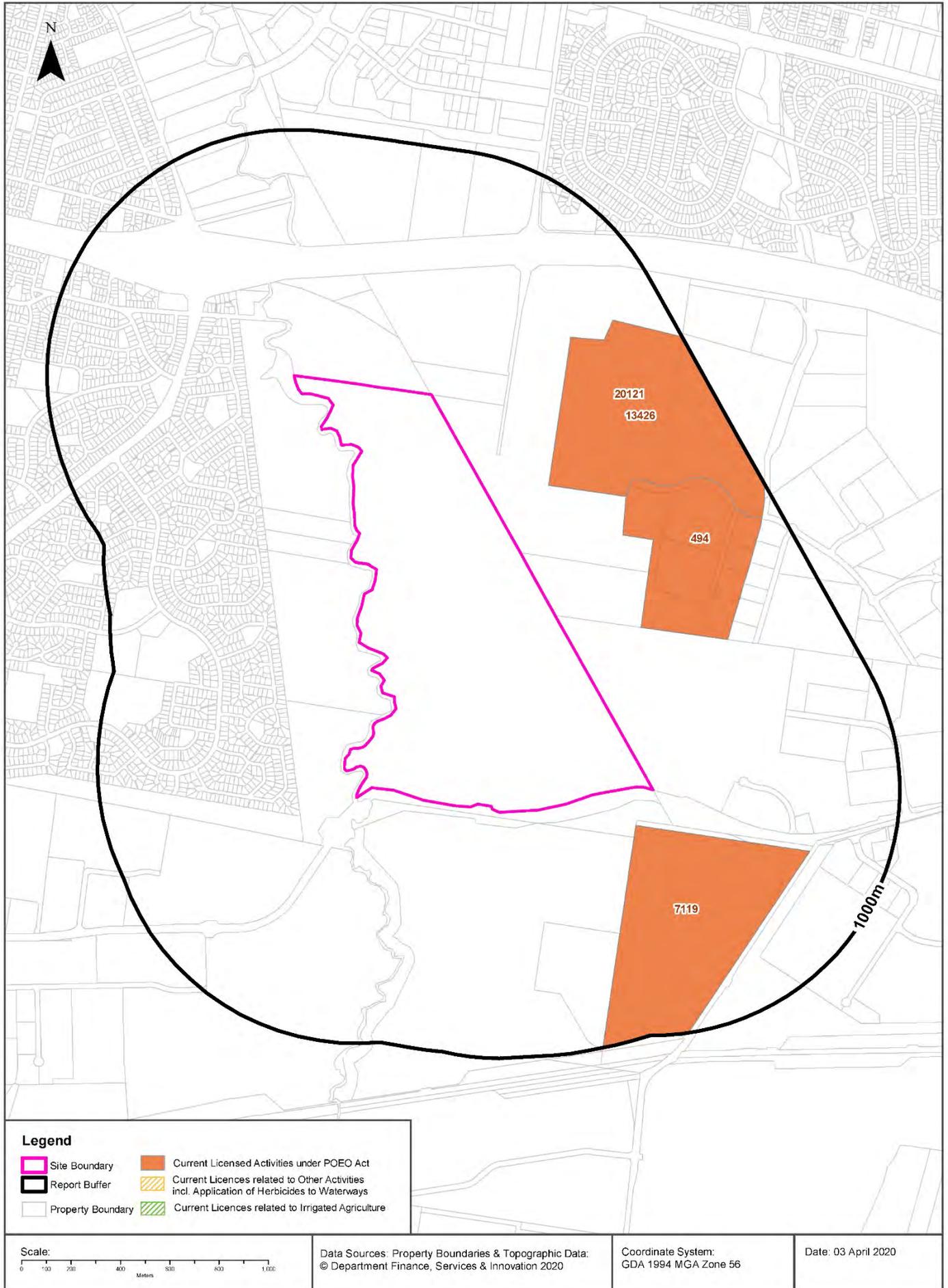
Sites within the dataset buffer:

Site Id	Site Name	Site Address	Dataset	Comments	Location Confidence	Distance	Direction
N/A	No records in buffer						

EPA Other Sites with Contamination Issues: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Current EPA Licensed Activities

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



EPA Activities

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Licensed Activities under the POEO Act 1997

Licensed activities under the Protection of the Environment Operations Act 1997, within the dataset buffer:

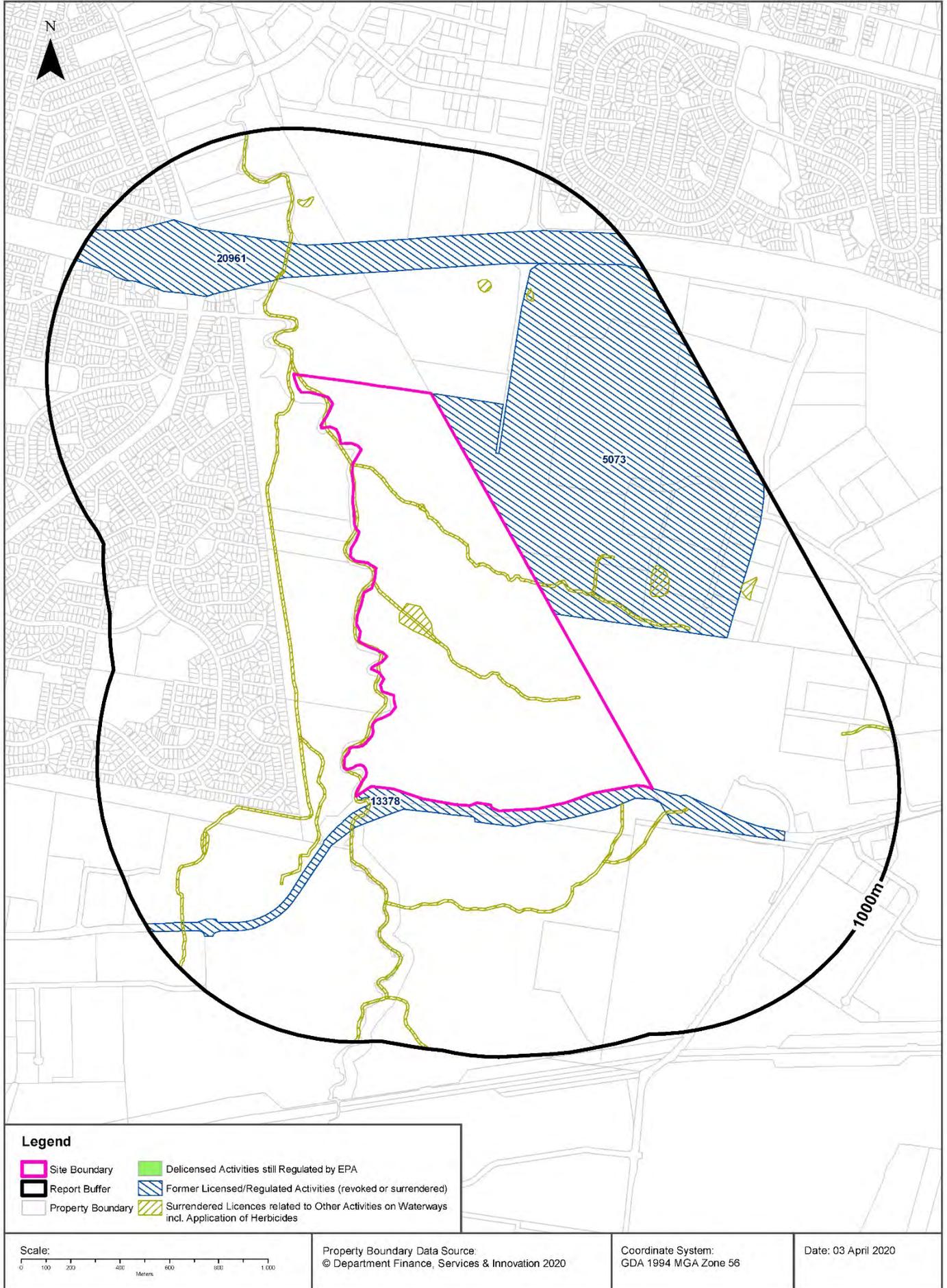
EPL	Organisation	Name	Address	Suburb	Activity	Loc Conf	Distance	Direction
7119	NSW ELECTRICITY NETWORKS OPERATIONS PTY LIMITED	TRANSGRID	200 OLD WALLGROVE ROAD	EASTERN CREEK	Waste storage - hazardous, restricted solid, liquid, clinical and related waste and asbestos waste	Premise Match	153m	South East
13426	Dial-A-Dump (EC) Pty Ltd	Genesis Facility	Honeycomb Drive	EASTERN CREEK	Waste disposal by application to land	Premise Match	234m	North East
13426	Dial-A-Dump (EC) Pty Ltd	Genesis Facility	Honeycomb Drive	EASTERN CREEK	Waste storage - other types of waste	Premise Match	234m	North East
20121	Dial-A-Dump (EC) Pty Ltd	Genesis Recycling Facility	Honeycomb Drive	EASTERN CREEK	Composting	Premise Match	234m	North East
20121	Dial-A-Dump (EC) Pty Ltd	Genesis Recycling Facility	Honeycomb Drive	EASTERN CREEK	Recovery of general waste	Premise Match	234m	North East
20121	Dial-A-Dump (EC) Pty Ltd	Genesis Recycling Facility	Honeycomb Drive	EASTERN CREEK	Waste storage - other types of waste	Premise Match	234m	North East
494	FULTON HOGAN INDUSTRIES PTY LTD	FULTON HOGAN INDUSTRIES PTY LTD	Honeycomb Drive	EASTERN CREEK	Recovery of general waste; Waste storage - other types of waste	Premise Match	280m	East

POEO Licence Data Source: Environment Protection Authority

© State of New South Wales through the Environment Protection Authority

Delicensed & Former Licensed EPA Activities

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



EPA Activities

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Delicensed Activities still regulated by the EPA

Delicensed activities still regulated by the EPA, within the dataset buffer:

Licence No	Organisation	Name	Address	Suburb	Activity	Loc Conf	Distance	Direction
N/A	No records in buffer							

Delicensed Activities Data Source: Environment Protection Authority
 © State of New South Wales through the Environment Protection Authority

Former Licensed Activities under the POEO Act 1997, now revoked or surrendered

Former Licensed activities under the Protection of the Environment Operations Act 1997, now revoked or surrendered, within the dataset buffer:

Licence No	Organisation	Location	Status	Issued Date	Activity	Loc Conf	Distance	Direction
4653	LUHRMANN ENVIRONMENT MANAGEMENT PTY LTD	WATERWAYS THROUGHOUT NSW	Surrendered	06/09/2000	Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	0m	Onsite
4838	Robert Orchard	Various Waterways throughout New South Wales - SYDNEY NSW 2000	Surrendered	07/09/2000	Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	0m	Onsite
6630	SYDNEY WEED & PEST MANAGEMENT PTY LTD	WATERWAYS THROUGHOUT NSW - PROSPECT, NSW, 2148	Surrendered	09/11/2000	Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	0m	Onsite
5073	HANSON CONSTRUCTION MATERIALS PTY LTD	HANSON CONSTRUCTION MATERIALS PTY LTD, Off Wallgrove Road, EASTERN CREEK	Surrendered	02/11/2000	Concrete works	Premise Match	0m	North East
5073	HANSON CONSTRUCTION MATERIALS PTY LTD	HANSON CONSTRUCTION MATERIALS PTY LTD, Off Wallgrove Road, EASTERN CREEK	Surrendered	02/11/2000	Crushing, grinding or separating	Premise Match	0m	North East
5073	HANSON CONSTRUCTION MATERIALS PTY LTD	HANSON CONSTRUCTION MATERIALS PTY LTD, Off Wallgrove Road, EASTERN CREEK	Surrendered	02/11/2000	Land-based extractive activity	Premise Match	0m	North East
5073	HANSON CONSTRUCTION MATERIALS PTY LTD	HANSON CONSTRUCTION MATERIALS PTY LTD, Off Wallgrove Road, EASTERN CREEK	Surrendered	02/11/2000	Recovery of general waste	Premise Match	0m	North East
5073	HANSON CONSTRUCTION MATERIALS PTY LTD	HANSON CONSTRUCTION MATERIALS PTY LTD, Off Wallgrove Road, EASTERN CREEK	Surrendered	02/11/2000	Waste storage - other types of waste	Premise Match	0m	North East

Licence No	Organisation	Location	Status	Issued Date	Activity	Loc Conf	Distance	Direction
13378	NACE CIVIL ENGINEERING PTY. LIMITED	Erskine Park Link Road, between Lenore Lane & Old Wallgrove Road, ERSKINE PARK	Surrendered	11/03/2011	Road construction	Road Match	0m	South
5073	FULTON HOGAN CONSTRUCTION PTY LTD	, M4 - East of Reservoir Road to East of Mamre Road, PARRAMATTA, NSW 2150,	Surrendered	30/06/2017	Road construction	Road Match	389m	North

Former Licensed Activities Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Historical Business Directories

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Business Directory Records 1950-1991 Premise or Road Intersection Matches

Universal Business Directory records from years 1991, 1986, 1982, 1978, 1975, 1970, 1965, 1961 & 1950, mapped to a premise or road intersection within the dataset buffer:

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
	No records in buffer						

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Business Directory Records 1950-1991 Road or Area Matches

Universal Business Directory records from years 1991, 1986, 1982, 1978, 1975, 1970, 1965, 1961 & 1950, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published:

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
	No records in buffer					

Reproduced with permission of UBD and Hardie Grant Media Pty Ltd DD 01/08/2018

Historical Business Directories

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Dry Cleaners, Motor Garages & Service Stations 1948-1993 Premise or Road Intersection Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories, mapped to a premise or road intersection, within the dataset buffer.

Note: The Universal Business Directories were published between 1948 and 1993. Dry Cleaners, Motor Garages & Service Stations have been extracted from all of these directories except the following years 1951, 1955, 1957, 1960, 1963, 1973, 1974, 1977, 1987.

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
	No records in buffer						

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Dry Cleaners, Motor Garages & Service Stations 1948-1993 Road or Area Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published.

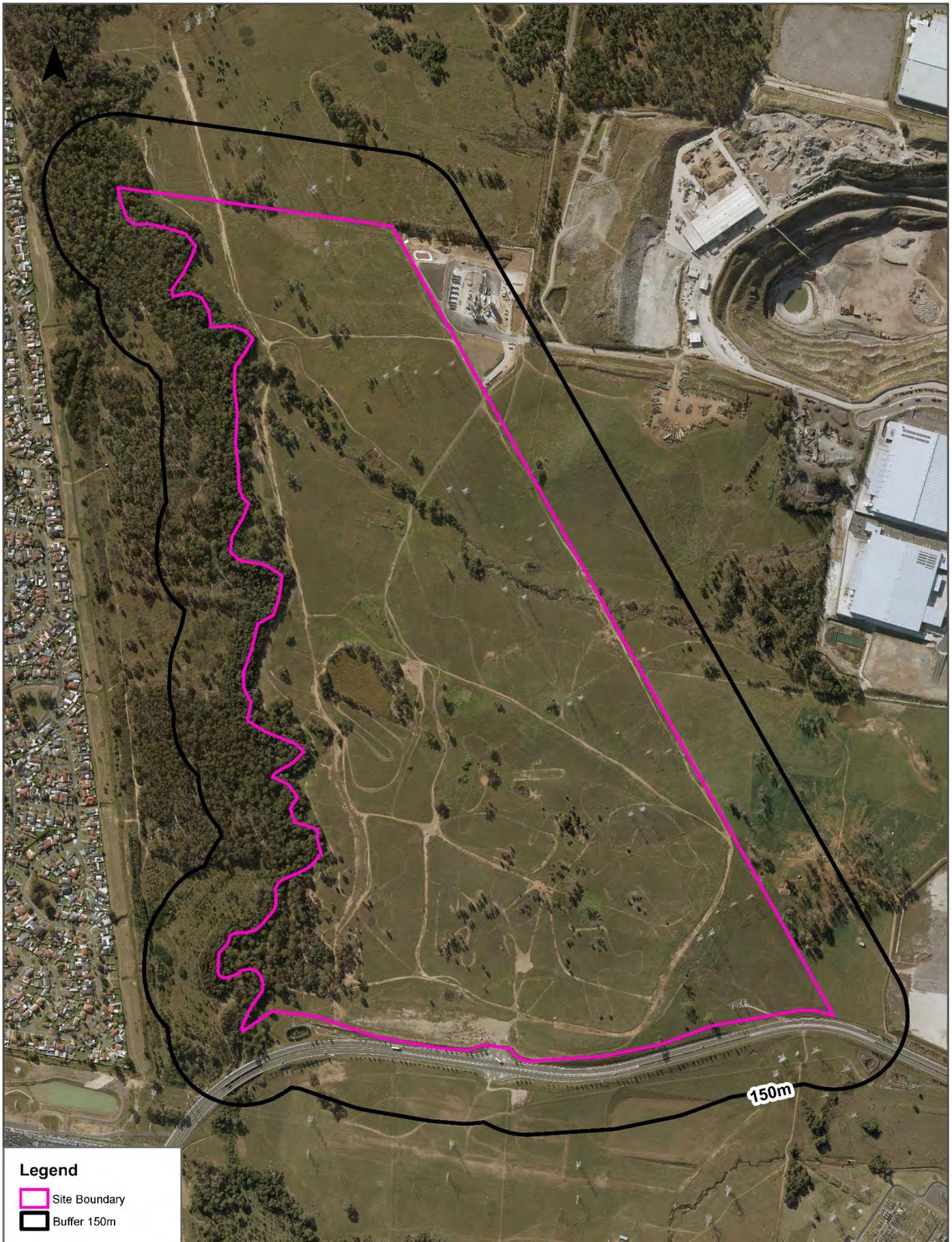
Note: The Universal Business Directories were published between 1948 and 1993. Dry Cleaners, Motor Garages & Service Stations have been extracted from all of these directories except the following years 1951, 1955, 1957, 1960, 1963, 1973, 1974, 1977, 1987.

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
	No records in buffer					

Reproduced with permission of UBD and Hardie Grant Media Pty Ltd DD 01/08/2018

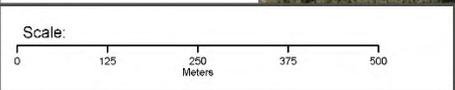
Aerial Imagery 2019

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



Legend

-  Site Boundary
-  Buffer 150m



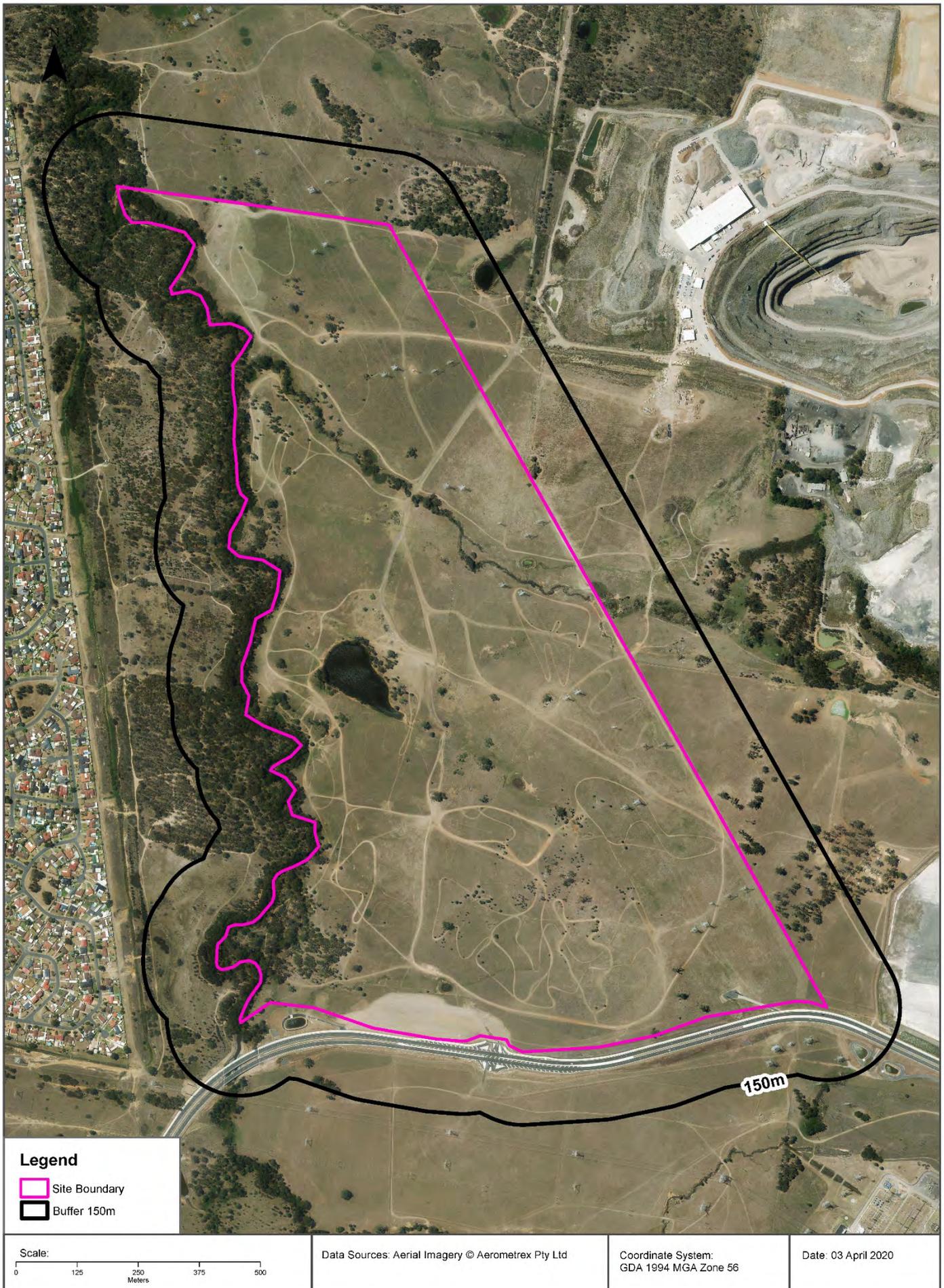
Data Sources: Aerial Imagery © Aerometrex Pty Ltd

Coordinate System:
GDA 1994 MGA Zone 56

Date: 03 April 2020

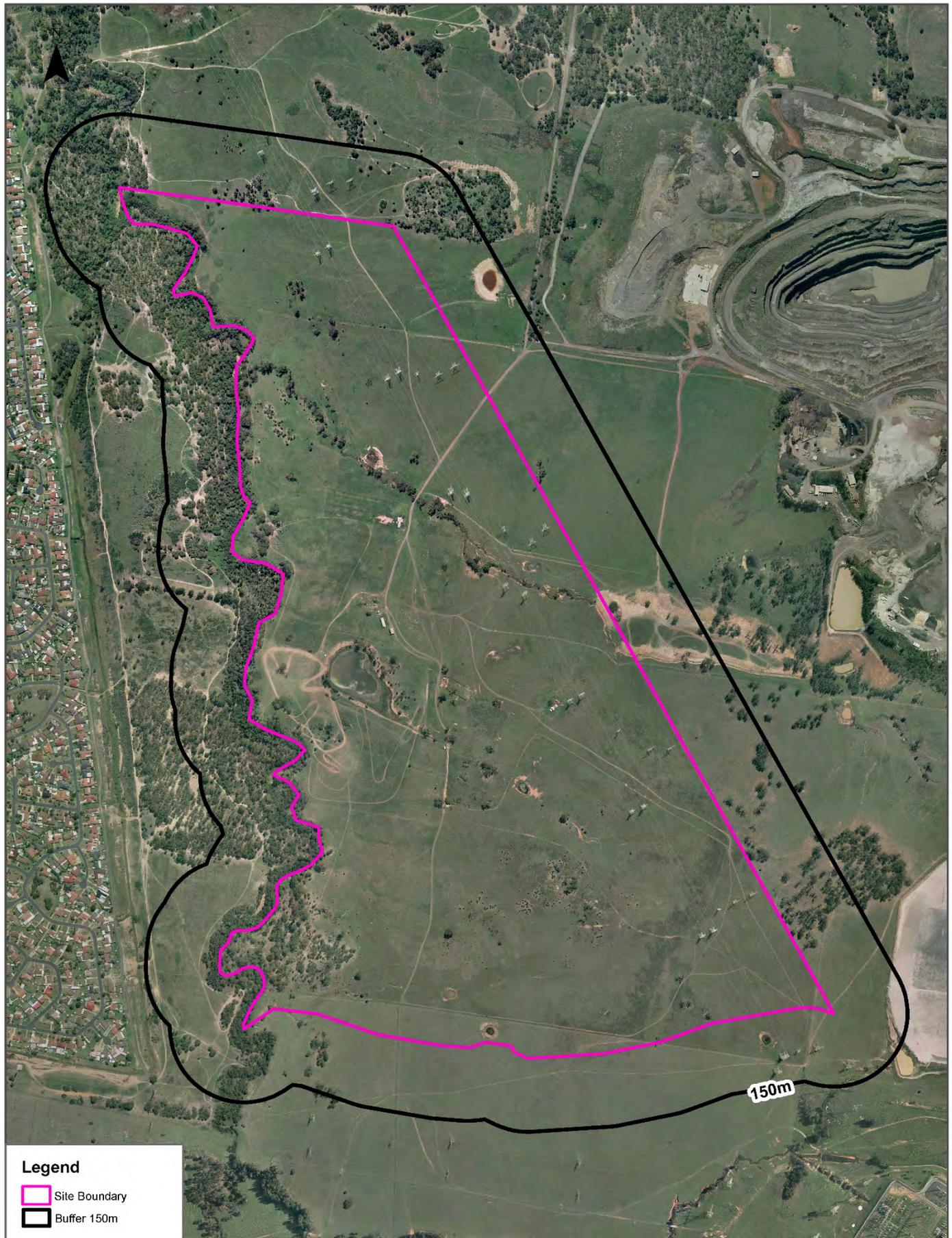
Aerial Imagery 2014

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



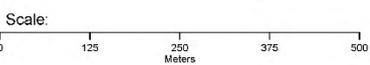
Aerial Imagery 2007

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



Legend

-  Site Boundary
-  Buffer 150m



Data Sources: Aerial Imagery © Aerometrex Pty Ltd

Coordinate System:
GDA 1994 MGA Zone 56

Date: 03 April 2020

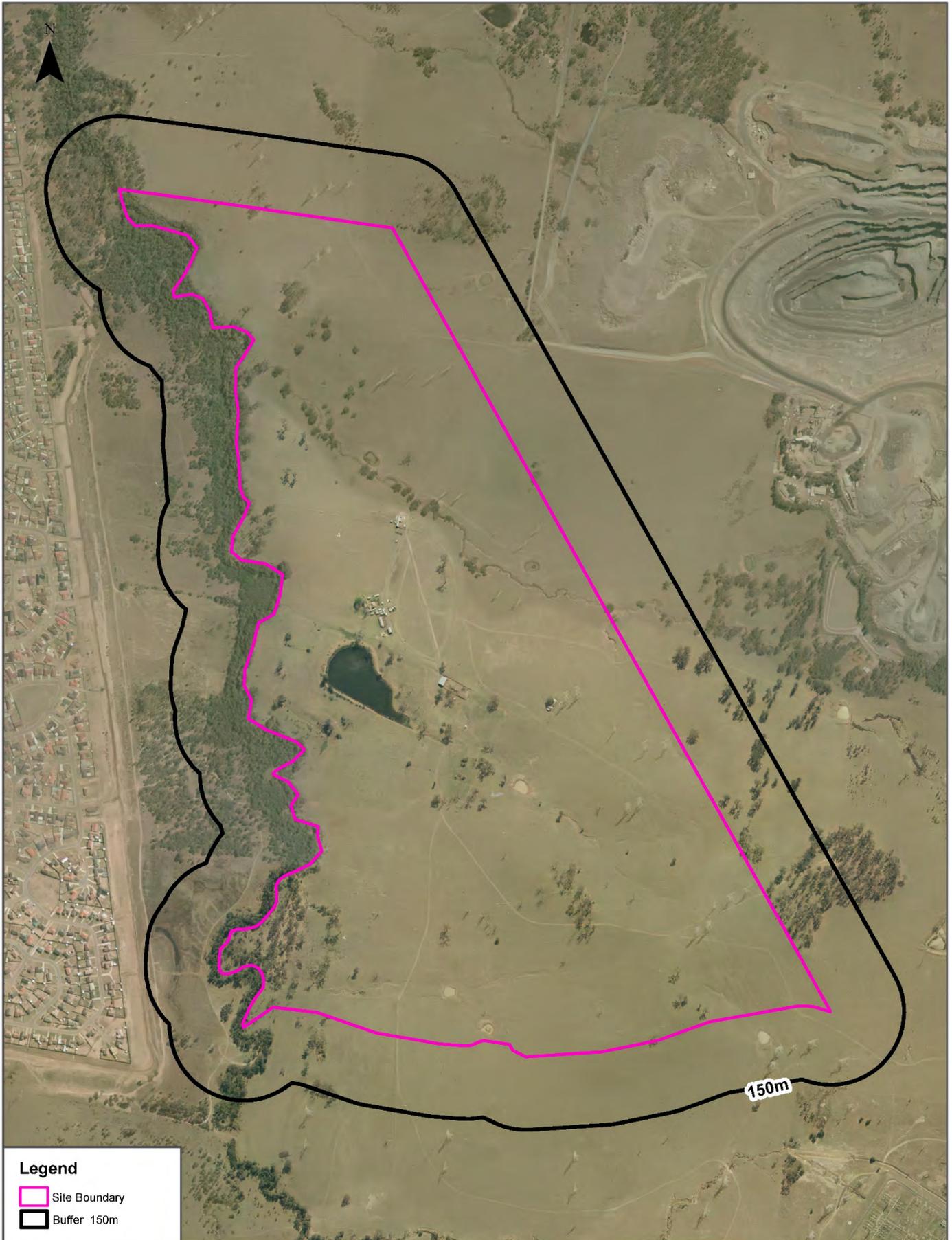
Aerial Imagery 2000

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



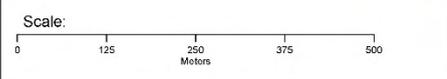
Aerial Imagery 1991

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



Legend

-  Site Boundary
-  Buffer 150m



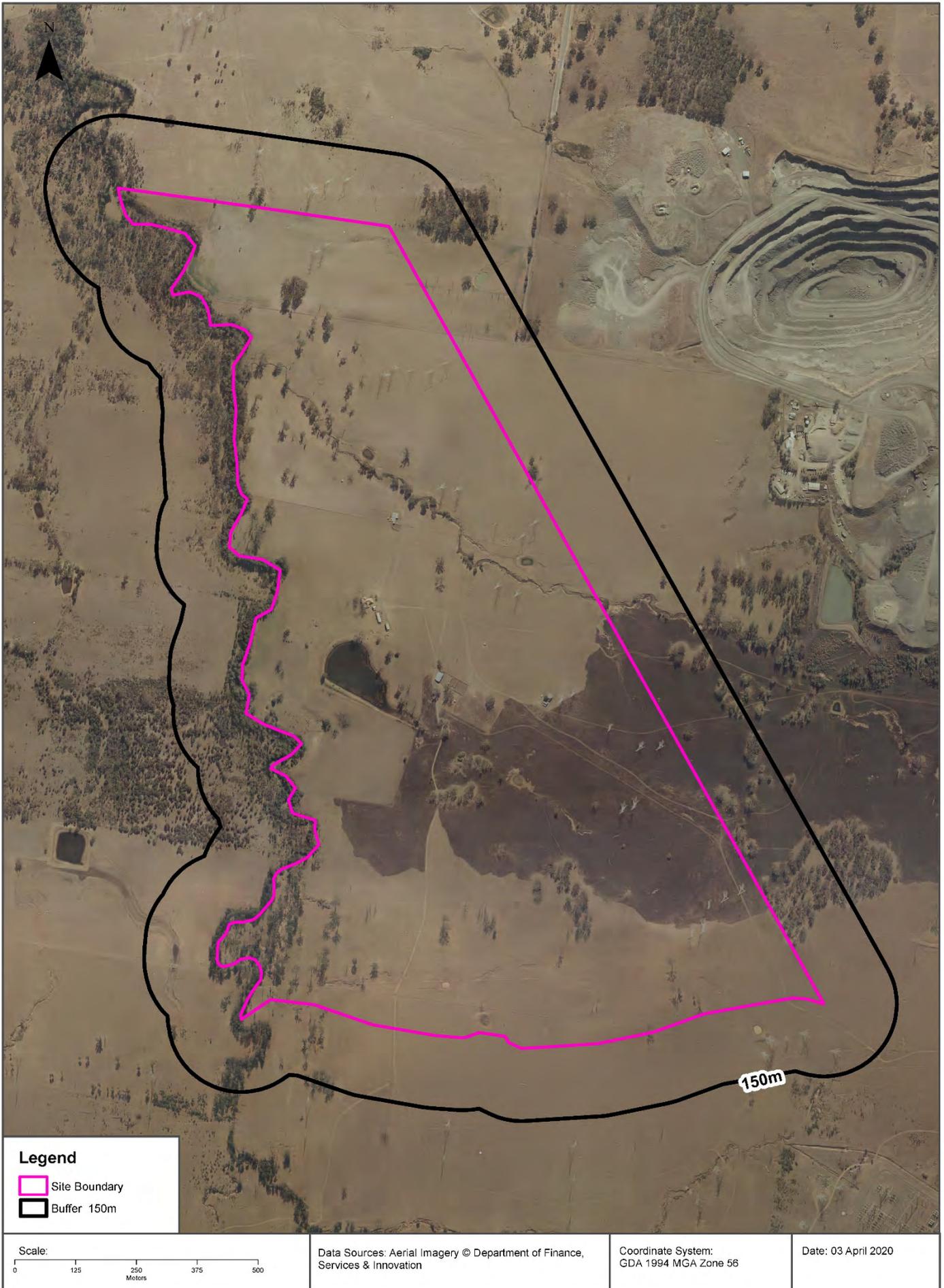
Data Sources: Aerial Imagery © Department of Finance, Services & Innovation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 03 April 2020

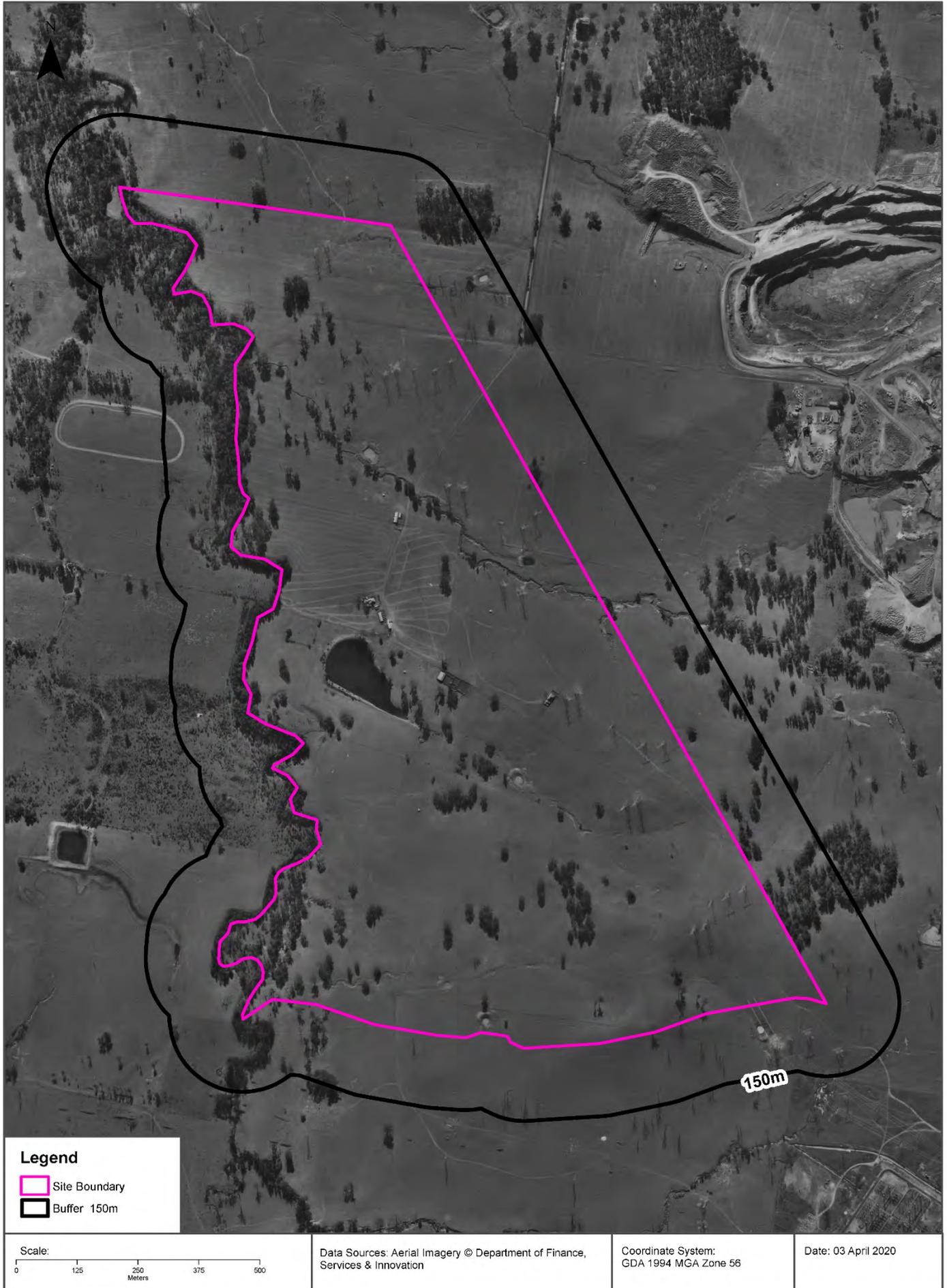
Aerial Imagery 1982

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



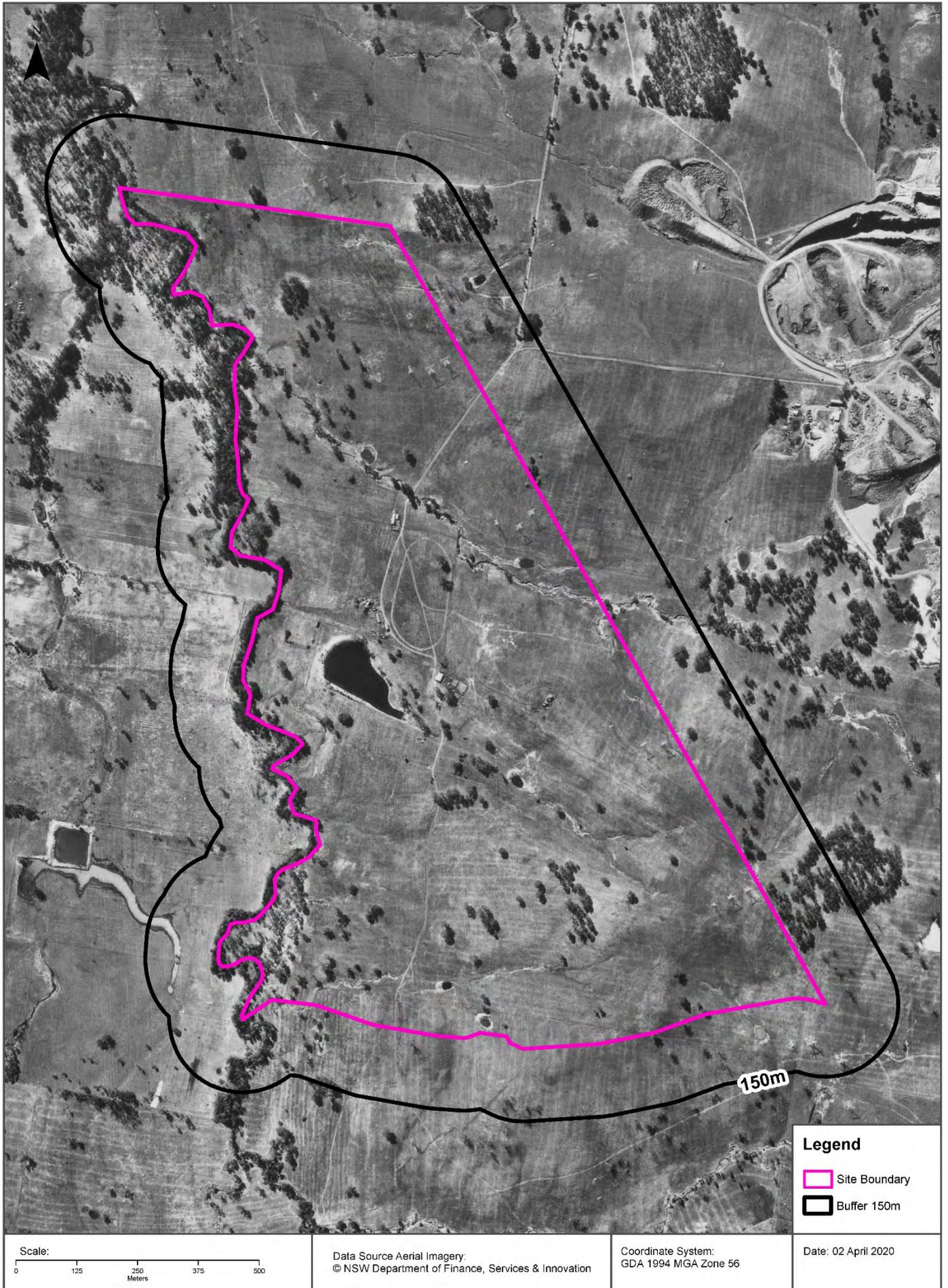
Aerial Imagery 1970

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



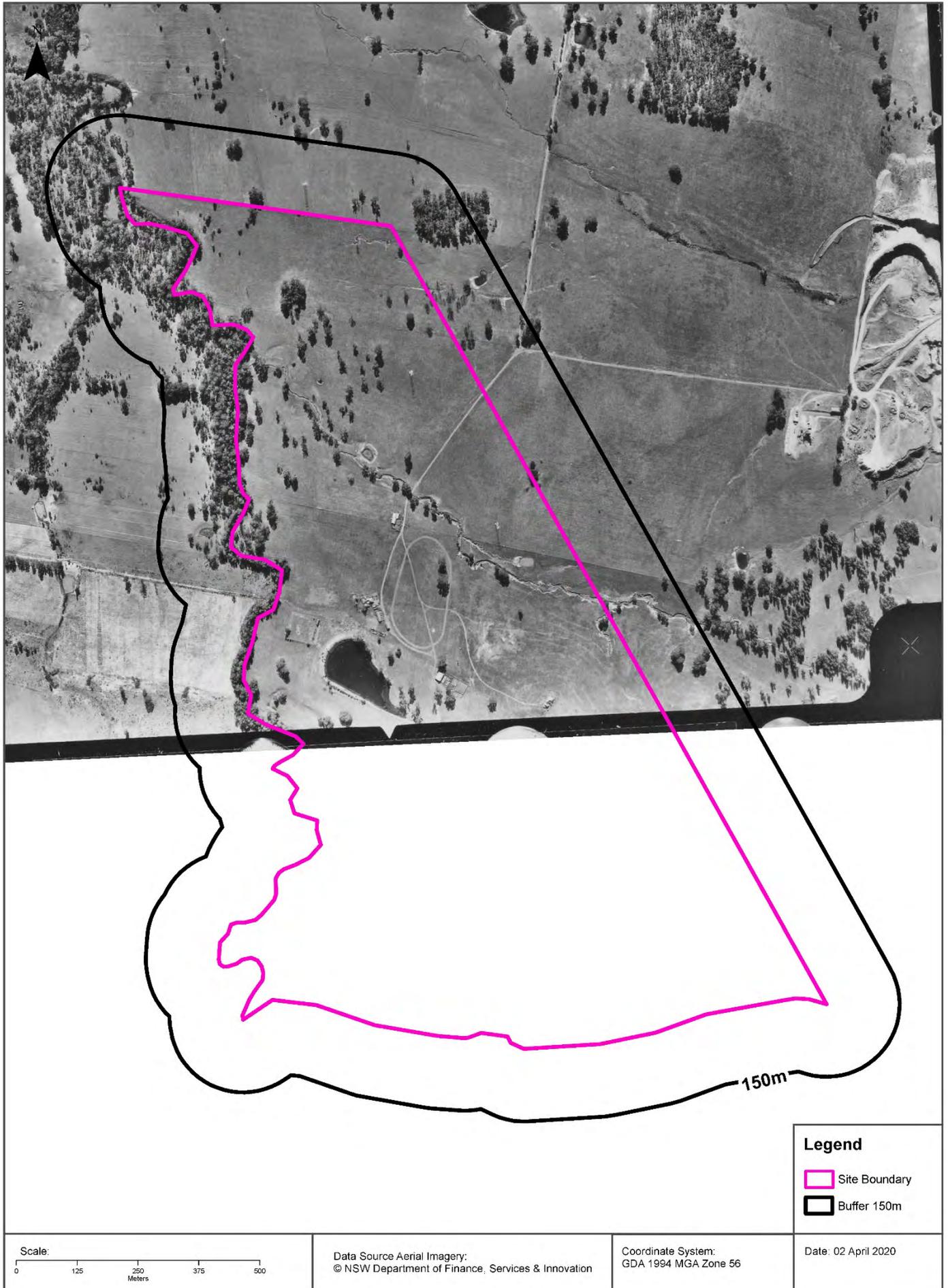
Aerial Imagery 1965

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



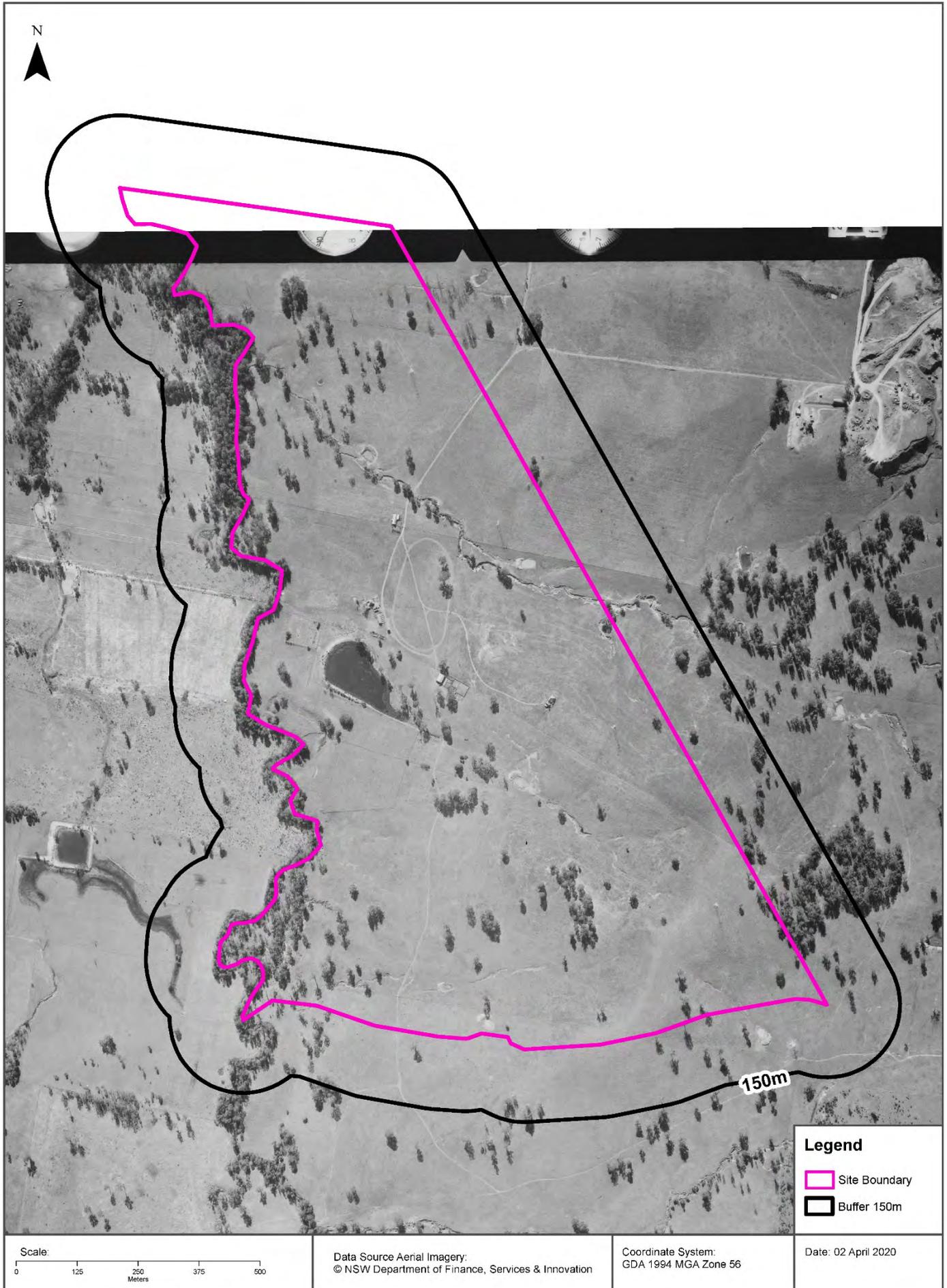
Aerial Imagery 1961

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



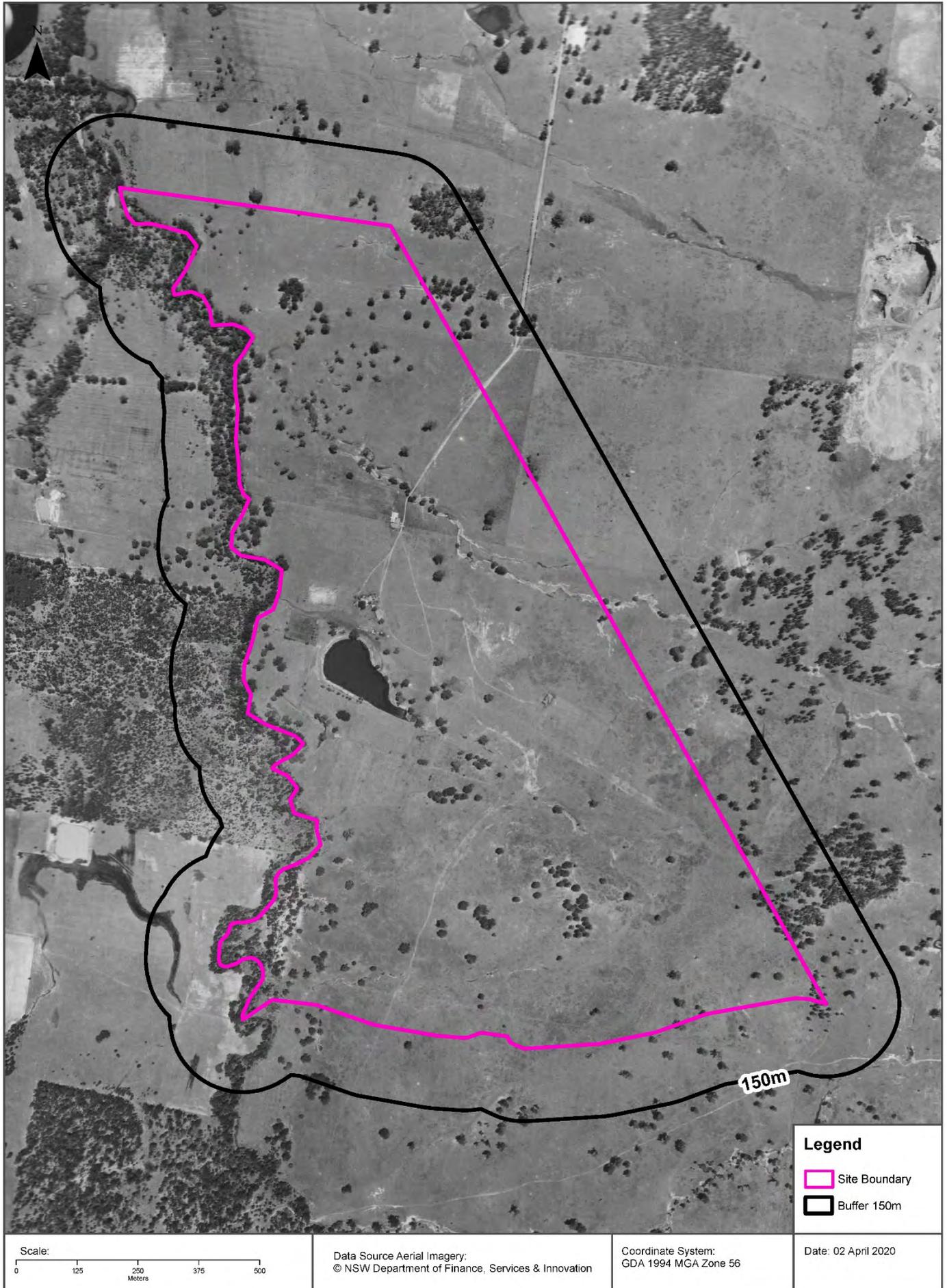
Aerial Imagery 1961

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



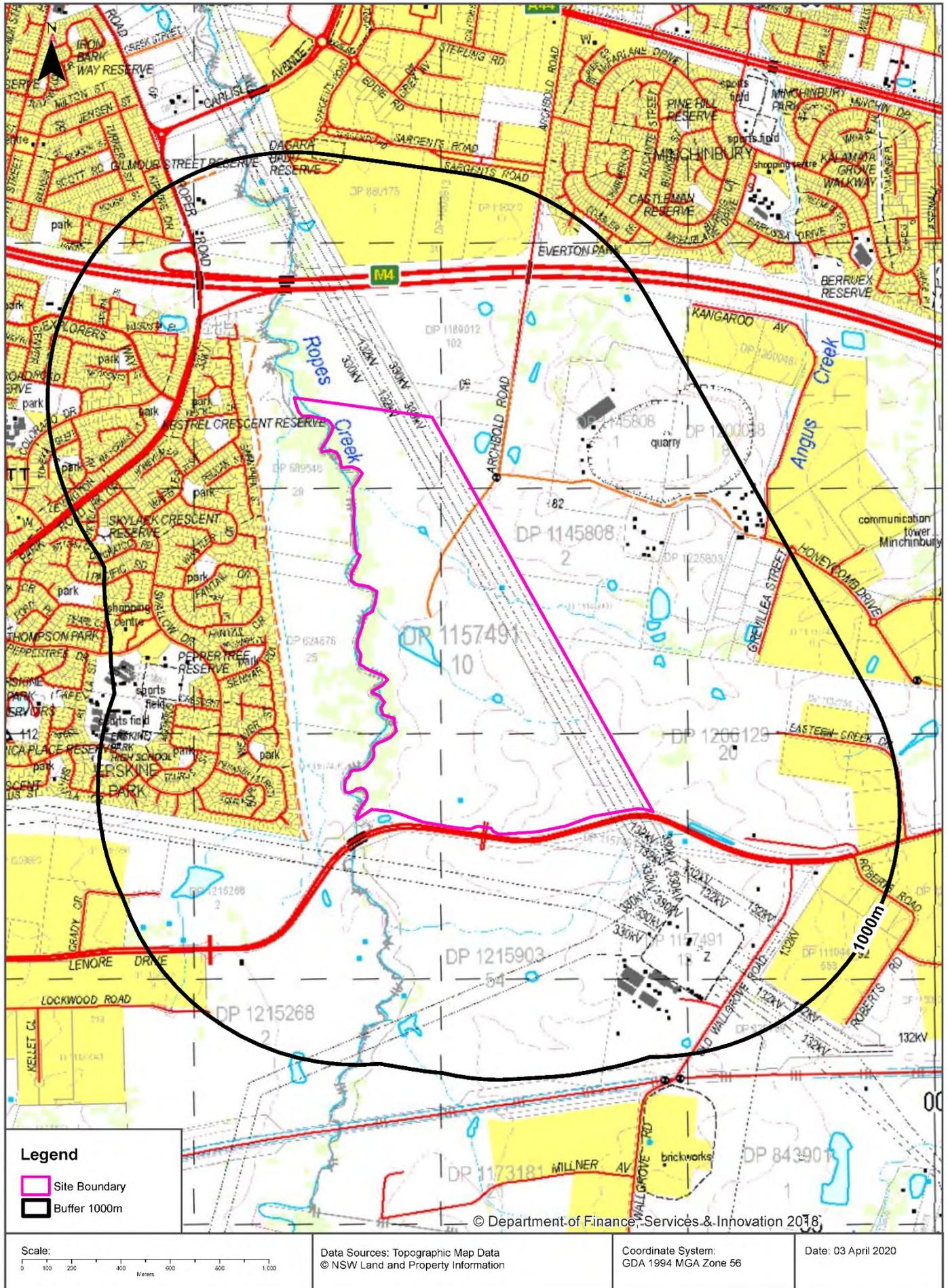
Aerial Imagery 1956

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



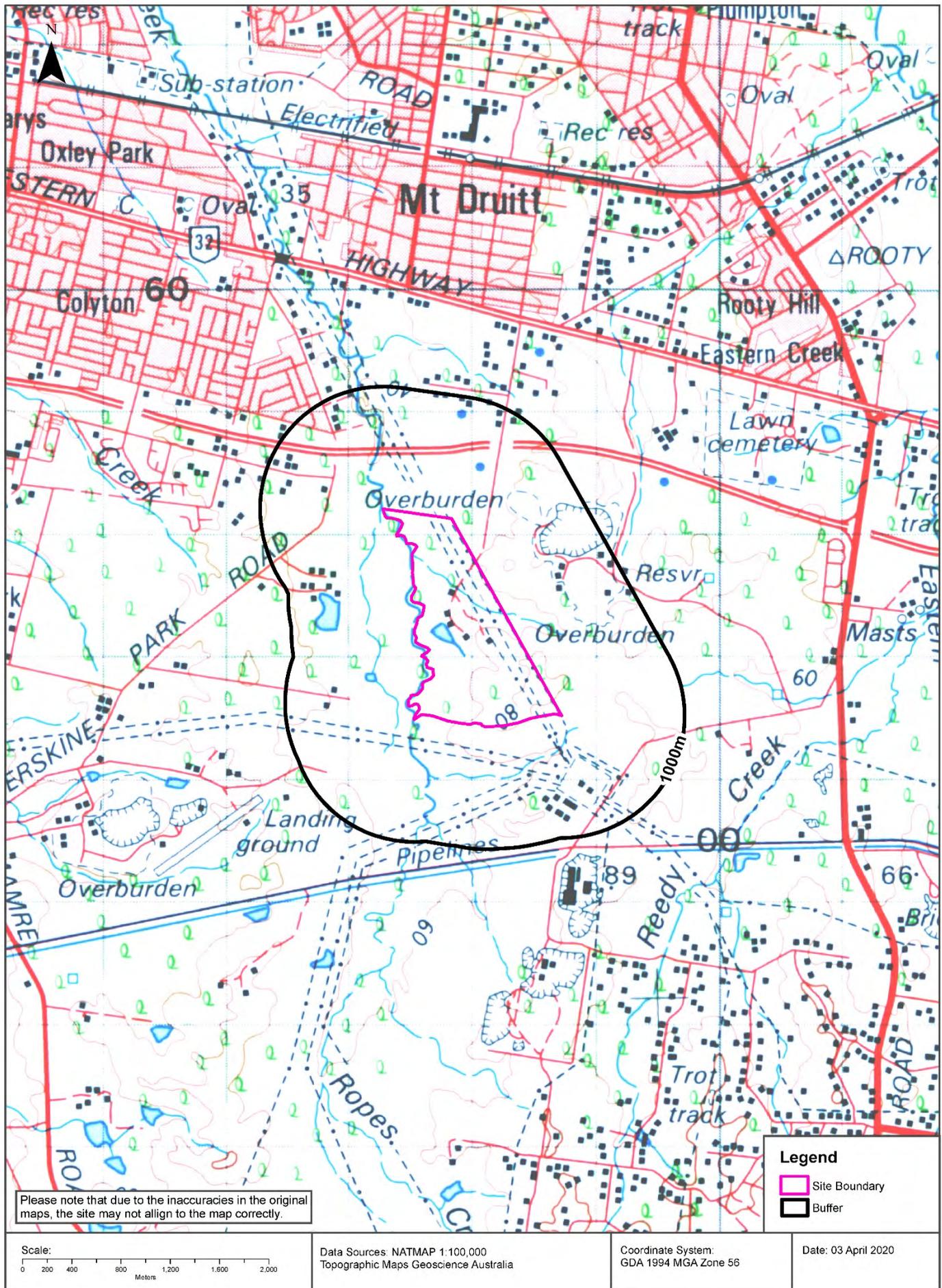
Topographic Map 2015

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



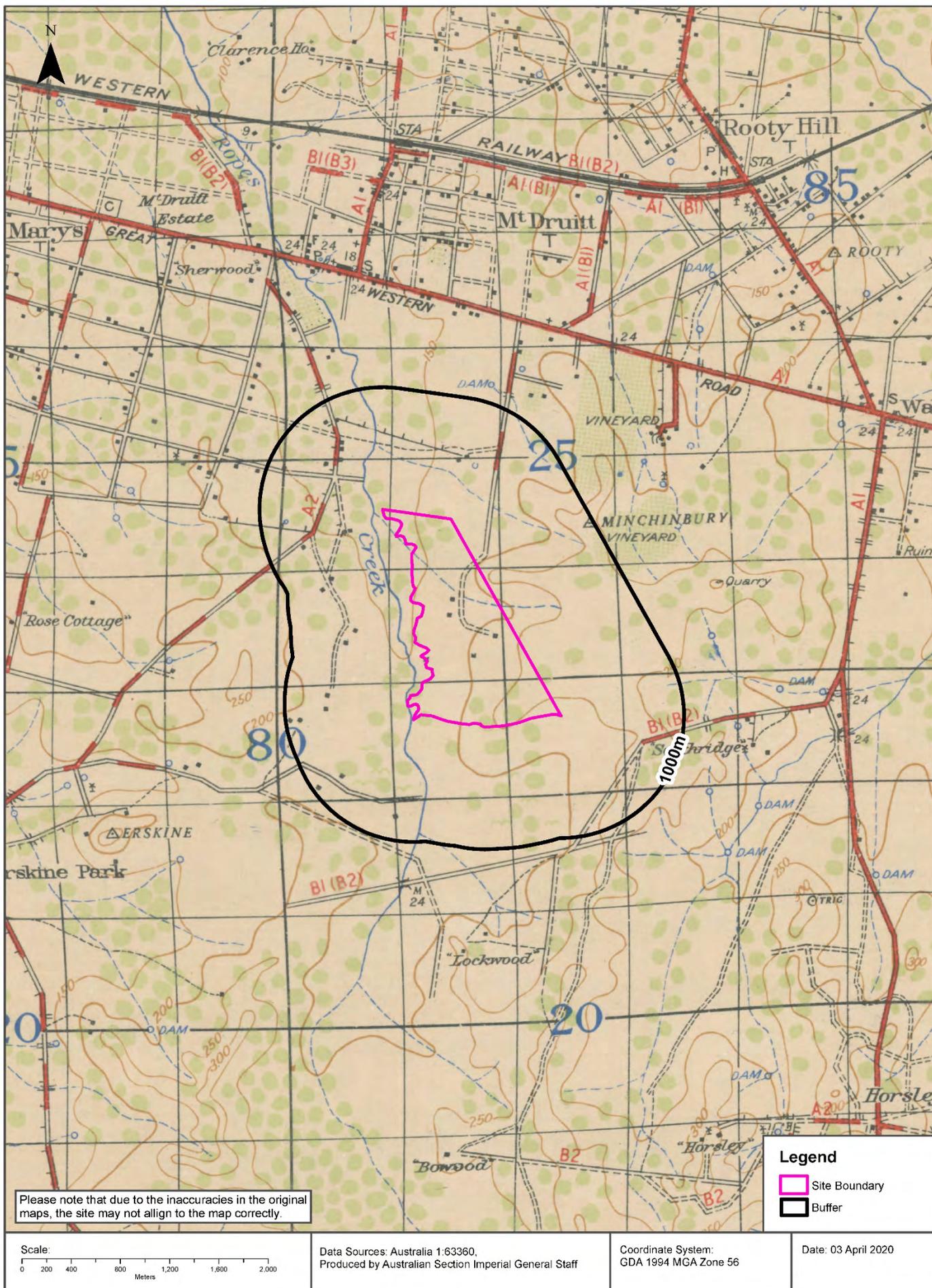
Historical Map 1975

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



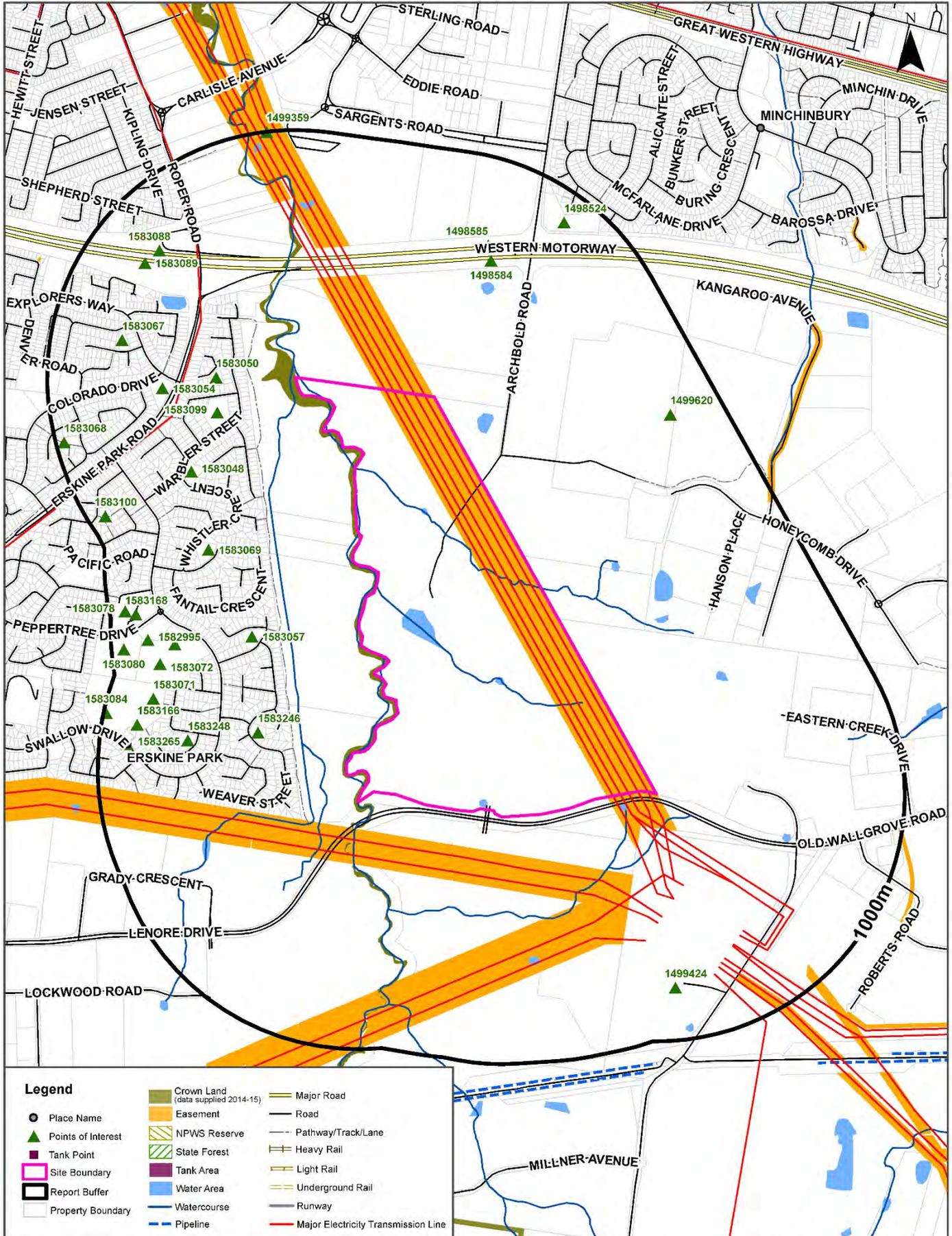
Historical Map c.1942

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



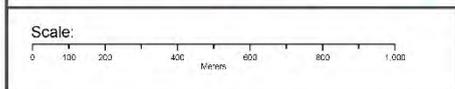
Topographic Features

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



Legend

● Place Name	■ Crown Land (data supplied 2014-15)	— Major Road
▲ Points of Interest	■ Easement	— Road
■ Tank Point	■ NPWS Reserve	— Pathway/Track/Lane
□ Site Boundary	■ State Forest	— Heavy Rail
□ Report Buffer	■ Tank Area	— Light Rail
□ Property Boundary	■ Water Area	— Underground Rail
	— Watercourse	— Runway
	— Pipeline	— Major Electricity Transmission Line



Data Sources: Property Boundaries & Topographic Data:
© Department Finance, Services & Innovation 2020

Coordinate System:
GDA 1994 MGA Zone 56

Date: 03 April 2020

Topographic Features

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Points of Interest

What Points of Interest exist within the dataset buffer?

Map Id	Feature Type	Label	Distance	Direction
1583050	Park	Park	320m	North West
1583099	Park	KESTREL CRESCENT RESERVE	341m	North West
1583246	Park	Park	378m	South West
1583057	Park	Park	431m	West
1583054	Park	Park	538m	North West
1583048	Park	Park	543m	North West
1583069	Park	Park	582m	West
1498584	Roadside Emergency Telephone	371	597m	North
1583248	Park	Park	647m	West
1498585	Roadside Emergency Telephone	372	651m	North
1583067	Park	Park	714m	North West
1583056	Park	PEPPERTREE RESERVE	744m	West
1583088	Roadside Emergency Telephone	374	751m	North West
1583089	Roadside Emergency Telephone	373k	763m	North West
1499424	Parking Area	Parking Area	786m	South East
1499620	Quarry - Open Cut	Quarry - Open Cut	797m	North East
1583072	Sports Field	Sports Field	812m	West
1583071	Sports Field	Sports Field	821m	West
1582995	Community Facility	ERSKINE PARK COMMUNITY CENTRE	851m	West
1583166	Parking Area	Parking Area	858m	West
1498524	Park	EVERTON PARK	879m	North
1583265	Suburb	ERSKINE PARK	887m	West
1583168	Parking Area	Parking Area	898m	West
1583100	Park	SKYLARK CRESCENT RESERVE	931m	West
1583078	Shopping Centre	ERSKINE PARK SHOPPING CENTRE	937m	West
1583080	Primary School	JAMES ERSKINE PUBLIC SCHOOL	950m	West
1583068	Park	Park	967m	North West
1583084	High School	ERSKINE PARK HIGH SCHOOL	990m	West
1499359	Park	DAGARA BADU RESERVE	1000m	North

Topographic Data Source: © Land and Property Information (2015)

Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

Topographic Features

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Tanks (Areas)

What are the Tank Areas located within the dataset buffer?

Note. The large majority of tank features provided by LPI are derived from aerial imagery & are therefore primarily above ground tanks.

Map Id	Tank Type	Status	Name	Feature Currency	Distance	Direction
	No records in buffer					

Tanks (Points)

What are the Tank Points located within the dataset buffer?

Note. The large majority of tank features provided by LPI are derived from aerial imagery & are therefore primarily above ground tanks.

Map Id	Tank Type	Status	Name	Feature Currency	Distance	Direction
	No records in buffer					

Tanks Data Source: © Land and Property Information (2015)

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Major Easements

What Major Easements exist within the dataset buffer?

Note. Easements provided by LPI are not at the detail of local governments. They are limited to major easements such as Right of Carriageway, Electrical Lines (66kVa etc.), Easement to drain water & Significant subterranean pipelines (gas, water etc.).

Map Id	Easement Class	Easement Type	Easement Width	Distance	Direction
120119382	Primary	Undefined		0m	Onsite
120107751	Primary	Undefined		111m	South
120115487	Primary	Undefined		359m	South
120111578	Primary	Undefined		426m	South
120115466	Primary	Undefined		532m	North
164434019	Primary	Electricity	60.96	768m	South West
120111700	Primary	Undefined		803m	South East
120115504	Primary	Undefined		808m	North West
120112149	Primary	Undefined		924m	South East
120111606	Primary	Undefined		932m	North West
169752963	Primary	Right of way	21.5m	972m	North East
153761056	Primary	Right of way	10m	986m	South East

Easements Data Source: © Land and Property Information (2015)

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Topographic Features

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

State Forest

What State Forest exist within the dataset buffer?

State Forest Number	State Forest Name	Distance	Direction
N/A	No records in buffer		

State Forest Data Source: © NSW Department of Finance, Services & Innovation (2018)
Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

National Parks and Wildlife Service Reserves

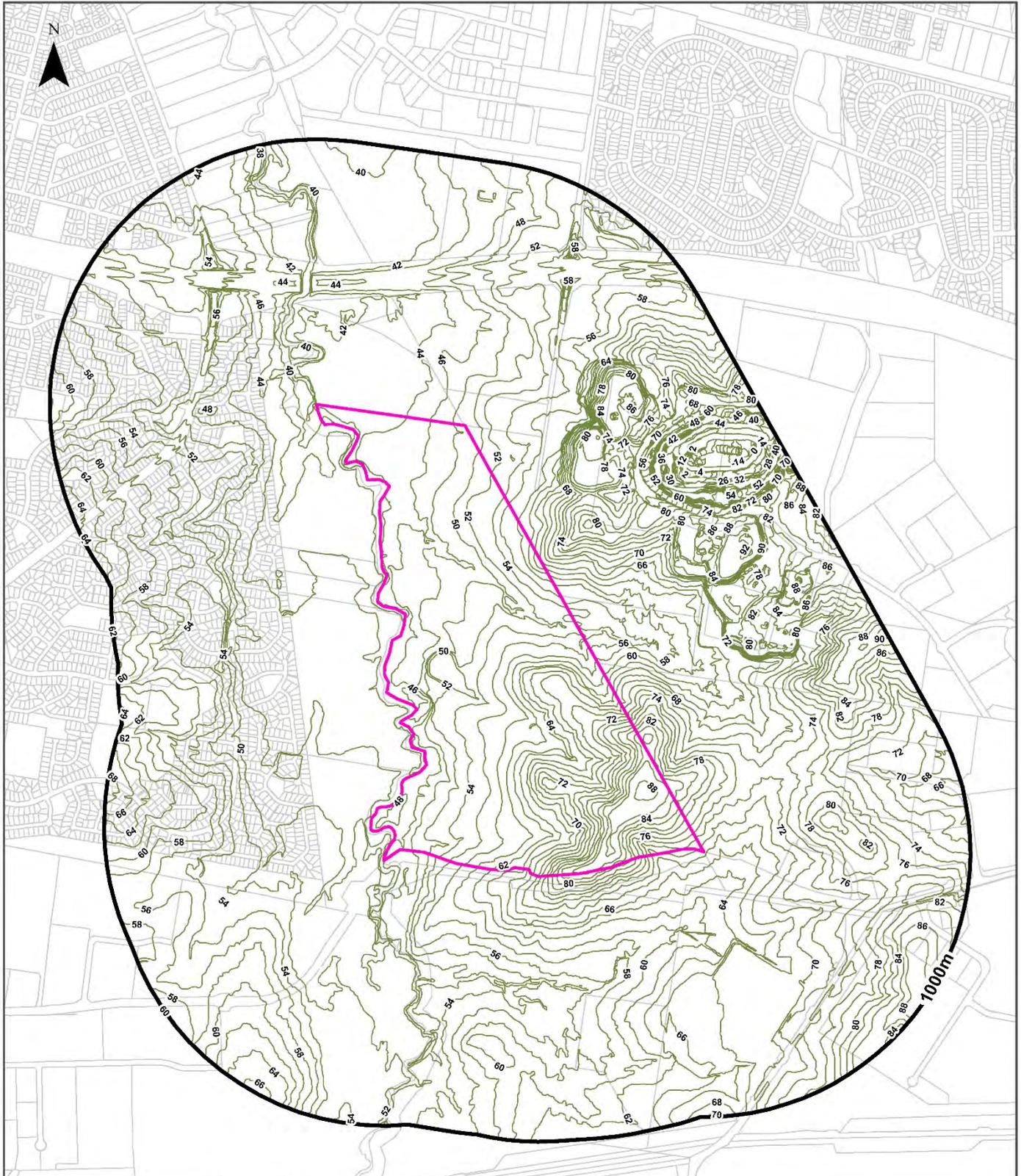
What NPWS Reserves exist within the dataset buffer?

Reserve Number	Reserve Type	Reserve Name	Gazetted Date	Distance	Direction
N/A	No records in buffer				

NPWS Data Source: © NSW Department of Finance, Services & Innovation (2018)
Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

Elevation Contours (m AHD)

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

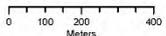


Legend

- Elevation Contour (m AHD)
- Site Boundary
- Report Buffer
- Property Boundary

Accuracy & Currency: This contour data can be up to 0.4 of the contour interval out in height and must therefore not be used for any design or engineering works, but only as a general guide to topography. Gaps may occur along contour lines due to vertical topography, obscured topography in the source photography such as buildings, dense vegetation or dead ground, or the fact that original buildings have been replaced in the intervening thirty years since the original contour capture.

Scale:



Data Sources: Property Boundaries & Topographic Data:
© Department Finance, Services & Innovation 2020

Coordinate System:
GDA 1994 MGA Zone 56

Date: 03 April 2020

Hydrogeology & Groundwater

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Hydrogeology

Description of aquifers on-site:

Description
Porous, extensive aquifers of low to moderate productivity

Description of aquifers within the dataset buffer:

Description
Porous, extensive aquifers of low to moderate productivity

Hydrogeology Map of Australia : Commonwealth of Australia (Geoscience Australia)
Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

Botany Groundwater Management Zones

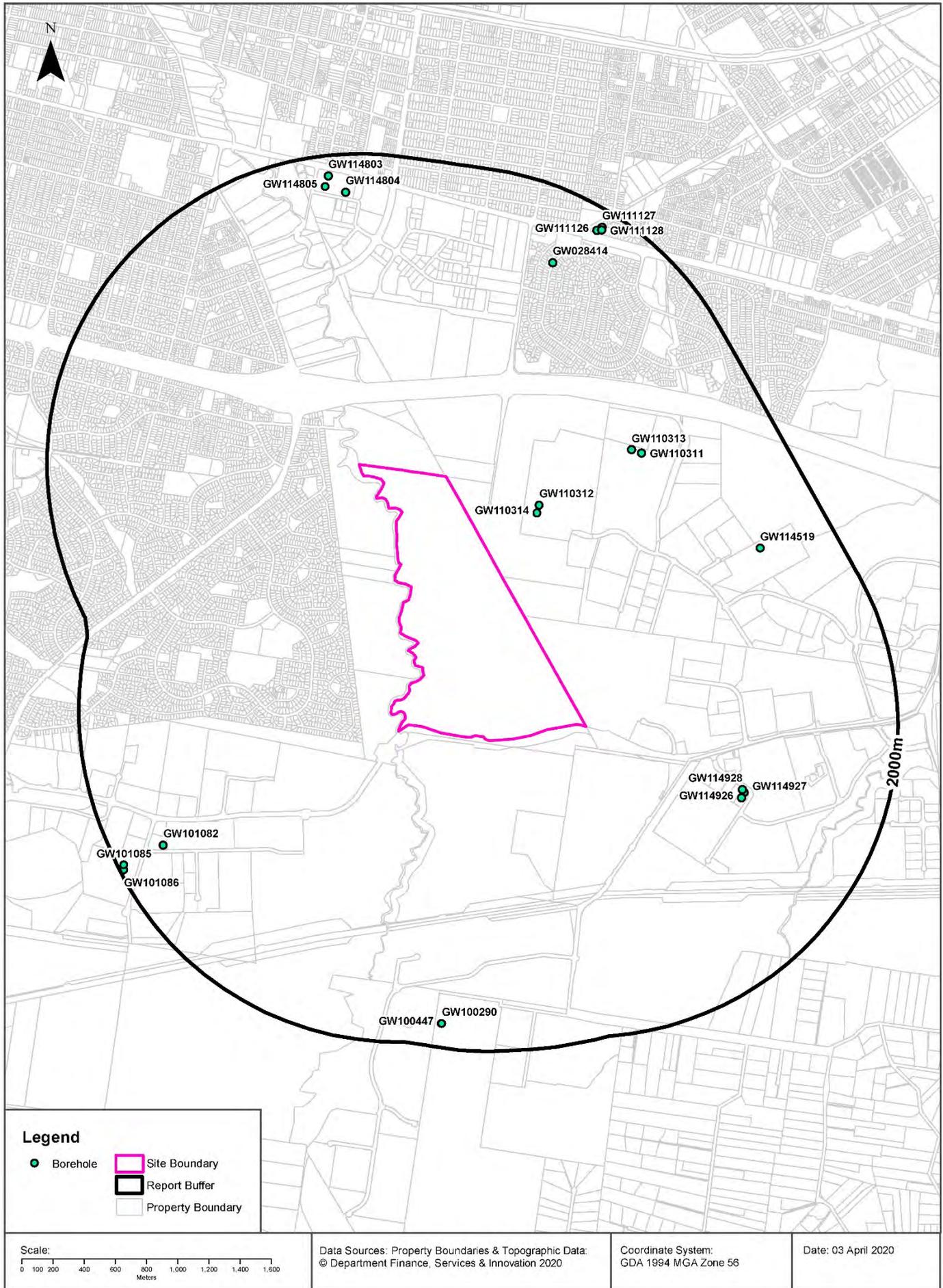
Groundwater management zones relating to the Botany Sand Beds aquifer within the dataset buffer:

Management Zone No.	Restriction	Distance	Direction
N/A	No records in buffer		

Botany Groundwater Management Zones Data Source : NSW Department of Primary Industries

Groundwater Boreholes

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



Hydrogeology & Groundwater

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Groundwater Boreholes

Boreholes within the dataset buffer:

GW No.	Licence No	Work Type	Owner Type	Authorised Purpose	Intended Purpose	Name	Complete Date	Final Depth (m)	Drilled Depth (m)	Salinity (mg/L)	SWL (m)	Yield (L/s)	Elev (AHD)	Dist	Dir
GW110 314	10BL602 119	Well	Private	Monitoring Bore	Monitoring Bore		08/07/2009	151.00	151.00		40.30	0.100		397m	North East
GW110 312	10BL602 119	Well	Private	Monitoring Bore	Monitoring Bore		08/07/2009	100.00	100.00		39.80	0.200		434m	North East
GW114 928	10BL604 993			Monitoring Bore	Monitoring Bore		10/10/2011	11.50	11.50					1084m	South West
GW114 926	10BL604 993	Bore	Private	Monitoring Bore	Monitoring Bore	CALTEX EASTERN CREE	08/07/2015	13.50	13.50					1101m	South West
GW114 927	10BL604 993	Bore	Private	Monitoring Bore	Monitoring Bore	CALTEX EASTERN CREE	08/07/2015	18.00	18.00					1105m	South West
GW110 313	10BL602 119	Well	Private	Monitoring Bore	Monitoring Bore		08/07/2009	150.00	150.00		40.30	0.200		1122m	North East
GW110 311	10BL602 119	Well	Private	Monitoring Bore	Monitoring Bore		08/07/2009	100.00	100.00		31.60	0.200		1169m	North East
GW114 519	10BL603 793	Bore	Private	Monitoring Bore	Monitoring Bore	Australand Industrial No111	04/08/2014	12.00	8.00					1535m	East
GW028 414	10BL020 250	Well	Private	Irrigation	Irrigation		01/03/1966	6.00	6.10					1538m	North
GW101 082	10BL157 654	Bore		Monitoring Bore	Test Bore		27/05/1996	40.30	40.30		12.43			1675m	South West
GW114 804	10BL604 242	Bore	Private	Monitoring Bore	Monitoring Bore		01/01/2010	8.50	8.50					1753m	North
GW114 805	10BL604 242	Bore	Private	Monitoring Bore	Monitoring Bore		01/01/2010	7.50	7.50					1799m	North
GW100 290	10BL154 250	Bore	Private	Monitoring Bore	Monitoring Bore		21/10/1994	80.00	80.00	1970				1847m	South
GW100 447	10BL157 800	Bore - Nested (4)	Private	Monitoring Bore	Monitoring Bore		11/11/1996	29.60	29.60	22900	2.89	0.100		1847m	South
GW111 126	10BL604 062	Well	Private	Monitoring Bore	Monitoring Bore		23/04/2010	10.00	10.00					1856m	North
GW114 803	10BL604 242	Bore	Private	Monitoring Bore	Monitoring Bore		01/01/2010	6.00	6.00					1866m	North
GW111 128	10BL604 062	Well	Private	Monitoring Bore	Monitoring Bore		23/04/2010	10.00	10.00					1875m	North
GW111 127	10BL604 062	Well	Private	Monitoring Bore	Monitoring Bore		23/04/2010	10.00	10.00					1892m	North
GW101 085	10BL157 654	Bore		Monitoring Bore	Test Bore		30/05/1996	99.30	99.30					1960m	South West
GW101 086	10BL157 654	Bore		Monitoring Bore	Test Bore		29/05/1996	69.70	69.70					1974m	South West

Borehole Data Source : NSW Department of Primary Industries - Office of Water / Water Administration Ministerial Corporation for all bores prefixed with GW. All other bores © Commonwealth of Australia (Bureau of Meteorology) 2015. Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

Hydrogeology & Groundwater

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Driller's Logs

Drill log data relevant to the boreholes within the dataset buffer:

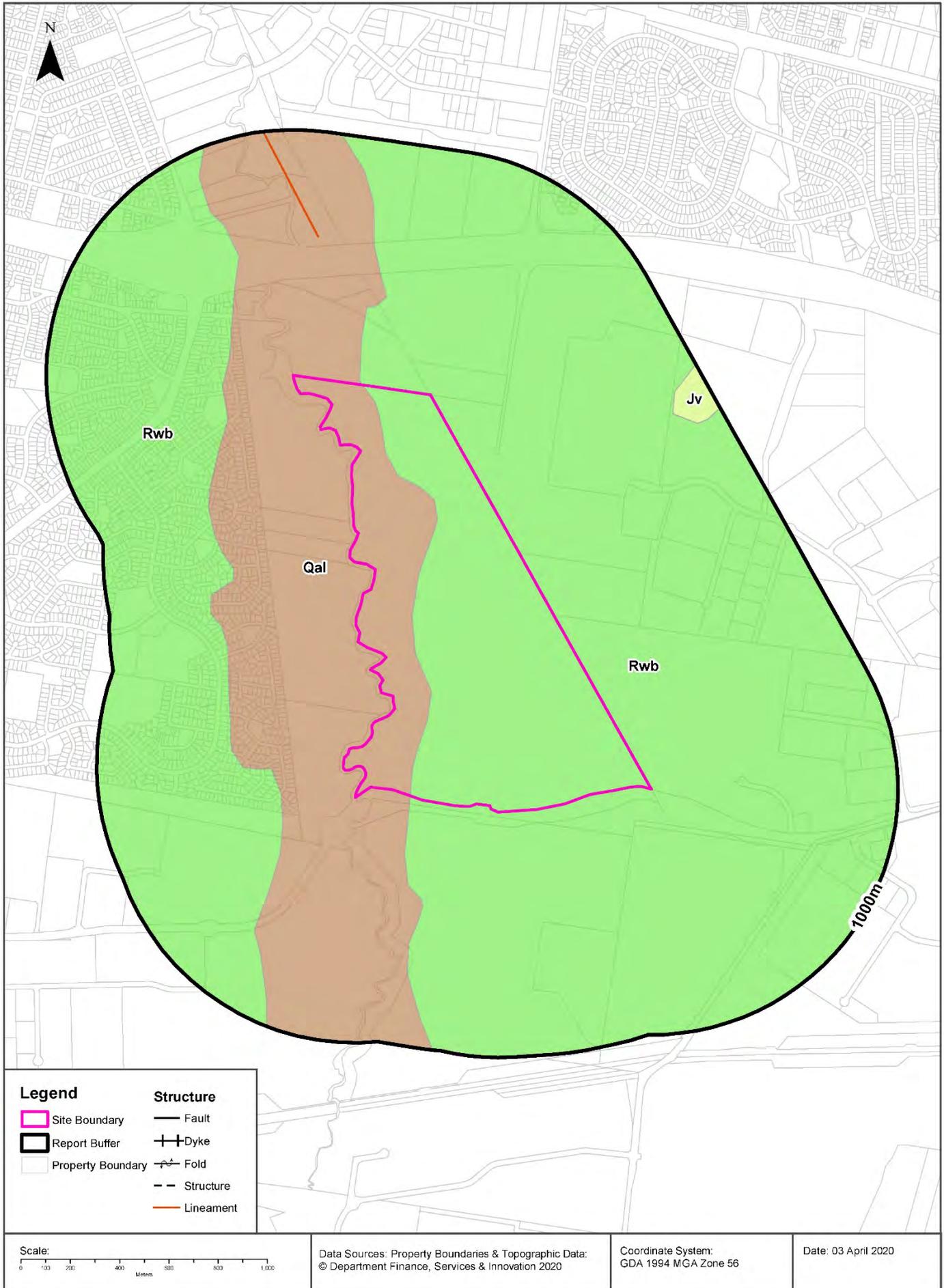
Groundwater No	Drillers Log	Distance	Direction
GW110314	0.00m-3.00m SHALE FILL 3.00m-8.00m WEATHERED SHALE,LIGHT BROWN 8.00m-96.00m SHALE,LIGHT GREY 96.00m-151.00m SHALE,DARK GREY	397m	North East
GW110312	0.00m-3.00m SHALE, FILL 3.00m-8.00m SHALE WEATHERED,LIGHT BROWN 8.00m-96.00m SHALE,LIGHT GREY 96.00m-100.00m SHALE,DARK GREY	434m	North East
GW114928	0.00m-0.15m FILL 0.15m-0.35m SILTY CLAY,LIGHT BROWN L/M PLASTICITY 0.35m-3.20m SHALE GREY BROWN 3.20m-6.30m AS ABOVE BUT SOFTER 6.30m-9.50m SHALE, DARK GREY,HARD, DRY 9.50m-11.50m AS ABOVE BUT WET.	1084m	South East
GW114926	0.00m-0.15m FILL 0.15m-1.70m SILTY CLAY RED BROWN, L.PLASTICITY 1.70m-2.20m SILTY CLAY DARK BROWN 2.20m-3.00m SHALE, LIGHT BROWN 3.00m-4.70m SHALE LIGHT BROWN HARD 4.70m-6.80m SHALE GREY BROWN 6.80m-12.00m SHALE, DARK GREY,DRY 12.00m-13.50m SHALE, DARK GREY, WET	1101m	South East
GW114927	0.00m-2.70m SILTY CLAY,RED BROWN MOTTLED L,PLASTICITY 2.70m-2.90m SILTY CLAY GRADING INTO EATHERED SHALE 2.90m-12.00m SHALE,WEATHERED BEDROCK,DARK GREY,DRY 12.00m-18.00m AS ABOVE BUT HARD.	1105m	South East
GW110313	0.00m-1.00m CLAY SILTY BROWN 1.00m-9.00m WEATHERED SHALE,BROWN 9.00m-31.00m SHALE, MEDIUM GREY 31.00m-39.00m SANDSTONE LIGHT GREY 39.00m-145.00m SHALE, DARK GREY 145.00m-150.00m SANDSTONE, LIGHT GREY	1122m	North East
GW110311	0.00m-1.00m CLAY SILTY BROWN 1.00m-9.00m SHALE WEATHERED,BROWN 9.00m-31.00m SHALE,MEDIUM,GREY 31.00m-100.00m SHALE,DARK GREY	1169m	North East
GW114519	0.00m-0.30m SILTY CLAY 0.30m-1.00m SILTY CLAY 1.00m-8.00m SHALE	1535m	North
GW028414	0.00m-3.66m Clay 3.66m-6.10m Shale Soft Broken 6.10m-6.11m Shale Grey Hard	1538m	East

Groundwater No	Drillers Log	Distance	Direction
GW100290	0.00m-1.00m FILL DOLERITE GRAVEL 1.00m-2.00m CLAY/ BLUE/ GREY 2.00m-4.00m SANDSTONE/ BROWN / YELLOW 4.00m-10.00m INTERBEDDED SILTSTONE / SANDSTONE 10.00m-12.00m SILTSTONE / DARK GREY 12.00m-15.00m SILTSTONE / SHALE & CLAY INTERBEDS 15.00m-17.00m SILTSTONE AND SHALE 17.00m-23.00m SILTSTONE MASSIVE 23.00m-53.00m SILTSTONE & SHALE INTERBEDDED 53.00m-54.00m SANDSTONE & SHALE INTERBEDDED 54.00m-57.00m SHALE & SILTSTONE INTERBEDDED 57.00m-61.00m SANDSTONE, SHALE, SILTSTONE INTERBEDDED 61.00m-63.00m SHALE, CARBONACEOUS 63.00m-64.00m SHALE, SILTSTONE, SANDSTONE: INTERBEDDED 64.00m-65.00m SHALE: CARBOINACEOUS 65.00m-68.00m SILTSTONE, SHALE: INTERBEDDED 68.00m-69.00m SHALE: CARBONACEOUS 69.00m-70.00m SHALE AND SILTSTONE : INTERBEDDED 70.00m-71.00m SHALE, SILTSTONE , SANDSTONE INTERBEDDED 71.00m-75.00m SHALE & SILTSTONE INTERBEDDED 75.00m-76.00m SHALE, CLAY, SILTSTONE INTERBEDDED 76.00m-80.00m SHALE, SILTSTONE: INTERBEDDED	1847m	South
GW100447	0.00m-1.00m CLAY 1.00m-29.60m SILTSTONE/SHALE	1847m	South
GW111126	0.00m-1.50m FILL 1.50m-4.00m CLAY FIRM L/BROWN 4.00m-5.00m SHALE GREY, L/BROWN CLAY 5.00m-8.00m SHALE GREY/ WEATHERED 8.00m-10.00m SHALE GREY/ WEATHERED, BLACK, SATURATED CLAY LENSES	1856m	North
GW111128	0.00m-1.50m FILL 1.50m-4.00m CLAY FIRM L/BROWN 4.00m-5.00m CLAY L/BROWN/ GREY SHALE 5.00m-8.00m SHALE GREY WEATHERED 8.00m-10.00m SHALE GREY WEATHERED, BLACK SATURATED CLAY LENSES	1875m	North
GW111127	0.00m-1.50m FILL 1.50m-4.00m CLAY FIRM L/BROWN 4.00m-5.00m SHALE GREY/L/BROWN CLAY 5.00m-8.00m SHALE GREY WEATHERED 8.00m-10.00m SHALE GREY WEATHERED, BLACK SATURATED CLAY LENSES	1892m	North

Drill Log Data Source: NSW Department of Primary Industries - Office of Water / Water Administration Ministerial Corp
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Geology 1:100,000

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



Geology

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Geological Units

What are the Geological Units onsite?

Symbol	Description	Unit Name	Group	Sub Group	Age	Dom Lith	Map Sheet	Dataset
Qal	Fine-grained sand, silt and clay				Quaternary		Penrith	1:100,000
Rwb	Shale, carbonaceous claystone, claystone, laminate, fine to medium-grained lithic sandstone, rare coal and tuff	Bringelly Shale	Wianamatta Group (undifferentiated)		Middle Triassic		Penrith	1:100,000

What are the Geological Units within the dataset buffer?

Symbol	Description	Unit Name	Group	Sub Group	Age	Dom Lith	Map Sheet	Dataset
Jv	Volcanic breccia, varying amounts of sedimentary breccia and basalt				Cretaceous		Penrith	1:100,000
Qal	Fine-grained sand, silt and clay				Quaternary		Penrith	1:100,000
Rwb	Shale, carbonaceous claystone, claystone, laminate, fine to medium-grained lithic sandstone, rare coal and tuff	Bringelly Shale	Wianamatta Group (undifferentiated)		Middle Triassic		Penrith	1:100,000

Geological Structures

What are the Geological Structures onsite?

Feature	Name	Description	Map Sheet	Dataset
No features				1:100,000

What are the Geological Structures within the dataset buffer?

Feature	Name	Description	Map Sheet	Dataset
Lineament			Penrith	1:100,000

Geological Data Source : NSW Department of Industry, Resources & Energy

© State of New South Wales through the NSW Department of Industry, Resources & Energy

Naturally Occurring Asbestos Potential

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Naturally Occurring Asbestos Potential

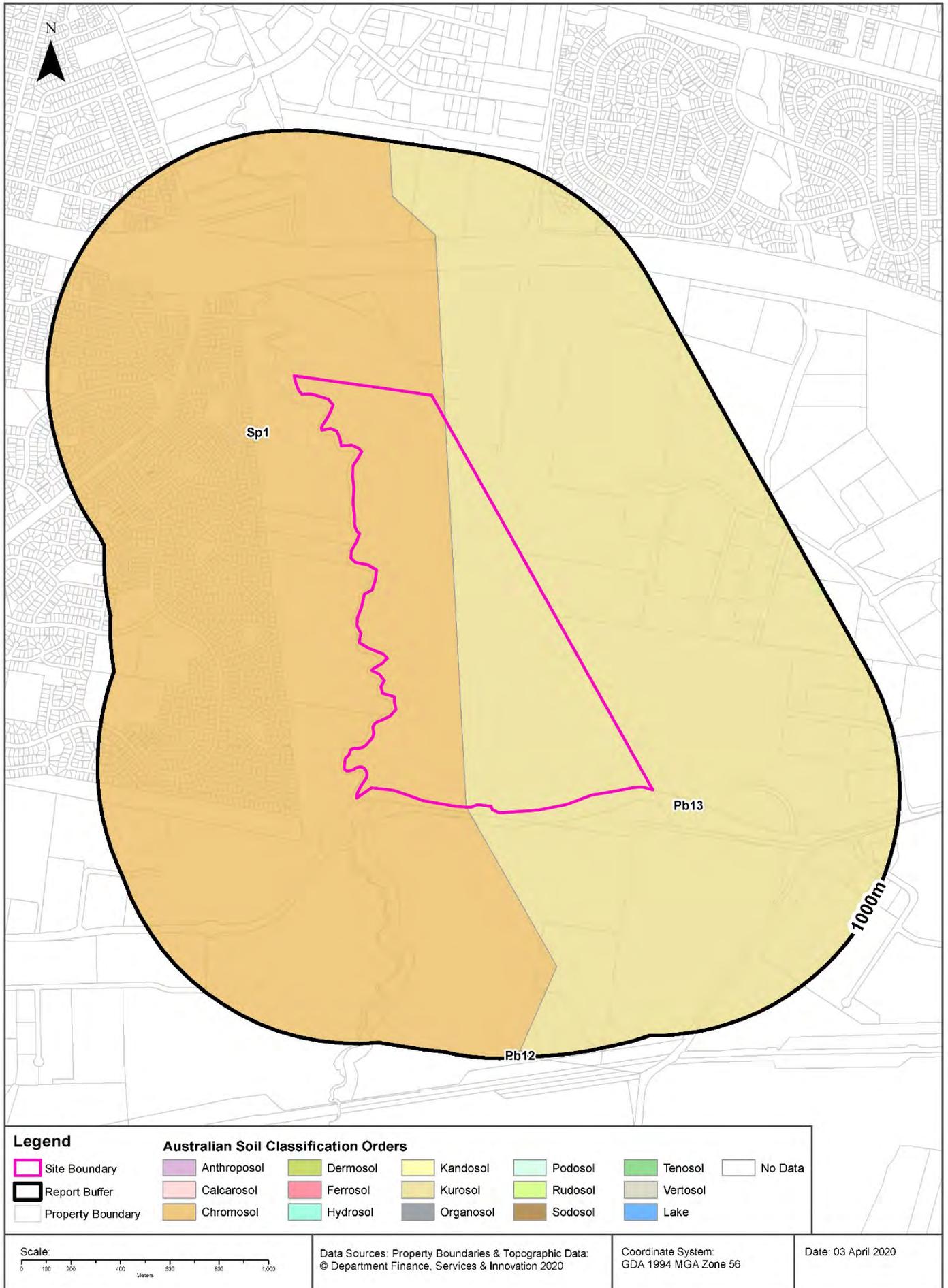
Naturally Occurring Asbestos Potential within the dataset buffer:

Potential	Sym	Strat Name	Group	Formation	Scale	Min Age	Max Age	Rock Type	Dom Lith	Description	Dist	Dir
No records in buffer												

Mining Subsidence District Data Source: © State of New South Wales through NSW Department of Industry, Resources & Energy

Atlas of Australian Soils

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



Soils

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Atlas of Australian Soils

Soil mapping units and Australian Soil Classification orders within the dataset buffer:

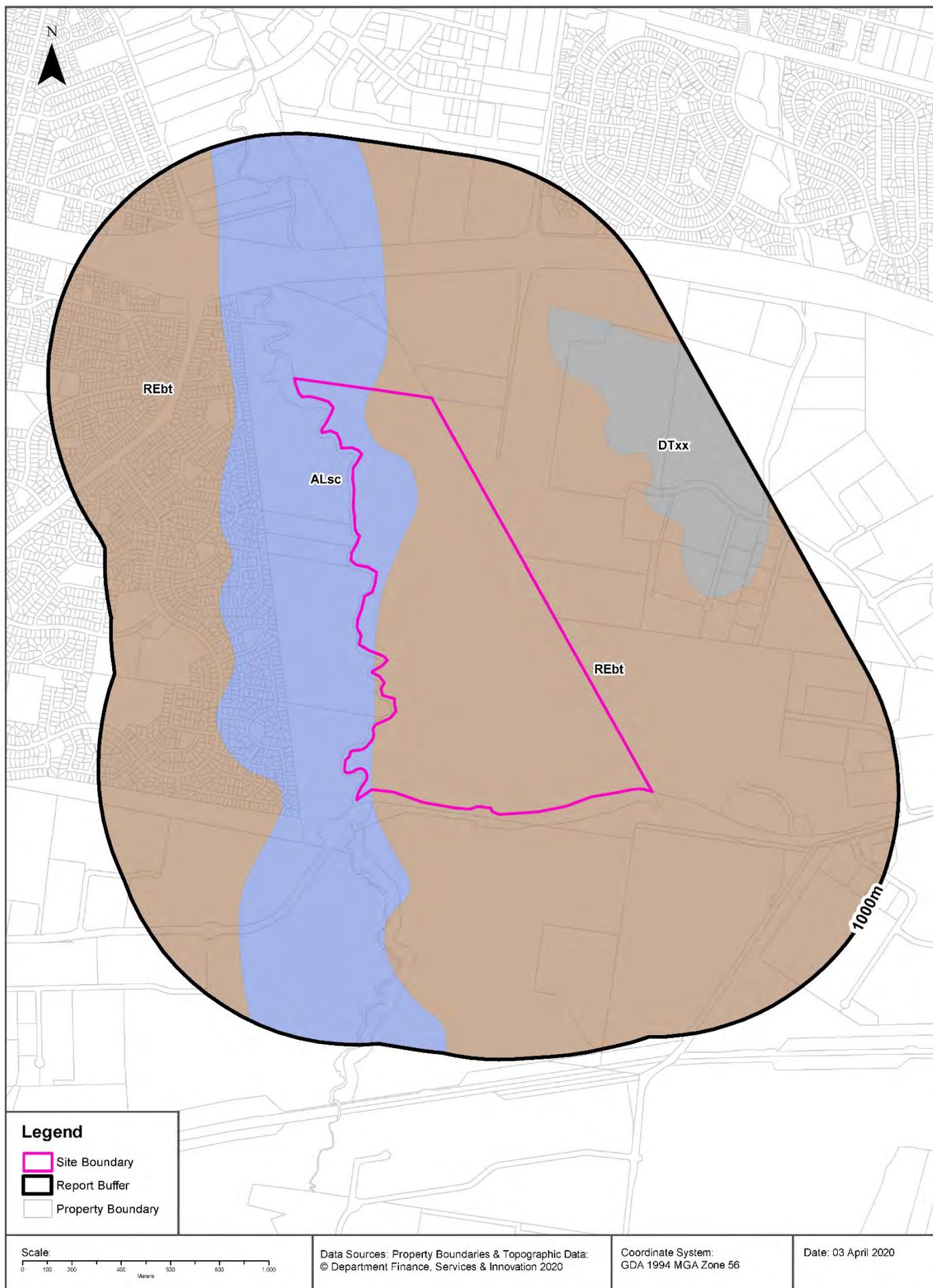
Map Unit Code	Soil Order	Map Unit Description	Distance
Pb13	Kurosol	Ridge and valley country of gently undulating ridge tops and steep side slopes often with slumping, also rounded hilly to steep hilly areas and relatively narrow valleys: chief soils are hard acidic red soils (Dr2.21) with hard acidic yellow mottled soils (Dy3.41); in places some ironstone gravels occur in both these soils. Associated are hard neutral and alkaline red soils (Dr2.22 and Dr2.23) in saddles and some mid-slope positions; (Dy3.42 and Dy3.43) soils, usually in depressions; and small areas of undescribed soils in wet soaks and valley areas. Small areas of other soils are likely throughout.	0m
Sp1	Chromosol	Gently undulating plain usually with a surface scatter of ironstone gravel: chief soils are hard acidic yellow soils (Dy2.61) on flat-topped ridges and higher situations generally and hard acidic yellow mottled soils (Dy3.41) or (Dy3.81) in lower-lying situations. They all commonly contain ironstone gravel through the profile. Associated are (Dy5.41) or (Dy5.81) soils, containing ironstone gravels; and shallow (Gn2.1) gravelly soils also with indurated materials below the solum. Iron-cemented and/or silica-cemented strata have been recorded in many areas below the soils. As mapped, areas of units X9, Pb12, and Tb35 may be included.	0m
Pb12	Kurosol	Gently rolling to rounded hilly country with some steep slopes and broad valleys: chief soils are hard acidic red soils (Dr2.21) with hard neutral and acidic yellow mottled soils (Dy3.42 and Dy3.41) on lower slopes and in valleys. Associated are small areas of various soils including (Gn3.54) on some ridges, (Dr3.31) on some slopes; (Dr2.23) in saddles and some mid-slope positions, and some low-lying swampy areas of (Uf6) soils and (Uc1.2) soils with peaty surfaces. Small areas of other soils such as (Db1.2) are likely throughout.	968m

Atlas of Australian Soils Data Source: CSIRO

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Soil Landscapes

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



Soils

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Soil Landscapes

What are the onsite Soil Landscapes?

Soil Code	Name	Group	Process	Map Sheet	Scale
ALsc	SOUTH CREEK		ALLUVIAL	Penrith	1:100,000
REbt	BLACKTOWN		RESIDUAL	Penrith	1:100,000

What are the Soil Landscapes within the dataset buffer?

Soil Code	Name	Group	Process	Map Sheet	Scale
ALsc	SOUTH CREEK		ALLUVIAL	Penrith	1:100,000
DTxx	DISTURBED TERRAIN		DISTURBED TERRAIN	Penrith	1:100,000
REbt	BLACKTOWN		RESIDUAL	Penrith	1:100,000

Soils Landscapes Data Source : NSW Office of Environment and Heritage

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Acid Sulfate Soils

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Environmental Planning Instrument - Acid Sulfate Soils

What is the on-site Acid Sulfate Soil Plan Class that presents the largest environmental risk?

Soil Class	Description	EPI Name
N/A		

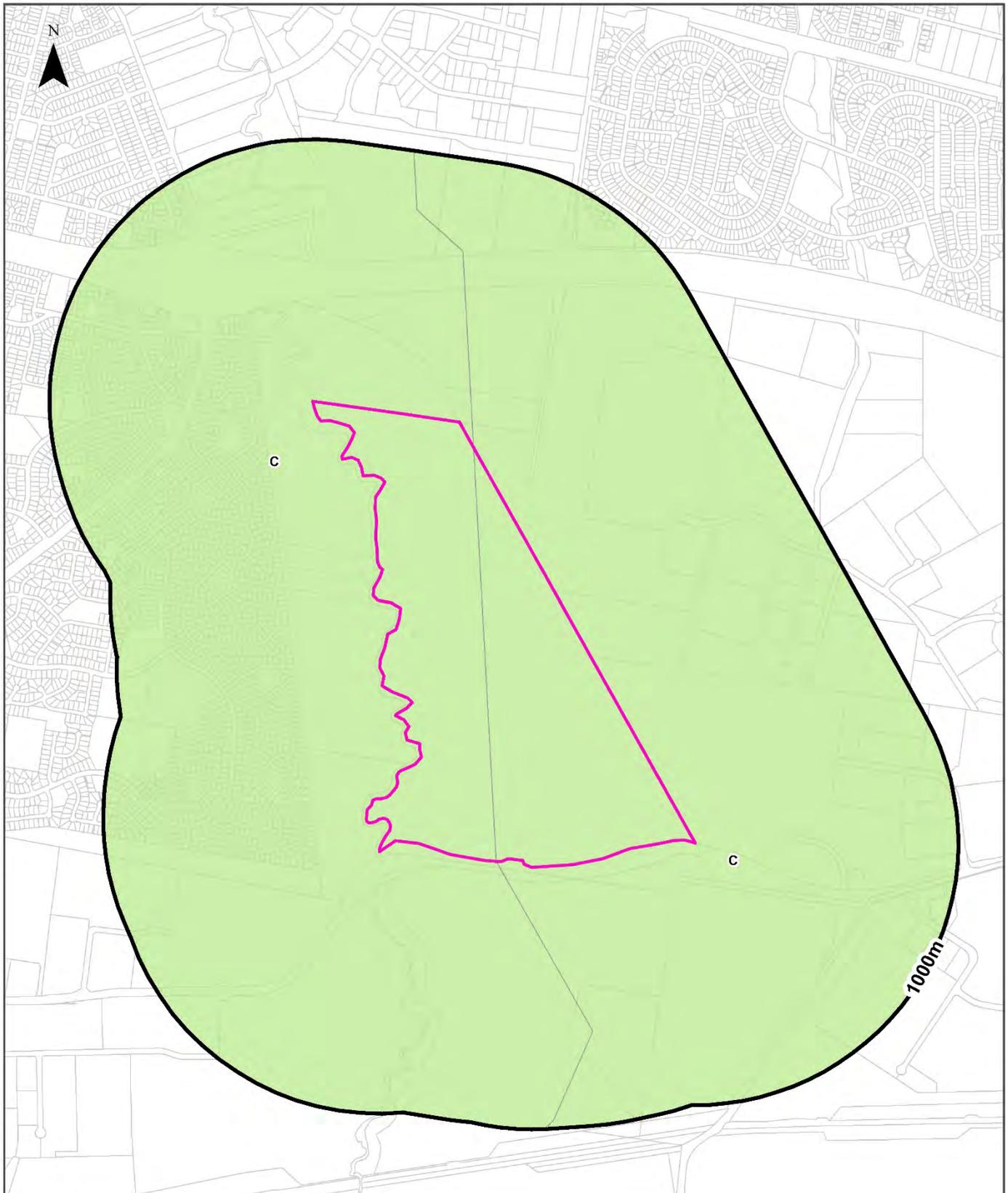
If the on-site Soil Class is 5, what other soil classes exist within 500m?

Soil Class	Description	EPI Name	Distance	Direction
N/A				

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Atlas of Australian Acid Sulfate Soils

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



Legend Site Boundary Report Buffer Property Boundary		Probability of occurrence of Acid Sulfate Soils A. High (>70%) B. Low (6-70%) C. Extremely Low (1-5%) D. No Chance (0%) No Data	
Scale: 		Data Sources: Property Boundaries & Topographic Data: © Department Finance, Services & Innovation 2020	Coordinate System: GDA 1994 MGA Zone 56
		Date: 03April 2020	

Acid Sulfate Soils

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Atlas of Australian Acid Sulfate Soils

Atlas of Australian Acid Sulfate Soil categories within the dataset buffer:

Class	Description	Distance
C	Extremely low probability of occurrence. 1-5% chance of occurrence with occurrences in small localised areas.	0m

Atlas of Australian Acid Sulfate Soils Data Source: CSIRO

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Dryland Salinity

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



Legend		Dryland Salinity - National Assessment		Salinity Potential of Western Sydney	
Site Boundary	Delineated risk area but no high hazard or risk rating for either 2000, 2020, 2050	High hazard or risk in 2020 and 2050	Area of Known Salinity	Area of High Salinity Potential	Area of Moderate Salinity Potential
Report Buffer	High hazard or risk in 2050 only	High hazard or risk in 2000 and 2050, 2020 not defined as high hazard	Area of Very Low Salinity Potential	Area of Water	
Property Boundary	High hazard or risk defined for 2050, but no assessment made for 2000 or 2020	High hazard or risk defined for all years: 2000, 2020, 2050			

<p>Scale:</p>	<p>Data Sources: Property Boundaries & Topographic Data. © Department Finance, Services & Innovation 2020</p>	<p>Coordinate System: GDA 1994 MGA Zone 56</p>	<p>Date: 03 April 2020</p>
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Dryland Salinity

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Dryland Salinity - National Assessment

Is there Dryland Salinity - National Assessment data onsite?

Yes

Is there Dryland Salinity - National Assessment data within the dataset buffer?

Yes

What Dryland Salinity assessments are given?

Assessment 2000	Assessment 2020	Assessment 2050	Distance	Direction
High hazard or risk	High hazard or risk	High hazard or risk	0m	Onsite
Delineated risk area but no high hazard or risk rating	Delineated risk area but no high hazard or risk rating	Delineated risk area but no high hazard or risk rating	270m	North West

Dryland Salinity Data Source : National Land and Water Resources Audit

The Commonwealth and all suppliers of source data used to derive the maps of "Australia, Forecast Areas Containing Land of High Hazard or Risk of Dryland Salinity from 2000 to 2050" do not warrant the accuracy or completeness of information in this product. Any person using or relying upon such information does so on the basis that the Commonwealth and data suppliers shall bear no responsibility or liability whatsoever for any errors, faults, defects or omissions in the information. Any persons using this information do so at their own risk.

In many cases where a high risk is indicated, less than 100% of the area will have a high hazard or risk.

Dryland Salinity Potential of Western Sydney

Dryland Salinity Potential of Western Sydney within the dataset buffer?

Feature Id	Classification	Description	Distance	Direction
274	MODERATE	Area of Moderate Salinity Potential	0m	Onsite
321	HIGH	Area of High Salinity Potential	0m	Onsite
777	SALT	Area of Known Salinity	40m	North
233	MODERATE	Area of Moderate Salinity Potential	71m	North West
773	SALT	Area of Known Salinity	94m	South
774	HIGH	Area of High Salinity Potential	246m	South
778	SALT	Area of Known Salinity	610m	North
227	HIGH	Area of High Salinity Potential	797m	South East

Dryland Salinity Potential of Western Sydney Data Source : NSW Office of Environment and Heritage

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Mining Subsidence Districts

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Mining Subsidence Districts

Mining Subsidence Districts within the dataset buffer:

District	Distance	Direction
There are no Mining Subsidence Districts within the report buffer		

Mining Subsidence District Data Source: © Land and Property Information (2016)

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State Environmental Planning Policy

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

State Significant Precincts

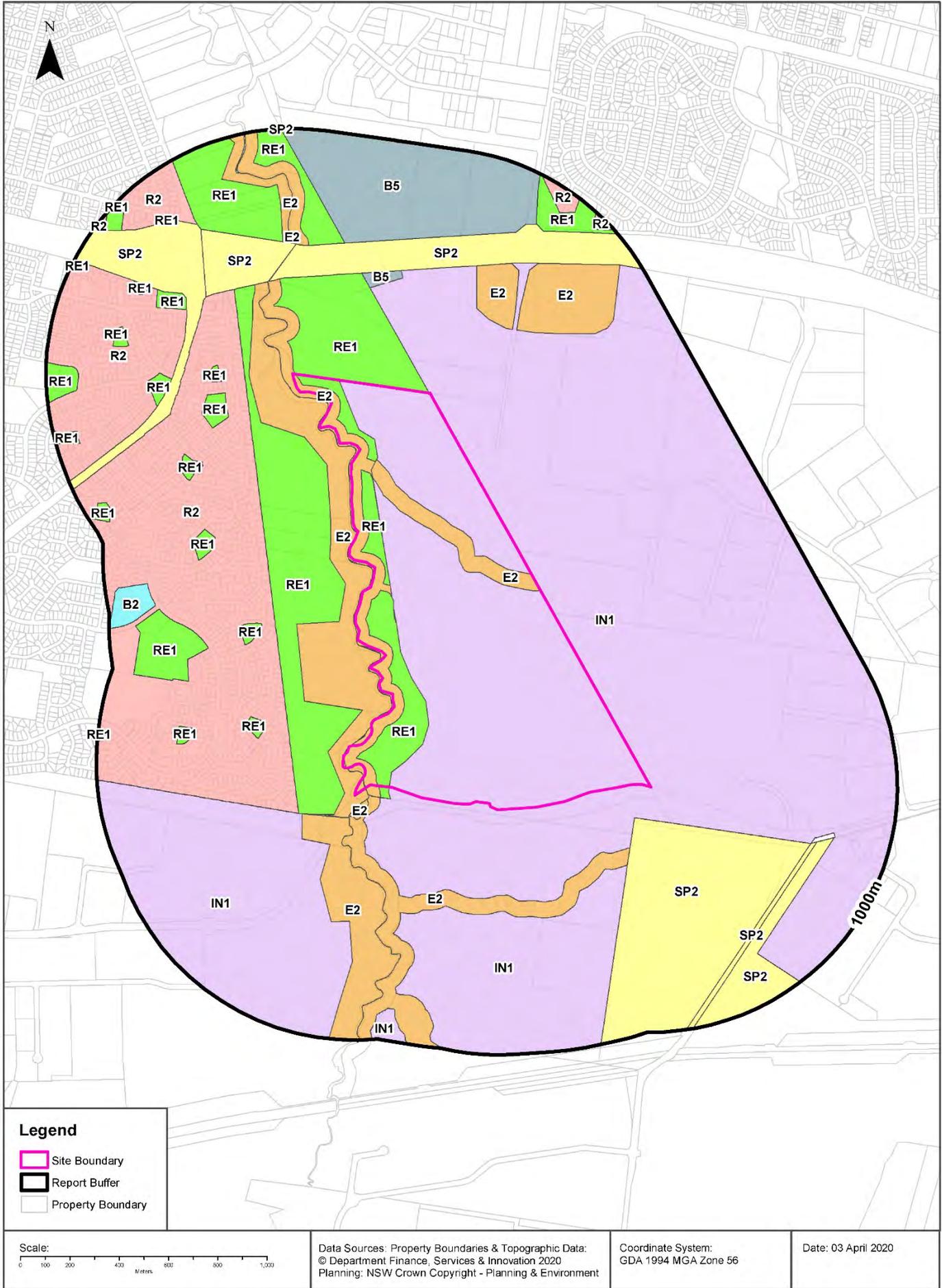
What SEPP State Significant Precincts exist within the dataset buffer?

Map Id	Precinct	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
N/A	No Records in Buffer							

State Environment Planning Policy Data Source: NSW Crown Copyright - Planning & Environment
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EPI Planning Zones

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



Environmental Planning Instrument

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Land Zoning

What EPI Land Zones exist within the dataset buffer?

Zone	Description	Purpose	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
IN1	General Industrial		State Environmental Planning Policy (Western Sydney Employment Area) 2009	08/11/2013	08/11/2013	16/11/2018	Blacktown Local Environmental Plan Amendment (Western Sydney Employment Area) 2013	0m	Onsite
RE1	Private Recreation		Blacktown Local Environmental Plan 2015	26/05/2015	07/07/2015	06/03/2020		0m	Onsite
E2	Environmental Conservation		Blacktown Local Environmental Plan 2015	26/05/2015	07/07/2015	06/03/2020		0m	Onsite
E2	Environmental Conservation		State Environmental Planning Policy (Western Sydney Employment Area) 2009	08/11/2013	08/11/2013	16/11/2018	Blacktown Local Environmental Plan Amendment (Western Sydney Employment Area) 2013	0m	Onsite
E2	Environmental Conservation		Penrith Local Environmental Plan 2010	22/09/2010	22/09/2010	20/12/2019		0m	North West
E2	Environmental Conservation		State Environmental Planning Policy (Western Sydney Employment Area) 2009	08/11/2013	08/11/2013	16/11/2018	Blacktown Local Environmental Plan Amendment (Western Sydney Employment Area) 2013	28m	South
RE1	Public Recreation		Penrith Local Environmental Plan 2010	22/09/2010	22/09/2010	20/12/2019		36m	West
E2	Environmental Conservation		State Environmental Planning Policy (Western Sydney Employment Area) 2009	08/11/2013	08/11/2013	16/11/2018	Blacktown Local Environmental Plan Amendment (Western Sydney Employment Area) 2013	41m	South West
E2	Environmental Conservation		State Environmental Planning Policy (Western Sydney Employment Area) 2009	08/11/2013	08/11/2013	16/11/2018	Blacktown Local Environmental Plan Amendment (Western Sydney Employment Area) 2013	96m	South
SP2	Infrastructure	Electricity Transmission & Distribution	Blacktown Local Environmental Plan 2015	26/05/2015	07/07/2015	06/03/2020		132m	South East
R2	Low Density Residential		Penrith Local Environmental Plan 2010	22/06/2018	22/06/2018	20/12/2019	Amendment No 19	194m	West

Zone	Description	Purpose	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
IN1	General Industrial		State Environmental Planning Policy (Western Sydney Employment Area) 2009	08/11/2013	08/11/2013	16/11/2018	Blacktown Local Environmental Plan Amendment (Western Sydney Employment Area) 2013	226m	South West
RE1	Private Recreation		Blacktown Local Environmental Plan 2010	28/01/2015	25/02/2015	20/12/2019	Amendment No 4	283m	North West
RE1	Private Recreation		Blacktown Local Environmental Plan 2010	28/01/2015	25/02/2015	20/12/2019	Amendment No 4	291m	North West
IN1	General Industrial		State Environmental Planning Policy (Western Sydney Employment Area) 2009	08/11/2013	08/11/2013	16/11/2018	Blacktown Local Environmental Plan Amendment (Western Sydney Employment Area) 2013	315m	South
RE1	Private Recreation		Blacktown Local Environmental Plan 2010	28/01/2015	25/02/2015	20/12/2019	Amendment No 4	343m	South West
RE1	Private Recreation		Blacktown Local Environmental Plan 2010	28/01/2015	25/02/2015	20/12/2019	Amendment No 4	380m	West
E2	Environmental Conservation		State Environmental Planning Policy (Western Sydney Employment Area) 2009	08/11/2013	08/11/2013	16/11/2018	Blacktown Local Environmental Plan Amendment (Western Sydney Employment Area) 2013	384m	North
SP2	Infrastructure	Classified Road	Blacktown Local Environmental Plan 2015	26/05/2015	07/07/2015	06/03/2020		389m	North East
SP2	Infrastructure	Classified Road	Penrith Local Environmental Plan 2010	22/09/2010	22/09/2010	20/12/2019		390m	North West
B5	Business Development		Blacktown Local Environmental Plan 2015	26/05/2015	07/07/2015	06/03/2020		391m	North
SP2	Infrastructure	Classified Road	Penrith Local Environmental Plan 2010	28/01/2015	25/02/2015	20/12/2019	Amendment No 4	428m	North West
E2	Environmental Conservation		State Environmental Planning Policy (Western Sydney Employment Area) 2009	08/11/2013	08/11/2013	16/11/2018	Blacktown Local Environmental Plan Amendment (Western Sydney Employment Area) 2013	436m	North
R2	Low Density Residential		Penrith Local Environmental Plan 2010	22/06/2018	22/06/2018	20/12/2019	Amendment No 19	460m	West
RE1	Public Recreation		Penrith Local Environmental Plan 2010	28/01/2015	25/02/2015	20/12/2019	Amendment No 4	488m	North West
RE1	Public Recreation		Penrith Local Environmental Plan 2010	28/01/2015	25/02/2015	20/12/2019	Amendment No 4	492m	North West
RE1	Public Recreation		Penrith Local Environmental Plan 2010	28/01/2015	25/02/2015	20/12/2019	Amendment No 4	504m	North West
E2	Environmental Conservation		Blacktown Local Environmental Plan 2015	26/05/2015	07/07/2015	06/03/2020		527m	North
RE1	Public Recreation		Blacktown Local Environmental Plan 2015	26/05/2015	07/07/2015	06/03/2020		528m	North
E2	Environmental Conservation		Penrith Local Environmental Plan 2010	22/09/2010	22/09/2010	20/12/2019		531m	North West
RE1	Public Recreation		Penrith Local Environmental Plan 2010	22/09/2010	22/09/2010	20/12/2019		541m	North West
RE1	Public Recreation		Penrith Local Environmental Plan 2010	28/01/2015	25/02/2015	20/12/2019	Amendment No 4	548m	West
B5	Business Development		Blacktown Local Environmental Plan 2015	26/05/2015	07/07/2015	06/03/2020		558m	North
RE1	Public Recreation		Penrith Local Environmental Plan 2010	28/01/2015	25/02/2015	20/12/2019	Amendment No 4	606m	West

Zone	Description	Purpose	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
RE1	Public Recreation		Penrith Local Environmental Plan 2010	28/01/2015	25/02/2015	20/12/2019	Amendment No 4	617m	West
SP2	Infrastructure	Local Road	Blacktown Local Environmental Plan 2015	26/05/2015	07/07/2015	06/03/2020		667m	South East
RE1	Public Recreation		Penrith Local Environmental Plan 2010	28/01/2015	25/02/2015	20/12/2019	Amendment No 4	673m	North West
RE1	Public Recreation		Penrith Local Environmental Plan 2010	28/01/2015	25/02/2015	20/12/2019	Amendment No 4	674m	North West
SP2	Infrastructure	Electricity Transmission & Distribution	Blacktown Local Environmental Plan 2015	26/05/2015	07/07/2015	06/03/2020		685m	South East
R2	Low Density Residential		Penrith Local Environmental Plan 2010	28/01/2015	25/02/2015	20/12/2019	Amendment No 4	722m	North West
RE1	Public Recreation		Penrith Local Environmental Plan 2010	28/01/2015	25/02/2015	20/12/2019	Amendment No 4	794m	North West
RE1	Public Recreation		Blacktown Local Environmental Plan 2015	26/05/2015	07/07/2015	06/03/2020		806m	North
B2	Local Centre		Penrith Local Environmental Plan 2010	28/01/2015	25/02/2015	20/12/2019	Amendment No 4	810m	West
IN1	General Industrial		State Environmental Planning Policy (Western Sydney Employment Area) 2009	08/11/2013	08/11/2013	16/11/2018	Blacktown Local Environmental Plan Amendment (Western Sydney Employment Area) 2013	869m	South
RE1	Public Recreation		Penrith Local Environmental Plan 2010	28/01/2015	25/02/2015	20/12/2019	Amendment No 4	869m	North West
RE1	Public Recreation		Penrith Local Environmental Plan 2010	28/01/2015	25/02/2015	20/12/2019	Amendment No 4	901m	West
R2	Low Density Residential		Blacktown Local Environmental Plan 2015	26/05/2015	07/07/2015	06/03/2020		904m	North East
RE1	Public Recreation		Penrith Local Environmental Plan 2010	28/01/2015	25/02/2015	20/12/2019	Amendment No 4	904m	North West
RE1	Public Recreation		Penrith Local Environmental Plan 2010	28/01/2015	25/02/2015	20/12/2019	Amendment No 4	909m	North West
RE1	Public Recreation		Penrith Local Environmental Plan 2010	28/01/2015	25/02/2015	20/12/2019	Amendment No 4	956m	North West
SP2	Infrastructure	Drainage	Blacktown Local Environmental Plan 2015	26/05/2015	07/07/2015	06/03/2020		983m	North
RE1	Public Recreation		Penrith Local Environmental Plan 2010	22/06/2018	22/06/2018	20/12/2019	Amendment No 19	989m	West

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Heritage

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Commonwealth Heritage List

What are the Commonwealth Heritage List Items located within the dataset buffer?

Place Id	Name	Address	Place File No	Class	Status	Register Date	Distance	Direction
N/A	No records in buffer							

Heritage Data Source: Australian Government Department of the Environment and Energy - Heritage Branch
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National Heritage List

What are the National Heritage List Items located within the dataset buffer?

Note. Please click on Place Id to activate a hyperlink to online website.

Place Id	Name	Address	Place File No	Class	Status	Register Date	Distance	Direction
N/A	No records in buffer							

Heritage Data Source: Australian Government Department of the Environment and Energy - Heritage Branch
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State Heritage Register - Curtilages

What are the State Heritage Register Items located within the dataset buffer?

Map Id	Name	Address	LGA	Listing Date	Listing No	Plan No	Distance	Direction
N/A	No records in buffer							

Heritage Data Source: NSW Crown Copyright - Office of Environment & Heritage
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Environmental Planning Instrument - Heritage

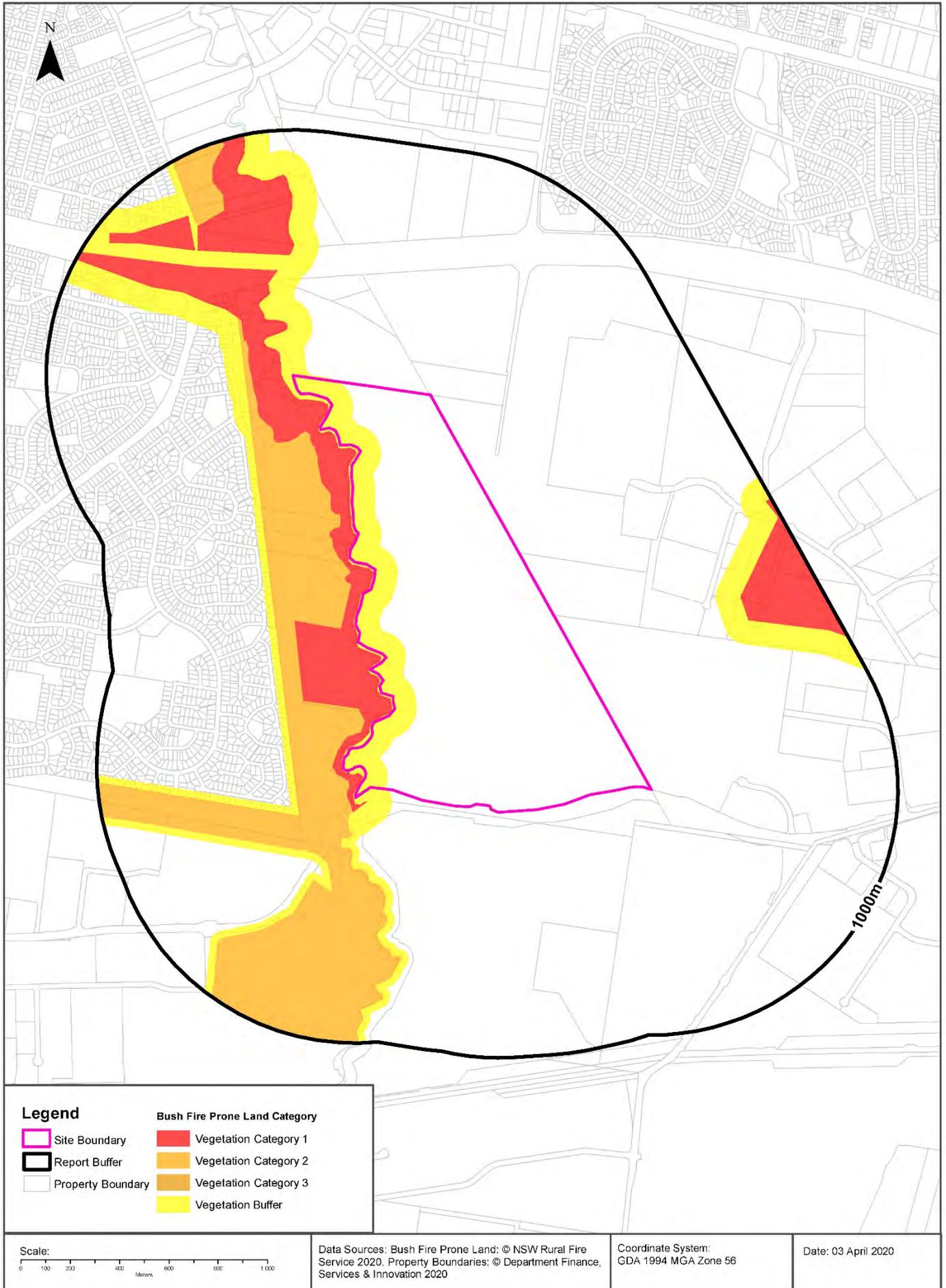
What are the EPI Heritage Items located within the dataset buffer?

Map Id	Name	Classification	Significance	EPI Name	Published Date	Commenced Date	Currency Date	Distance	Direction
N/A	No records in buffer								

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Natural Hazards - Bush Fire Prone Land

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



Natural Hazards

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Bush Fire Prone Land

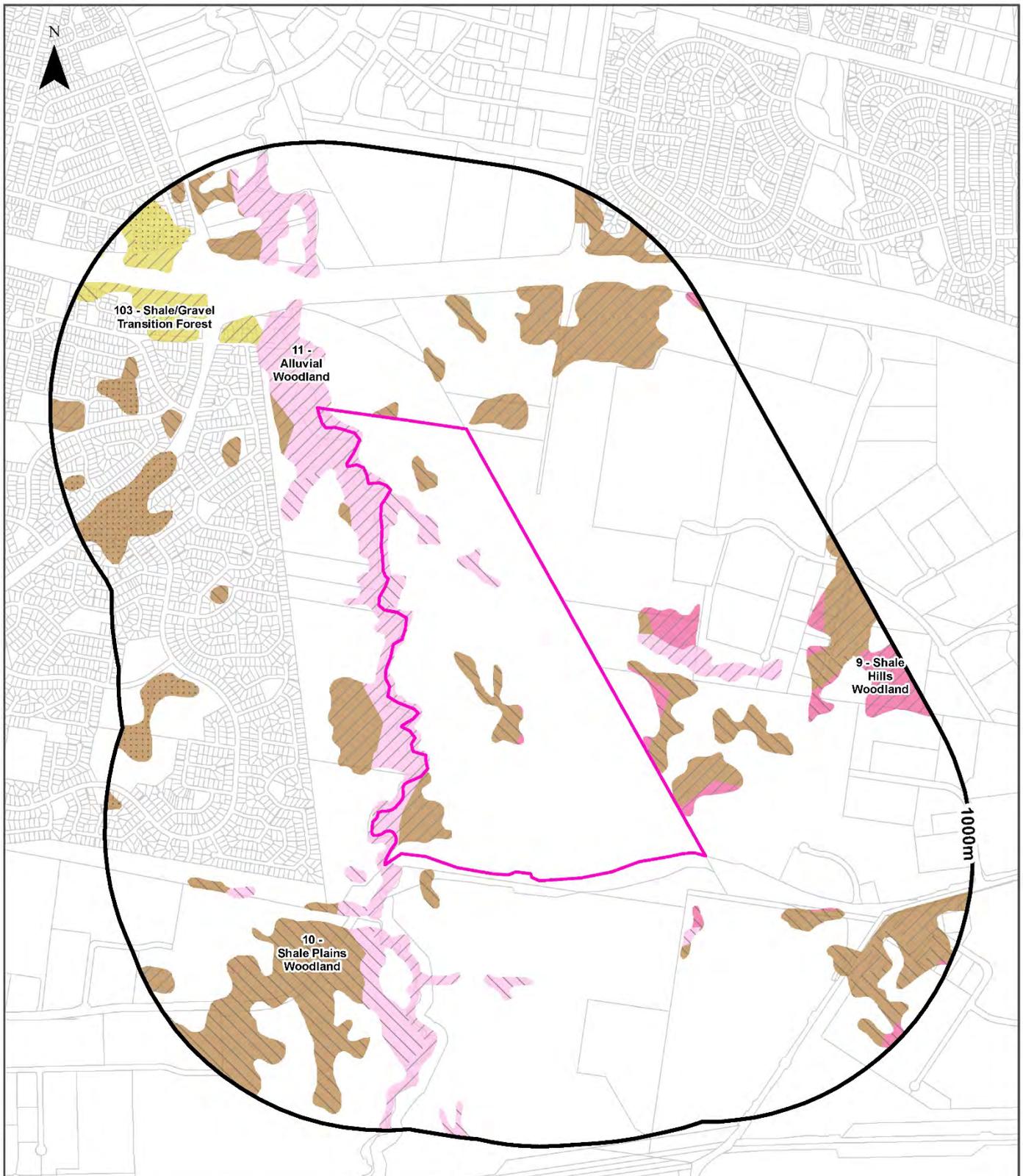
What are the nearest Bush Fire Prone Land Categories that exist within the dataset buffer?

Bush Fire Prone Land Category	Distance	Direction
Vegetation Buffer	0m	Onsite
Vegetation Category 1	2m	North West
Vegetation Category 2	29m	South West

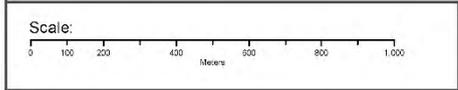
NSW Bush Fire Prone Land - © NSW Rural Fire Service under Creative Commons 4.0 International Licence

Ecological Constraints - Remnant Vegetation of the Cumberland Plain

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



Legend	
Site Boundary	Crown cover greater than 10%
Report Buffer	Crown cover less than 10%
Property Boundary	Crown cover less than 10% (urban areas)
RAMSAR Wetlands	



Data Sources: Property Boundaries & Topographic Data:
© Department Finance, Services & Innovation 2020

Coordinate System:
GDA 1994 MGA Zone 56

Date: 03 April 2020

Ecological Constraints

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Remnant Vegetation of the Cumberland Plain

What remnant vegetation of the Cumberland Plain exists within the dataset buffer?

Description	Crown Cover	Distance	Direction
10 - Shale Plains Woodland	Crown cover greater than 10%	0m	Onsite
11 - Alluvial Woodland	Crown cover greater than 10%	0m	Onsite
9 - Shale Hills Woodland	Crown cover greater than 10%	0m	Onsite
10 - Shale Plains Woodland	Crown cover less than 10%	0m	Onsite
11 - Alluvial Woodland	Crown cover less than 10%	0m	Onsite
9 - Shale Hills Woodland	Crown cover less than 10%	0m	Onsite
103 - Shale/Gravel Transition Forest	Crown cover greater than 10%	326m	North West
10 - Shale Plains Woodland	Crown cover less than 10% (urban areas)	556m	West
103 - Shale/Gravel Transition Forest	Crown cover less than 10% (urban areas)	798m	North West
103 - Shale/Gravel Transition Forest	Crown cover less than 10%	901m	North West

Remnant Vegetation of the Cumberland Plain : NSW Office of Environment and Heritage
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Ramsar Wetlands

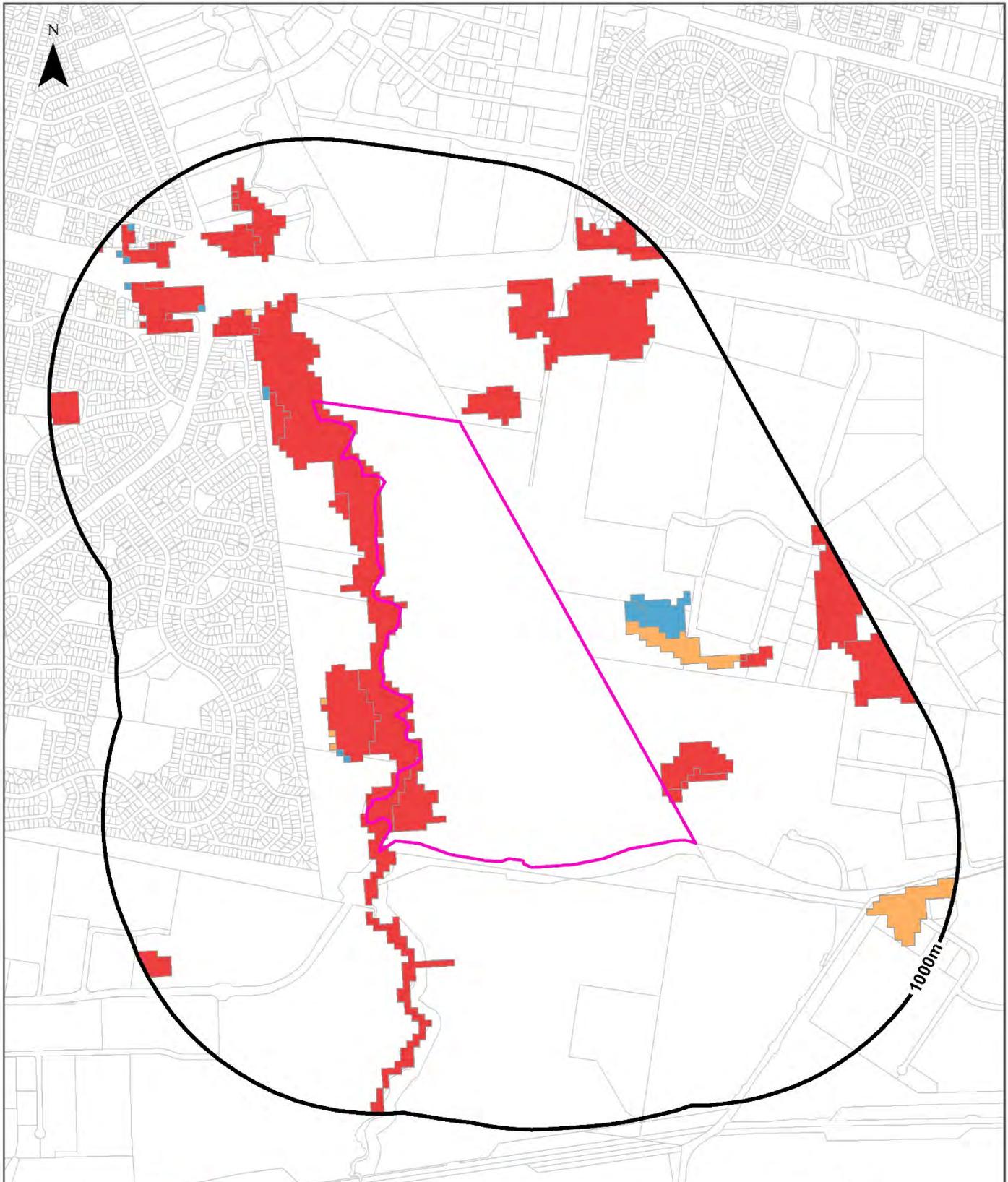
What Ramsar Wetland areas exist within the dataset buffer?

Map Id	Ramsar Name	Wetland Name	Designation Date	Source	Distance	Direction
N/A	No records in buffer					

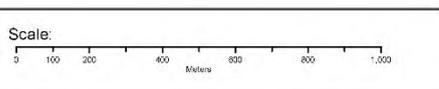
Ramsar Wetlands Data Source: © Commonwealth of Australia - Department of Environment

Ecological Constraints - Groundwater Dependent Ecosystems Atlas

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



Legend		
	Site Boundary	
	Report Buffer	
	Property Boundaries	
	High potential GDE - from national assessment	
	High potential GDE - from regional studies	
	Moderate potential GDE - from national assessment	
	Moderate potential GDE - from regional studies	



Data Sources: Property Boundaries & Topographic Data:
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Coordinate System:
GDA 1994 MGA Zone 56

Date: 03 April 2020

Ecological Constraints

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Groundwater Dependent Ecosystems Atlas

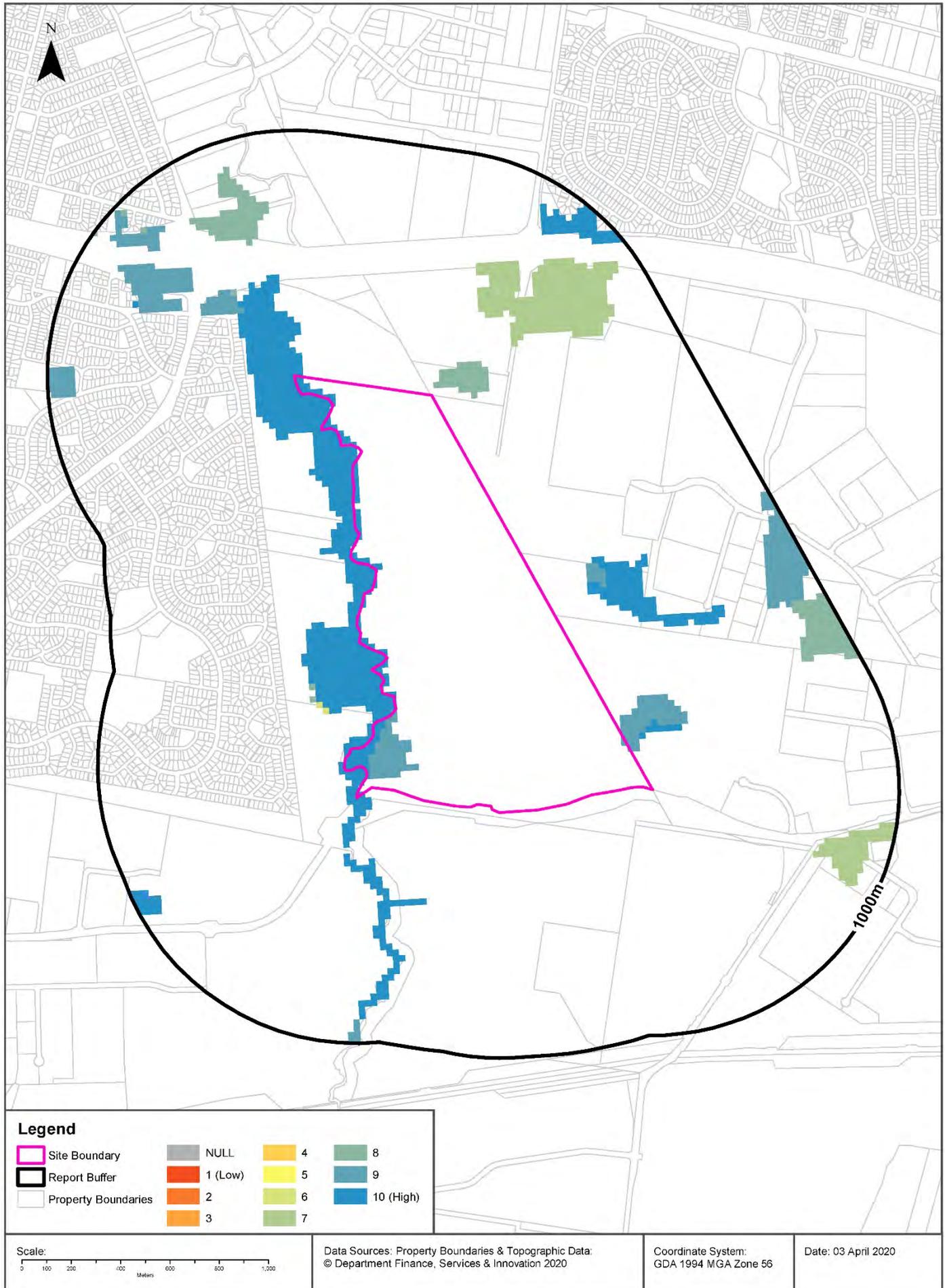
Type	GDE Potential	Geomorphology	Ecosystem Type	Aquifer Geology	Distance
Terrestrial	High potential GDE - from national assessment	Undulating to low hilly country, mainly on shale.	Vegetation	Consolidated sedimentary	0m
Terrestrial	High potential GDE - from national assessment	Undulating to low hilly country, mainly on shale.	Vegetation	Unconsolidated sedimentary	0m
Terrestrial	Moderate potential GDE - from national assessment	Undulating to low hilly country, mainly on shale.	Vegetation	Consolidated sedimentary	157m
Terrestrial	Low potential GDE - from national assessment	Undulating to low hilly country, mainly on shale.	Vegetation	Unconsolidated sedimentary	163m

Groundwater Dependent Ecosystems Atlas Data Source: The Bureau of Meteorology

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Ecological Constraints - Inflow Dependent Ecosystems Likelihood

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)



Ecological Constraints

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

Inflow Dependent Ecosystems Likelihood

Type	IDE Likelihood	Geomorphology	Ecosystem Type	Aquifer Geology	Distance
Terrestrial	9	Undulating to low hilly country, mainly on shale.	Vegetation	Consolidated sedimentary	0m
Terrestrial	10	Undulating to low hilly country, mainly on shale.	Vegetation	Unconsolidated sedimentary	0m
Terrestrial	8	Undulating to low hilly country, mainly on shale.	Vegetation	Consolidated sedimentary	28m
Terrestrial	6	Undulating to low hilly country, mainly on shale.	Vegetation	Unconsolidated sedimentary	169m
Terrestrial	7	Undulating to low hilly country, mainly on shale.	Vegetation	Consolidated sedimentary	377m

Inflow Dependent Ecosystems Likelihood Data Source: The Bureau of Meteorology

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Ecological Constraints

Lenore Drive, Eastern Creek, NSW 2766 (Part 1)

NSW BioNet Atlas

Species on the NSW BioNet Atlas that have a NSW or federal conservation status, a NSW sensitivity status, or are listed under a migratory species agreement, and are within 10km of the site?

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Amphibia	Litoria aurea	Green and Golden Bell Frog	Endangered	Not Sensitive	Vulnerable	
Animalia	Aves	Anseranas semipalmata	Magpie Goose	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Anthochaera phrygia	Regent Honeyeater	Critically Endangered	Not Sensitive	Critically Endangered	
Animalia	Aves	Apus pacificus	Fork-tailed Swift	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Ardea ibis	Cattle Egret	Not Listed	Not Sensitive	Not Listed	CAMBA;JAMBA
Animalia	Aves	Artamus cyanopterus cyanopterus	Dusky Woodswallow	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Burhinus grallarius	Bush Stone-curlew	Endangered	Not Sensitive	Not Listed	
Animalia	Aves	Calidris acuminata	Sharp-tailed Sandpiper	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Callocephalon fimbriatum	Gang-gang Cockatoo	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Calyptorhynchus banksii samuели	Red-tailed Black-Cockatoo (inland subspecies)	Vulnerable	Category 2	Not Listed	
Animalia	Aves	Calyptorhynchus lathami	Glossy Black-Cockatoo	Vulnerable	Category 2	Not Listed	
Animalia	Aves	Certhionyx variegatus	Pied Honeyeater	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Charadrius hiaticula	Ringed Plover	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Chthonicola sagittata	Speckled Warbler	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Daphoenositta chrysoptera	Varied Sittella	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Ephippiorhynchus asiaticus	Black-necked Stork	Endangered	Not Sensitive	Not Listed	
Animalia	Aves	Gallinago hardwickii	Latham's Snipe	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Glossopsitta pusilla	Little Lorikeet	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Haliaeetus leucogaster	White-bellied Sea-Eagle	Vulnerable	Not Sensitive	Not Listed	CAMBA
Animalia	Aves	Hieraaetus morphnoides	Little Eagle	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Hirundapus caudacutus	White-throated Needletail	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Ixobrychus flavicollis	Black Bittern	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Lathamus discolor	Swift Parrot	Endangered	Category 3	Critically Endangered	
Animalia	Aves	Lophochroa leadbeateri	Major Mitchell's Cockatoo	Vulnerable	Category 2	Not Listed	
Animalia	Aves	Lophoictinia isura	Square-tailed Kite	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Vulnerable	Not Sensitive	Not Listed	

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Aves	<i>Merops ornatus</i>	Rainbow Bee-eater	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	<i>Neophema pulchella</i>	Turquoise Parrot	Vulnerable	Category 3	Not Listed	
Animalia	Aves	<i>Ninox connivens</i>	Barking Owl	Vulnerable	Category 3	Not Listed	
Animalia	Aves	<i>Ninox strenua</i>	Powerful Owl	Vulnerable	Category 3	Not Listed	
Animalia	Aves	<i>Petroica boodang</i>	Scarlet Robin	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	<i>Petroica phoenicea</i>	Flame Robin	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	<i>Pezoporus wallicus wallicus</i>	Eastern Ground Parrot	Vulnerable	Category 3	Not Listed	
Animalia	Aves	<i>Pluvialis squatarola</i>	Grey Plover	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	<i>Poephila cincta cincta</i>	Black-throated Finch (southern subspecies)	Presumed Extinct	Not Sensitive	Endangered	
Animalia	Aves	<i>Polytelis swainsonii</i>	Superb Parrot	Vulnerable	Category 3	Vulnerable	
Animalia	Aves	<i>Rostratula australis</i>	Australian Painted Snipe	Endangered	Not Sensitive	Endangered	
Animalia	Aves	<i>Stagonopleura guttata</i>	Diamond Firetail	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	<i>Stictonetta naevosa</i>	Freckled Duck	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	<i>Todiramphus chloris</i>	Collared Kingfisher	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	<i>Tringa nebularia</i>	Common Greenshank	Not Listed	Not Sensitive	Not Listed	
Animalia	Aves	<i>Tyto novaehollandiae</i>	Masked Owl	Vulnerable	Category 3	Not Listed	
Animalia	Gastropoda	<i>Meridolum corneovirens</i>	Cumberland Plain Land Snail	Endangered	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	Vulnerable	Not Sensitive	Endangered	
Animalia	Mammalia	<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Miniopterus australis</i>	Little Bent-winged Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Myotis macropus</i>	Southern Myotis	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Phascolarctos cinereus</i>	Koala	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	<i>Vespadelus troungtoni</i>	Eastern Cave Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Reptilia	<i>Antaresia stimsoni</i>	Stimson's Python	Vulnerable	Not Sensitive	Not Listed	
Animalia	Reptilia	<i>Aspidites ramsayi</i>	Woma	Vulnerable	Not Sensitive	Not Listed	
Animalia	Reptilia	<i>Caretta caretta</i>	Loggerhead Turtle	Endangered	Not Sensitive	Endangered	
Animalia	Reptilia	<i>Chelonia mydas</i>	Green Turtle	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Reptilia	<i>Lucasium stenodactylum</i>	Crowned Gecko	Vulnerable	Not Sensitive	Not Listed	
Animalia	Reptilia	<i>Tiliqua occipitalis</i>	Western Blue-tongued Lizard	Vulnerable	Not Sensitive	Not Listed	

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Plantae	Flora	<i>Acacia pubescens</i>	Downy Wattle	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Allocasuarina glareicola</i>		Endangered	Not Sensitive	Endangered	
Plantae	Flora	<i>Callistemon linearifolius</i>	Netted Bottle Brush	Vulnerable	Category 3	Not Listed	
Plantae	Flora	<i>Cynanchum elegans</i>	White-flowered Wax Plant	Endangered	Not Sensitive	Endangered	
Plantae	Flora	<i>Dillwynia tenuifolia</i>		Endangered Population, Vulnerable	Not Sensitive	Not Listed	
Plantae	Flora	<i>Dillwynia tenuifolia</i>		Vulnerable	Not Sensitive	Not Listed	
Plantae	Flora	<i>Eucalyptus leucoxydon</i> subsp. <i>pruinosa</i>	Yellow Gum	Vulnerable	Not Sensitive	Not Listed	
Plantae	Flora	<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Eucalyptus scoparia</i>	Wallangarra White Gum	Endangered	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Grevillea juniperina</i> subsp. <i>juniperina</i>	Juniper-leaved Grevillea	Vulnerable	Not Sensitive	Not Listed	
Plantae	Flora	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Small-flower Grevillea	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Hibbertia puberula</i>		Endangered	Not Sensitive	Not Listed	
Plantae	Flora	<i>Isotoma fluviatilis</i> subsp. <i>fluviatilis</i>		Not Listed	Not Sensitive	Extinct	
Plantae	Flora	<i>Macadamia integrifolia</i>	Macadamia Nut	Not Listed	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i>	Native Pear	Endangered Population	Not Sensitive	Not Listed	
Plantae	Flora	<i>Micromyrtus minutiflora</i>		Endangered	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Persoonia nutans</i>	Nodding Geebung	Endangered	Not Sensitive	Endangered	
Plantae	Flora	<i>Pilularia novae-hollandiae</i>	Austral Pillwort	Endangered	Category 3	Not Listed	
Plantae	Flora	<i>Pimelea curviflora</i> var. <i>curviflora</i>		Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Pimelea spicata</i>	Spiked Rice-flower	Endangered	Not Sensitive	Endangered	
Plantae	Flora	<i>Pterostylis saxicola</i>	Sydney Plains Greenhood	Endangered	Category 2	Endangered	
Plantae	Flora	<i>Pultenaea parviflora</i>		Endangered	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Senna acclinis</i>	Rainforest Cassia	Endangered	Not Sensitive	Not Listed	
Plantae	Flora	<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	Endangered	Not Sensitive	Vulnerable	

Data does not include NSW category 1 sensitive species.
NSW BioNet: © State of NSW and Office of Environment and Heritage

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Premise match	Georeferenced to the site location / premise or part of site
General area or suburb match	Georeferenced with the confidence of the general/approximate area
Road match	Georeferenced to the road or rail
Road intersection	Georeferenced to the road intersection
Feature is a buffered point	Feature is a buffered point
Land adjacent to geocoded site	Land adjacent to Georeferenced Site
Network of features	Georeferenced to a network of features

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Appendix B. Site Photographs



Photograph 1 – Offsite facing north-west towards Southern Precast Site



Photograph 2 – Area east of Southern Precast Site (offsite facing south)



Photograph 3 – Area east of Southern Precast Site (offsite facing west)



Photograph 4 – Offsite facing north towards land adjacent to and east of Precast Site



Photograph 5 – Offsite facing west towards Southern Precast Site



Photograph 6 – Southern Precast Site – Gypsum board (onsite facing north)

Notes:

Jacobs

IA199800 Stage 1 Contamination Assessment Rev0

Site:	METROWEST PRECAST FACILITY	
Project:	STAGE 1 CONTAMINATION ASSESSMENT	
Date:	APRIL 2020	
Drawing:	OBSERVATION PHOTOGRAPHS	Appendix B



Photograph 7 – Southern Precast Site Southern Boundary with Lenore Drive – Fly tipped waste materials (onsite facing south)



Photograph 8 – Southern Precast Site Southern Boundary – Fill embankment and fly tipped waste (onsite facing west)



Photograph 9 – Southern Precast Site Southern Boundary – Fill embankment and fly tipped waste (onsite facing east)



Photograph 10 – Southern Precast Site Southern Boundary – Timber stockpile (onsite facing east)



Photograph 11 – Southern Precast Site Southern Boundary – Fill embankment and stockpiled C&D waste (onsite facing south-west)



Photograph 12 – Southern Precast Site Southern Boundary – Fill embankment and fly tipped waste (onsite facing east)

Notes:

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IA199800 Stage 1 Contamination Assessment Rev0

Site:	METROWEST PRECAST FACILITY	
Project:	STAGE 1 CONTAMINATION ASSESSMENT	
Date:	APRIL 2020	
Drawing:	OBSERVATION PHOTOGRAPHS	Appendix B



Photograph 13– Southern Precast Site Southern Boundary – C&D waste stockpiles (onsite facing east)



Photograph 14 – Southern Precast Site Southern Boundary – Fly tipped assorted waste stockpiles (onsite facing south)



Photograph 15– Southern Precast Site Southern Boundary – Fly tipped assorted waste stockpiles (onsite facing west)



Photograph 16 – Southern Precast Site – Access track washout and dispersive soils (onsite facing east)



Photograph 17 – Southern Precast Site – Fly tipped fibrous boarding potential asbestos containing material (onsite)



Photograph 18 – Ropes Creek - Possible blackwater effect resulting from high organic carbon (offsite facing north-west)

Notes:

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IA199800 Stage 1 Contamination Assessment Rev0

Site: METROWEST PRECAST FACILITY
 Project: STAGE 1 CONTAMINATION ASSESSMENT
 Date: APRIL 2020

Drawing: **OBSERVATION
 PHOTOGRAPHS**

**Appendix
 B**



Photograph 19 – Environmental Protection Area adjacent to Ropes Creek – Evidence of public use of site for recreational activities (offsite facing east)



Photograph 20 – Environmental Protection Area adjacent to Ropes Creek – Fly tipped waste materials adjacent within wooded area (offsite facing west)



Photograph 21 – Environmental Protection Area adjacent to Ropes Creek – Fly tipped waste materials adjacent within wooded area (offsite facing north-east)



Photograph 22 – Environmental Protection Area adjacent to Ropes Creek – Fly tipped waste materials adjacent within wooded area (offsite facing north)



Photograph 23 – Environmental Protection Area adjacent to Ropes Creek – Fly tipped waste materials adjacent within wooded area (offsite facing north)



Photograph 24 – Environmental Protection Area adjacent to Ropes Creek – Fly tipped waste materials adjacent within wooded area (offsite facing north-east)

Notes:

Jacobs

IA199800 Stage 1 Contamination Assessment Rev0

Site:	METROWEST PRECAST FACILITY	
Project:	STAGE 1 CONTAMINATION ASSESSMENT	
Date:	APRIL 2020	
Drawing:	OBSERVATION PHOTOGRAPHS	Appendix B



Photograph 25 –Fly tipped waste materials adjacent within wooded area (offsite)



Photograph 26 – Northern Precast Site – Stormwater retention pond (offsite facing east)



Photograph 27– View from main retention pond (offsite facing west)



Photograph 28– Northern Precast Site – Drainage to main stormwater retention pond (onsite facing south)



Photograph 29– Northern Precast Site – Drainage to main stormwater retention pond and Northern Precast Site (onsite facing south-west)



Photograph 30– Northern Precast Site (onsite facing west)

Notes:

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IA199800 Stage 1 Contamination Assessment Rev0

Site:	METROWEST PRECAST FACILITY	
Project:	STAGE 1 CONTAMINATION ASSESSMENT	
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Photograph 31– Adjacent land use (offsite facing east)



Photograph 32– Northern Precast Site – Sewer access hole cover (onsite).

Notes:

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Site:	METROWEST PRECAST FACILITY	
Project:	STAGE 1 CONTAMINATION ASSESSMENT	
Date:	APRIL 2020	
Drawing:	OBSERVATION PHOTOGRAPHS	Appendix B

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Appendix C

Noise and Vibration

SYDNEY METRO WEST

Eastern Creek Precast Facilities Noise and Vibration Technical Report

Prepared for:

Sydney Metro
Level 43, 680 George Street,
Sydney, NSW 2000

SLR Ref: 610.18331-R05
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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Sydney Metro (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

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610.18331-R05-v1.1	23 October 2020	Jordan McMahon	Antony Williams	Antony Williams
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Glossary and Abbreviations

Item	Description / Definition
Attended noise monitoring	Operator attended noise monitoring which is completed to determine the various contributors to the noise environment of an area. It is usually done over a short period, such as 15-minutes.
CNVS	<i>Sydney Metro Construction Noise and Vibration Standard</i> . Replaces the <i>Sydney Metro Construction Noise and Vibration Strategy</i> (Sydney Metro, 2017)
Cumulative impacts	Impacts that, when considered together, have different and/or more substantial impacts than a single impact assessed on its own.
dB(A)	Decibel, A-weighted
DEC	Department of Environment and Conservation (now EPA)
DECC	Department of Environment and Climate Change (now EPA)
DECCW	Department of Environment, Climate Change and Water (now EPA)
EPA	Environment Protection Authority
Heavy vehicles	A heavy vehicle is classified as a Class 3 vehicle (a two-axle truck) or larger, in accordance with the Austroads Vehicle Classification System.
HNA	Highly Noise Affected. Relates to construction noise levels of ≥ 75 dBA and is the point above which there may be strong community reaction to noise construction noise levels.
ICNG	Interim Construction Noise Guideline
INP	Industrial Noise Policy
LA _{eq}	The average noise level during a measurement period, such as the daytime or night-time
LA _{Fmax}	The maximum noise level measured during a monitoring period, using 'fast' weighting
mm/s	Millimetres per second
NATA	National Association of Testing Authorities
NCA	Noise Catchment Area
NML	Noise Management Level
Noise intensive equipment	Construction equipment that is particularly noisy and causes annoyance. Includes items such as rockbreakers and concrete saws
NPfI	Noise Policy for Industry
OOH	Out of Hours
OOHW	Out of Hours Work
PPV	Peak particle velocity
RBL	Rating Background Level. This is the background noise level measured at a particular location. The method for calculating the RBL is defined in the NSW <i>Noise Policy for Industry</i> .
Realistic worst-case scenarios	Realistic worst-case construction scenarios have been developed to assess the potential impacts from the proposal. These scenarios are based on the noisiest items of equipment which would likely be required to complete the works.
RMS	Root Mean Square

Item	Description / Definition
RNP	Road Noise Policy
SLR	SLR Consulting Australia Pty Ltd
Standard Construction Hours	Monday to Friday 7 am to 6 pm and Saturdays from 8 am to 1 pm
SWL	Sound Power Level
Unattended noise monitoring	Noise monitoring which is typically completed over a seven day period using unattended noise monitoring equipment. The equipment is left in a certain location to measure the existing background noise levels during the daytime, evening and night-time.
VDV	Vibration Dose Value
Worst-case impacts and noise levels	The worst-case (i.e. highest) impacts or noise levels predicted in this report

1 Introduction

1.1 Overview of the Proposed Works

Sydney Metro is proposing to construct and operate two adjacent precast facilities (the proposal) to support the construction of the proposed Sydney Metro West. The precast facilities which are the subject of this proposal would manufacture precast concrete segments for the purpose of lining the Sydney Metro West tunnels.

The proposal would comprise the following key features and activities:

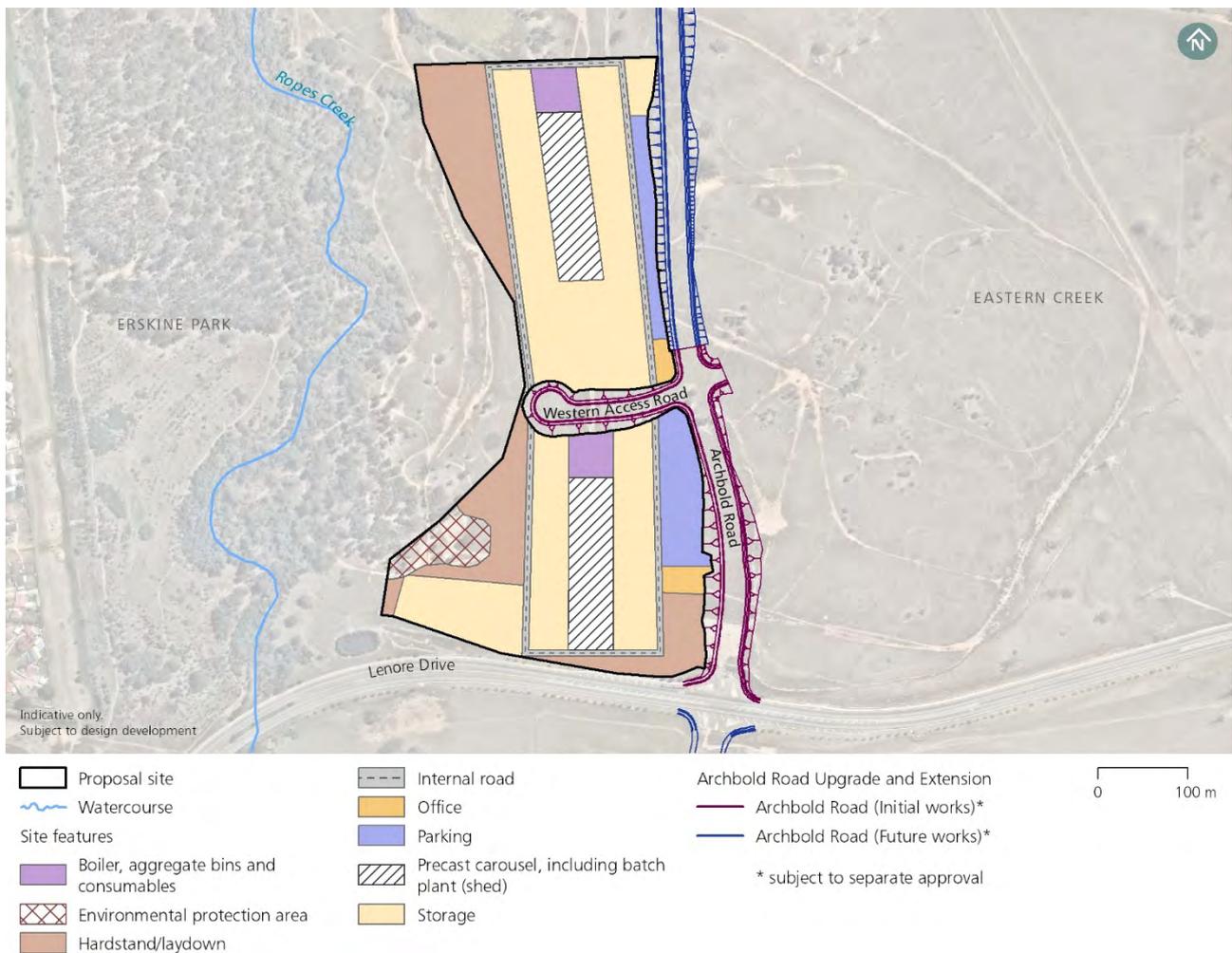
- Site establishment at the proposal site at Eastern Creek including vegetation clearing, remediation, and earthworks
- The establishment and operation of two separate and adjacent precast facilities on the proposal site, the northern and southern precast facilities. Each precast facility would include:
 - A precast yard including a shed for construction of precast concrete segments and storage laydown areas
 - Boiler, aggregate bins and consumables
 - Office facilities
 - On-site parking for up to 60 light vehicles
- Internal roads with entrances to each facility from the Western Access Road located between the northern and southern precast facilities (external roads would be subject to separate approvals)
- Ancillary supporting infrastructure, including utilities installation (power, water, sewerage, gas and communications), lighting, signage and landscaping.

The northern and southern precast facilities would operate concurrently, 24 hours a day, seven days a week for the majority of the lifespan of the project.

The proposal would be temporary, operating for an approximate timeframe of four to five years, subject to the delivery strategy and construction program for Sydney Metro West.

The proposed layout of the proposal is provided in **Figure 1**.

Figure 1 Indicative Site Layout



1.2 Purpose and Scope of this Report

This technical paper is one of a number of technical papers that form part of the Review of Environmental Factors. The purpose of this technical paper is to identify and assess the potential impacts of the proposal in relation to noise and vibration during the construction and operation of the precast facilities.

This report includes the following:

- Describes the existing environment
- Summarises the construction and operational noise and vibration assessment of the proposal on the nearby communities and receivers
- Identifies feasible and reasonable noise and vibration mitigation and management measures to be incorporated in the detailed design and construction stage of the proposal.

1.3 Structure of this Report

The remainder of this report is structured as follows:

- **Section 2** details the existing noise environment
- **Section 3** provides the policy relevant to the assessment
- **Section 4** documents the assessment methodology
- **Section 5** provides an assessment of the potential noise and vibration impacts of the proposal during construction
- **Section 6** provides an assessment of the potential noise and vibration impacts during the operation of the proposal
- **Section 7** identifies mitigation and management measures.

1.4 Terminology

The assessment has used specific acoustic terminology and an explanation of common terms is included in **Appendix A**. A glossary is also provided at the start of this document which lists the various terms used throughout this document.

2 Existing Noise Environment

2.1 Site

The proposal is located at Eastern Creek within the Blacktown City Council local government area. The proposal would be located at Lenore Drive, Eastern Creek (the proposal site).

The 'proposal site' refers to the area that would be directly impacted by the proposal as shown in **Figure 1**. The proposal site is an undeveloped greenfield site within the broader context of surrounding established industrial areas at Eastern Creek.

Directly to the north and east, the proposal site is bounded by undeveloped land zoned for future industrial use under the *State Environmental Planning Policy (Western Sydney Employment Area) 2009* (WSEA SEPP). Further to the north of the proposal site, beyond the M4 Western Motorway, is the existing Business Development Area at Minchinbury. Further to the east of the proposal site is the existing Bingo Eastern Creek Recycling Facility and the wider Eastern Creek Industrial Precinct. To the south of the proposal site there is a zoned public recreation area and an electrical substation to the south-east of the proposal site. The proposal site is bounded by Ropes Creek and riparian vegetation on the western boundary. The Erskine Park residential area extends further west (about 375 metres) from the proposal site.

Beyond the proposal site, the wider locality features a mix of land uses, including residential, commercial, public recreation and a number of industrial sites.

2.2 Noise Study Area

The proposal is located in Eastern Creek immediately north of Lenore Drive, around 1.5 kilometres south of M4 Motorway and three kilometres west of M7 Motorway. The existing land uses surrounding the proposal are residential receivers in Erskine Park to the west, with various commercial and industrial areas to the east and south. The nearest residential receivers are located about 375 metres to the west, with residential areas also being to the north at a distance of around 1.7 kilometres in Minchinbury.

Existing noise levels in the noise study area are generally controlled by road traffic noise from nearby motorways and arterial road, along with industrial noise from the surrounding existing commercial facilities.

All identified receivers surrounding the proposal are included in the assessment and have been grouped into Noise Catchment Areas (NCAs) to assist in summarising the potential impacts. The noise study area and NCAs are shown in **Figure 2** and described in **Table 1**.

Table 1 Noise Catchment Areas and Surrounding Land Uses

NCA	Description
NCA01	West of the proposal in Erskine Park. This catchment is mostly residential with the nearest receivers being about 375 metres to the west of the proposal. A small number of commercial receivers are in this catchment at the Erskine Park Shopping Centre, which is off Shallow Drive.
NCA02	North of the proposal in Minchinbury, between the M4 Motorway and Great Western Highway. This catchment consists of commercial and industrial receivers to the immediate north of the proposal, and residential receivers to the northeast and northwest. The nearest receivers in this catchment are about 1.7 kilometres away.
NCA03	East of the proposal in Eastern Creek and west of M7 Motorway. This catchment is commercial and industrial. The nearest receiver is about 800 metres east of the proposal.
NCA04	South of the proposal in Erskine Park (to the southwest), Eastern Creek (to the south) and Horsley Park (further south). This catchment is commercial and industrial. The nearest receivers in this catchment are about 800 metres away.

2.3 Sensitive Receivers

Receivers potentially sensitive to noise and vibration have been categorised as residential buildings, ‘other sensitive’ land uses which includes educational institutions, child care centres, medical facilities, places of worship, outdoor recreation areas, or commercial and industrial buildings.

The noise study area (shown in **Figure 2**) includes residential buildings and ‘other sensitive’ land uses, such as schools, commercial and industrial buildings. No other receiver types have been identified in the noise study area.

2.4 Noise Surveys and Monitoring Locations

2.4.1 Unattended Ambient Noise Monitoring Results

Unattended ambient noise monitoring was completed in the noise study area in 2016 and 2019 as part of previous nearby projects. There have not been any significant changes to the proposal site and surrounds since this monitoring was undertaken which would influence its suitability for this assessment. The measured noise levels have been used to determine the existing noise environment and to set criteria to assess the potential impacts from the proposal.

The ambient noise monitoring locations were selected with reference to the procedures outline in the NSW EPA *Noise Policy for Industry* (NPfI). The measured existing noise levels are representative of receivers in each NCA that would likely be most affected by the proposal.

The noise monitoring equipment continuously measured existing noise levels in 15-minute periods during the daytime, evening and night-time. All equipment carried current National Association of Testing Authorities (NATA) calibration certificates and the calibration was checked before and after each measurement.

The results of the noise monitoring have been processed with reference to the NPfI to exclude noise from extraneous events and/or data affected by adverse weather conditions, such as strong wind or rain, to establish representative existing noise levels for each NCA.

The monitoring locations are shown in **Figure 2** with the results summarised in **Table 2**. Descriptions of each monitoring location and the measured noise environment, together with graphs of the daily measured noise level, are in **Appendix B**.

Table 2 Summary of Unattended Noise Monitoring Results

Location ID	Address	Noise Level (dBA) ^{1,2}					
		Background Noise (RBL)			Average Noise Level (LAeq)		
		Day	Evening	Night	Day	Evening	Night
L01	82 Weaver Street, Erskine Park	37	37 ³ (actual 40)	37 ³ (actual 39)	47	46	45
L02	8 Farrington St, Minchinbury	41	41 ³ (actual 45)	41	55	57	49

Note 1: The RBL and LAeq noise levels have been determined with reference to the procedures in the NPfI.

Note 2: Daytime is 7.00 am to 6.00 pm, evening is 6.00 pm to 10.00 pm and night-time is 10.00 pm to 7.00 am.

Note 3: RBL for evening set at no greater than the daytime, and RBL for night-time set no greater than the day or evening following conservative principles outlined in the NPfI.

The unattended noise monitoring results indicate existing daytime background noise levels in the noise study area are dominated by road traffic noise from distant major roads, including the M4 Motorway and Great Western Highway.

2.4.2 Attended Noise Measurements

Short-term attended noise monitoring was completed at each ambient noise monitoring location, during previous investigations. The attended measurements allow the contributions of the various noise sources at each location to be determined. Detailed observations from the attended measurements are provided in **Appendix B**.

2.5 Prevailing Weather Conditions

An assessment of prevailing wind conditions has been completed using data measured at Horsley Park Equestrian Centre Weather Station. The detailed weather analysis for the 12-month period from January to December 2019 is shown in **Appendix C** consistent with the requirements of NPfI Fact Sheet D. The measured prevailing weather conditions are summarised in **Table 3**.

Table 3 Prevailing Weather Conditions

Weather Condition	Frequency of Occurrence		
	Daytime (7am to 6pm)	Evening (6pm to 10pm)	Night-time (10pm to 7am)
Wind - Calm	Less than 30%	Less than 30%	Greater than 30%
Wind - 0.5 to 2 metres per second	Less than 30%	Less than 30%	Less than 30%
Wind - 2 to 3 metres per second	Less than 30%	Less than 30%	Less than 30%
Wind - 0.5 to 3 metres per second	Less than 30%	Greater than 30%	Greater than 30%
Atmospheric Stability F or G – Moderately or Extremely Stable	Less than 30%	Less than 30%	Greater than 30%

As shown above, the seasonal frequency of occurrence of the prevailing winds during the daytime is less than 30 per cent, however, prevailing winds during the evening and night-time exceeds the 30 per cent threshold. Temperature inversions of Class F (moderately stable) or Class G (extremely stable) also occur for more than 30 per cent of the night-time period.

With reference to **Appendix C**, the prevailing wind direction during the evening and night-time is from the west and south-west. This is a noise-enhancing source to receiver direction for receivers north and east of the project site.

The resulting meteorological modelling conditions are discussed in **Section 4.2.3**.

3 Legislative and Policy Framework

This section summarises the guidelines and/or policies referred to in the assessment.

3.1 Relevant Guidelines Overview

The guidelines used in this assessment are listed in **Table 4**. The guidelines aim to protect the community and environment from excessive adverse noise and vibration impacts from the proposal.

Table 4 Noise and Vibration Guidelines

Guideline/Policy Name	Where Guideline Used
<i>Interim Construction Noise Guideline (ICNG)</i> , Department of Environment and Climate Change (DECC), 2009	Assessment of airborne construction noise impacts on sensitive receivers
<i>Assessing Vibration: a technical guideline</i> , Department of Environment and Conservation (DEC), 2006	Assessment of vibration impacts on sensitive receivers
<i>AS2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors</i>	Provides recommended design sound levels for internal areas of occupied spaces
<i>Road Noise Policy (RNP)</i> , Department of Environment, Climate Change and Water (DECCW), 2011	Assessment of construction traffic impacts and operational impacts of facility related traffic on public roads
<i>BS 7385 Part 2-1993 Evaluation and measurement for vibration in buildings Part 2</i> , BSI, 1993	Screening assessment of vibration impacts (cosmetic damage) to sensitive buildings and structures
<i>DIN 4150:Part 3-2016 Structural vibration – Effects of vibration on structures</i> , Deutsches Institute fur Normung, 1999	Screening assessment of vibration impacts (cosmetic damage) to vibration sensitive heritage buildings and structures, where the structure is found to be unsound
<i>Sydney Metro Construction Noise and Vibration Standard (CNVS)</i> , Sydney Metro, 2020	Assessment and management protocols for construction of Sydney Metro projects. This Sydney Metro standard is based on the requirements of the ICNG and Transport for NSW <i>Construction Noise and Vibration Strategy</i> , as appropriate to Sydney Metro and is the guiding strategy for assessing and managing the potential impacts during construction of the proposal. This Sydney Metro standard replaces the <i>Sydney Metro Construction Noise and Vibration Strategy</i> (Sydney Metro, 2017)
<i>Noise Policy for Industry (NPfI)</i> , Environmental Protection Authority (EPA), 2017	Assessment of operational industrial noise emissions from the proposal, including sleep disturbance. Ambient noise monitoring and analysis procedures

3.2 Construction Airborne Noise Guidelines

The *Sydney Metro Construction Noise and Vibration Standard (CNVS)* references the *NSW Interim Construction Noise Guideline (ICNG)* for assessing and managing impacts from construction noise on projects undertaken by Sydney Metro.

The ICNG contains procedures for determining project specific Noise Management Levels (NMLs) for sensitive receivers. The realistic ‘worst-case’ noise levels from construction of a project are predicted and then compared to the NMLs in a 15-minute assessment period to determine the likely impacts.

The NMLs are not mandatory limits, however, where construction noise levels are predicted or measured to be above the NMLs, feasible and reasonable work practices to minimise noise emissions are to be investigated.

3.2.1 Residential Receivers

The ICNG approach for determining NMLs at residential receivers is shown in **Table 5**.

Table 5 ICNG NMLs for Residential Receivers

Time of Day	NML L _{Aeq} (15minute)	How to Apply
Standard Construction Hours: Monday to Friday 7:00 am to 6:00 pm Saturday 8:00 am to 1:00 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. <ul style="list-style-type: none"> Where the predicted or measured L_{Aeq}(15minute) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practises to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly Noise Affected 75 dBA	The Highly Noise Affected (HNA) level represents the point above which there may be strong community reaction to noise. <ul style="list-style-type: none"> Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restructuring the hours that the very noisy activities can occur, taking into account: <ul style="list-style-type: none"> Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools or 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.
Outside Standard Construction Hours:	Noise affected RBL + 5 dB	<ul style="list-style-type: none"> A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB above the noise affected level, the proponent should negotiate with the community.

Note 1: The RBL is the Rating Background Level and the ICNG refers to the calculation procedures in the *NSW Industrial Noise Policy (INP)*. The INP has been superseded by the *NSW EPA Noise Policy for Industry (NPI)*. The RBLs have been determined in accordance with the calculation procedures outlined in the NPI as described in **Section 2.4**.

In the ICNG, works are recommended to be completed during Standard Construction Hours. More stringent requirements are placed on works that are required to be completed outside of Standard Construction Hours (i.e. during the evening or night-time) which reflects the greater sensitivity of communities to noise impacts during these periods.

Construction of the proposal is generally expected to be completed during Standard Construction Hours.

3.2.1.1 Summary of Residential NMLs

The residential NMLs for the proposal have been determined using the results from the unattended ambient noise monitoring (see **Section 2.4**) and are shown in **Table 6**.

Table 6 Residential Receiver Construction NMLs

NCA	Representative Background Monitoring Location	NML (LAeq(15minute) – dBA)				Sleep Disturbance Screening Criteria (52 dBA or RBL +15 dB whichever is higher)
		Standard Construction (RBL +10 dB)	Out of Hours (RBL +5 dB)			
		Daytime ¹	Daytime ¹	Evening ¹	Night-time ¹	
NCA01	L01	47	42	42	42	52
NCA02	L02	51	46	46	46	56
NCA03	N/A	N/A	N/A	N/A	N/A	N/A
NCA04	N/A	N/A	N/A	N/A	N/A	N/A

Note 1: Daytime out of hours is 7 am to 8 am and 1 pm to 6 pm on Saturday, and 8 am to 6 pm on Sunday and public holidays.

The noise monitoring locations were selected on the basis of being representative of the potentially most affected residential receivers in each NCA.

3.2.2 Other Sensitive Land Uses and Commercial Receivers

Non-residential land uses have been identified in the noise study area. These include ‘other sensitive’ land uses such as educational institutions and commercial/industrial properties. The ICNG NMLs for ‘other sensitive’ receivers are shown in **Table 7**.

Table 7 ICNG NMLs for ‘Other Sensitive’ Receivers

Land Use	Noise Management Level LAeq(15minute) (dBA) (Applied when the property is in use)	
	Internal	External
Classrooms at schools and other educational institutions	45	55 ¹
Commercial	-	70
Industrial	-	75

Note 1: The criteria is specified as an internal noise level for this receiver category. As the noise model predicts external noise levels, it has been conservatively assumed that all schools and places of worship have openable windows and external noise levels are 10 dB higher than the corresponding internal level, which is representative of windows being partially open to provide ventilation. Hospitals are assumed to have fixed windows with 20 dB higher external levels.

3.3 Construction Traffic Noise Guidelines

The potential impacts from construction traffic when travelling on public roads are assessed under the NSW *Road Noise Policy (RNP)*.

An initial screening test is first applied to evaluate if existing road traffic noise levels are expected to increase by more than 2.0 dB due to construction traffic. Where this is considered likely, further assessment is required using the RNP base criteria shown in **Table 8**.

Table 8 RNP Criteria for Assessing Construction Traffic on Public Roads

Road Category	Type of Project/Land Use	Assessment Criteria (dBA)	
		Daytime (7 am - 10 pm)	Night-time (10 pm - 7 am)
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	LAeq(15hour) 60 (external)	LAeq(9hour) 55 (external)

Where the criteria are exceeded the proposal would consider the use of all feasible and reasonable mitigation and management measures to minimise the impacts.

3.4 Construction Vibration Guidelines

The effects of vibration from construction works can be divided into three categories:

- Those in which the occupants of buildings are disturbed (**human comfort**). People can sometimes perceive vibration impacts when vibration generating construction works are located close to occupied buildings. Vibration from construction works tends to be intermittent in nature and the EPA's *Assessing Vibration: a technical guideline* (2006) provides criteria for intermittent vibration based on the Vibration Dose Value (VDV) shown in **Table 9**.
- Those where building contents may be affected (**building contents**). People perceive vibration at levels well below those likely to cause damage to building contents. For most receivers, the human comfort vibration criteria are the most stringent and it is generally not necessary to set separate criteria for vibration effects on typical building contents.
- Those where the integrity of the building may be compromised (**structural or cosmetic damage**). If vibration from construction works is sufficiently high it can cause cosmetic damage to elements of affected buildings. Industry standard cosmetic damage vibration limits are specified in Australian Standard AS 2187-2, British Standard BS 7385 and German Standard DIN 4150, which are referenced in the Sydney Metro CNVS, which adds an additional layer of conservatism to the recommendations in the British Standard. The limits are shown in **Figure 3** and **Table 10**.

Table 9 Human Comfort Vibration Dose Values for Intermittent Vibration

Building Type	Assessment Period	Vibration Dose Value ¹ (m/s ^{1.75})	
		Preferred	Maximum
Critical Working Areas (e.g. operating theatres or laboratories)	Day or night-time	0.10	0.20
Residential	Daytime	0.20	0.40
	Night-time	0.13	0.26
Offices, schools, educational institutions and places of worship	Day or night-time	0.40	0.80
Workshops	Day or night-time	0.80	1.60

Note 1: The VDV accumulates vibration energy over the daytime and night-time assessment periods, and is dependent on the level of vibration as well as the duration.

Figure 3 Transient Vibration Values for Minimal Risk of Cosmetic Damage

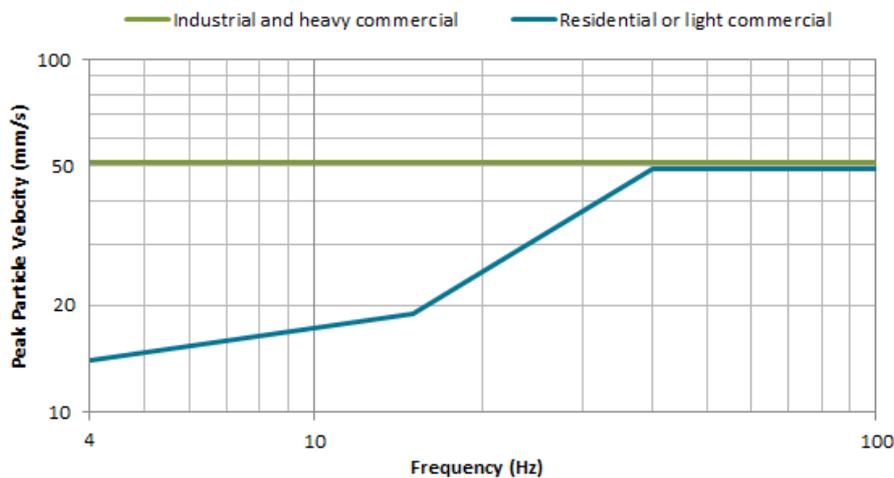


Table 10 Transient Vibration Values for Minimal Risk of Cosmetic Damage

Type of Building	Peak Particle Velocity ¹
Reinforced or framed structures. Industrial and heavy commercial buildings	25 mm/s
Unreinforced or light framed structures. Residential or light commercial type buildings	7.5 mm/s

Note 1: Cosmetic damage vibration limits are conservatively recommended to be reduced by 50 percent to account for dynamic loading caused by continuous vibration dynamic magnification due to resonance.

3.4.1 Heritage Buildings and Structures

The Sydney Metro CNVS states that heritage buildings and structures should be assessed according to the cosmetic damage screening criteria in **Table 10** and should not be assumed to be more sensitive to vibration unless found to be structurally unsound.

Where heritage buildings and structures are found to be structurally unsound, a more conservative cosmetic damage objective of 2.5 mm/s Peak Particle Velocity (PPV) (from DIN 4150) would be considered.

No heritage buildings or structures have been identified within or in proximity of the proposal site.

3.5 Industrial Operational Noise Guidelines

3.5.1 Noise Policy for Industry

The NPfI was released in 2017 and sets out the NSW Environment Protection Authority (EPA)'s requirements for the assessment and management of noise from industry in NSW.

Trigger Levels

The NPfI describes 'trigger levels' which inform the noise level at which feasible and reasonable noise management measures should be considered. Two forms of noise objectives are provided – one to account for 'intrusive' noise impacts and one to protect the 'amenity' of particular land uses.

- The **intrusiveness** of an industrial noise source is generally considered acceptable if the L_{Aeq} noise level of the source, measured over a period of 15 minutes, does not exceed the background noise level by more than 5 dB. Intrusive noise levels are only applied to residential receivers. For other receiver types, only the amenity levels apply.
- To limit continual increases in noise levels from the use of the intrusiveness level alone, the ambient noise level within an area from all industrial sources should remain below the recommended **amenity** levels specified in the NPfI for that particular land use.

The more stringent of the intrusive and amenity trigger levels become the Project Noise Trigger Level which is used to assess the potential impacts from the proposal.

For this assessment, the area surrounding the proposal is considered to be 'suburban' which is characterised as an area that is affected by traffic noise with some limited commerce or industry.

Project Specific Criteria

The project specific noise trigger levels for the nearest residential and commercial receivers are shown in **Table 11**. The lower of the intrusive and amenity criteria are shown in bold.

Table 11 Project Noise Trigger Levels – Industrial Noise

NCA	Receiver	Period	Recommended Amenity Noise Level LAeq (dBA)	Measured Noise Level (dBA)		Project Noise Trigger Levels LAeq(15minute) (dBA)	
				RBL ¹	LAeq(period)	Intrusiveness	Amenity ^{2,3}
NCA01, NCA03 and NCA04	Residential	Daytime	55	37	47	42	58
		Evening	45	37 ⁴	46	42	48
		Night-time	40	37 ⁴	45	42	43
	Commercial	When in use	65	-	-	-	68
NCA02	Residential	Daytime	55	41	55	46	58
		Evening	45	41 ⁴	57	46	48
		Night-time	40	41	49	46	43
	Commercial	When in use	65	-	-	-	68

Note 1: RBL = Rating Background Level.

Note 2: The recommended amenity noise levels have been assigned as the project amenity noise level (ie not reduced by 5 dB) as other sources of industrial noise in the area are distant and unlikely to significantly affect receivers near to the project.

Note 3: The project amenity noise levels have been converted to a 15-minute level by adding 3 dB.

Note 4: The measured evening/night-time RBL was found to be higher than the daytime/evening. In these situations, the evening/night-time RBL would typically be reduced to match the daytime/evening RBL however the NPfI acknowledges this may not always be appropriate and alternate approaches may be justified. In this case, a conservative approach has been used and the RBL has been reduced.

Sleep Disturbance

The most current method for assessing sleep disturbance is contained in the NPfI. The NPfI defines sleep disturbance criterion as 52 dBA LAFmax or the prevailing background level plus 15 dB, whichever is greater. The 52 dBA LAFmax criterion has been used for this proposal as this is the criterion which applies to the nearest residential receivers in NCA01.

3.6 Operational Road Traffic Noise

When traffic related to the proposed operation of the facility is on the public road network, vehicle movements are regarded as ‘additional road traffic’ (rather than as part of the site operations) and are assessed under the NSW *Road Noise Policy* (RNP).

The RNP requires any increase in the total traffic noise level to be limited to 2.0 dB above that of the existing road traffic noise level. The RNP criteria applicable to the proposal is provided in **Table 12**.

Table 12 RNP Criteria for Assessing Additional Vehicles on Public Roads

Road Category	Type of Project/Land Use	Assessment Criteria (dBA)	
		Daytime (7 am - 10 pm)	Night-time (10 pm - 7 am)
Freeway/arterial/sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	LAeq(15hour) 60 (external)	LAeq(9hour) 55 (external)

4 Assessment Methodology

This section describes the methodology used to assess the potential noise and vibration impacts from the proposal.

4.1 Construction Noise and Vibration Assessment

4.1.1 Airborne Noise Assessment

A noise model of the noise study area has been used to predict noise levels from construction of the proposal to all surrounding receivers. The model uses ISO 9613 algorithms in SoundPLAN software to predict noise levels at external building facades.

Local terrain, receiver buildings and structures were digitised in the noise model to develop a three-dimensional representation of the proposal site and the surrounding noise study area.

Works Descriptions

Representative scenarios have been developed to assess the likely impacts from the various construction phases of the works. These scenarios are shown in **Table 13** together with a high-level description of each works activity. The location of the various work scenarios is shown in **Figure 4**.

The assessment uses 'realistic worst-case' scenarios to determine the impacts from the noisiest 15-minute period that are likely to occur for each work scenario, as required by the ICNG. The impacts represent construction noise levels without mitigation applied.

The assessment is generally considered conservative as the calculations assume several items of construction equipment are in use at the same time within individual scenarios.

Table 13 Construction Scenario Descriptions

Scenario ¹	Activity	Description
Site Establishment	Vegetation Clearing	Clearing the proposal site of existing vegetation, trees, soil and debris.
	Earthworks	Bulk earthworks including excavation, compaction and haulage of materials.
	Utilities	Installation of power, water, sewerage, etc.
Civil and Building Work	Establishment of Roads	Construction of pavements and sealing of internal access roads for the proposed precast facilities.
	Construction of Built Form	Construction of precast facilities and site offices.
Commissioning	Decommissioning and Fit out	Includes decommissioning /demobilisation of the construction area, fit-out of the shed and commissioning of operational facilities.
	Landscaping	Site landscaping.

Note 1: Equipment lists for each scenario and Sound Power Level data are provided in **Appendix D**.

Figure 4 Construction Works Locations



Working Hours

The works would generally be carried out during Standard Construction Hours. Standard Construction Hours are defined in the ICNG as:

- 7 am to 6 pm Monday to Friday
- 8 am to 1 pm Saturdays
- No work on Sundays or public holidays.

Other activities that may be carried out outside of the Standard Construction Hours would include:

- Work determined to comply with the relevant noise management level at the nearest sensitive receiver
- The delivery of materials outside approved hours as required by the NSW Police or other authorities for safety reasons
- Emergency situations where it is required to avoid the loss of lives and properties and/or to prevent environmental harm
- Situations where agreement is reached with affected receivers.

No other out-of-hours works are anticipated as part of the proposal. If out-of-hours works are required, Sydney Metro would follow the ICNG and Sydney Metro *Construction Noise and Vibration Standard* and obtain any necessary approvals.

Works Schedule

Subject to planning approval, the works are planned to start in early 2021 and be complete by the end of 2022.

4.1.2 Construction Vibration

The potential impacts during vibration intensive works have been assessed assuming a vibratory roller could be used anywhere within the proposal site (see **Figure 4**).

4.1.3 Construction Traffic Noise

During the construction period the following vehicle numbers are anticipated during Standard Construction Hours for each precast facility:

- Light vehicles: 60 vehicles (per facility) arriving in the hour before the start of shifts (6 am to 7 am for weekday shifts) and 60 vehicles (per facility) leaving in the hour after the end of shifts (6 pm to 7 pm for weekday shifts)
- Heavy vehicles: maximum of 10 heavy vehicles (per facility) per hour during standard construction hours (7 am to 6 pm).

Haulage routes would only travel east of the proposal site as per the below roads:

- Temporary haulage route (prior to the completion of Archbold Road), upgraded and extended Archbold Road (subject to separate approval), Lenore Drive, Old Wallgrove Road, Wallgrove Road and M7 Motorway.
- No haulage routes are anticipated to travel west of the proposal site.

As all construction traffic would travel east and access the M7 Motorway via existing busy arterial roads through commercial/industrial areas, no impacts from construction traffic at sensitive receivers are expected and have not been considered further.

4.2 Operational Industrial Noise Assessment

A three-dimensional SoundPLAN noise model of the noise study area has been used to predict operational noise levels to the surrounding receivers.

Local terrain, receiver buildings and structures were digitised in the noise model to develop a three-dimensional representation of the noise study area and surrounding areas.

4.2.1 Operational Information

The proposal would produce and transport precast segments. Operational elements of the proposal include:

- Both the northern precast and southern precast would operate concurrently for a temporary timeframe of four to five years, subject to the program for construction for Sydney Metro West
- The proposal would have 24 hours per day, seven days per week operations
- Haulage routes would only travel to the east of the proposal site. Indicative operational vehicle movements are outlined in **Table 14**.

Table 14 Indicative Operational Vehicle Movements (per precast facility)

Time of the Day	Heavy Vehicles (maximum per hour)	Light Vehicles (maximum per hour)	Light Vehicles – Staff (indicative maximum based on shift change times)
Day (7am – 6pm)	12	8	60 (6am - 7am)
Evening (6pm-10pm)	6	5	60 (5pm-6pm) 60 (6pm-7pm)
Night (10pm-7am)	6	5	60 (5am-6am)

Note 1: Heavy vehicles have been assumed to be evenly distributed across the worst-case hour period.

Internal access roads would be established including vehicles access and egress points on the eastern side. There would be one entrance to the proposal site, a joint site entrance for both facilities located between the northern and southern precast facilities.

The batch plant facilities would include:

- A concrete batching plant enclosed in a shed with a height of about eight metres. All openings are assumed to face east
- Site amenities including crib sheds, ablutions and offices
- Car parking areas for provision of up to 60 light vehicles at each precast facility.

4.2.2 Operational Scenarios

The following operational scenarios in **Table 15** have been assessed for the proposed precast facility.

Table 15 Operational Scenarios

Scenario	Equipment	Operating Hours
Segment precast factory (internal)	Concrete mixer truck Concrete pump Concrete vibrator Gantry crane	24/7
Segment storage	Telehandler Forklift Gantry crane	24/7
External equipment	Front end loader Containerised boilers ¹ Light vehicles Heavy vehicles	24/7

Note 1: Assumed to not be a significant contributor to noise emissions.

The noise generated by the facility is generally not expected to contain any particularly annoying characteristics (i.e. tonal or low frequency components) and therefore NPfl modifying factor corrections have not been applied to the assessment.

4.2.3 Meteorological Conditions

Weather conditions with the potential to increase noise at receivers are a feature of the area (see **Section 2.5** and **Appendix C**). The NPfl requires assessment under noise-enhancing weather conditions when the frequency of occurrence of noise-enhancing conditions is measured to be greater than 30 per cent. The meteorological conditions included in the noise modelling are summarised in **Table 16**.

Table 16 Meteorological Conditions for Noise Modelling

Assessable Weather Condition	Period	Air Temp. (°C)	Relative Humidity (per cent)	Wind Velocity (metres per second)	Modelled Wind Direction	Stability Category ¹
Standard	Daytime	21	59	0.5	Source > Receiver	D
	Evening	20	67	0.5	Source > Receiver	D
	Night-time	17	75	0.5	Source > Receiver	D
Noise-Enhancing	Evening	20	67	3	Source > Receiver ²	D
	Night-time	17	75	3	Source > Receiver ²	D
	Night-time	17	75	2	From south-west	F

Note 1: Refer to the NPfl for definitions of these categories.

Note 2: Prevailing wind direction more than 30 per cent occurrence is from the south-west, south-south-west and west-south-west.

As described in the NPfl, where wind is identified as a significant feature, noise modelling should consider a three metres per second wind in the directions identified as significant, or alternatively use a source-to-receiver component for all receivers of three metres per second as a conservative approach.

The prevailing wind direction near the proposal site is from the southwest for more than 30 per cent of the time. A three metres per second source to receiver wind direction in the evening and night-time has therefore been conservatively applied to the assessment for all receivers. It is noted that this approach is conservative for receivers to the west of the proposal site in NCA01 as the prevailing wind direction is from the south-west.

Noise-enhancing temperature inversions as part of stability Class F have also been modelled during the night-time.

5 Construction Assessment

5.1 Construction Noise

The following overview is based on the predicted impacts at the most affected receivers and is representative of the worst-case situation where construction equipment is at the closest point to each receiver.

The assessment shows the predicted impacts based on the exceedance of the management levels, as per the categories in **Table 17**. The likely subjective response of people affected by the impacts is also shown in the table, noting that the subjective response would vary and depends on the period in which the impacts occur.

Table 17 Exceedance Bands and Corresponding Subjective Response to Impacts

Exceedance of Management Level	Likely Subjective Response	Impact Colouring
No exceedance	No impact	
1 to 10 dB	Minor to marginal	
11 dB to 20 dB	Moderate	
>20 dB	High	

The predicted construction airborne noise impacts are presented for the most affected receivers. Receivers which are further away from the works and/or shielded from view would have substantially lower impacts. The assessment is generally considered conservative as the calculations assume several items of construction equipment are in use at the same time within individual scenarios.

A summary of the predicted construction airborne noise levels (without additional mitigation) in each NCA for the various construction activities is shown in **Table 18** for the nearest residential and commercial receivers.

The table presents the maximum impact from the construction scenarios. This represents the likely maximum noise levels expected during construction with noise generating works.

Construction noise level contours across the proposal site are shown in **Figure 5** for the scenario which results in the highest predicted noise levels at the adjacent receivers (*Site Establishment – Earthworks*).

The noise levels presented in this report are based on a realistic worst-case assessment of each works scenario. For most construction activities, it is expected that the construction noise levels during less intensive activities would frequently be lower than predicted.

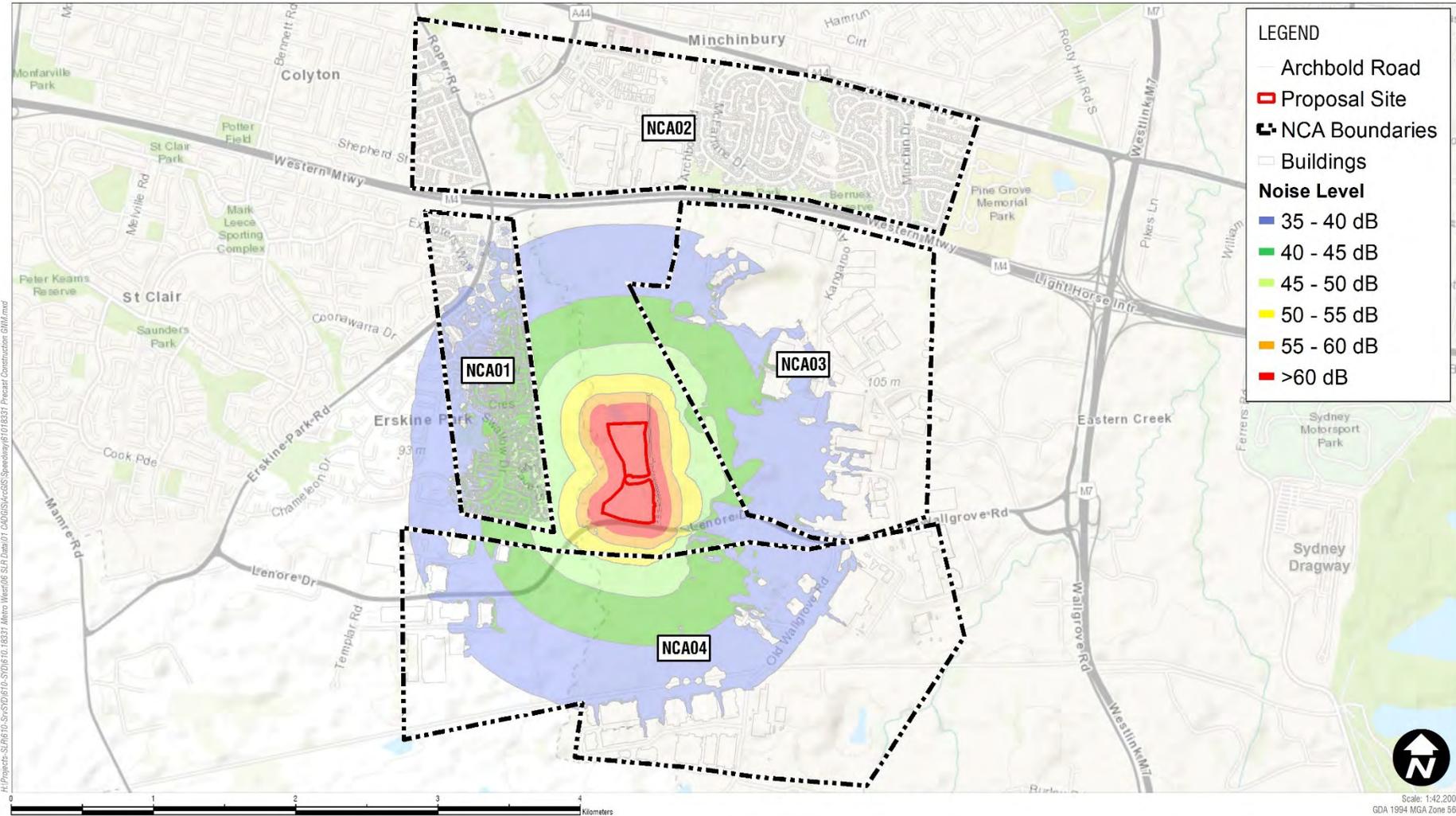
Table 18 Predicted Worst-Case Construction Noise Impacts – Standard Construction Hours

NCA	NML (dBA)	Predicted Worst-case LAeq(15minute) Noise Level (dBA)						
		Site Establishment			Civil and Building Work		Commissioning	
		Vegetation Clearing	Earthworks	Utilities	Establishment of Roads	Construction of Built Form	Decommissioning and Fit out	Landscaping
Residential – Daytime								
NCA01	47	47	50	34	46	45	42	31
NCA02	51	<30	<30	<30	<30	<30	<30	<30
NCA03	47	N/A – no residential receivers in this NCA						
NCA04	47	N/A – no residential receivers in this NCA						
Commercial – Daytime								
NCA01	70	39	42	<30	39	37	34	<30
NCA02	70	32	35	<30	33	31	<30	<30
NCA03	70	40	43	<30	40	38	35	<30
NCA04	70	39	42	<30	38	37	34	<30

Legend

 No Exceedance	 1 - 10 dB above NML	 11 - 20 dB above NML	 >20 dB above NML
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Figure 5 Predicted Construction Noise Level Contours – Site Establishment – Earthworks



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The above assessment shows the construction works are anticipated to comply with the relevant criteria with the exception of a minor exceedance of the NMLs in NCA01 during the noisiest scenario which is *Site Establishment – Earthworks*. This temporary impact is only expected for a relatively short period of the works when noise generating works are occurring at the western site boundary of the proposal, which is closest to the sensitive receivers in NCA01. The worst-case predicted noise level is 50 dBA which is comparable to the existing L_{Aeq} noise levels in the NCA (see **Table 2**) and would be below annoyance levels within the potentially affected buildings. As such, this exceedance is considered to be of low significance. The noise levels from all other scenarios are predicted to be compliant at all receivers.

The impacts presented above are based on all equipment working simultaneously in each assessed scenario. There would be periods when construction noise levels are much lower than the worst-case levels predicted and there would be times when no equipment is in use.

The proposed noise mitigation measures for construction airborne noise impacts are discussed in **Section 7.1**.

5.2 Construction Vibration

Vibration intensive equipment is proposed to be used during construction and includes the use of a vibratory roller. This item of vibration intensive equipment could be used anywhere within the construction footprint shown in **Figure 4**.

The nearest receivers are about 375 metres from the proposal site and therefore impacts from vibration intensive works during construction of the proposal are anticipated to be negligible.

5.3 Cumulative Construction Impacts

The cumulative impact assessment for construction noise is provided in Chapter 8 (Environmental Impacts Assessment) of the REF.

6 Operational Assessment

6.1 Operational Noise

Operational noise emissions from the proposal have been predicted to the identified sensitive receivers in the noise study area. The following presents a summary of the predicted levels and likely impacts at the most affected receivers in each NCA, which is typically the nearest receivers.

The predicted levels represent realistic worst-case scenarios during the concurrent operation of both precast facilities, based on the assumptions detailed in **Section 4.2**. The industrial noise emissions would vary during operation, depending on delivery and production schedules, and would frequently be lower than the worst-case levels presented.

The predicted operational noise levels at the nearest receivers from industrial noise emissions are shown in **Table 19** for both standard and noise-enhancing weather conditions.

Table 19 Industrial Noise Assessment

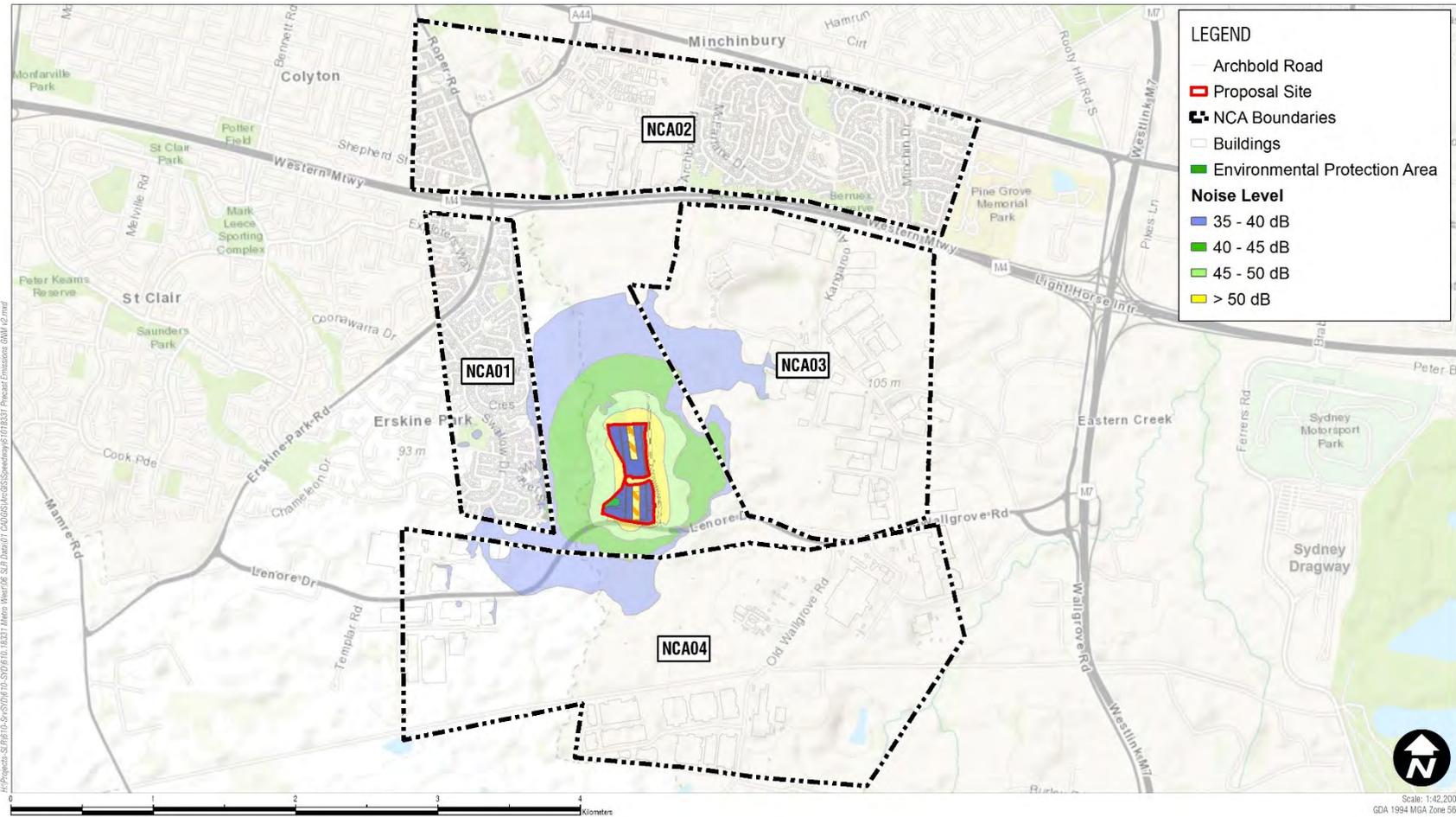
Receiver Type	Receiver Location	Period	Noise Level LAeq(15 minute) (dBA)			Compliance?
			Project Trigger Level	Predicted	Exceedance	
Standard Weather Conditions						
Residential	NCA01	Daytime	42	39	-	Yes
		Evening	42	38	-	Yes
		Night-time	42	38	-	Yes
	NCA02	Daytime	46	30	-	Yes
		Evening	46	<30	-	Yes
		Night-time	43	30	-	Yes
Commercial	NCA01	When in use	68	37	-	Yes
	NCA02	When in use	68	30	-	Yes
	NCA03	When in use	68	37	-	Yes
	NCA04	When in use	68	36	-	Yes
Noise-Enhancing Weather Conditions						
Residential	NCA01	Daytime	N/A ¹	N/A ¹	N/A ¹	N/A ¹
		Evening	42	40	-	Yes
		Night-time	42	42	-	Yes
	NCA02	Daytime	N/A ¹	N/A ¹	N/A ¹	N/A ¹
		Evening	46	<30	-	Yes
		Night-time	43	34	-	Yes
Commercial	NCA01	When in use	68	41	-	Yes
	NCA02	When in use	68	35	-	Yes
	NCA03	When in use	68	41	-	Yes
	NCA04	When in use	68	40	-	Yes

Note 1: Noise-enhancing weather conditions are not a feature of the area during the daytime.

The above assessment shows that compliance with the criteria is predicted at all receivers during facility operation under both standard and noise enhancing weather conditions.

To indicate the extent of the predicted noise levels, noise contours have been generated and are shown in **Figure 6**.

Figure 6 Noise Contours – Predicted Operational Noise Levels (Daytime, Standard Weather)



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6.2 Sleep Disturbance

Truck movements and precast segment loading activities are expected to result in the highest maximum noise levels from the proposal during operation. The predicted worst-case maximum noise levels at the nearest residential receivers are presented in **Table 20**.

Table 20 Summary of Predicted Sleep Disturbance Noise Levels

NCA	Source	L _{Amax} Noise Level (dBA)		Compliance?
		Criteria	Predicted	
NCA01	Truck movements	52	47	Yes
NCA02			35	Yes

The above shows that maximum noise levels from the facility are expected to comply with the sleep disturbance screening criteria and therefore further consideration of maximum noise levels is not required.

6.3 Operational Road Traffic Noise

Traffic would access the site from Lenore Drive via a temporary haulage route and, once complete, the upgraded and extended Archbold Road, and generally travel east to access the M7 Motorway via existing busy arterial roads through commercial/industrial areas. As such, no impacts from traffic at sensitive receivers are expected.

7 Mitigation and Management Measures

7.1 Construction Management

The ICNG acknowledges that due to the nature of construction works it is inevitable that there would be impacts where construction is near sensitive receivers. Where exceedances of the management levels are predicted, the following mitigation and management measures would be applied, where feasible and reasonable.

7.1.1 Standard Mitigation Measures

The Sydney Metro CNVS contains a number of 'standard mitigation measures' for mitigating and managing construction impacts on Sydney Metro projects/proposals. The measures are shown in **Appendix E** and would be applied to the works where feasible and reasonable.

Although the Sydney Metro *Construction Noise and Vibration Standard* is typically applied to the construction phase of projects, it is proposed to also use this standard for the operational phase of the precast facilities considering their role in supporting construction of Sydney Metro West and their use by the tunnelling contractors.

7.1.2 Additional Noise Mitigation Measures

The proposed construction works are predicted to result in only a minor exceedance for the noisiest scenario at the nearest receivers to the west. The predicted levels of construction noise would be similar to the existing ambient levels of noise in the catchment and are not expected to result in any adverse impact. All other works are expected to result in noise levels that are below the NMLs.

As the works would generally be completed during Standard Construction Hours it is not considered necessary to consider any 'additional mitigation measures' (outlined in the Sydney Metro CNVS) for this proposal.

7.1.3 Proposal Specific Mitigation

The proposal-specific mitigation measures which would be implemented where feasible and reasonable to minimise noise and vibration impact from the proposal are listed in **Table 21**.

Table 21 Proposal Specific Noise Mitigation Measures

Item	Mitigation Measure
Notification	Receivers that would potentially be affected by noise and/or vibration from the works would be appropriately notified before the relevant works start.
Monitoring	Noise monitoring at the most affected receiver(s) would be undertaken at the start of the works to check the levels are as predicted and to confirm that the standard mitigation measures are adequate.

7.2 Operational Management

Operational noise levels from the facility are expected to comply with the noise goals during standard and noise-enhancing weather conditions meaning there is no requirement to consider operational mitigation measures.

8 Conclusion

Sydney Metro is proposing to construct and operate two adjacent precast facilities (the proposal) to support the construction of the proposed Sydney Metro West. The precast facilities which are the subject of this proposal would manufacture precast concrete segments for the purpose of lining the Sydney Metro West tunnels.

The existing land use surrounding the proposal site is a mix of residential and commercial receivers, with the nearest residential receivers being situated about 375 metres to the west of the proposal.

8.1 Construction

The proposed construction activities would generally be completed during Standard Construction Hours. The potential construction noise and vibration impacts have been predicted to the nearest receivers.

The impacts are predicted to be compliant with the Noise Management Levels during all works, except for a minor exceedance during the worst-case noise scenario, which is expected to be during *Site Establishment – Earthworks*. All other construction works are predicted to comply with the management levels.

The main potential source of construction vibration would be from vibratory rollers. The separation distance between the nearest works location and the nearest potentially affected receivers is sufficient for vibration levels to be compliant with both the human comfort and cosmetic damage criteria.

The potential impacts would be mitigated and managed as per the strategies documented in this report.

8.2 Operation

The proposed operational activities would occur 24 hours per day, seven days a week for the majority of the lifespan of the project. The potential operational noise impacts have been predicted to the nearest receivers.

Operational noise levels from the facility are expected to comply with the noise goals at the surrounding receivers in all periods during both standard and noise-enhancing weather conditions.

APPENDIX A

Acoustic Terminology

1. Sound Level or Noise Level

The terms ‘sound’ and ‘noise’ are almost interchangeable, except that ‘noise’ often refers to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range with the loudest sound pressure to which the human ear can respond being ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2. ‘A’ Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an ‘A-weighting’ filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People’s hearing is most sensitive to sounds at mid frequencies (500 Hz to 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as ‘linear’, and the units are expressed as dB(lin) or dB.

3. Sound Power Level

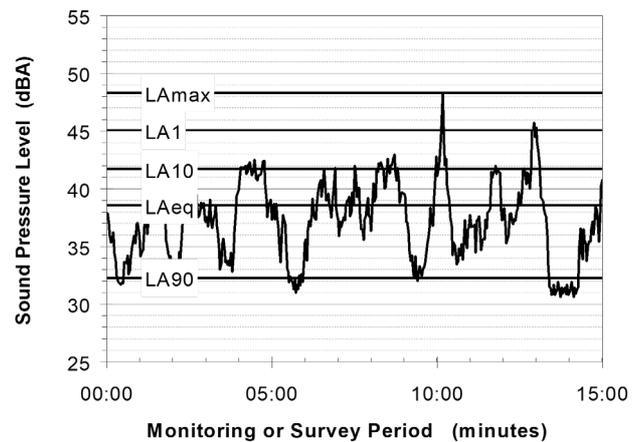
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure is similar to the effect of an electric radiator, which is characterised by a power rating but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4. Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

- LA1 The noise level exceeded for 1% of the 15 minute interval.
- LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.
- LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.
- LAeq The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

5. Frequency Analysis

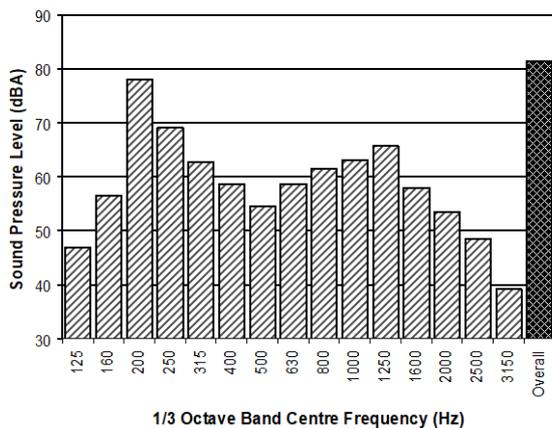
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (three bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



6. Annoying Noise (Special Audible Characteristics)

A louder noise will generally be more annoying to nearby receivers than a quieter one. However, noise is often also found to be more annoying and result in larger impacts where the following characteristics are apparent:

- **Tonality** - tonal noise contains one or more prominent tones (ie differences in distinct frequency components between adjoining octave or 1/3 octave bands), and is normally regarded as more annoying than 'broad band' noise.
- **Impulsiveness** - an impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.
- **Intermittency** - intermittent noise varies in level with the change in level being clearly audible. An example would include mechanical plant cycling on and off.
- **Low Frequency Noise** - low frequency noise contains significant energy in the lower frequency bands, which are typically taken to be in the 10 to 160 Hz region.

7. Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of 'peak' velocity or 'rms' velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as 'peak particle velocity', or PPV. The latter incorporates 'root mean squared' averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements (ie vertical, longitudinal and transverse).

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V , expressed in mm/s can be converted to decibels by the formula $20 \log (V/V_0)$, where V_0 is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used.

8. Human Perception of Vibration

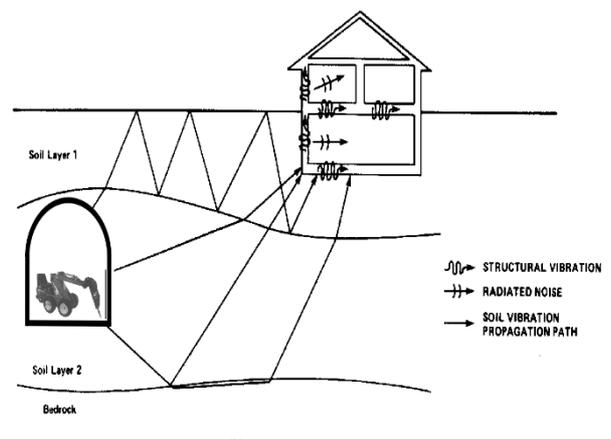
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as 'normal' in a car, bus or train is considerably higher than what is perceived as 'normal' in a shop, office or dwelling.

9. Ground-borne Noise, Structure-borne Noise and Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed 'structure-borne noise', 'ground-borne noise' or 'regenerated noise'. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

The following figure presents an example of the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.

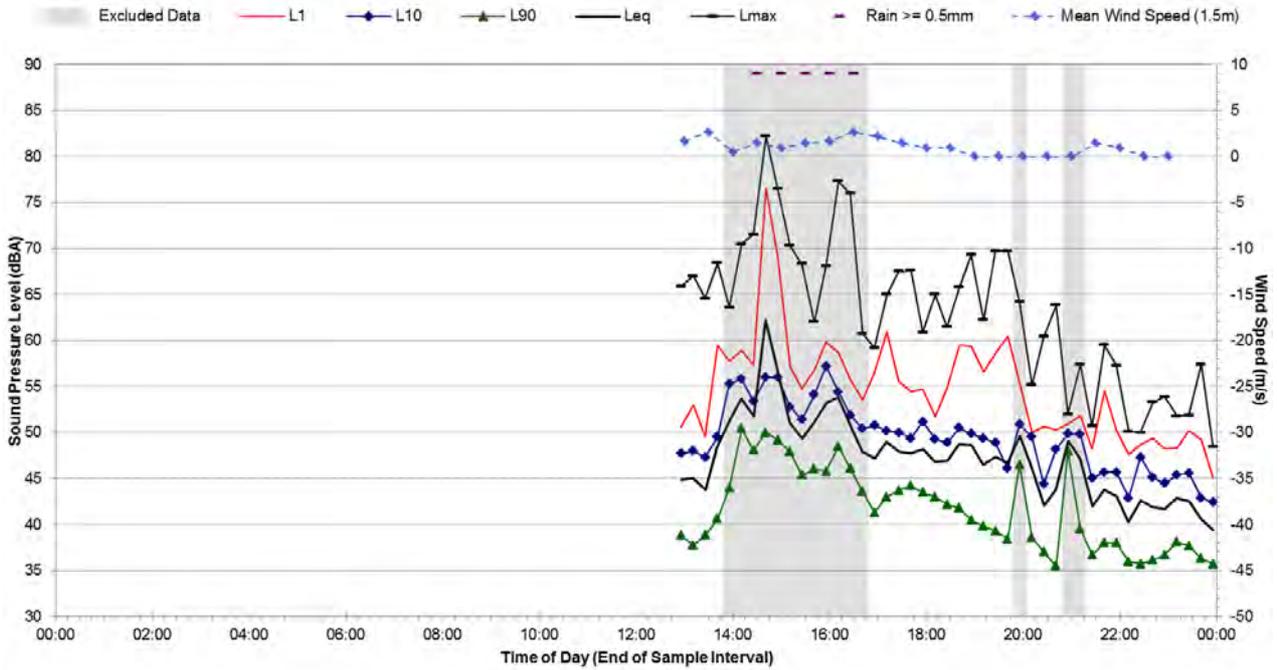


The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise.

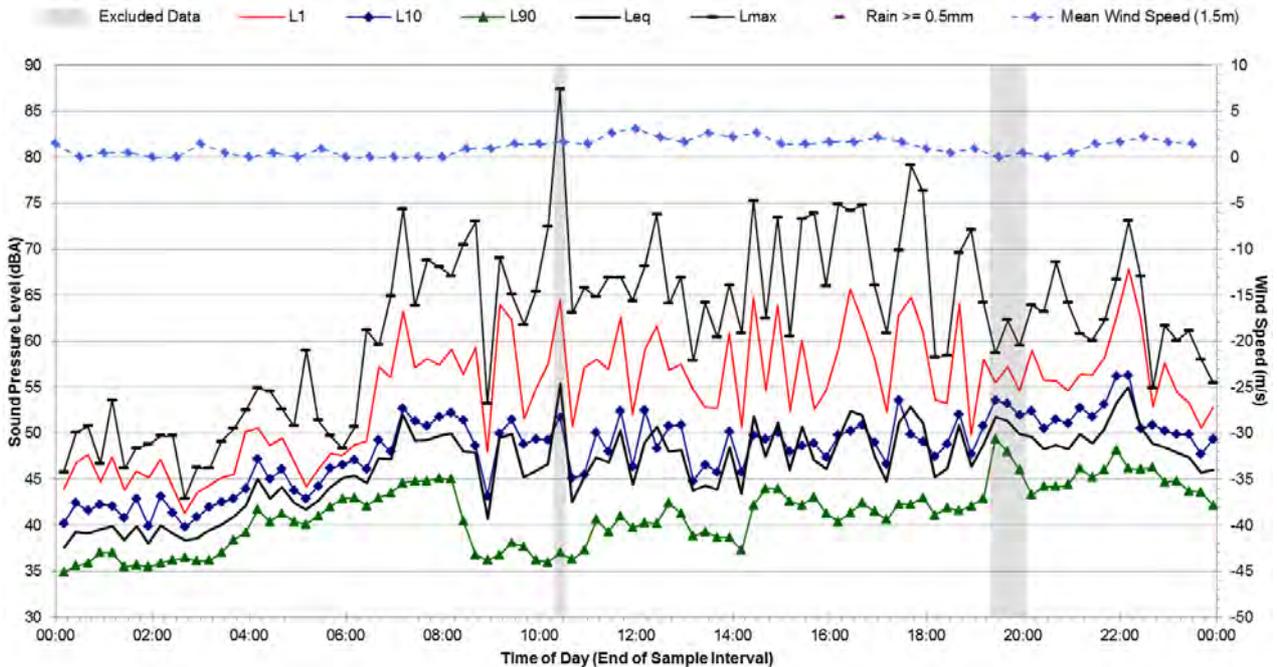
APPENDIX B

Noise Monitoring Data

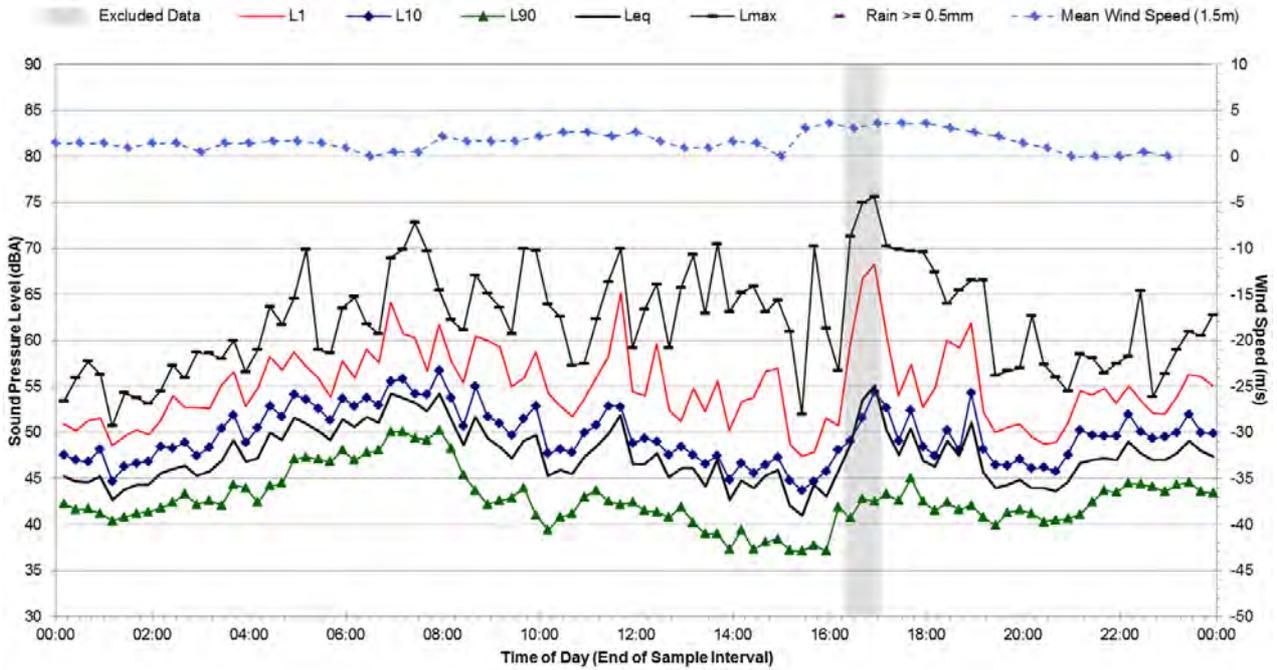
Statistical Ambient Noise Levels L2 - 82 Weaver Street, Erskine Park - Tuesday, 29 March 2016



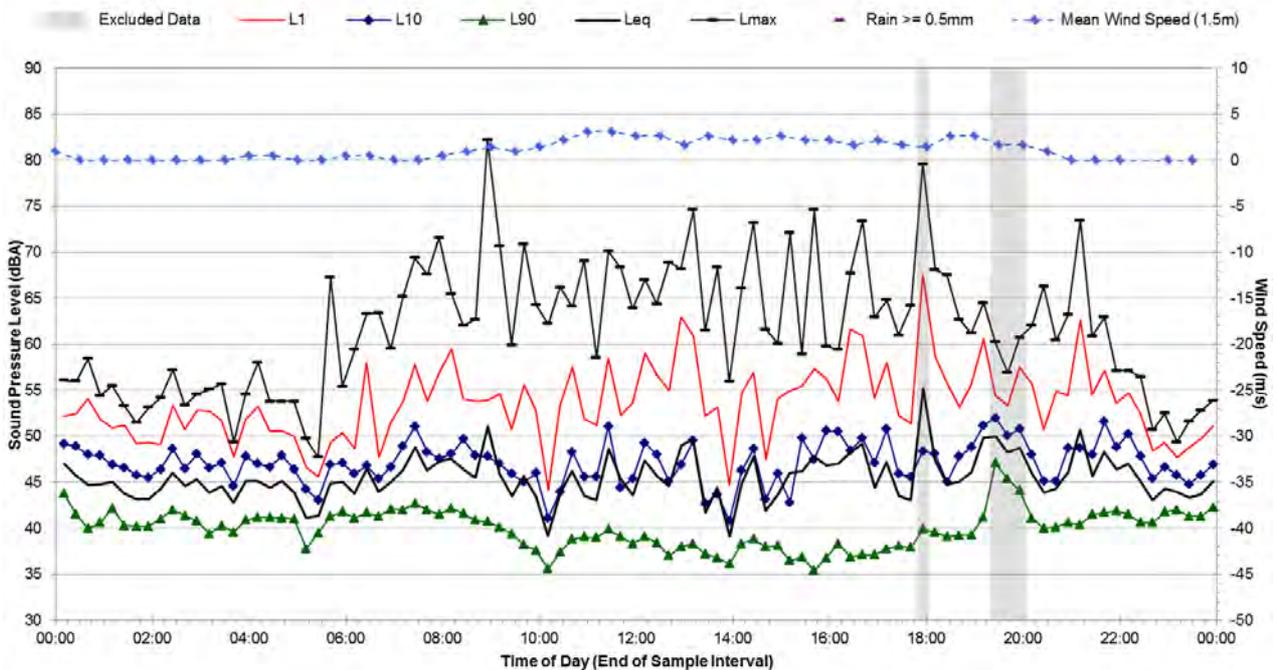
Statistical Ambient Noise Levels L2 - 82 Weaver Street, Erskine Park - Wednesday, 30 March 2016



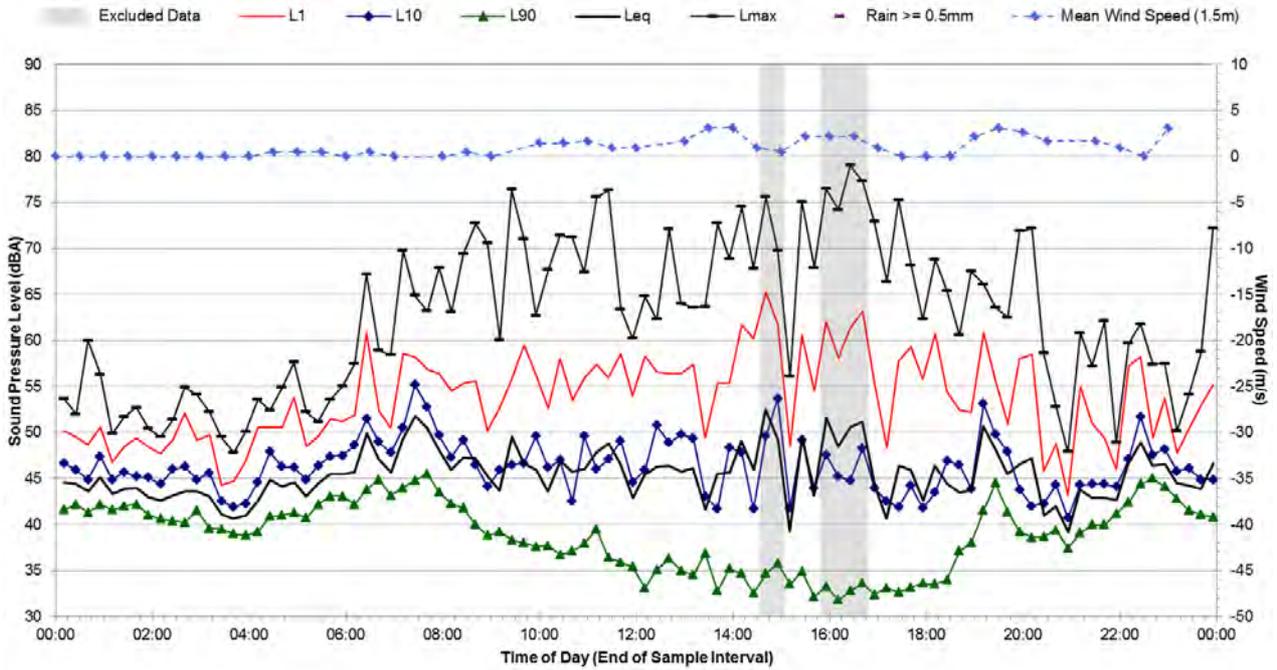
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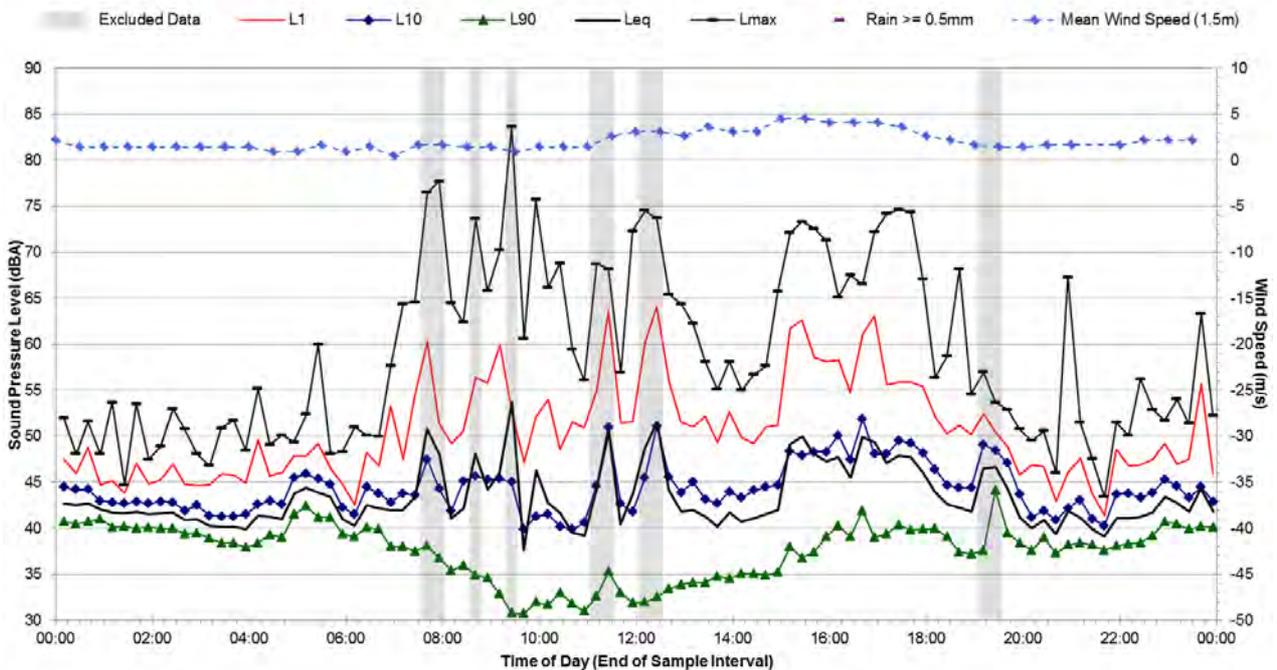
Statistical Ambient Noise Levels L2 - 82 Weaver Street, Erskine Park - Friday, 1 April 2016



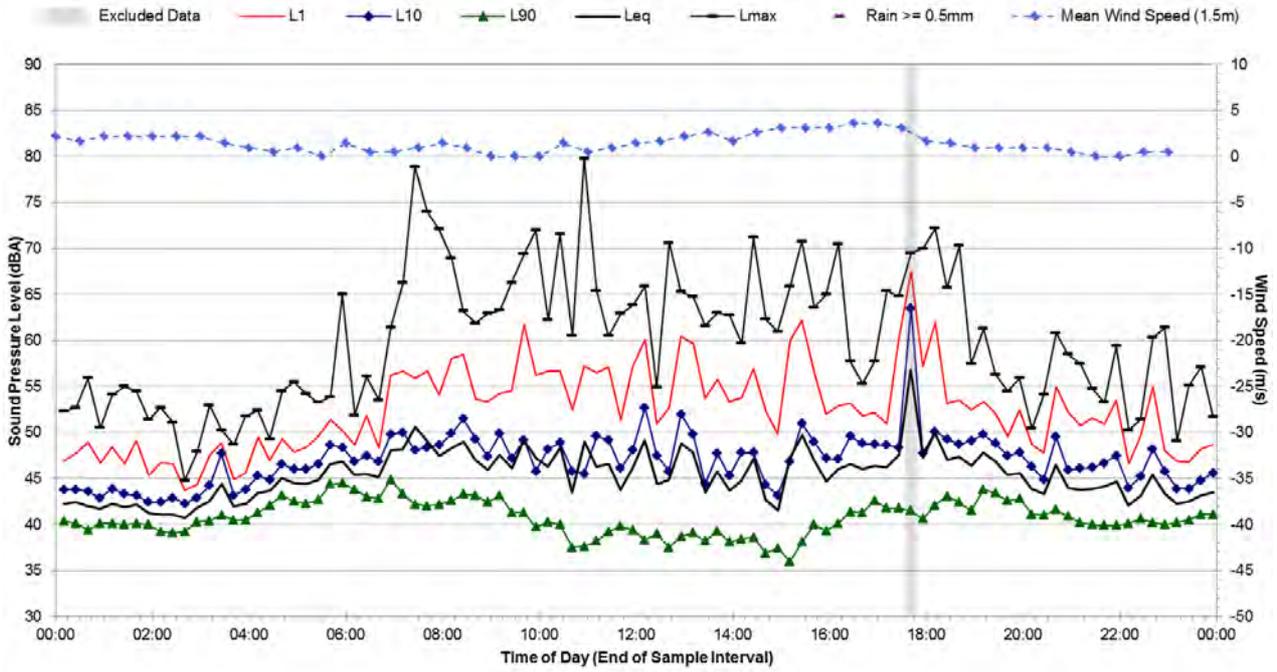
Statistical Ambient Noise Levels L2 - 82 Weaver Street, Erskine Park - Saturday, 2 April 2016



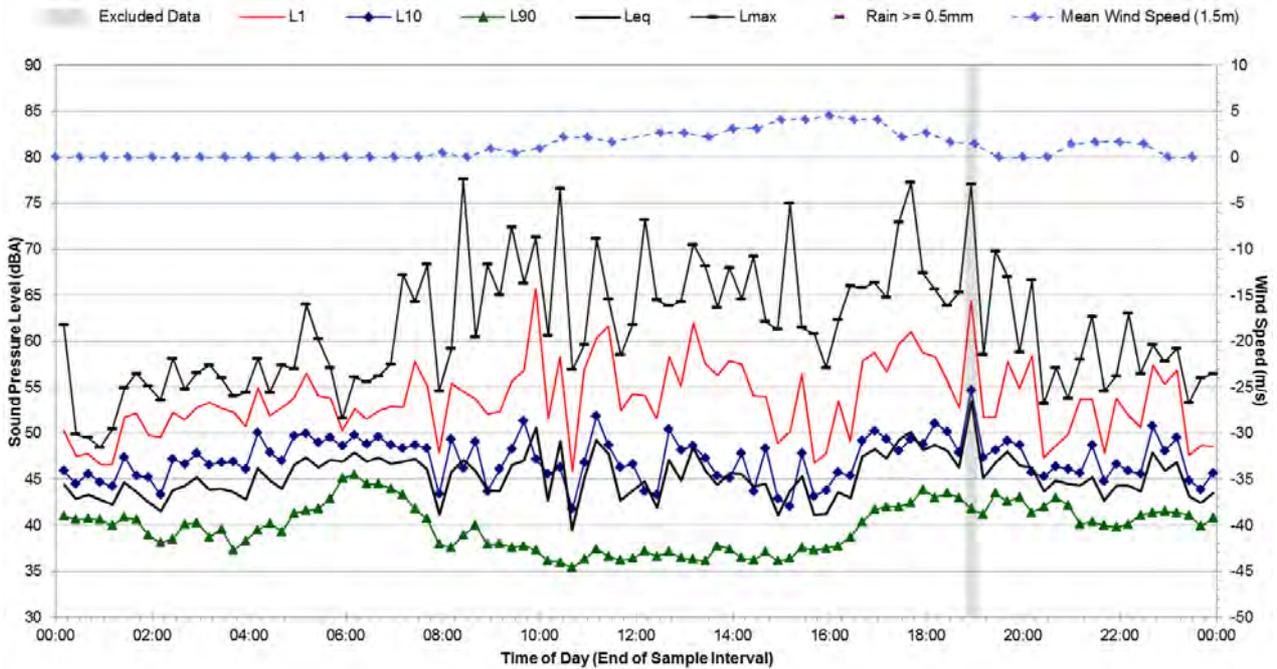
Statistical Ambient Noise Levels L2 - 82 Weaver Street, Erskine Park - Sunday, 3 April 2016



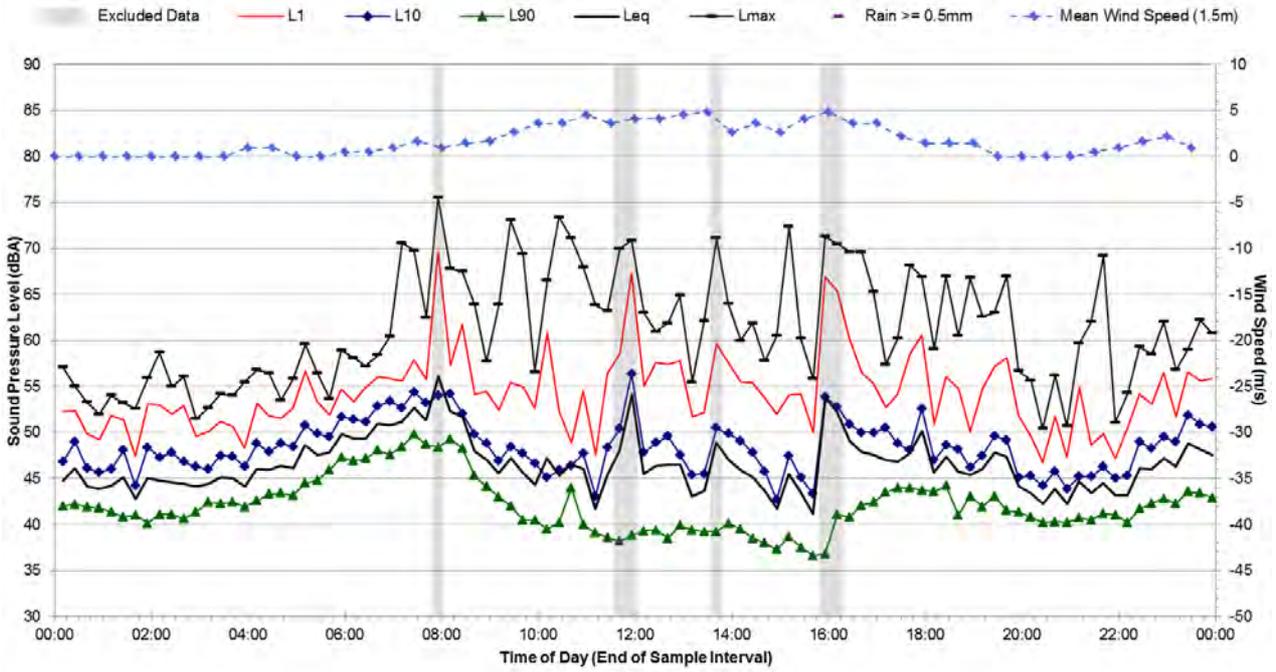
Statistical Ambient Noise Levels L2 - 82 Weaver Street, Erskine Park - Monday, 4 April 2016



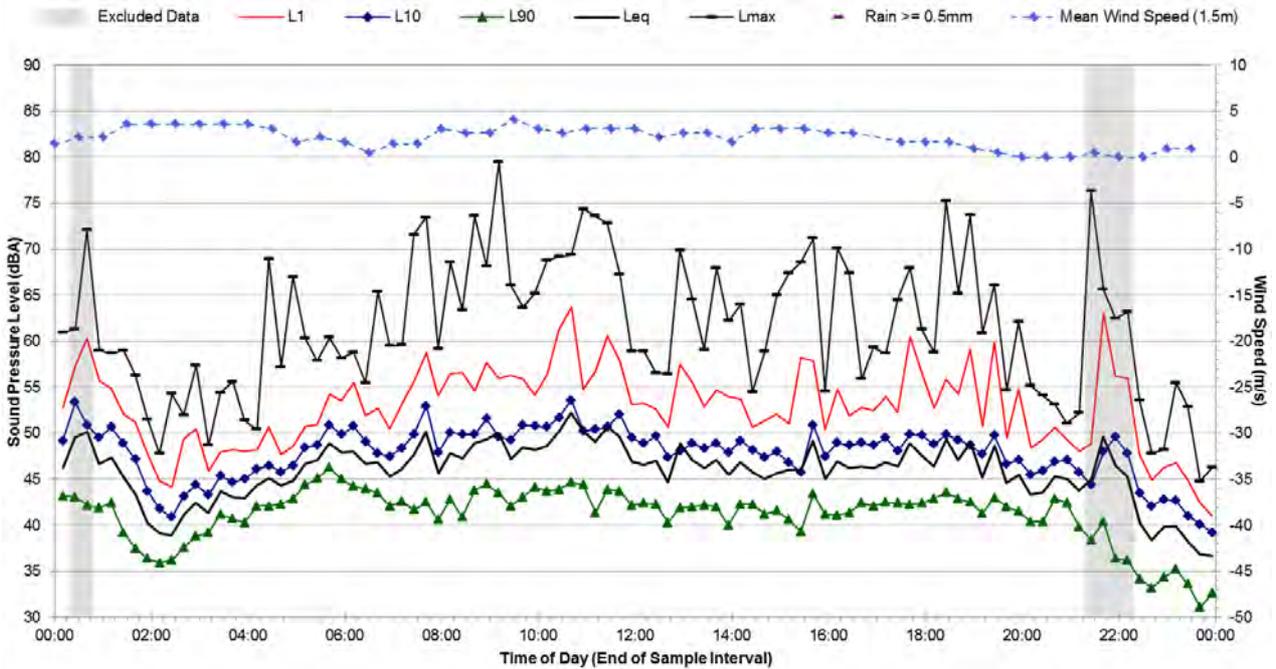
Statistical Ambient Noise Levels L2 - 82 Weaver Street, Erskine Park - Tuesday, 5 April 2016



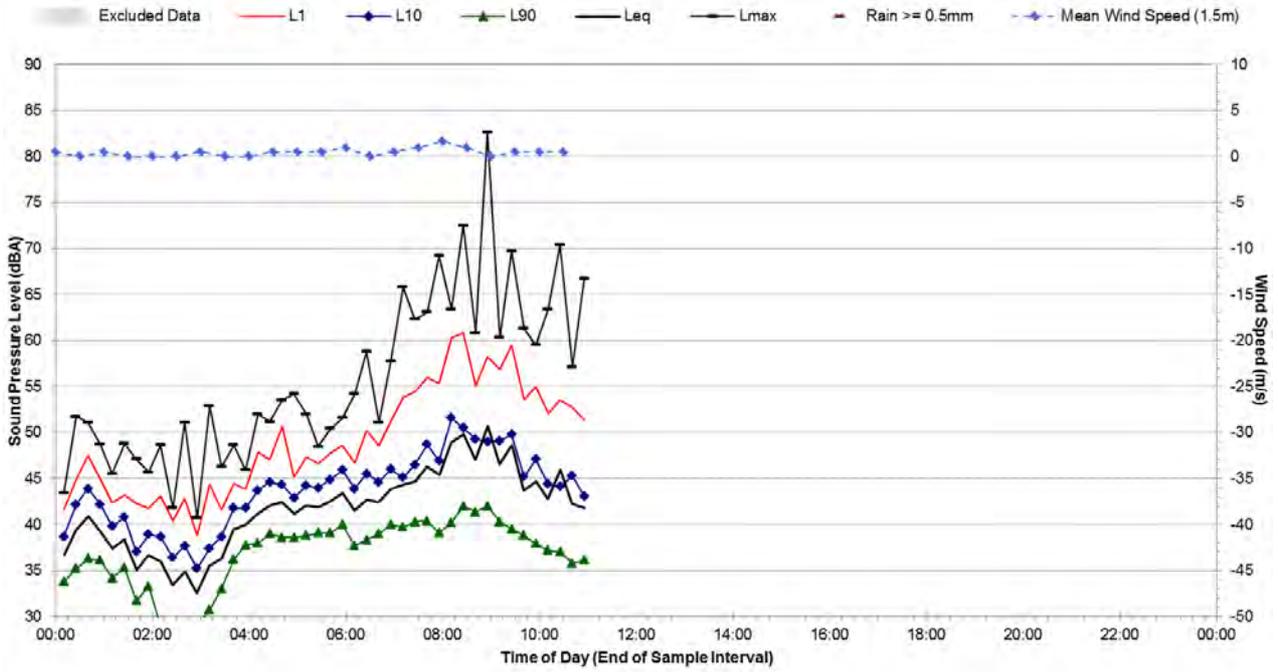
Statistical Ambient Noise Levels L2 - 82 Weaver Street, Erskine Park - Wednesday, 6 April 2016



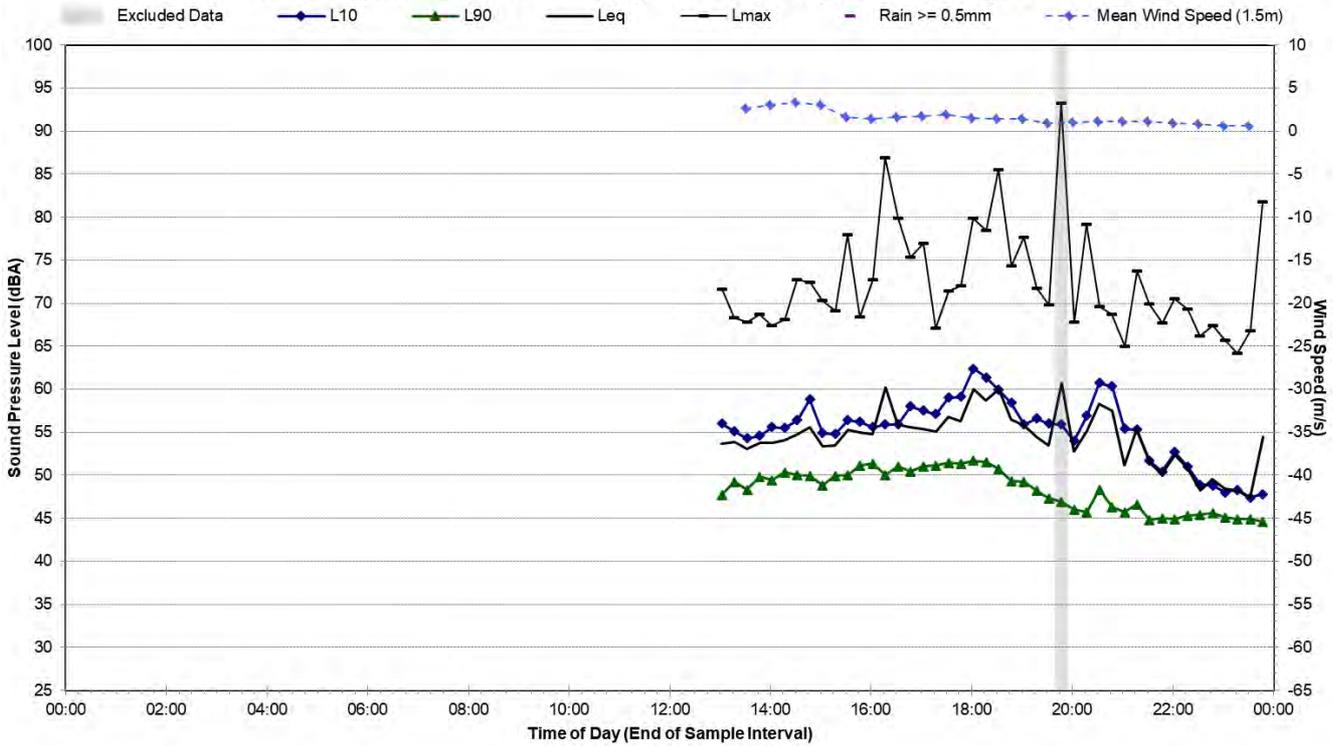
Statistical Ambient Noise Levels L2 - 82 Weaver Street, Erskine Park - Thursday, 7 April 2016



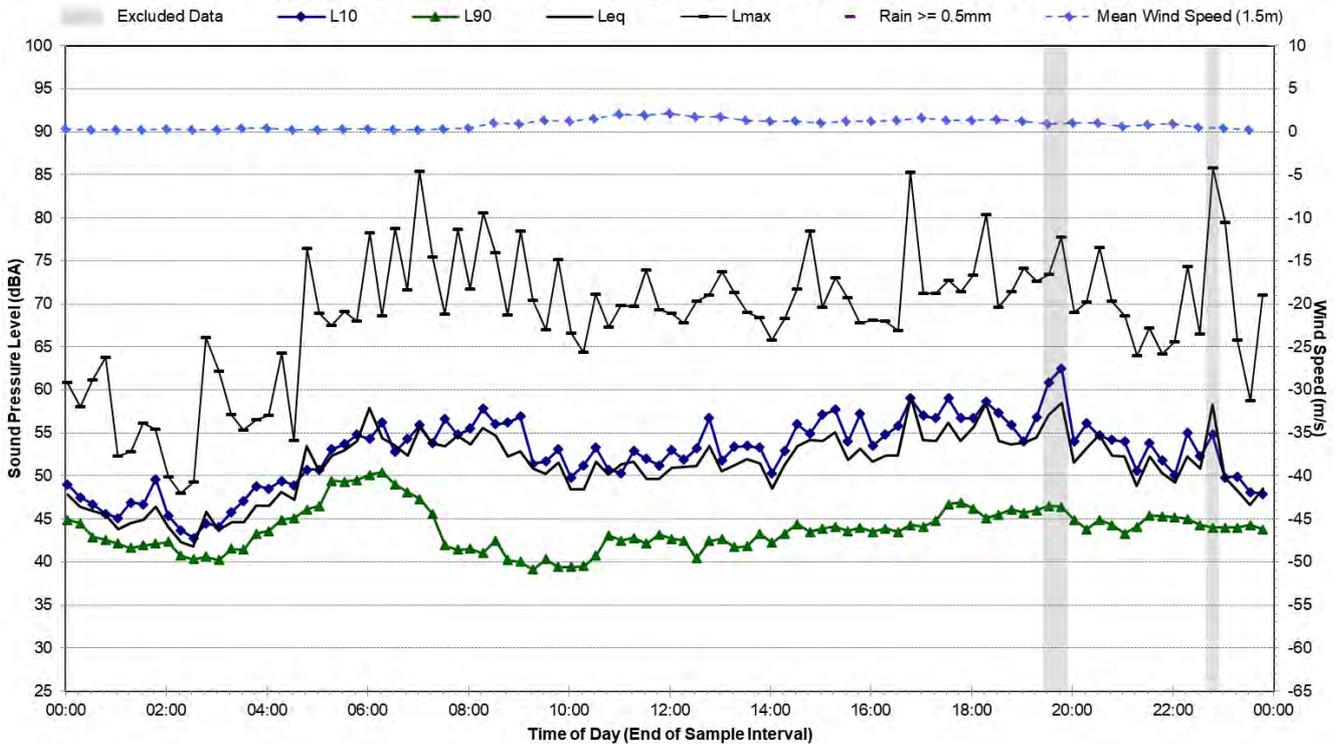
Statistical Ambient Noise Levels L2 - 82 Weaver Street, Erskine Park - Friday, 8 April 2016



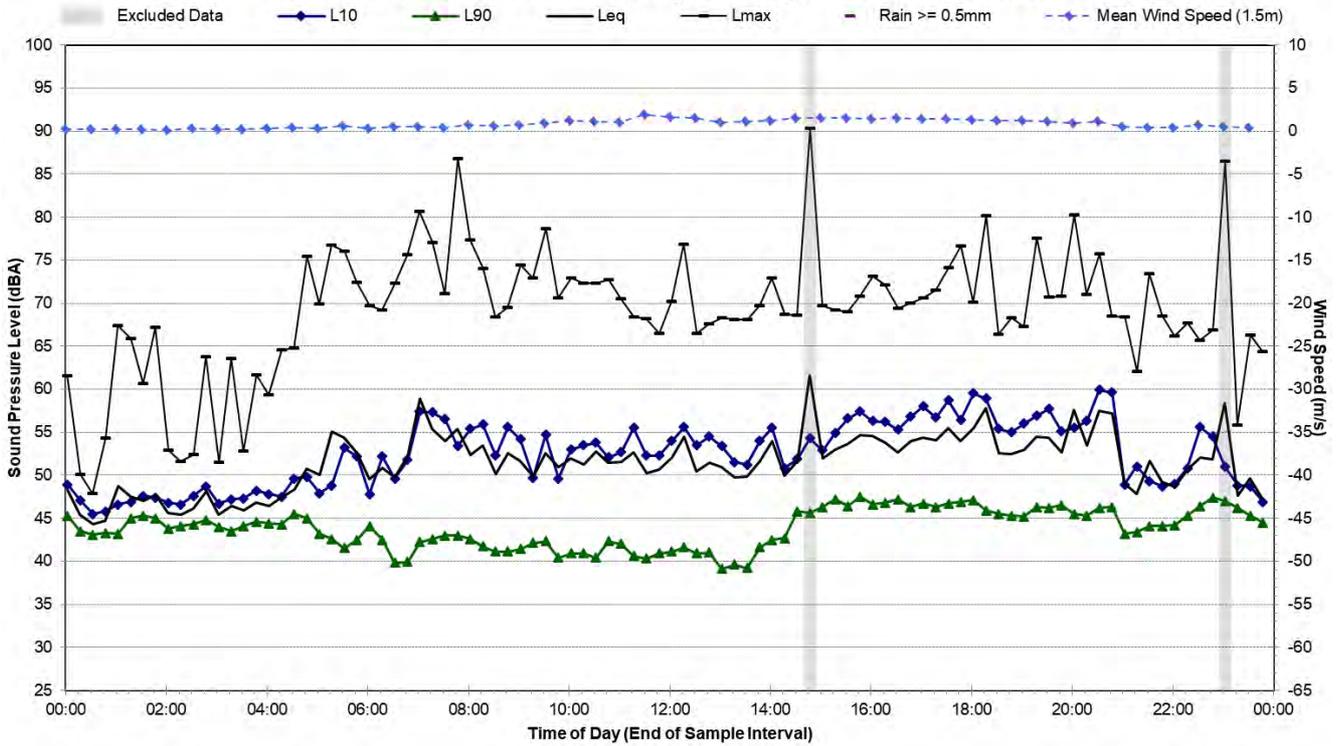
Statistical Ambient Noise Levels 8 Farrington St, Minchinbury - Wednesday, 29 January 2020



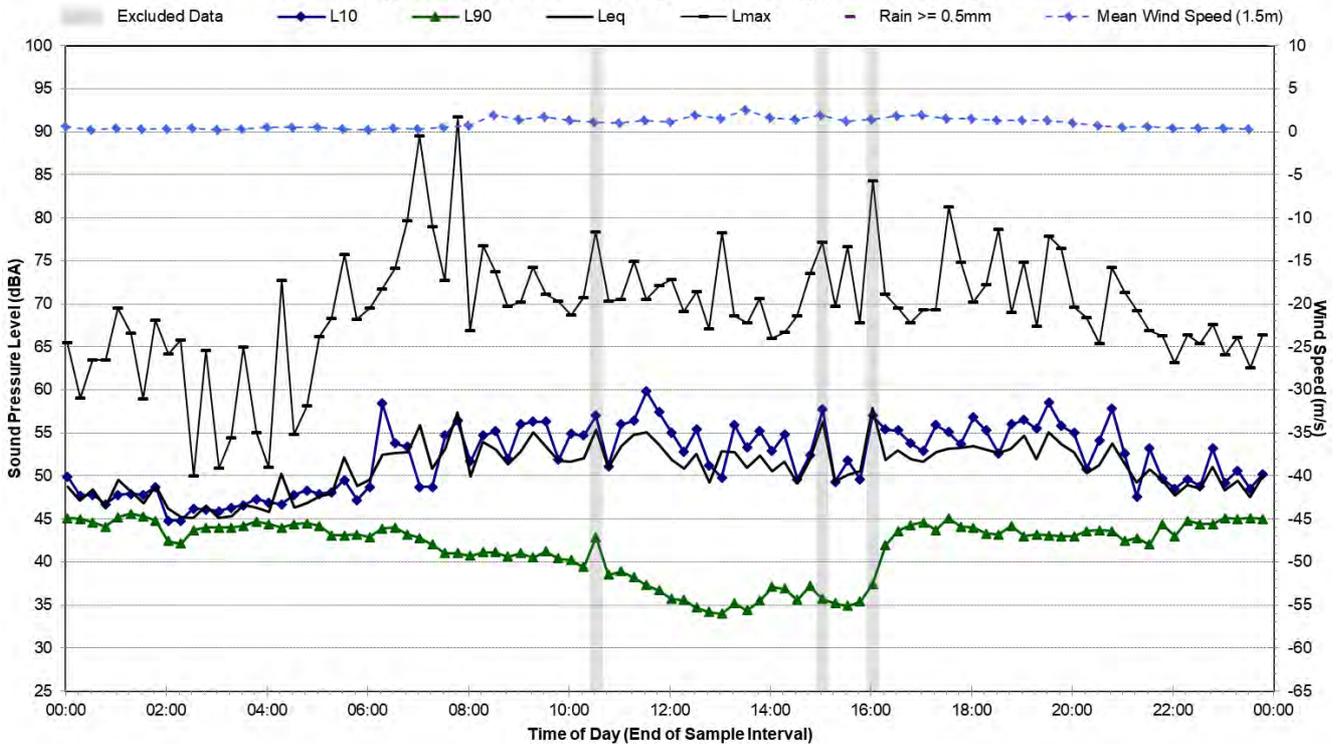
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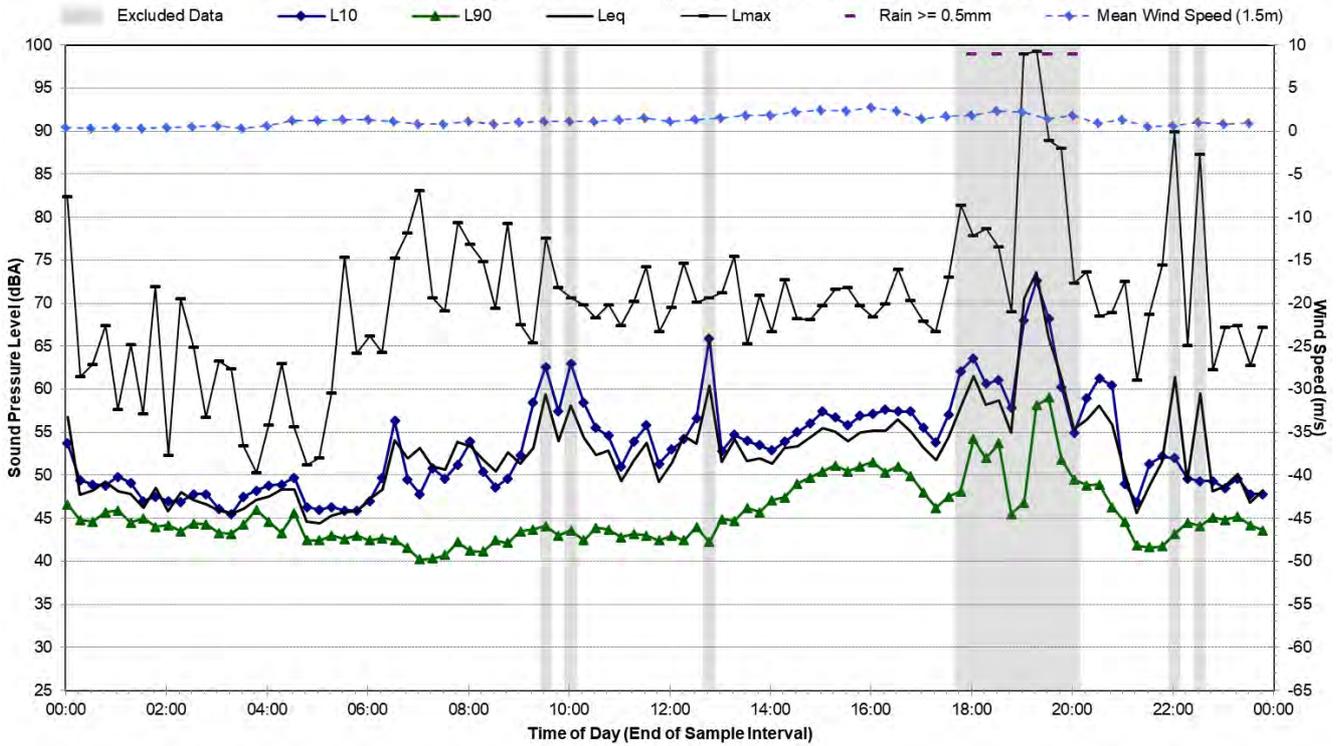
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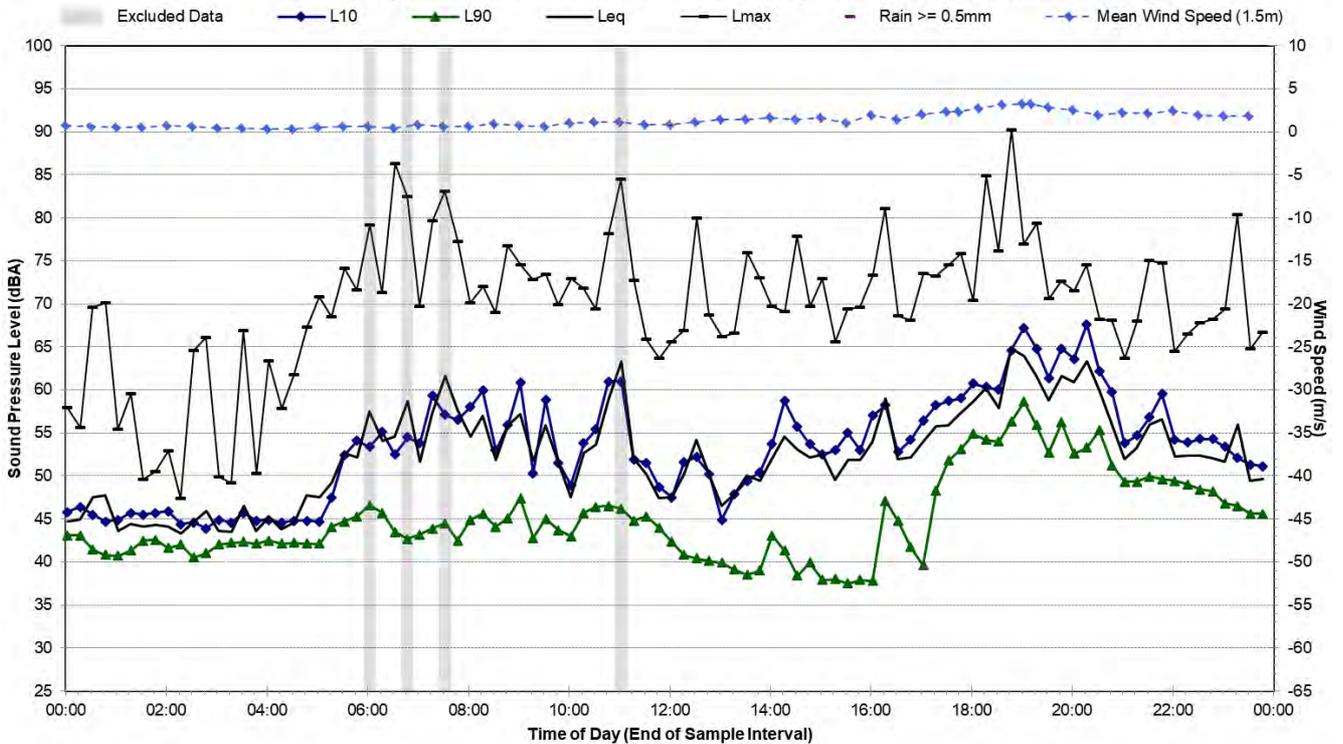
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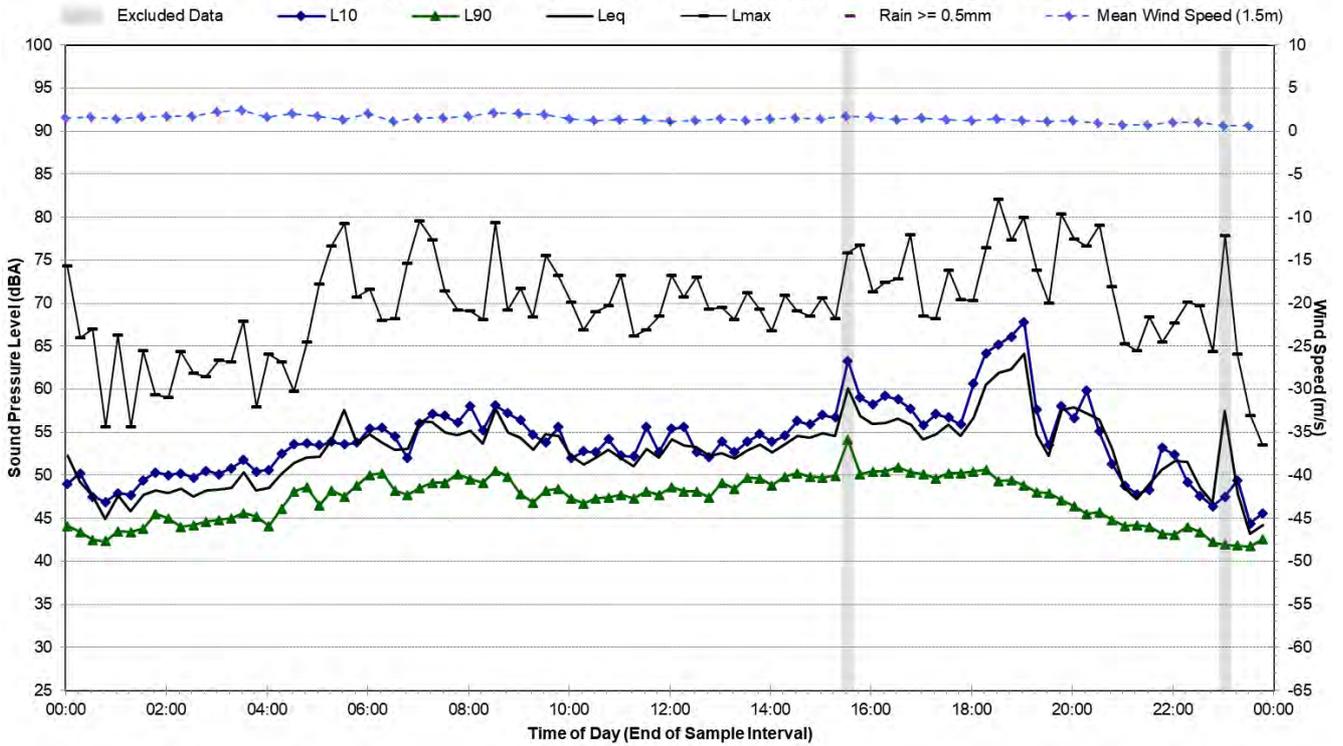
Statistical Ambient Noise Levels 8 Farrington St, Minchinbury - Sunday, 2 February 2020



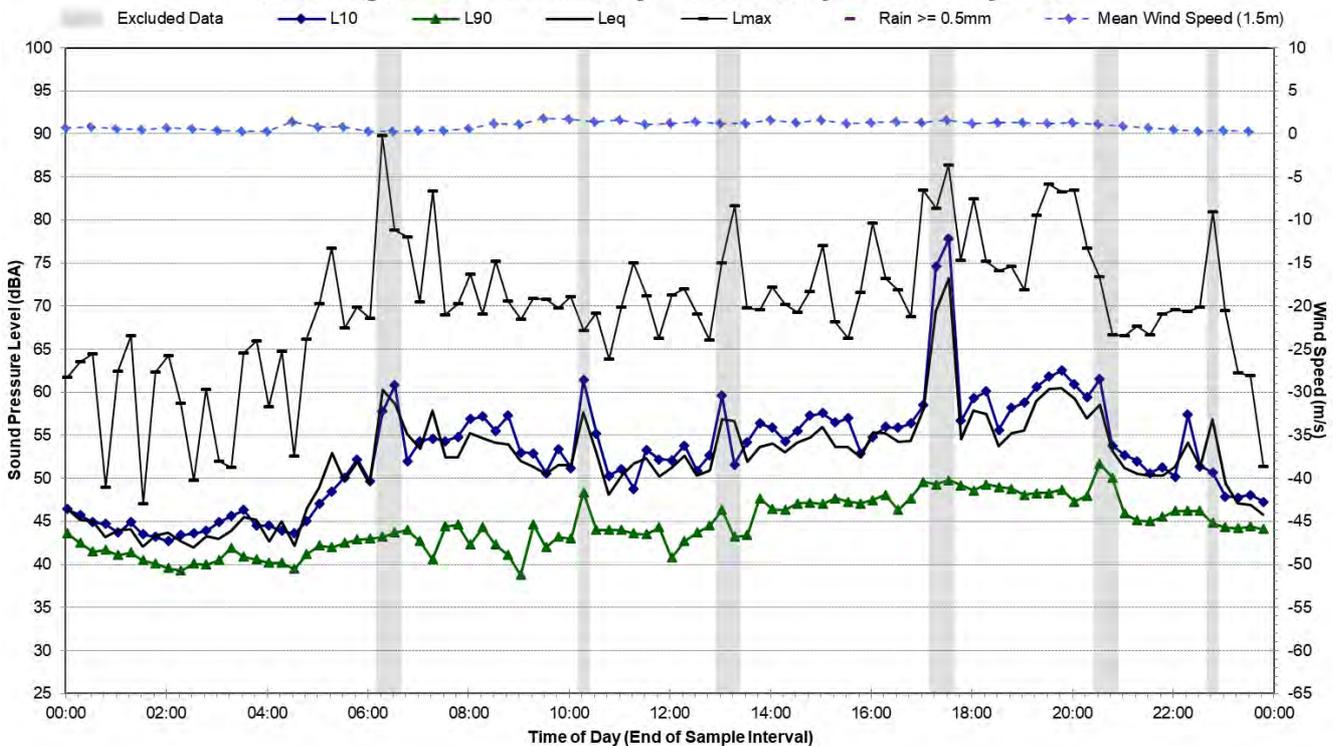
Statistical Ambient Noise Levels 8 Farrington St, Minchinbury - Monday, 3 February 2020



Statistical Ambient Noise Levels 8 Farrington St, Minchinbury - Tuesday, 4 February 2020

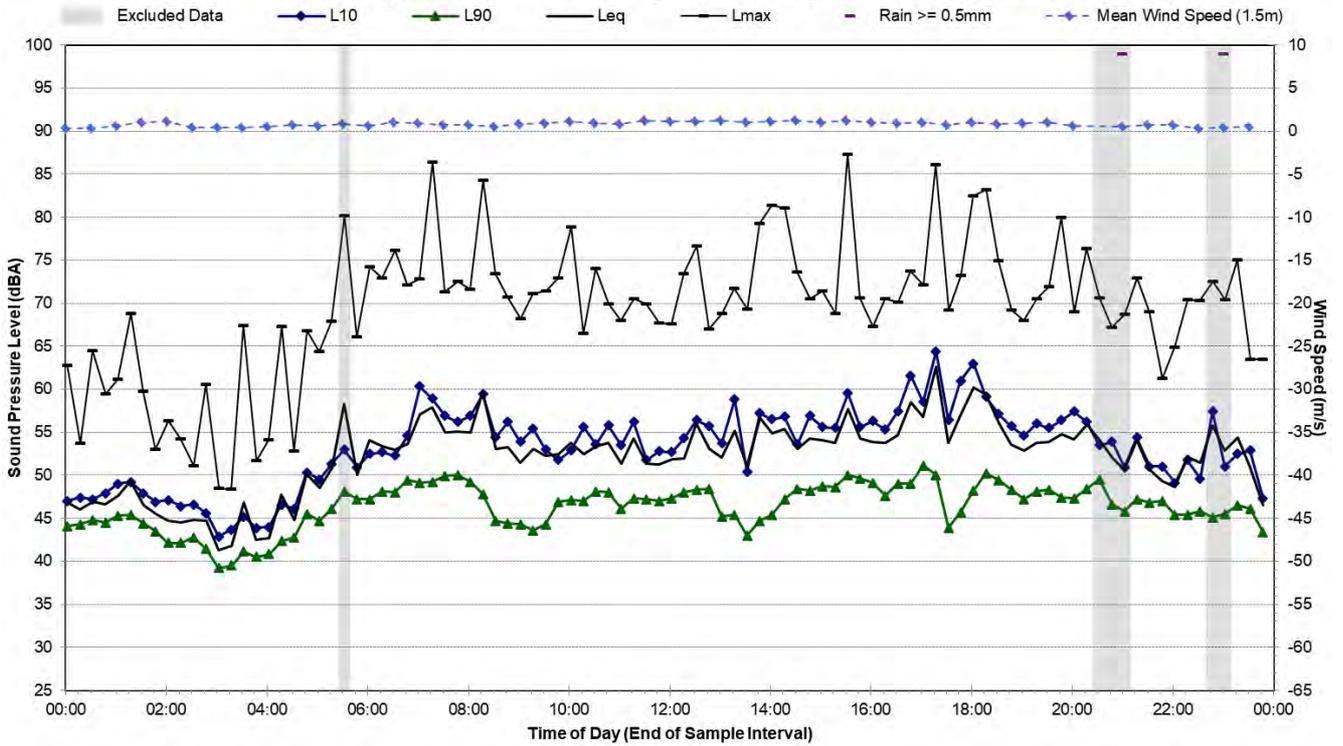


Statistical Ambient Noise Levels 8 Farrington St, Minchinbury - Wednesday, 5 February 2020



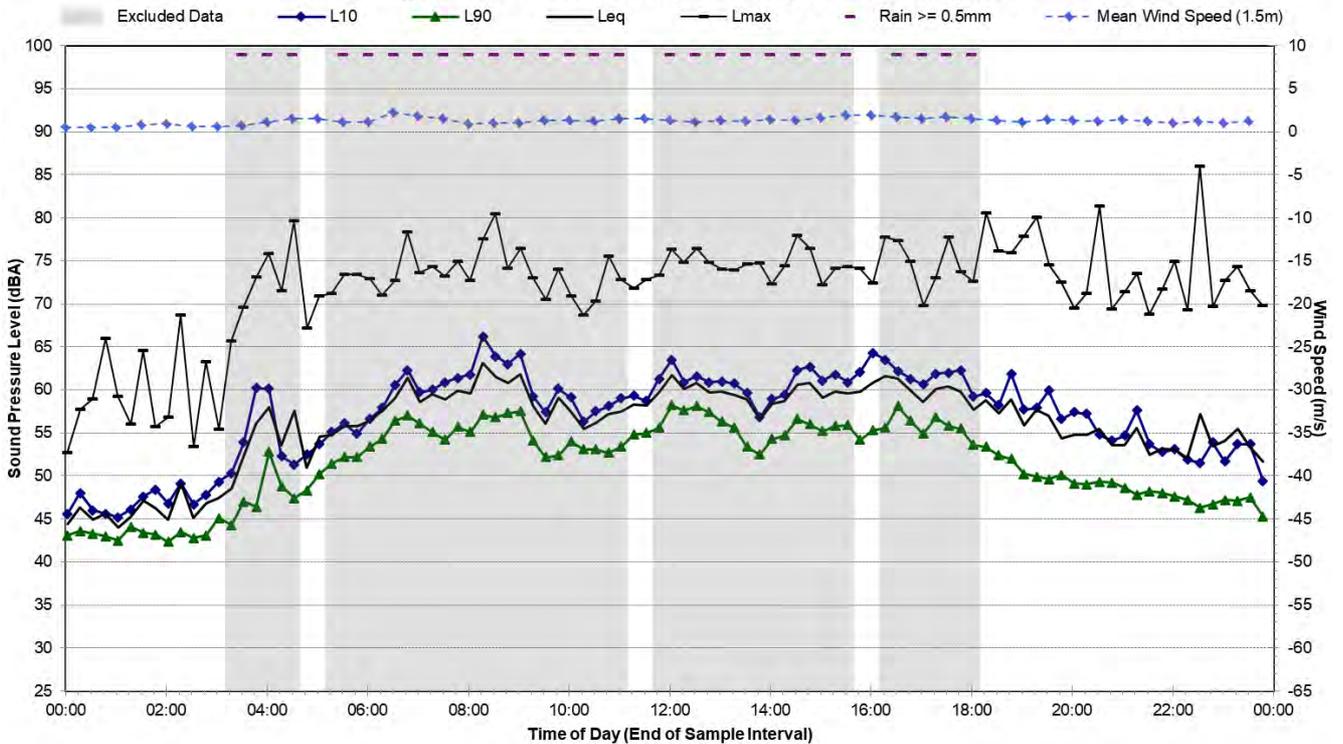
Statistical Ambient Noise Levels

8 Farrington St, Minchinbury - Thursday, 6 February 2020

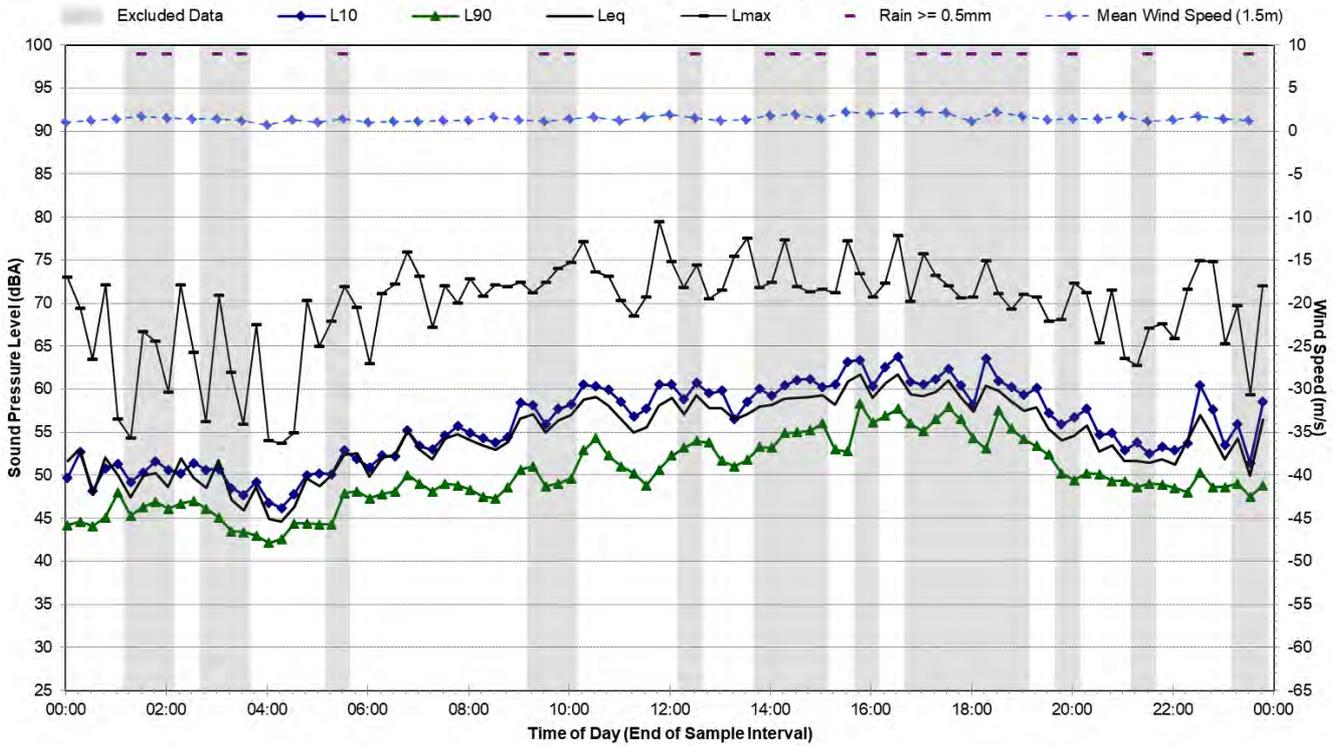


Statistical Ambient Noise Levels

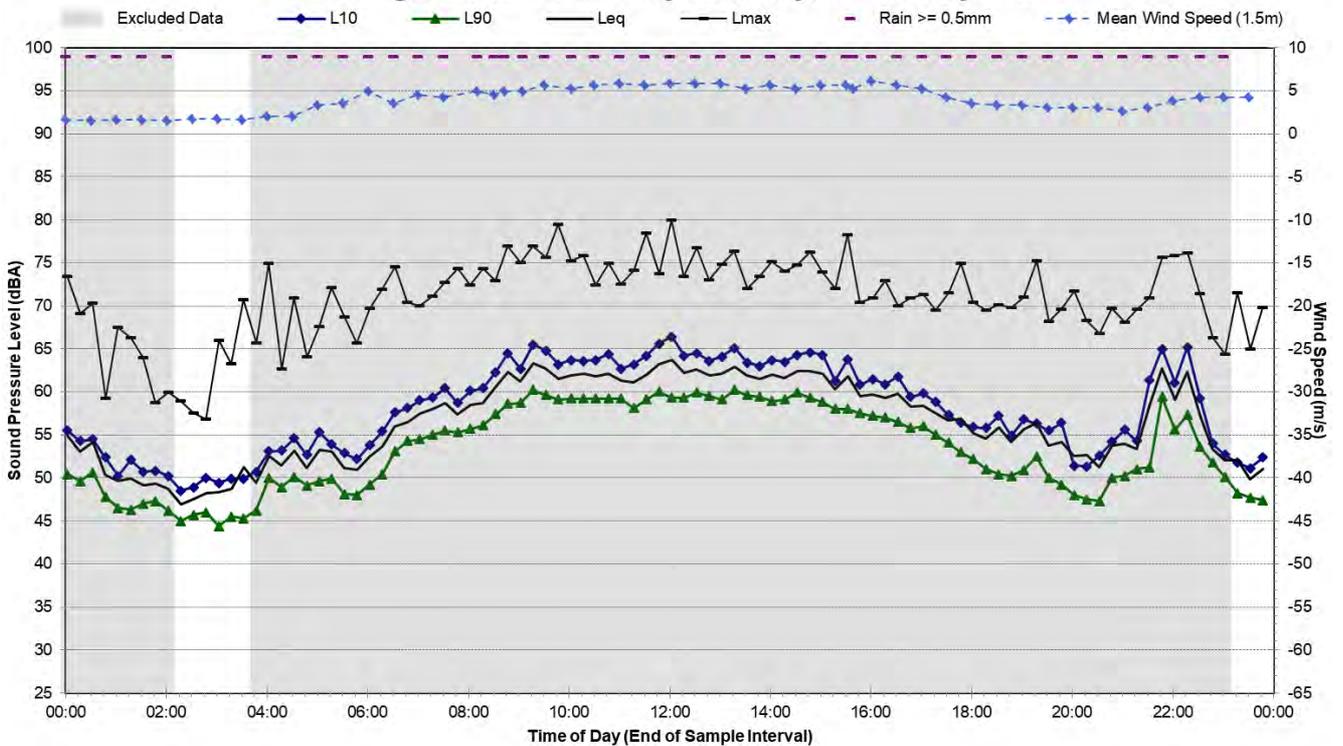
8 Farrington St, Minchinbury - Friday, 7 February 2020



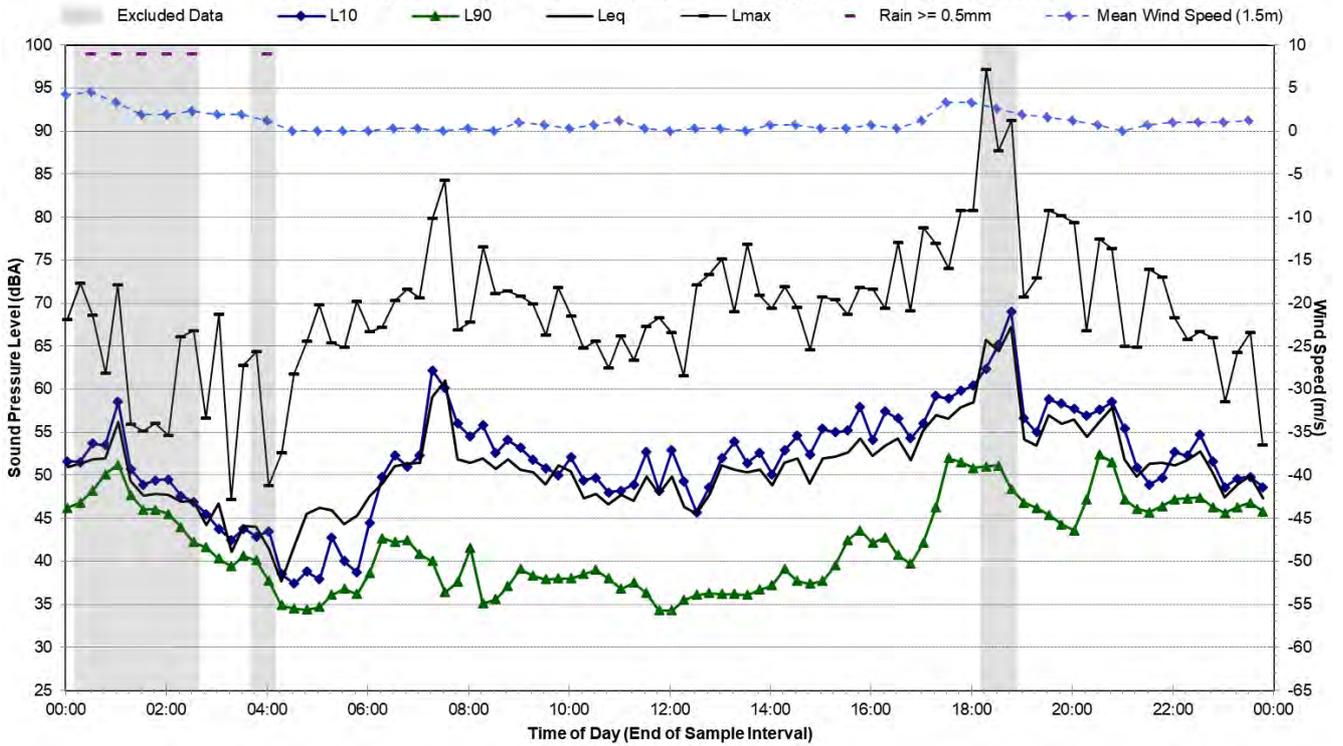
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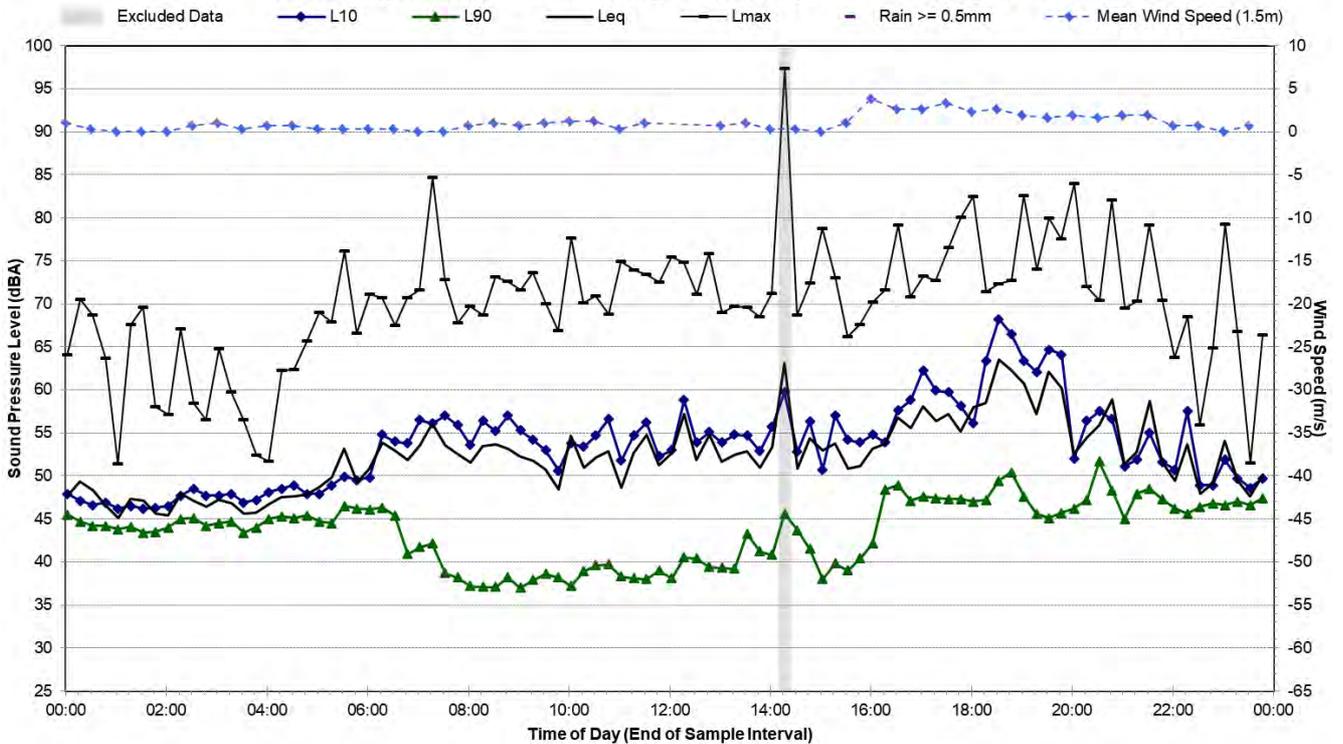
Statistical Ambient Noise Levels 8 Farrington St, Minchinbury - Sunday, 9 February 2020



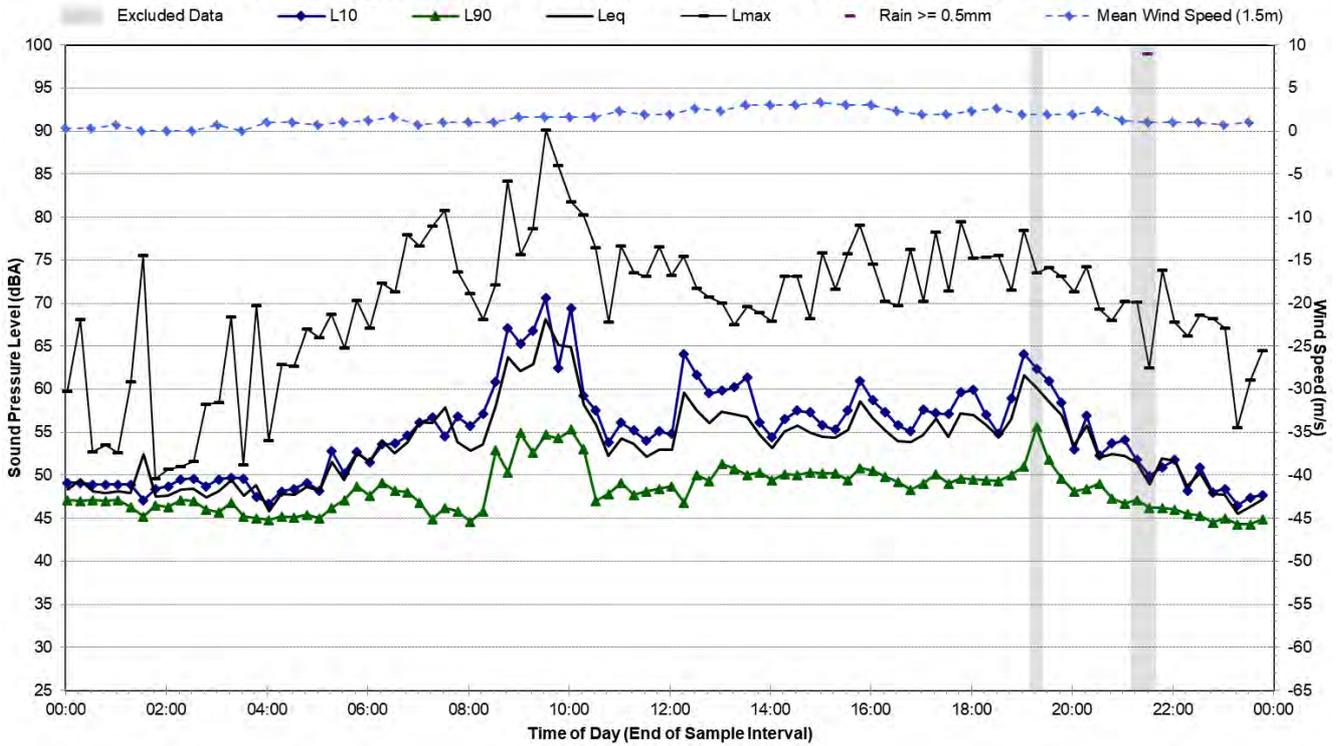
Statistical Ambient Noise Levels 8 Farrington St, Minchinbury - Monday, 10 February 2020



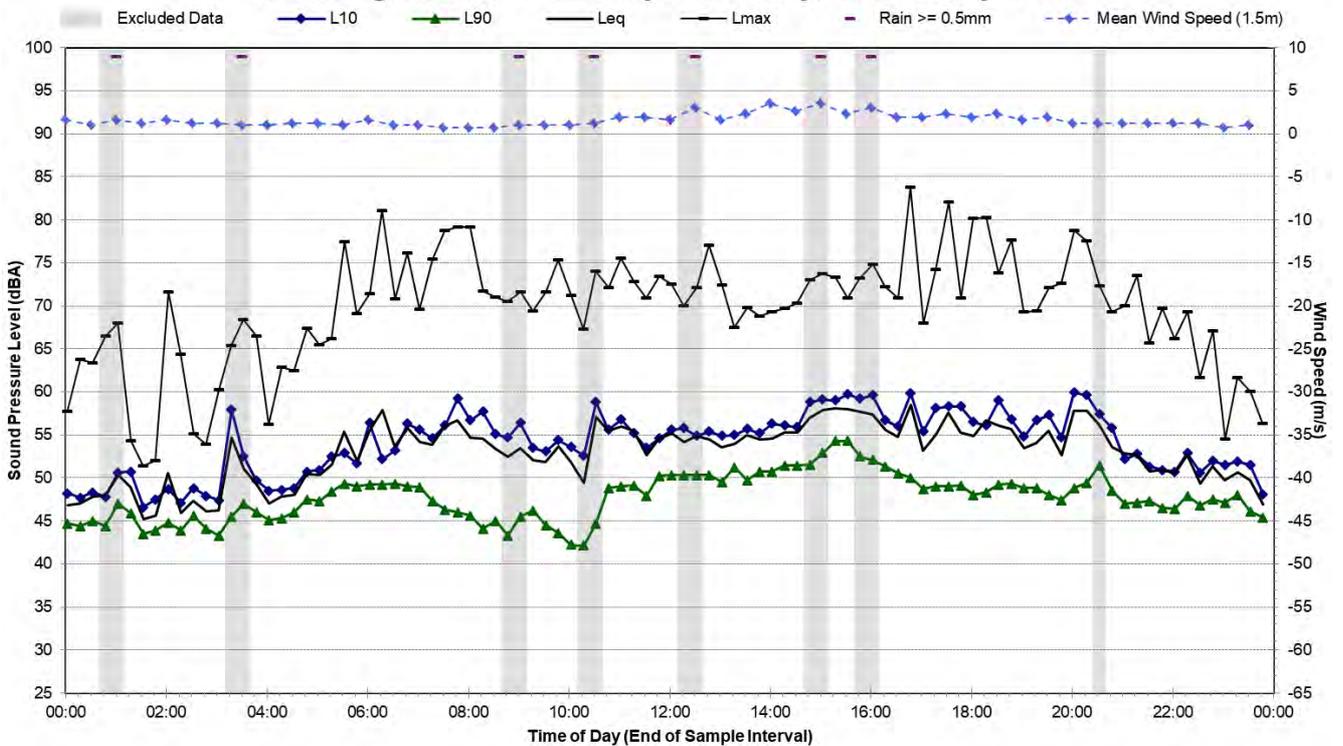
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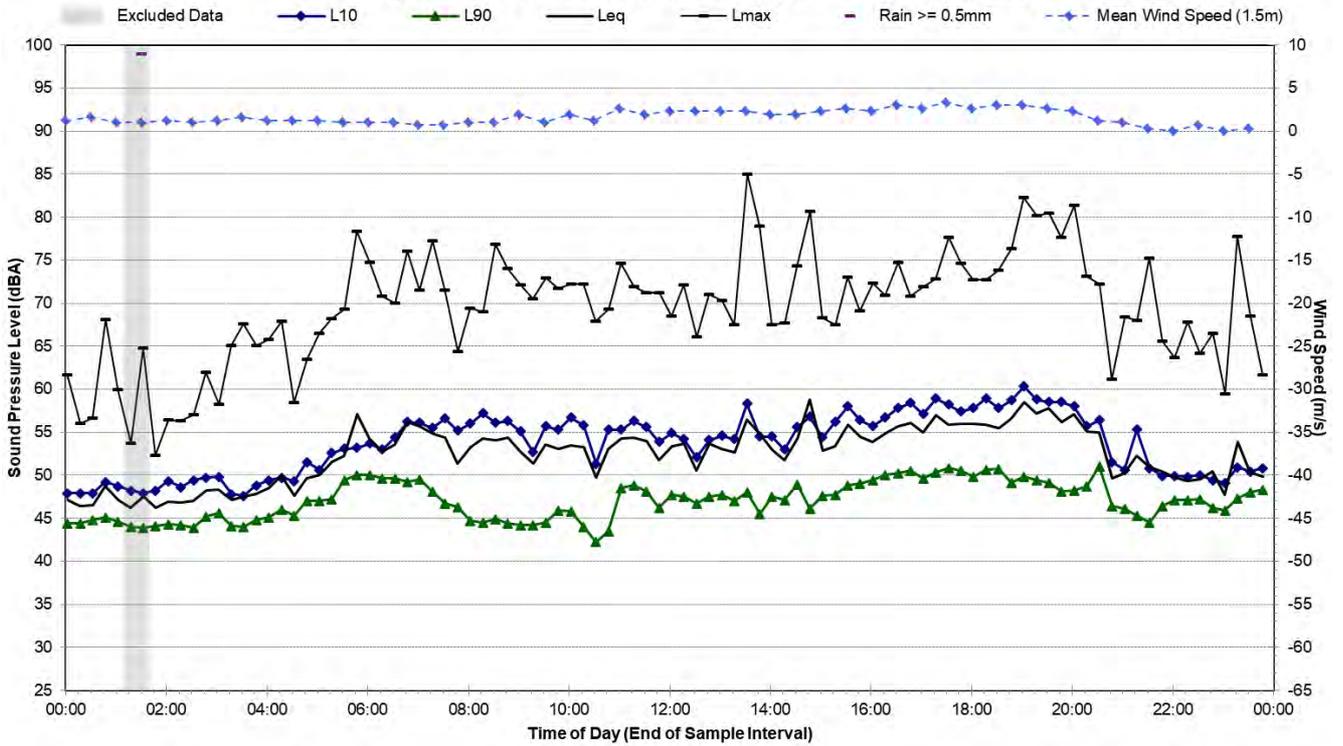
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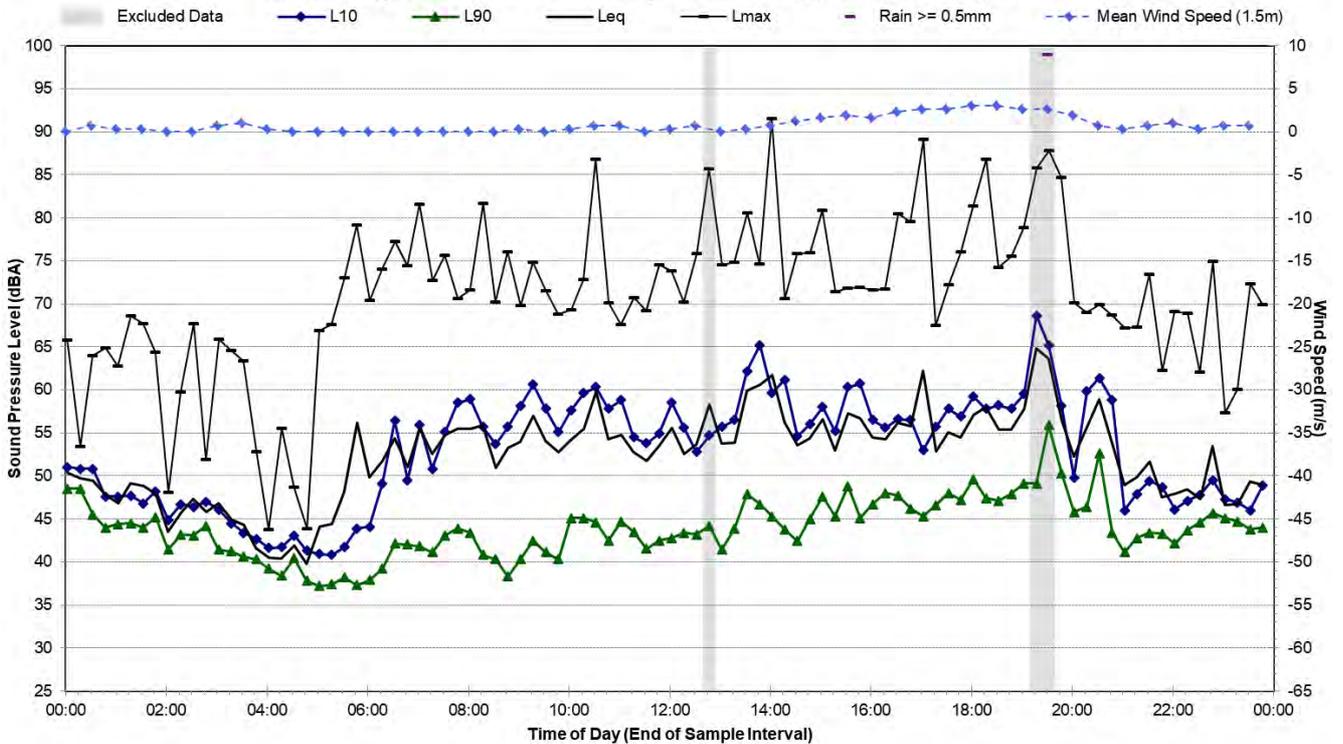
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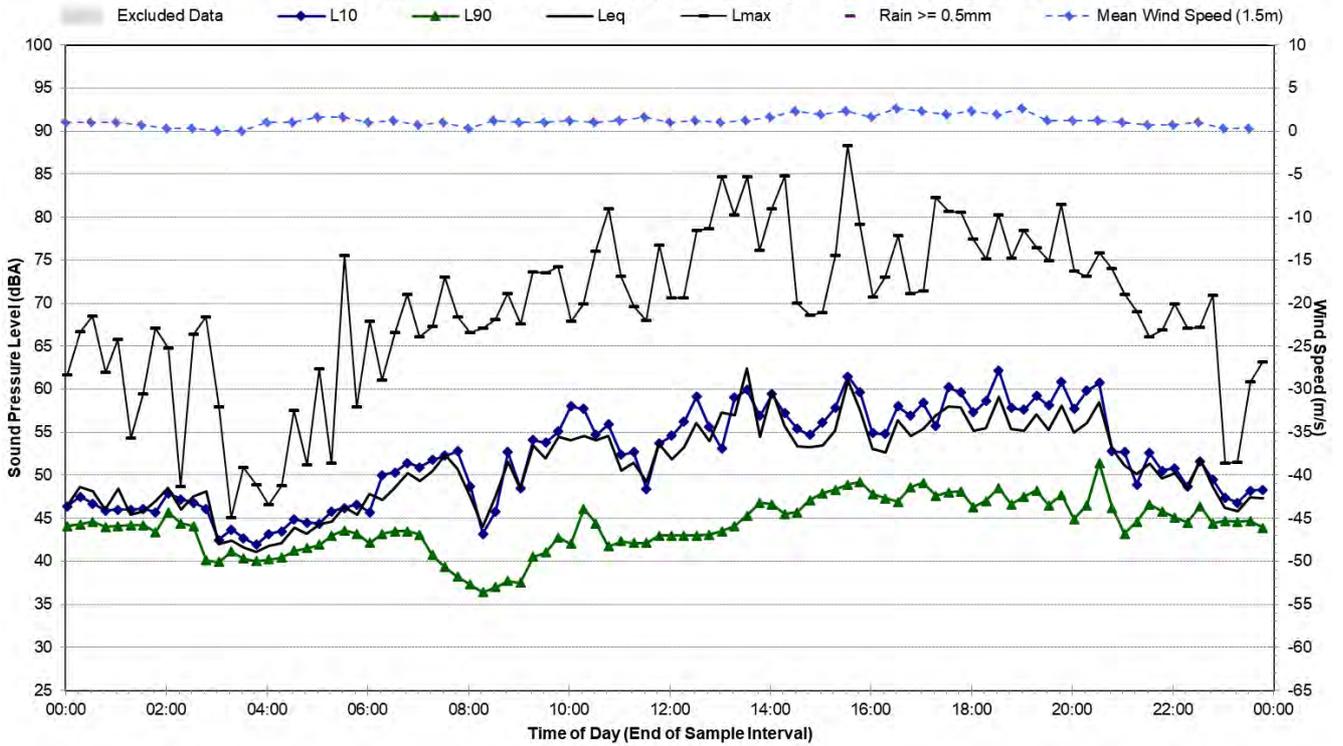
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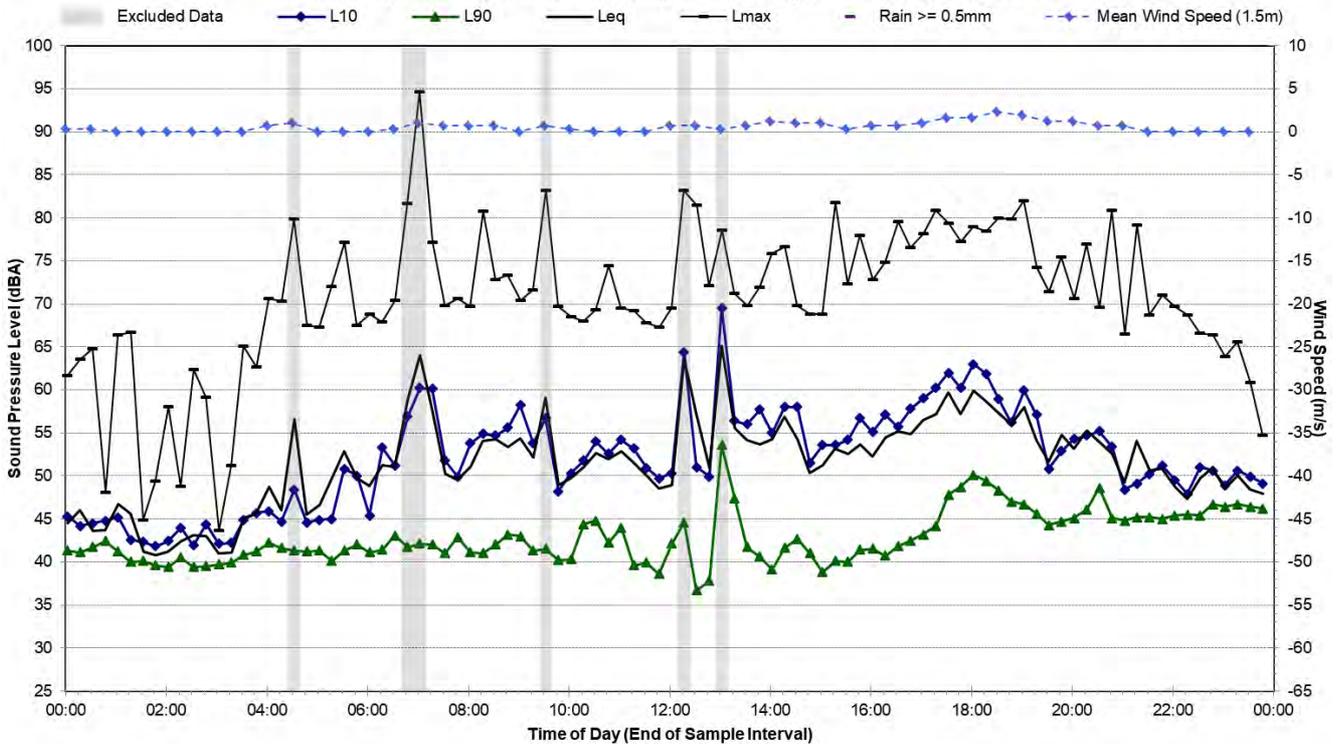
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Statistical Ambient Noise Levels 8 Farrington St, Minchinbury - Sunday, 16 February 2020

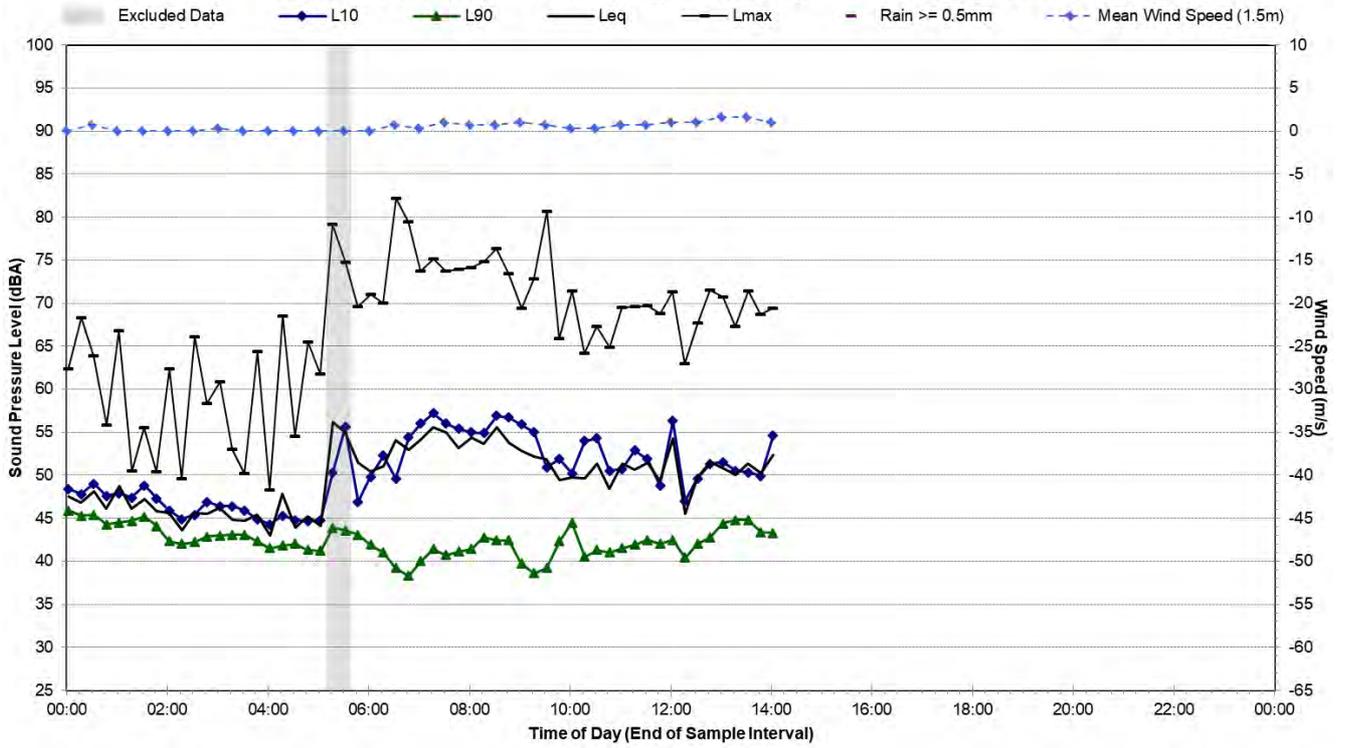


Statistical Ambient Noise Levels 8 Farrington St, Minchinbury - Monday, 17 February 2020



Statistical Ambient Noise Levels

8 Farrington St, Minchinbury - Tuesday, 18 February 2020



APPENDIX C

Weather Analysis Input Data

Noise-enhancing weather conditions such as wind and temperature inversions have the potential to increase noise levels from industrial or road noise sources at nearby receivers.

In order to determine the prevailing weather conditions, 12 months of weather data (January 2019 to December 2019) was obtained from the Bureau of Meteorology automatic weather station at Horsley Park. This data was analysed to determine the frequency of noise-enhancing wind and temperature inversion conditions which may affect noise levels at the site.

Wind

Wind has the potential to increase noise at a receiver when wind is light and stable, and blows from the direction of the source of noise to the receiver. At higher wind speeds, the noise produced by the wind can obscure noise generated from industrial and transport sources.

Wind effects need to be considered where wind is a feature of the project area. The NPfl states that where wind blows from the source to the receiver at speeds up to three metres per second for more than 30 per cent of the daytime, evening or night-time in any season, then wind is considered to be a feature of the area and noise level predictions must be made under these conditions.

The measured weather data was analysed to determine the frequency of occurrence of wind speeds up to three metres per second in each period. The results of the wind analysis for the daytime, evening and night-time periods are presented in **Table C-1**, **Table C-2** and **Table C-3** below. In each table, the wind direction and percentage occurrence are those dominant during each season.

Table C-1 Seasonal Frequency of Occurrence of Wind Speed Intervals in 2019 – Daytime

Season	Dominant Wind Direction	Frequency of Occurrence (per cent)			
		Calm	0.5 to 2 metres per second	2 to 3 metres per second	0.5 to 3 metres per second
Annual	N	9.6	13.5	6.5	20.1
Summer	NNE	9.0	12.2	8.8	21.0
Autumn	N	12.8	16.0	7.1	23.0
Winter	WNW	11.5	16.4	5.3	21.7
Spring	N	5.1	12.5	8.0	20.5

Table C-2 Seasonal Frequency of Occurrence of Wind Speed Intervals in 2019 – Evening

Season	Dominant Wind Direction	Frequency of Occurrence (per cent)			
		Calm	0.5 to 2 metres per second	2 to 3 metres per second	0.5 to 3 metres per second
Annual	S	16.6	11.0	8.5	19.5
Summer	E	6.3	12.6	14.7	27.3
Autumn	S	24.4	13.0	8.1	21.1
Winter	SW, SSW, WSW	20.4	16.9, 15.5, 17.1	16, 15.9, 13.8	32.9, 31.4, 30.9
Spring	SE	15.2	13.4	9.3	22.7

Table C-3 Seasonal Frequency of Occurrence of Wind Speed Intervals in 2019 – Night-time

Season	Dominant Wind Direction	Frequency of Occurrence (per cent)			
		Calm	0.5 to 2 metres per second	2 to 3 metres per second	0.5 to 3 metres per second
Annual	SW	35.6	17.7	11.4	29.1
Summer	S	36.2	18.4	9.1	27.5
Autumn	SW, WSW	43.0	19.3, 19.5	12.8, 11.3	32.1, 30.8
Winter	WSW, SW, W	26.1	20.4, 18.0, 19.3	18.4, 18.8, 12.5	38.8, 36.8, 31.8
Spring	SW	37.3	19.0	8.5	27.5

The above analysis of prevailing wind conditions indicates that during the daytime periods, winds of up to 3 metres per second did not exceed the 30 per cent threshold during any season. However, the 30 per cent threshold was exceeded during the night-time period in Autumn in both the south-west and west-south-west directions, as well as during the evening and night-time period in winter, in the south-west, west and west-south-west directions.

Based on the prevailing wind analysis conducted for the 2019 weather data, wind was found to be a feature of the area during the evening and night-time periods.

Temperature Inversions

Temperature inversions have the ability to increase noise levels by focusing sound waves towards sensitive receivers. Temperature inversions occur predominantly at night-time when the atmosphere is stable and temperatures are cooler. For a temperature inversion to be a significant characteristic of the area, the NPfI defines that it needs to occur for approximately 30 per cent of the total night-time during winter. This equates to approximately two nights per week.

The Pasquill-Gifford assignment scheme identifies seven Stability Classes – A to G – to categorise the degree of atmospheric stability, as shown below.

Table C-4 Description of Atmospheric Stability Classes

Atmospheric Stability Class	Category Description
A	Extremely unstable
B	Moderately unstable
C	Slightly unstable
D	Neutral
E	Slightly stable
F	Moderately stable
G	Extremely stable

The measured weather data has been analysed to determine the frequency of each stability class and is presented below. Noise-enhancing temperature inversions are categorised as atmospheric stability Class F or Class G.

Table C-5 Night-time Stability Class Distribution – 2019

Stability Class	Frequency of Occurrence (per cent)				
	Annual	Summer	Autumn	Winter	Spring
A	0.0	0.0	0.0	0.0	0.0
B	0.0	0.0	0.0	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0
D	45.1	49.3	40.2	49.4	41.8
E	12.1	13.5	11.5	10.3	13.2
F	12.2	10.9	10.3	14.3	13.2
G	30.6	26.3	38.0	26.0	31.9
F+G	42.7	37.2	48.3	40.3	45.1

The above analysis indicates that temperature inversions of Class F or Class G occur more than 30 per cent of the night-time period during all four seasons.

Based on this analysis of the 2019 weather data, temperature inversions are a feature of the area during the night-time period.

APPENDIX D

Construction Information

Table D-1 Equipment Lists and Sound Power Levels

Equipment		Back Hoe (7.5 tonne JCB)	Chainsaw ¹	Concrete Mixer Truck	Concrete Pump	Concrete Vibrator	Excavator (14 tonne)	Excavator (22 tonne)	Grader	Hand Tools	Hydraulic Jack	Mobile Crane (100 tonne)	Mobile Crane (35 tonne)	Paving Machine	Roller - Vibratory (12 tonne) ¹	Truck	Welding Equipment	
Sound Power Level ²		102	114	103	106	102	97	99	108	94	95	100	98	105	109	107	97	
Ref	Scenario																	
Site Establishment	Vegetation Clearing		X				X										X	
	Earthworks	X					X	X	X						X	X		
	Utilities						X			X								
Civil and Building Work	Establishment of Roads						X			X				X	X	X		
	Construction of Built Form			X	X	X	X			X		X	X					X
Commissioning	Decommissioning and Fit out						X	X		X	X						X	
	Landscaping									X								

Note 1: Equipment classified as ‘annoying’ in the ICNG, due to being highly noise intensive, tonal and/or intermittent, and requires an additional 5 dB correction.

Note 2: Sound power level data is taken from the DEFRA Noise Database, RMS *Construction and Vibration Guideline* and TfNSW *Construction Noise and Vibration Strategy*.

APPENDIX E

Sydney Metro CNVS Standard Mitigation Measures

Table E-1 CNVS Summary of the Standard Mitigation and Management Measures

Action Required	Applies To	Details
Management measures		
Implementation of any project specific mitigation measures required	Airborne noise Ground-borne noise and vibration	In addition to the measures set out in this table, any project specific mitigation measures identified in the environmental assessment documentation (e.g. EA, REF, submissions or representations report) or approval or licence conditions must be implemented.
Implement community consultation measures	Airborne noise Ground-borne noise and vibration	Periodic Notification (monthly letterbox drop) ¹ Website Project information and construction response telephone line Email distribution list Place Managers
Register of Noise Sensitive Receivers	Airborne noise Ground-borne noise and vibration	A register of all noise and vibration sensitive receivers (NSRs) would be kept on site. The register would include the following details for <ul style="list-style-type: none"> • Address of receiver • Category of receiver (e.g. Residential, Commercial etc.) • Contact name and phone number
Site inductions	Airborne noise Ground-borne noise and vibration	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: <ul style="list-style-type: none"> • All relevant project specific and standard noise and vibration mitigation measures • Relevant licence and approval conditions • Permissible hours of work • Any limitations on high noise generating activities • Location of nearest sensitive receivers • Construction employee parking areas • Designated loading/unloading areas and procedures • Site opening/closing times (including deliveries) • Environmental incident procedures
Behavioural practices	Airborne noise	No swearing or unnecessary shouting or loud stereos/radios; on site. No dropping of materials from height; throwing of metal items; and slamming of doors. No excessive revving of plant and vehicle engines Controlled release of compressed air.
Monitoring	Airborne noise Ground-borne noise and vibration	A noise monitoring program is to be carried out for the duration of the works in accordance with the Construction Noise and Vibration Management Plan and any approval and licence conditions.
Attended vibration measurements	Ground-borne vibration	Attended vibration measurements are required at the commencement of vibration generating activities to confirm that vibration levels satisfy the criteria for that vibration generating activity. Where there is potential for exceedances of the criteria further vibration site law investigations would be undertaken to determine the site-specific safe working distances for that vibration generating activity. Continuous vibration monitoring with audible and visible alarms would be conducted at the nearest sensitive receivers whenever vibration generating activities need to take place inside the applicable safe-working distances.

¹ Detailing all upcoming construction activities at least 14 days prior to commencement of relevant works

Action Required	Applies To	Details
Source controls		
Construction hours and scheduling	Airborne noise Ground-borne noise and vibration	Where feasible and reasonable, construction would be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels would be scheduled during less sensitive time periods.
Construction respite period	Ground-borne noise and vibration Airborne noise	High noise and vibration generating activities ² may only be carried out in continuous blocks, not exceeding 3 hours each, with a minimum respite period of one hour between each block ³ .
Equipment selection	Airborne noise Ground-borne noise and vibration	Use quieter and less vibration emitting construction methods where feasible and reasonable. For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts. Similarly, diaphragm wall construction techniques, in lieu of sheet piling, will have significant noise and vibration benefits.
Maximum noise levels	Airborne-noise	The noise levels of plant and equipment must have operating Sound Power Levels compliant with the criteria in Table 11 of the CNVS.
Rental plant and equipment	Airborne-noise	The noise levels of plant and equipment items are to be considered in rental decisions and in any case cannot be used on site unless compliant with the criteria in Table 11 of the CNVS.
Plan worksites and activities to minimise noise and vibration	Airborne noise Ground-borne vibration	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site.
Non-tonal reversing alarms	Airborne noise	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Minimise disturbance arising from delivery of goods to construction sites	Airborne noise	Loading and unloading of materials/deliveries is to occur as far as possible from NSRs Select site access points and roads as far as possible away from NSRs Dedicated loading/unloading areas to be shielded if close to NSRs Delivery vehicles to be fitted with straps rather than chains for unloading, wherever feasible and reasonable
Path controls		
Shield stationary noise sources such as pumps, compressors, fans etc.	Airborne noise	Stationary noise sources should be enclosed or shielded where feasible and reasonable whilst ensuring that the occupational health and safety of workers is maintained. Appendix D of AS 2436:2010 lists materials suitable for shielding.
Shield sensitive receivers from noisy activities.	Airborne noise	Use structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable) and consideration of site topography when siting plant.

² Includes jack and rock hammering, sheet and pile driving, rock breaking and vibratory rolling.

³ "Continuous" includes any period during which there is less than a 60 minutes respite between ceasing and recommencing any of the work.

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Appendix D

Transport and Traffic Assessment



Sydney Metro Precast Facilities

Transport and traffic assessment

v05 | Final

23 October 2020

Sydney Metro Authority



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Subject	Sydney Metro West Eastern Creek Precast Facilities – Transport and traffic assessment	Project Name	Sydney Metro West Eastern Creek Precast Facilities Review of Environmental Factors
From	Clarence Li and Phillip Truong	Project No.	IA199800
Date	23 October 2020		

1. Introduction

1.1 Proposal overview

Sydney Metro is proposing to construct and operate two adjacent precast facilities (the proposal) to support the construction of the proposed Sydney Metro West. The precast facilities which are the subject of this proposal would manufacture precast concrete segments for the purpose of lining the Sydney Metro West tunnels. A Review of Environmental Factors (REF) has been prepared for the proposal seeking approval under Part 5 of the *Environmental Planning and Assessment 1979* (EP&A Act).

The key components of the proposal include:

- Site establishment at the proposal site at Eastern Creek including vegetation clearing, remediation, and earthworks
- The establishment and operation of two separate and adjacent precast facilities on the proposal site, the northern and southern precast facilities. Each precast facility would include:
 - A precast yard including a shed for construction of precast concrete segments and storage laydown areas
 - Boiler, aggregate bins and consumables
 - Office facilities
 - On-site parking for up to 60 light vehicles
- Internal roads with entrances to each facility from the Western Access Road located between the northern and southern precast facilities (external roads would be subject to separate approvals)
- Ancillary supporting infrastructure, including utilities installation (power, water, sewerage, gas and communications), lighting, signage and landscaping

Haulage routes would only travel to the east of the proposal site. Indicative operational vehicle numbers for each precast facility site are outlined in Table 1-1.

Table 1-1 Indicative operational vehicles (per precast facility)¹

Time of day	Heavy vehicles (maximum per hour)	Light vehicles (maximum per hour)	Light vehicles – staff (indicative maximum based on shift change times)
Day (7am - 6pm)	12	8	60 (6am - 7am)
Evening (6pm - 10pm)	6	5	60 (5pm - 6pm) 60 (6pm - 7pm)
Night (10pm - 7am)	6	5	60 (5am-6am)

¹ Operational light and heavy vehicles are assumed to generate two movements (one movement in and one movement out of the facilities) per vehicle per hour. Staff light vehicles are assumed to generate only one movement per vehicle during staff change hours.

The northern and southern precast facilities would operate concurrently, 24 hours a day, seven days a week for the majority of the lifespan of the project.

The proposal would be temporary, operating for an approximate timeframe of four to five years, subject to the delivery strategy and construction program for Sydney Metro West. The footprint and operational layout of the proposal is shown in Figure 1-1.

The proposal does not include the construction of the surrounding road network (upgraded and extended of Archbold Road), which would be undertaken by other parts of Transport for New South Wales (Transport for NSW) under a separate approval.

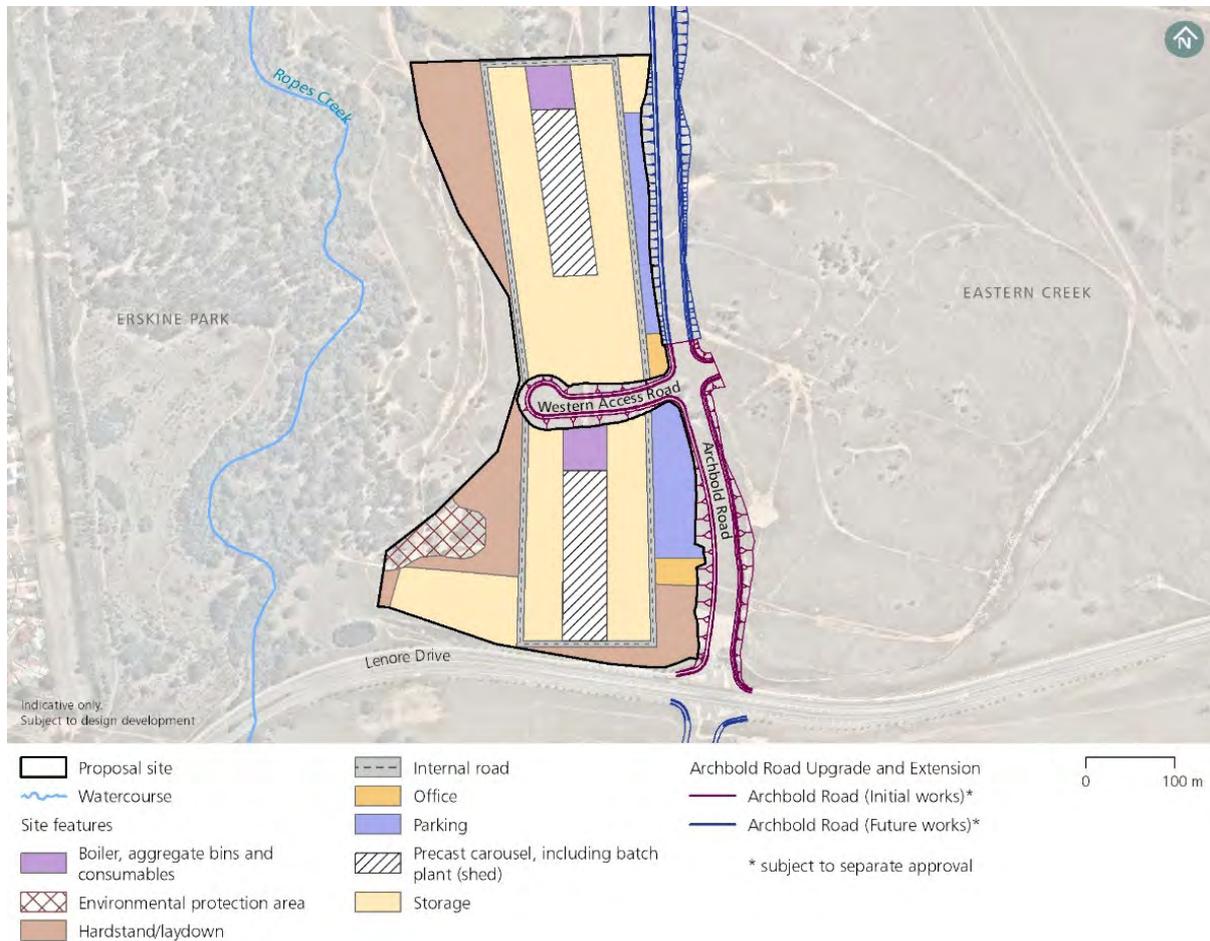


Figure 1-1 Overview of the proposal

1.2 Purpose and scope of this report

This memorandum is one of a number of technical papers that form part of the REF. The purpose of this memorandum is to identify and assess the potential impacts of the proposal in relation to transport and traffic and to identify management and mitigation measures to minimise these impacts.

1.3 Structure of this report

This technical memorandum is structured as follows:

- Section 2 describes the assessment methodology
- Section 3 details the existing traffic and transport environment
- Section 4 provides an assessment of the potential transport and traffic impacts of the proposal during construction
- Section 5 provides an assessment of the potential transport and traffic impacts of the proposal during operation
- Section 6 identifies proposed transport and traffic management and mitigation measures.

2. Assessment methodology

2.1 Overall assessment approach

To assess the impact of the proposal on the transport and traffic network, the following methodology has been used to identify and, where possible, quantify the following:

- Potential impacts on road network performance – assessed through the use of traffic modelling to determine the performance of the road network with and without vehicles associated with construction and operation of the proposal. Traffic counts were collected in November 2019 to inform the assessment of road network performance. There have been no recent major roadworks, upgrades or developments within the vicinity of the proposal site that would impact on the suitability on the November 2019 traffic counts for the assessment.
- Potential impacts on parking, property access, public transport, pedestrians and cyclists – assessed through an analysis of existing provisions and a comparison with provisions during construction and operation
- Cumulative impacts – the cumulative impact assessment for traffic and transport is provided in Chapter 8 (Environmental impact assessment) of the REF.

2.2 Traffic modelling approach

To assess the potential impacts of the proposal on road network performance, traffic modelling has been undertaken of proposed construction vehicle routes between the proposal site and the nearest arterial road inclusive of the arterial road interface.

The approach to traffic modelling undertaken for this assessment aligns with the *Traffic Modelling Guidelines* (Roads and Maritime, 2013) and includes the following broad steps:

- Development of calibrated and validated single intersection base models to align with existing operational conditions along each construction vehicle route
- Development of future year base models to align with anticipated operational conditions in the year of peak construction activity (2022) and year of peak operational activity (2026)
- Application of anticipated construction and operational traffic demands to the future year base models to enable the identification of potential impacts on road network performance.

Models were developed using the SIDRA INTERSECTION 8 traffic modelling software package. SIDRA INTERSECTION 8 is a micro-analytical tool for evaluation of intersection performance mainly in terms of capacity, level of service and a wide range of other performance measures such as delay, queue length and stops for vehicles and pedestrians, as well as fuel consumption, pollutant emissions and operating cost. SIDRA INTERSECTION 8 can be used as an aid for the design and evaluation of fixed-time / pre-timed and actuated signalised intersections, signalised pedestrian crossings, signalised single-point interchanges, roundabouts, all-way stop sign control and give-way sign control.

The traffic modelling was undertaken for the morning peak (6.00 am to 7.00 am for both construction and operation) and evening peak periods only (6.00 pm to 7.00 pm for construction and 5.00 pm to 6.00 pm for operation), which is consistent with the standard approach for this type of assessment. The peak traffic periods represent a worst-case scenario as during these periods the road network experiences the maximum background traffic demand and the available spare capacity of the road network is at its most limited.

2.2.1 Performance indicators

The performance of a road network is largely dependent on the operating performance of intersections, which form capacity control points. The performance indicators that are reported for this assessment include:

- Intersection Level of Service – based on criteria outlined in Table 2-1 and defined in the *Guide to Traffic Generating Developments* (Roads and Traffic Authority, 2002). The average delay assessed for signalised intersections is for all movements. The average delay assessed for priority (sign-controlled) intersections is for the worst movement and is expressed in seconds per vehicle
- Maximum queue length on each approach (in metres).

Table 2-1 Intersection Level of Service criteria

Level of Service	Average delay per vehicle (seconds/vehicle)	Traffic signals and roundabouts
A	Less than 15	Good operation
B	15 to 28	Good with acceptable delays and spare capacity
C	29 to 42	Satisfactory
D	43 to 56	Operating near capacity
E	57 to 70	At capacity; at signals, incidents will cause delays Roundabouts require other control mode
F	Over 70	Extra capacity required

Source: *Guide to Traffic Generating Developments* (Roads and Traffic Authority, 2002)

It is generally accepted that when intersection performance falls to Level of Service E during peak periods, investigations should be initiated to determine if suitable remediation can be provided. However, limited road capacity and high demand mean that Level of Service F is regularly experienced by motorists, particularly during peak periods.

3. Existing transport and traffic environment

3.1 Road network overview

Old Wallgrove Road / Lenore Drive is an east-west arterial road that provides access to local roads servicing industrial precincts at Erskine Park and Eastern Creek. Old Wallgrove Road becomes Lenore Drive west of Telopea Place. Old Wallgrove Road connects to Wallgrove Road and the M7 Motorway at its eastern end, which provide access to the wider Sydney arterial and motorway network. Wallgrove Road and the M7 Motorway run in a north-south direction and are designated as tertiary and primary freight routes, respectively. The M7 Motorway carries high volumes of freight vehicles and as a primary freight route, it provides access interstate and to strategically important ports, airports, industrial areas, freight terminals, and intermodal terminals and hubs. Wallgrove Road also carries high volumes of freight vehicles and as a tertiary freight route, it provides connections to the local road network and the lower-order elements of the State Road system.

Local roads in the vicinity of the precinct include Telopea Place, Roberts Road, Eastern Creek Drive, Southridge Street and Mini Link Road. These roads provide access to nearby industrial precincts and

the intersection of these roads with Old Wallgrove Road are signalised. Unrestricted kerbside parking is permitted on Telopea Place, Roberts Road, Eastern Creek Drive and Southridge Street.

It is assumed the upgraded and extended Archbold Road between Lenore Drive and the proposal site access would be open to traffic by mid-2022. The upgrade and extension of Archbold Road would be undertaken by other parts of Transport for NSW under a separate approval. This first stage of the planned Archbold Road upgrade and extension would provide access to the proposal site from Lenore Drive, via a new section of Archbold Road and the Western Access Road. Prior to completion of the Archbold Road extension between Lenore Drive and the proposal site access, construction traffic as part of the proposal would utilise a temporary haul road. Once complete, the proposal site would be accessed from the Western Access Road located between the northern and southern precast facilities.

The road network in the vicinity of the proposal is shown in Figure 3-1.

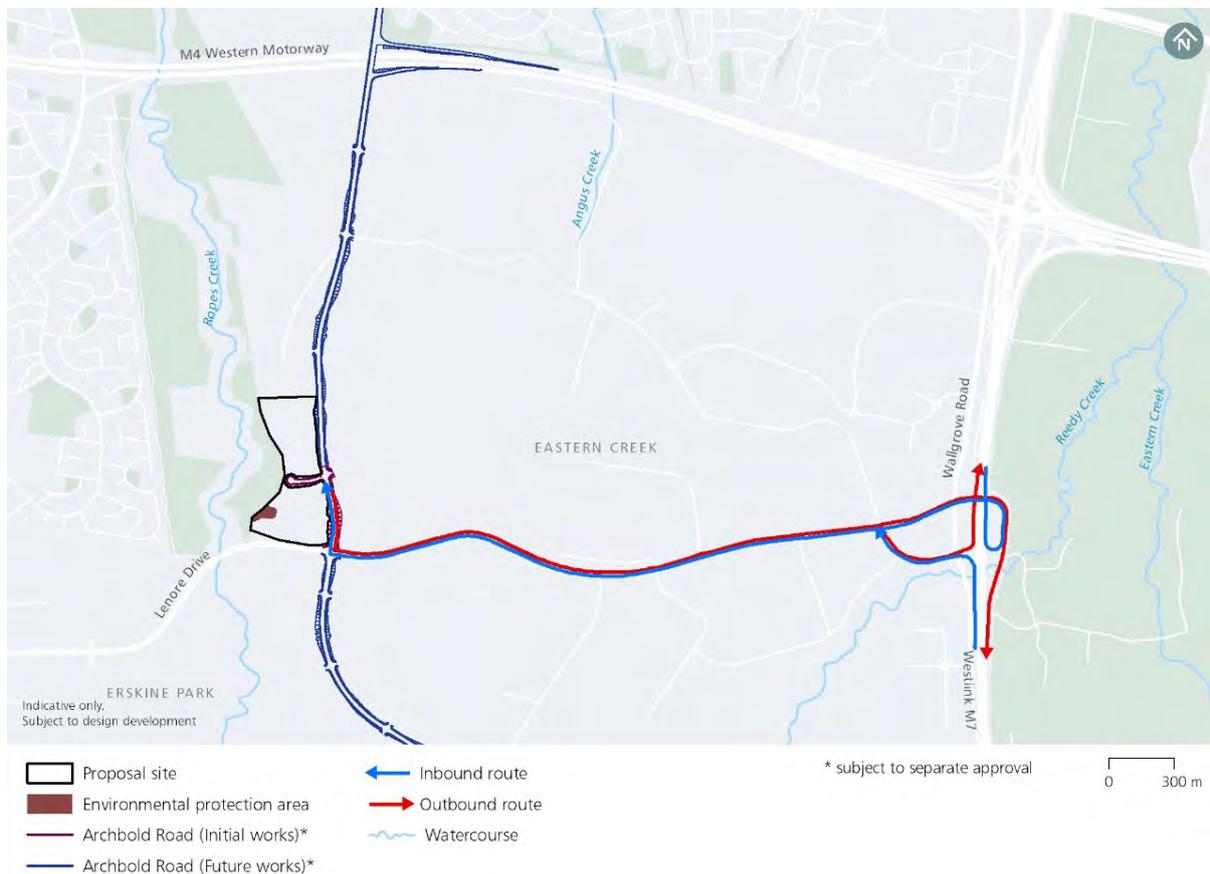


Figure 3-1 Road network in the vicinity of the proposal

3.2 Traffic volumes and patterns

The M7 Motorway is a limited-access high-speed road and carries high traffic volumes. Elsewhere on the arterial and local road network, traffic volumes are highest on Wallgrove Road, which carries over 1,000 vehicles in each direction during the peak hours. Traffic volumes are also high on Old Wallgrove Road, which carries between 690 and 1,090 vehicles per hour in each direction and exhibits a

westbound peak direction during the morning peak hour and an eastbound peak direction during the evening peak hour. Traffic volumes on all other roads near the proposal are substantially lower.

Approximate peak hour midblock volumes on key roads within the vicinity of the proposal are shown in Table 3-1. The upgraded and extended Archbold Road has not been provided as this has yet to be constructed and opened to traffic.

Table 3-1 Existing peak hour traffic volumes by direction (2019)

Road	Direction	Morning peak hour volume (veh / hr)	Evening peak hour volume (veh / hr)
Old Wallgrove Road / Lenore Drive	Eastbound	750	880
	Westbound	1,090	690
Wallgrove Road	Northbound	1,070	1,380
	Southbound	1,410	1,480
Telopea Place/Old Wallgrove Road	Northbound	230	510
	Southbound	40	30
Roberts Road	Northbound	250	370
	Southbound	330	290
Eastern Creek Drive	Northbound	120	60
	Southbound	90	80
Southridge Street	Northbound	80	170
	Southbound	10	30
Mini Link Road/Quarry Road	Northbound	320	350
	Southbound	0	10

Source: SCATS count data (Transport for NSW, November 2019)

3.3 Existing intersection performance

As detailed in Section 2.1, traffic modelling was completed to ascertain the existing performance of key intersections during the morning and evening peak hours in the vicinity of the proposal. The results are presented in Table 3-2, and represent the performance of the intersections in the absence of the proposal and other projects within and in the vicinity of the proposal.

Modelled intersection performance indicates that all intersections near the proposal site currently perform satisfactorily at or above Level of Service C during the morning and evening peak hours.

Table 3-2 Modelled peak hour existing intersection performance (2019)

Intersection and peak hour	Intersection throughput (veh / hr)	Average delay (sec / veh)	Level of Service	Maximum queue length by directional approach (m)	
Old Wallgrove Road / Lenore Drive / Telopea Place					
Morning (6 am to 7 am)	1,720	30	C	NB	15
				EB	80
				SB	< 5
				WB	55
Evening (5 pm to 6 pm)	1,490	33	C	NB	75
				EB	35
				SB	< 5
				WB	75
Evening (6 pm to 7 pm)	950	30	C	NB	40
				EB	25
				SB	< 5
				WB	35
Old Wallgrove Road / Roberts Road					
Morning (6 am to 7 am)	1,800	14	A	NB	25
				EB	35
				SB	-
				WB	110
Evening (5 pm to 6 pm)	1,600	20	B	NB	35
				EB	40
				SB	-
				WB	75
Evening (6 pm to 7 pm)	1,060	14	A	NB	15
				EB	20
				SB	-
				WB	30
Old Wallgrove Road / Eastern Creek Drive					
Morning (6 am to 7 am)	1,850	10	A	NB	-
				EB	65
				SB	35

Intersection and peak hour	Intersection throughput (veh / hr)	Average delay (sec / veh)	Level of Service	Maximum queue length by directional approach (m)	
				WB	50
Evening (5 pm to 6 pm)	1,540	11	A	NB	-
				EB	65
				SB	35
				WB	30
Evening (6 pm to 7 pm)	1,040	11	A	NB	-
				EB	50
				SB	15
				WB	20
Old Wallgrove Road / Southridge Street					
Morning (6 am to 7 am)	1,910	18	B	NB	15
				EB	50
				SB	5
				WB	95
Evening (5 pm to 6 pm)	1,600	23	B	NB	20
				EB	60
				SB	5
				WB	45
Evening (6 pm to 7 pm)	1,120	23	B	NB	15
				EB	40
				SB	5
				WB	30
Old Wallgrove Road / Mini Link Road					
Morning (6 am to 7 am)	1,880	24	B	NB	35
				EB	45
				SB	< 5
				WB	65
Evening (5 pm to 6 pm)	1,620	27	B	NB	25
				EB	55
				SB	< 5
				WB	30

Intersection and peak hour	Intersection throughput (veh / hr)	Average delay (sec / veh)	Level of Service	Maximum queue length by directional approach (m)	
Evening (6 pm to 7 pm)	1,190	23	B	NB	10
				EB	30
				SB	< 5
				WB	20
M7 Motorway southbound ramps / Wallgrove Road / Old Wallgrove Road					
Morning (6 am to 7 am)	3,100	34	C	NB	135
				EB	65
				SB	115
				WB	50
Evening (5 pm to 6 pm)	2,910	27	B	NB	95
				EB	110
				SB	160
				WB	25
Evening (6 pm to 7 pm)	2,010	33	C	NB	80
				EB	70
				SB	100
				WB	15
M7 Motorway northbound ramps / Wallgrove Road / Mini Link Road					
Morning (6 am to 7 am)	2,640	34	C	NB	130
				EB	60
				SB	80
				WB	55
Evening (5 pm to 6 pm)	3,090	41	C	NB	145
				EB	70
				SB	145
				WB	25
Evening (6 pm to 7 pm)	1,780	35	C	NB	75
				EB	40
				SB	60
				WB	25

3.4 Public transport network

There are no train stations located in close proximity to the proposal. Bus routes 738 and 835 are located near the proposal and are shown in Figure 3-2.

Route 738 is operated by Busways and is a loop service between Mount Druitt and Horsley Park via Wallgrove Road, Old Wallgrove Road and Roberts Road. Route 738 operates at a frequency of two buses per hour during the weekday morning and evening peak periods.

Route 835 is operated by Transit Systems and travels between Western Sydney University Kingswood and Prairiewood via Lenore Drive, Old Wallgrove Road and Wallgrove Road. Route 835 operates at a frequency of two buses per hour in each direction during the weekday morning and evening peak periods.

Bus stops are located along Old Wallgrove Road / Lenore Drive, Wallgrove Road and Roberts Road. Bus priority lanes are provided at the intersections of Old Wallgrove Road and Telopea Place, Eastern Creek Drive and Southbridge Street.

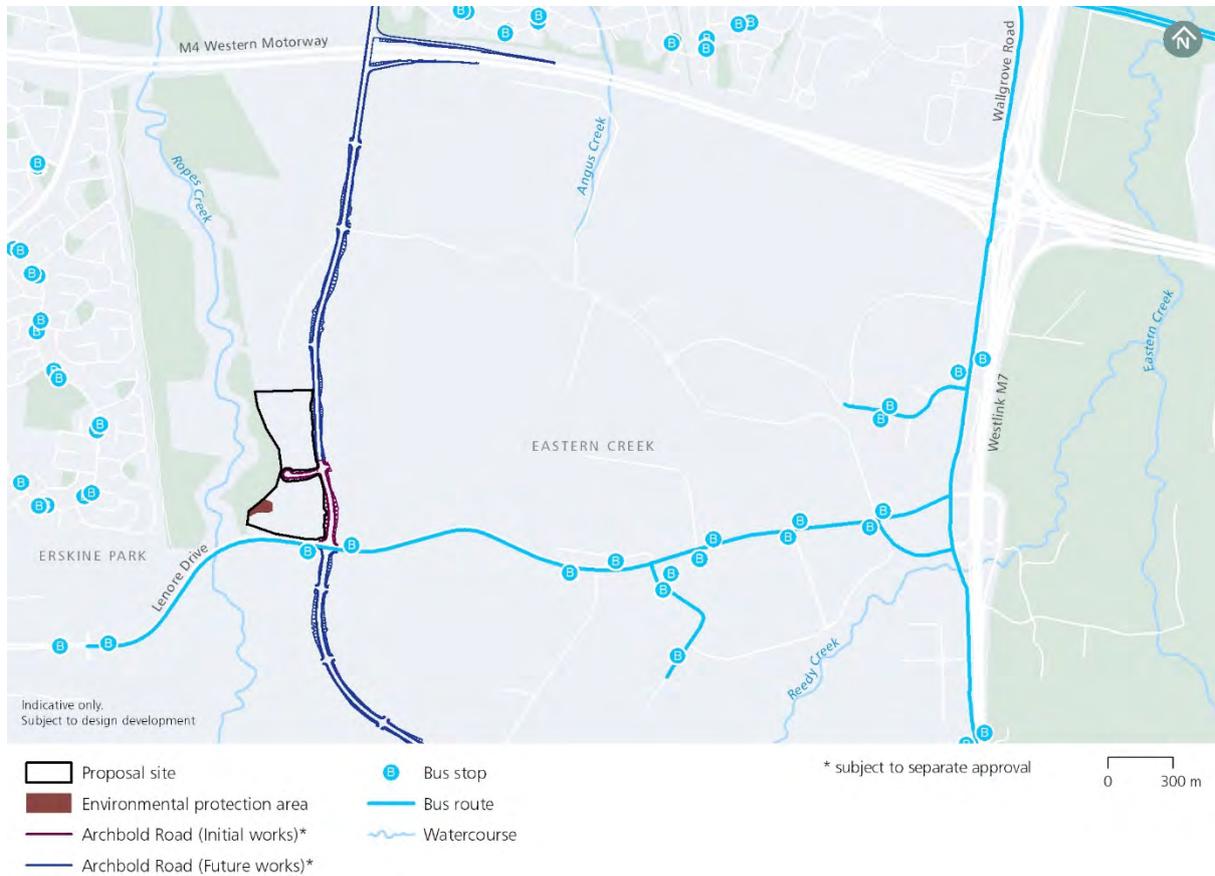


Figure 3-2 Public transport network surrounding the proposal

3.5 Active transport network

Pedestrian activity within the immediate vicinity of the proposal is low given the industrial land uses present. Footpaths are provided on both sides of Old Wallgrove Road between Telopea Place and Wallgrove Road and include a shared user path on the northern side of the road. A shared user path is provided on the northern side of Lenore Drive; footpaths are not provided on the southern side. Footpaths are not provided on Wallgrove Road, with the exception of limited sections of shared user paths that provide connectivity to Mini Link Road and the M7 Motorway shared user path.

The cycle network near the proposal is shown in Figure 3-3 and is well established with provision of a number of off-road shared user paths. Shared user paths are provided on Lenore Drive and Old Wallgrove Road and provide connections to the regional cycle network via the M7 Motorway shared user path.



Figure 3-3 Off-road cycle network in the vicinity of the proposal

Source: Cycleway Finder (Transport for NSW, 2019)

4. Construction

4.1 Key assumptions

4.1.1 Construction worker parking

All staff parking would be accommodated on-site and not on surrounding local streets. Provision for parking during construction would be provided within the proposal site.

4.1.2 Construction assessment year

Construction is proposed to commence in early 2021 and scheduled to reach completion by the end of 2022. The total duration of construction is anticipated to be around 20 months. As such, 2022 has been used as the construction assessment year.

4.1.3 Construction site location and access

The proposal site is bounded by Lenore Drive to the south and Ropes Creek to the west. Site access and egress to and from the construction site would be right-in, left-out via Lenore Drive and left-in, right out via the temporary haul road and, once complete, the first stage of the upgraded and

extended Archbold Road (subject to separate approval). The intersection of Lenore Drive and the upgraded and extended Archbold Road would be signalised. The Archbold Road / Lenore Drive intersection would be located approximately 1.3 kilometres west of the Old Wallgrove Road / Lenore Drive / Telopea Place intersection.

Haulage routes would only travel east of the proposal site, generally via arterial roads, as described below and shown in Figure 4-1:

- From the proposal site along the temporary haul road (and once complete, the upgraded and extended Archbold Road) to Lenore Drive
- Lenore Drive to Old Wallgrove Road
- Old Wallgrove Road to Wallgrove Road
- Old Wallgrove Road to M7 Motorway.

No haulage routes are anticipated to travel west of the proposal site.

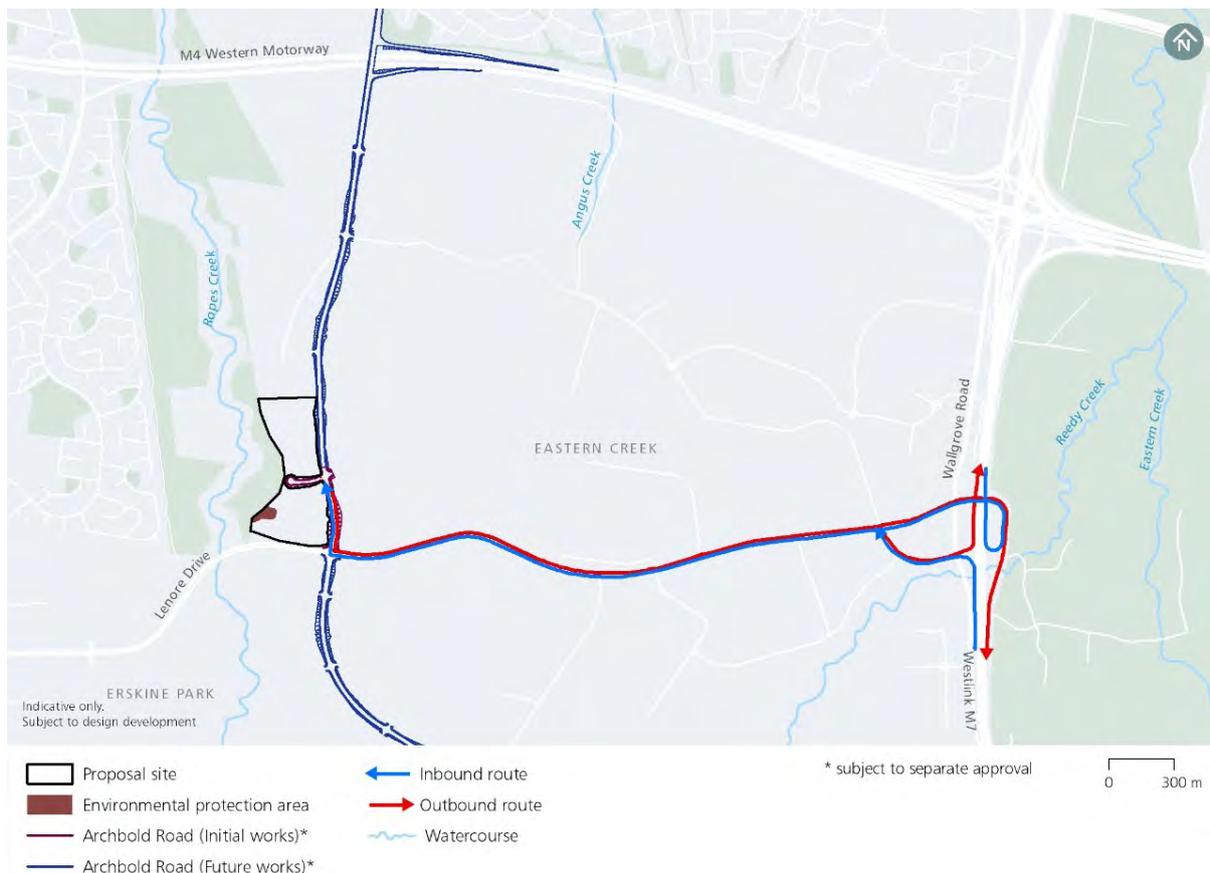


Figure 4-1 Proposed haulage routes

4.1.4 Construction vehicles

Construction vehicles would access and egress the proposal site generally during standard construction hours. The hours that were modelled for the construction scenario represent the

maximum number of vehicles on the road network and coincide with construction workers travelling to and from the proposal site. Modelling the maximum number of vehicles on the road network represents the worst-case scenario. The forecast number of construction vehicles to and from the proposal site at each facility would be:

- Light vehicles: 60 vehicles (per facility) arriving in the hour before the start of shifts (6 am to 7 am) and 60 vehicles (per facility) leaving in the hour after the end of shifts (6 pm to 7 pm)
- Heavy vehicles: maximum of 10 heavy vehicles (per facility) per hour during standard construction hours (7 am to 6 pm). For the purposes of the traffic assessment, heavy vehicles have been assumed to be comprised of two 12.5-metre trucks, seven 19-metre trucks and one 30-metre truck.

4.2 Impacts on road network performance

Intersection performance results under the '2022 without construction of proposal' (without vehicles associated with construction of the proposal) and '2022 with construction of proposal' (with vehicles associated with construction of the proposal) scenarios are summarised in Table 4-1 for the morning and evening peak hours.

Modelled intersection performance with construction traffic indicates that all intersections forming part of the construction vehicle access and egress route would perform at the same Level of Service compared to the scenario without construction traffic. Further, intersections delays would either not change or would increase by up to two seconds, which is considered a negligible impact on the road network. As a result, additional traffic generated by construction of the proposal would have a negligible or minimal impact on the operation of the surrounding road network.

Modelled intersection performance at the Old Wallgrove Road / Roberts Road, Old Wallgrove Road / Eastern Creek Drive and Old Wallgrove Road / Southridge Street intersections indicates that the Level of Service would improve very slightly with construction traffic. This is due to reallocation of signal phasing times at signalised intersections in response to additional traffic demand and is considered negligible.

Table 4-1 Modelled peak hour intersection performance during construction

Intersection and peak hour	2022 without construction of proposal				2022 with construction of proposal					
	Intersection throughput (veh / hr)	Average delay (sec / veh)	Level of Service	Maximum queue length by directional approach (m)	Intersection throughput (veh / hr)	Average delay (sec / veh)	Level of Service	Maximum queue length by directional approach (m)		
Old Wallgrove Road / Lenore Drive / Telopea Place										
Morning (6 am to 7 am)	2,100	40	C	NB	30	2,220	40	C	NB	30
				EB	130				EB	130
				SB	< 5				SB	< 5
				WB	110				WB	110
	1,270	32	C	NB	65	1,390	33	C	NB	70

Intersection and peak hour	2022 without construction of proposal				2022 with construction of proposal			
	Intersection throughput (veh / hr)	Average delay (sec / veh)	Level of Service	Maximum queue length by directional approach (m)	Intersection throughput (veh / hr)	Average delay (sec / veh)	Level of Service	Maximum queue length by directional approach (m)
Evening (6 pm to 7 pm)				EB 35				EB 55
				SB < 5				SB < 5
				WB 40				WB 40
Old Wallgrove Road / Roberts Road								
Morning (6 am to 7 am)	2,070	14	A	NB 25	2,190	14	A	NB 25
				EB 40				EB 40
				SB -				SB -
				WB 135				WB 150
Evening (6 pm to 7 pm)	1,220	14	A	NB 15	1,350	13	A	NB 15
				EB 30				EB 35
				SB -				SB -
				WB 35				WB 40
Old Wallgrove Road / Eastern Creek Drive								
Morning (6 am to 7 am)	2,100	9	A	NB -	2,230	9	A	NB -
				EB 75				EB 75
				SB 30				SB 30
				WB 60				WB 70
Evening (6 pm to 7 pm)	1,190	9	A	NB -	1,310	8	A	NB -
				EB 50				EB 60
				SB 10				SB 10
				WB 15				WB 15
Old Wallgrove Road / Southridge Street								
Morning (6 am to 7 am)	2,250	19	B	NB 15	2,370	18	B	NB 15
				EB 60				EB 55
				SB 5				SB 5
				WB 120				WB 135

Intersection and peak hour	2022 without construction of proposal				2022 with construction of proposal					
	Intersection throughput (veh / hr)	Average delay (sec / veh)	Level of Service	Maximum queue length by directional approach (m)	Intersection throughput (veh / hr)	Average delay (sec / veh)	Level of Service	Maximum queue length by directional approach (m)		
Evening (6 pm to 7 pm)	1,340	22	B	NB	20	1,460	22	B	NB	20
				EB	50				EB	60
				SB	5				SB	5
				WB	35				WB	35
Old Wallgrove Road / Mini Link Road										
Morning (6 am to 7 am)	2,270	25	B	NB	40	2,400	25	B	NB	50
				EB	60				EB	60
				SB	< 5				SB	< 5
				WB	85				WB	90
Evening (6 pm to 7 pm)	1,510	24	B	NB	10	1,640	25	B	NB	10
				EB	40				EB	45
				SB	< 5				SB	< 5
				WB	25				WB	25
M7 Motorway southbound ramps / Wallgrove Road / Old Wallgrove Road										
Morning (6 am to 7 am)	3,430	37	C	NB	150	3,490	37	C	NB	150
				EB	80				EB	80
				SB	130				SB	130
				WB	80				WB	95
Evening (6 pm to 7 pm)	2,290	34	C	NB	90	2,350	35	C	NB	90
				EB	85				EB	85
				SB	115				SB	125
				WB	24				WB	20
M7 Motorway northbound ramps / Wallgrove Road / Mini Link Road										
Morning (6 am to 7 am)	2,760	36	C	NB	140	2,820	38	C	NB	145
				EB	70				EB	75
				SB	90				SB	95
				WB	60				WB	60

Intersection and peak hour	2022 without construction of proposal				2022 with construction of proposal					
	Intersection throughput (veh / hr)	Average delay (sec / veh)	Level of Service	Maximum queue length by directional approach (m)	Intersection throughput (veh / hr)	Average delay (sec / veh)	Level of Service	Maximum queue length by directional approach (m)		
Evening (6 pm to 7 pm)	2,170	39	C	NB	90	2,230	41	C	NB	95
				EB	60				EB	60
				SB	80				SB	80
				WB	35				WB	35

4.3 Impacts on parking and property access

As described in Section 4.1.1, all staff parking would be accommodated on-site and not on surrounding local streets. Therefore, there would be no impact on parking during construction of the proposal. There would also be no impact on property access during construction of the proposal.

4.4 Impacts on the public transport network

Wallgrove Road, Old Wallgrove Road and Lenore Drive are used by buses and also form part of the proposed construction vehicle route. Minimal impacts on buses are expected and would be limited to a potential minor increase in travel time due to the additional construction vehicles on the road network. No impacts are anticipated on the operation of bus stops.

4.5 Impacts on the active transport network

Prior to construction of the first stage of the upgraded and extended Archbold Road and installation of traffic signals at the Archbold Road / Lenore Drive intersection, heavy vehicles would be required to cross the shared user path on the northern side of Lenore Drive to access the site. Although pedestrian and cyclist volumes on these shared user paths are low, management and mitigation measures to minimise these impacts would be applied and are discussed further in Section 6.

It is assumed the upgraded and extended Archbold Road between Lenore Drive and the proposal site access would be open to traffic by mid-2022. Following the opening of the upgraded and extended Archbold Road, no impacts to pedestrians and cyclists are anticipated given that footpaths and shared user paths in the vicinity of the proposal would remain open during construction of the proposal. There are no safety concerns anticipated given that the Archbold Road / Lenore Drive intersection would be signalised, shared paths run along the length of the haulage route and the minimal volumes of pedestrians and cyclists.

4.6 Cumulative construction impacts

The cumulative impact assessment for traffic and transport is provided in Chapter 7 (Environmental Impact Assessment) of the REF.

5. Operation

5.1 Key assumptions

5.1.1 Operation assessment year

The proposal would be commissioned in late 2022. Both the northern and southern precast facilities would operate concurrently for an approximate timeframe of four to five years, subject to the delivery strategy and construction program for Sydney Metro West. The year 2026 has been selected as the operation assessment year as it is the last year of anticipated operations and presents a worst-case scenario with the greatest background traffic growth. The operation assessment assumes concurrent operation of the northern and southern precast facilities.

5.1.2 Operation hours

The proposal would operate 24 hours per day, seven days per week with a total operational workforce of 120 staff.

5.1.3 Operation vehicle parking

All staff parking would be accommodated on-site and not on surrounding local streets. Provision for parking during operation would be provided within the proposal site.

5.1.4 Operation access

Access and egress to and from the site would be right-in, left-out via Lenore Drive and left-in, right out from the Western Access Road to the first stage of the upgraded and extended Archbold Road (subject to separate approval). The precast sites would be accessed by the Western Access Road between the northern and southern facilities (off the upgraded and extended Archbold Road). The intersection of Lenore Drive and the upgraded and extended Archbold Road would be signalised. The Archbold Road / Lenore Drive intersection would be located approximately 1.3 kilometres west of the Old Wallgrove Road / Lenore Drive / Telopea Place intersection.

Haulage routes would only travel east of the proposal site as described below and shown in Figure 4-1:

- From the proposal site along the upgraded and extended Archbold Road to Lenore Drive
- Lenore Drive to Old Wallgrove Road
- Old Wallgrove Road to Wallgrove Road
- Old Wallgrove Road to M7 Motorway.

No haulage routes are anticipated to travel west of the proposal site.

5.1.5 Operational vehicles

The hours that were modelled for the operation scenario represent the maximum number of vehicles on the road network and coincide with workers travelling to and from the proposal site, as well as heavy vehicle movements. Modelling the maximum number of vehicles on the road network represents the worst-case scenario. The forecast number of operation vehicles to and from the proposal site at each facility would be:

- Light vehicles: 60 vehicles (per facility) arriving in the hour before the start of shifts (6.00 am to 7.00 am for day shifts and 6.00 pm to 7.00 pm for night shifts) and 60 vehicles (per facility) leaving in the hour after the end of shifts (5.00 pm to 6.00 pm for day shifts and 5.00 am to 6.00 am for night shifts)
- Heavy vehicles: maximum of 12 heavy vehicles (per facility) per hour between 7.00 am to 6.00 pm. For the purposes of the traffic assessment, heavy vehicles have been assumed to be comprised of one 12.5-metre truck, 10 19-metre trucks and one 30-metre truck.
- Heavy vehicles: maximum of six heavy vehicles (per facility) per hour between 6.00 pm to 7.00 am. For the purposes of the traffic assessment, heavy vehicles have been assumed to be comprised of one 12.5-metre truck, four 19-metre trucks and one 30-metre truck.

5.1.6 Ongoing maintenance

The proposal would be placed on a routine cleaning, inspection and maintenance schedule. Mechanical and electrical components would be tested and inspected routinely as would fire and safety equipment. Maintenance access would be via the main entry point (upgraded and extended Archbold Road). Maintenance and service vehicles would use parking facilities at each precast facility already provided for operational vehicles.

5.2 Impacts on road network performance

Intersection performance results under the '2026 without operation of proposal' (without vehicles associated with operation of the proposal) and '2026 with operation of proposal' (with vehicles associated with operation of the proposal) scenarios are summarised in Table 5-1 for the morning and evening peak hours.

Modelled intersection performance with operation traffic indicates that most intersections forming part of the operational vehicle access and egress route would perform at the same Level of Service compared to the scenario without operational traffic. The Old Wallgrove Road / Lenore Drive / Telopea Place intersection would experience a decrease in level of service in the morning peak hour from C to D, however this is associated with a two second increase in average delay, which is considered negligible. As a result, additional traffic generated by operation of the proposal would have a negligible or minimal impact on the operation of the surrounding road network.

Modelled intersection performance at the Old Wallgrove Road / Roberts Road and Old Wallgrove Road / Eastern Creek Drive intersections indicates that the Level of Service would improve very slightly with operation traffic. This is due to reallocation of signal phasing times at signalised intersections in response to additional traffic demand and is considered negligible.

Table 5-1 Modelled peak hour intersection performance during operation

Intersection and peak hour	2026 without operation of proposal				2026 with operation of proposal					
	Intersection throughput (veh / hr)	Average delay (sec / veh)	Level of Service	Maximum queue length by directional approach (m)	Intersection throughput (veh / hr)	Average delay (sec / veh)	Level of Service	Maximum queue length by directional approach (m)		
Old Wallgrove Road / Lenore Drive / Telopea Place										
Morning (6 am to 7 am)	2,350	41	C	NB	40	2,500	43	D	NB	40
				EB	165				EB	180
				SB	< 5				SB	< 5
				WB	85				WB	85
Evening (5 pm to 6 pm)	2,360	43	D	NB	250	2,530	47	D	NB	270
				EB	85				EB	130
				SB	< 5				SB	< 5
				WB	110				WB	120
Old Wallgrove Road / Roberts Road										
Morning (6 am to 7 am)	2,120	14	A	NB	25	2,280	14	A	NB	25
				EB	40				EB	40
				SB	-				SB	-
				WB	140				WB	160
Evening (5 pm to 6 pm)	1,760	20	B	NB	40	1,930	19	B	NB	40
				EB	60				EB	75
				SB	-				SB	-
				WB	75				WB	80
Old Wallgrove Road / Eastern Creek Drive										
Morning (6 am to 7 am)	2,140	8	A	NB	-	2,290	8	A	NB	-
				EB	70				EB	75
				SB	25				SB	25
				WB	65				WB	75
Evening (5 pm to 6 pm)	1,690	11	A	NB	-	1,870	10	A	NB	-
				EB	90				EB	105
				SB	25				SB	25
				WB	30				WB	30

Intersection and peak hour	2026 without operation of proposal				2026 with operation of proposal					
	Intersection throughput (veh / hr)	Average delay (sec / veh)	Level of Service	Maximum queue length by directional approach (m)	Intersection throughput (veh / hr)	Average delay (sec / veh)	Level of Service	Maximum queue length by directional approach (m)		
Old Wallgrove Road / Southridge Street										
Morning (6 am to 7 am)	2,310	19	B	NB	25	2,460	19	B	NB	25
				EB	55				EB	60
				SB	5				SB	5
				WB	130				WB	145
Evening (5 pm to 6 pm)	1,860	24	B	NB	30	2,030	24	B	NB	30
				EB	80				EB	95
				SB	5				SB	5
				WB	45				WB	50
Old Wallgrove Road / Mini Link Road										
Morning (6 am to 7 am)	2,320	25	B	NB	45	2,480	25	B	NB	55
				EB	60				EB	60
				SB	< 5				SB	< 5
				WB	85				WB	95
Evening (5 pm to 6 pm)	2,040	29	C	NB	15	2,210	30	C	NB	15
				EB	85				EB	100
				SB	< 5				SB	< 5
				WB	40				WB	45
M7 Motorway southbound ramps / Wallgrove Road / Old Wallgrove Road										
Morning (6 am to 7 am)	3,460	37	C	NB	130	3,530	38	C	NB	130
				EB	80				EB	80
				SB	150				SB	155
				WB	80				WB	100
Evening (5 pm to 6 pm)	3,380	29	C	NB	85	3,470	31	C	NB	90
				EB	115				EB	110
				SB	215				SB	235
				WB	75				WB	75

Intersection and peak hour	2026 without operation of proposal				2026 with operation of proposal					
	Intersection throughput (veh / hr)	Average delay (sec / veh)	Level of Service	Maximum queue length by directional approach (m)	Intersection throughput (veh / hr)	Average delay (sec / veh)	Level of Service	Maximum queue length by directional approach (m)		
M7 Motorway northbound ramps / Wallgrove Road / Mini Link Road										
Morning (6 am to 7 am)	2,860	35	C	NB	150	2,940	38	C	NB	160
				EB	70				EB	70
				SB	85				SB	95
				WB	60				WB	60
Evening (5 pm to 6 pm)	3,900	47	D	NB	165	3,990	49	D	NB	165
				EB	120				EB	140
				SB	215				SB	220
				WB	35				WB	35

5.3 Impacts on parking and property access

As described in Section 5.1.3, all staff parking would be accommodated on-site and not on surrounding local streets. Therefore, there would be no impact on parking during operation of the proposal. There would also be no impact on property access during operation of the proposal.

5.4 Impacts on the public transport network

Wallgrove Road, Old Wallgrove Road and Lenore Drive are used by buses and also form part of the proposed operational vehicle route. Minimal impacts to buses are expected and would be limited to a potential minor increase in travel time due to the additional operational vehicles on the road network. No impacts are anticipated on the operation of bus stops.

5.5 Impacts on the active transport network

No impacts to pedestrians and cyclists are anticipated given that footpaths and shared paths in the vicinity of the proposal would not be affected during operation of the proposal. There are no safety concerns anticipated given that the Archbold Road / Lenore Drive intersection would be signalised, shared paths run along the length of the haulage route and the minimal volumes of pedestrians and cyclists.

5.6 Cumulative operation impacts

The cumulative impact assessment for traffic and transport is provided in Chapter 7 (Environmental impact assessment) of the REF.

6. Management and mitigation measures

The Construction Traffic Management Framework (CTMF) for Sydney Metro West would be applied to the construction and operation of the proposal. The framework provides an overall strategy and approach for construction traffic management, an outline of the traffic management requirements and processes that would be applied, and interactions with relevant stakeholders (including working collaboratively with other stakeholders to manage cumulative impacts). It establishes the traffic management processes and acceptable criteria to be considered and followed when managing impacts to the road network. Although the CTMF is typically applied to the construction phase of projects, it is proposed to also adopt this framework for the operational phase of the precast facilities considering their role in supporting construction of Sydney Metro West and their use by the tunnelling contractors.

A summary of management and mitigation measures is included in Table 6-1.

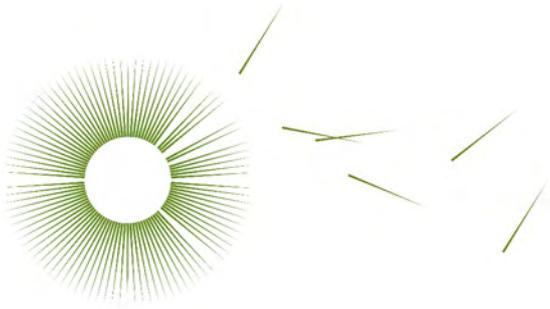
Table 6-1 Management and mitigation measures

No.	Impact	Management / mitigation measure
T1	Traffic-related incidents	In the event of a traffic-related incident, coordination would be carried out with Transport Coordination and / or the Transport Management Centre's Operations Manager.
T2	Emergency vehicles	Access to properties for emergency vehicles would be provided at all times.
T3	Site access and egress	All trucks would enter and exit the proposal site in a forward direction, where feasible and reasonable.
T4	Staff parking	All staff parking would be provided on-site and not on surrounding local streets.
T5	Active transport users	The driver induction process would include safety awareness in relation to all road users, particularly pedestrians and cyclists at the proposal site access point at Archbold Road / Lenore Drive during construction.

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Appendix E

Landscape and Visual Impact Assessment



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Sydney Metro West

Eastern Creek Precast Facilities

Landscape and visual impact assessment



October 2020

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Key terms

Term	Definition
landscape	<i>'All aspects of a tract of land, including landform, vegetation, buildings, villages, towns, cities and infrastructure.'</i> (Transport for NSW, 2020)
landscape character	The ... <i>'combined quality of built, natural and cultural aspects which make up an area and provide its unique sense of place'</i> . (Transport for NSW, 2020)
Northern precast facility	Proposed precast facility at the north of the proposal site
proposal (the)	Construction of two (2) separate precast facilities, a northern and southern precast facility, each including boiler, aggregate bins and consumables, hardstand/laydown areas, offices, parking, precast carousel including batch plant, and warehouses.
proposal site (the)	Site located at Lenore Drive opposite Old Wallgrove Road, Eastern Creek.
Southern precast facility	Proposed precast facility at the south of the proposal site.
visual study area	Area encompassing the proposal site and immediate surrounds including the visual catchment of the proposal and areas of the landscape that provide a setting for the proposal site.
view	<i>'Any sight, prospect or field of vision as seen from a place, and may be wide or narrow, partial or full, pleasant or unattractive, distinctive or nondescript, and may include background, mid ground and/or foreground elements or features.'</i> (Australian Institute of Landscape Architects QLD, 2018)
viewpoint	<i>'The specific location of a view, typically used for assessment purposes.'</i> (Australian Institute of Landscape Architects QLD, 2018)
visual absorption capacity	<i>'The potential for a landscape or scene to absorb a particular change without a noticeable loss of valued attributes.'</i> (Australian Institute of Landscape Architects QLD, 2018)

1. Introduction

1.1. Sydney Metro West Eastern Creek Precast Facilities

Sydney Metro propose to establish two precast facilities (the proposal) to support the construction of the proposed Sydney Metro West. The precast facilities would manufacture precast concrete segments for lining the underground twin tunnels. A Review of Environmental Factors (REF) is to be prepared for the proposal seeking approval under Part 5 of the *Environmental Planning and Assessment 1979* (EP&A Act).

The key components of the proposal include:

- Site establishment at the proposal site at Eastern Creek including vegetation clearing, remediation, and earthworks
- The establishment and operation of two separate and adjacent precast facilities on the proposal site, the northern and southern precast facilities. Each precast facility would include:
 - A precast yard including a shed for construction of precast concrete segments and storage laydown areas
 - Boiler, aggregate bins and consumables
 - Office facilities
 - On-site parking for up to 60 light vehicles.
- Internal roads with entrances to each facility from the Western Access Road located between the northern and southern precast facilities (external roads would be subject to separate approvals)
- Ancillary supporting infrastructure, including utilities installation (power, water, sewerage, gas and communications), lighting, signage and landscaping.

The northern and southern precast facilities would operate concurrently, 24 hours a day, seven days a week for the majority of the lifespan of the project. The footprint and operational layout of the proposal is shown in Figure 1-1.

1.2. Purpose and scope of this report

This technical paper, Technical Paper: Landscape and Visual Impact Assessment, is one of a number of technical papers that form part of the REF for the proposal. The purpose of this technical paper is to identify and assess the potential impacts of the proposal in relation to landscape and visual amenity.

This report includes the following:

- A summary of the relevant legislative and policy framework
- A description of the existing landscape and visual conditions of the site and visual study area

- An assessment of impacts on the landscape
- An assessment of the daytime visual impact
- An assessment of night-time visual impact
- Identification of mitigation and management measures
- A conclusion.

1.3. Structure of this report

The remainder of this report is structured as follows:

- Chapter 2 provides the legislative and policy framework relevant to the proposal
- Chapter 3 documents the assessment methodology including a method for assessing the impact on the landscape, daytime views and night-time views to the proposal
- Chapter 4 details the existing environment
- Chapter 5 provides an assessment of the potential landscape and visual impacts of the proposal during construction and operation
- Chapter 6 identifies mitigation and management measures.

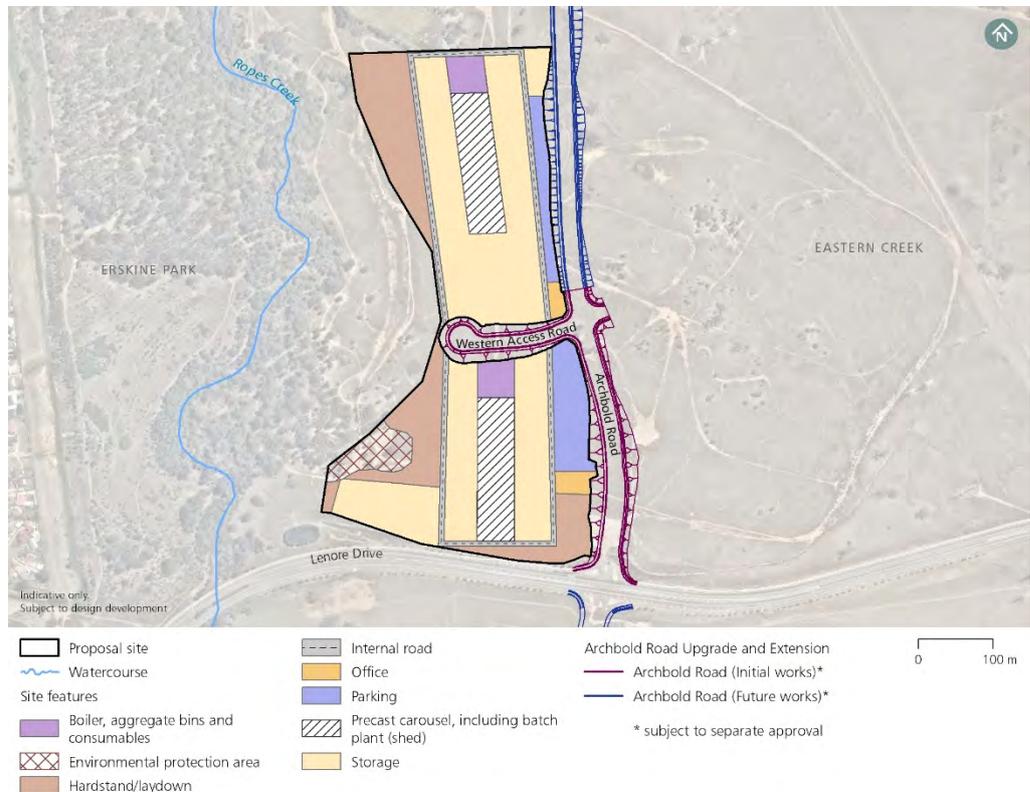


Figure 1-1 Indicative site layout

2. Legislative and policy framework

The following chapter provides a brief review of the State and Local Authority planning documents which provide guidance for the management of landscape character and visual amenity for the study area.

2.1. State legislation and planning guidance

2.1.1. A Metropolis of Three Cities – the Greater Sydney Region Plan, 2018

This plan sets a 40-year vision and establishes a 20-year plan to manage growth and change for Greater Sydney. It divides Greater Sydney into three regions, including the *'Western Parkland City'*, the *'Central River City'* (including Eastern Creek) and the *'Eastern Harbour City'* centred around Sydney CBD (Greater Sydney Commission, 2018a, p.6).

The role of this plan is to co-ordinate a whole-of-government approach to providing the appropriate infrastructure to support the growth of three cities. It also intends to provide a coordinated approach to district level planning.

The proposal site at Eastern Creek is located at the western edge of the *'Central River City'*, within an area identified as a *'Western Sydney Employment Area'*, between the M7 Motorway and Erskine Park (Greater Sydney Commission, 2018a, p.15).

Greater Sydney's *'green infrastructure'* including *'urban tree canopy, green ground cover, bushland, waterways, parks and open spaces'* (Greater Sydney Commission, 2018a, p.6) are identified in this plan as valued assets and several strategies in this plan relate to green infrastructure. This includes setting a target to increase tree canopy cover from the current 23 per cent to 40 per cent (Greater Sydney Commission, 2018a, Strategy 30.1, p.164). Strategy 25.1 aims to *'protect environmentally sensitive areas of waterways'* (Greater Sydney Commission, 2018a, p.151) including the South Creek Parkland Investigation area which encompasses the Ropes Creek corridor, which is located immediately to the west of the proposal site.

Objective 32 of the plan aims to connect parks, open spaces, bushland, walking and cycling paths through network of green spaces known as the Greater Sydney Green Grid. In the *'Western Parkland City vision'*, South Creek is identified as a *'Parkland Investigation'* area and part of the green grid (Greater Sydney Commission, 2018a, p.15). The plan aims for South Creek to be a *'cool green corridor'* through the Western Parkland City which provides a *'green spine to improve amenity'* (Greater Sydney Commission, 2018a, p.17 and p.107). Ropes Creek, the M4 Motorway and the Warragamba to Prospect Water Supply Pipelines are identified as green grid opportunities (Greater Sydney Commission, 2018a, p.169).

2.1.2. Our Greater Sydney 2056 Central City District Plan - connecting communities, 2018

The Central City District Plan provides a 20-year plan to manage growth and provides a *'guide for implementing the Greater Sydney Region Plan, A Metropolis of Three Cities, at a district level and provides a bridge between regional and local planning'* (Greater Sydney Commission, 2018b, p.14).

The Central City District encompasses four local government areas including Blacktown, The Hills, Cumberland and Parramatta City Councils. The proposal site is located in the south western corner of the Blacktown City Council area, within the *'Western Sydney Employment Area'*, adjacent to Ropes Creek, which is part of the South Creek Parkland Investigation area (Greater Sydney Commission, 2018b, p.11). Planning Priority C14 reinforces the aims identified in the Greater Sydney Region Plan, prioritising the creation of *'a Parkland City urban structure and identity, with South Creek as a defining spatial element'*. The district plan aims to create a *'cool and green parkland city'*, including *'corridors of public open space and expanding the urban tree canopy'* (Greater Sydney Commission, 2018b, p.101).

Planning Priority C15 *'Protecting and improving the health and enjoyment of the District's waterways'* and aims to improve the character and *'sense of place'* of the district (Greater Sydney Commission, 2018b, p.14). In particular, objective 28 aims to protect and enhance scenic and cultural landscapes including urban bushland, parkland areas and waterways such as South Creek and its tributaries (including Ropes Creek), which contribute to the *'identity and international profile of Greater Sydney'* (Greater Sydney Commission, 2018b, p105).

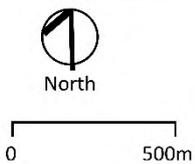
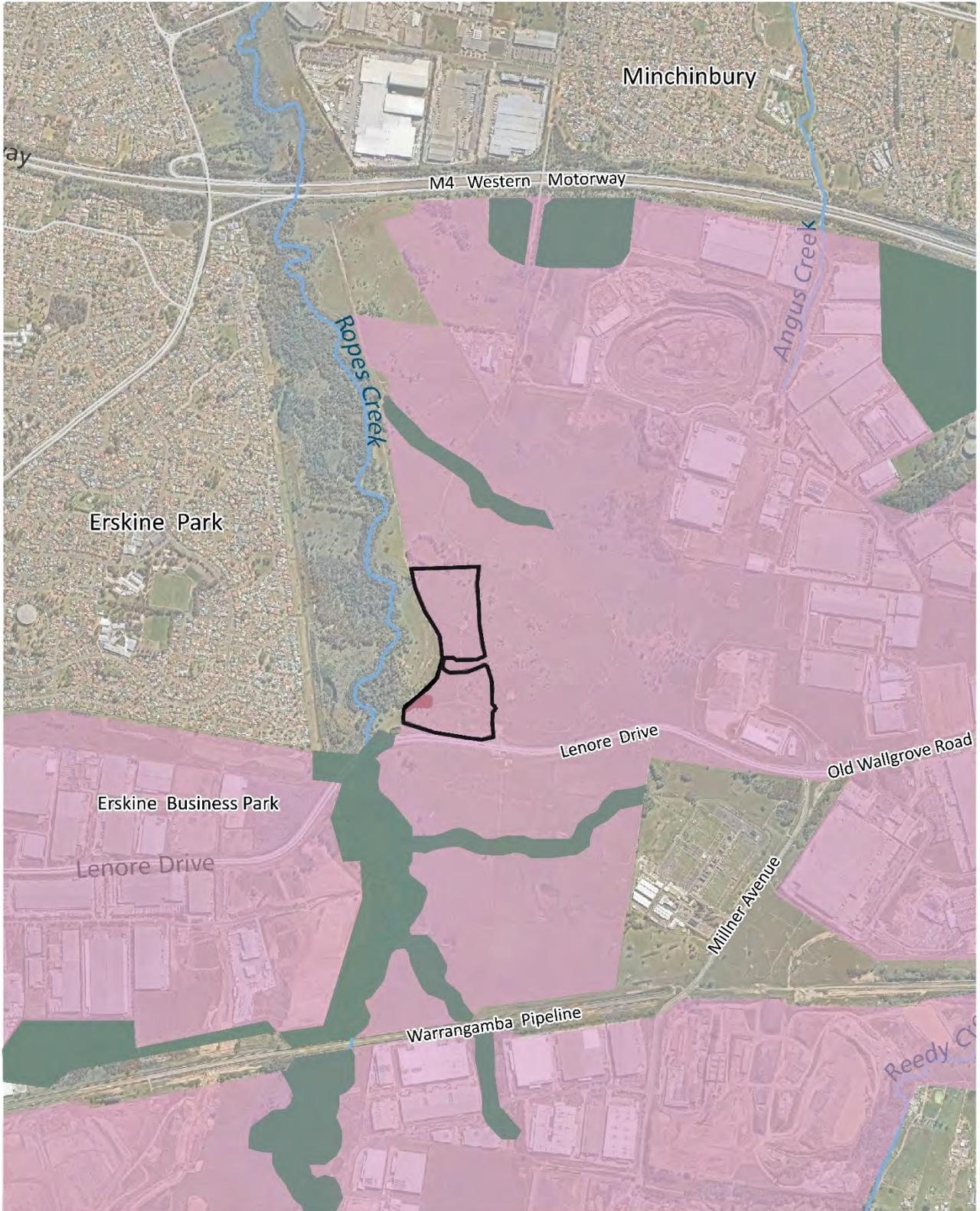
Green infrastructure is planned to be increased through the delivery of green grid connections such as the *'Ropes Creek Corridor'* which aims to improve the environmental quality and enhance access to open space and recreation, including provision of walking and cycling trails (Planning Priority C16, Greater Sydney Commission, 2018b, p.108-109).

2.1.3. State Environmental Planning Policy (Western Sydney Employment Area) 2009 (WSEA SEPP)

The aim of this Policy is to put in place planning controls that will enable the Western Sydney Employment Area to rezone and develop the land for *'employment or environmental conservation purposes'* (NSW State Government, 2009, cl.3.2.c). A key priority is to ensure that development occurs in an *'environmentally sensitive'* manner, conserving and rehabilitating areas that have a *'high biodiversity or heritage or cultural value'* (NSW State Government, 2009, cl.3.2.f).

The proposal site is zoned IN1 General Industrial and located in the Ropes Creek Precinct (no.6). A Draft DCP has been exhibited for the Ropes Creek Precinct that includes specific objectives and development controls for this area (refer to section 2.2.1 of this technical paper).

Figure 2-1 shows the location of the WSEA SEPP land zoning for and surrounding the proposal site.



Key		WSEA SEPP zoning:	
	Proposal site		General Industrial
	Environmental protection area		Environmental Conservation

Figure 2-1 WSEA SEPP land zoning

2.2. Local Government planning guidance

The proposal site is located within the western part of Blacktown City Council local government area, with the boundary of Penrith City Council local government area located to the west of the proposal site along Ropes Creek. While the proposal site is exempt from the requirements of the planning documents of both the Blacktown and Penrith City Councils, they provide some useful context to the current and intended land uses of the surrounding area and therefore have been considered for the purposes of this assessment.

The following documents apply to the areas surrounding the proposal site:

- *Blacktown Local Strategic Planning Statement* (Blacktown City Council, 2020)
- *Blacktown Local Environmental Plan 2015* (Blacktown City Council, 2015a)
- *Blacktown Development Control Plan 2015* (Blacktown City Council, 2015a)
- *Draft Ropes Creek Development Control Plan 2016* (NSW Department of Planning & Environment, 2016)
- *Penrith Local Strategic Planning Statement* (Penrith City Council, 2020)
- *Penrith Local Environmental Plan 2010* (Penrith City Council, 2010)
- *Penrith Development Control Plan 2014* (Penrith City Council, 2014)
- *Penrith Scenic & Cultural Landscapes Study* (Penrith City Council, 2019b)

2.2.1. Blacktown City Council planning guidance

Blacktown Local Strategic Planning Statement, 2020

The purpose of the *Blacktown Local Strategic Planning Statement* (LSPS) is to provide a vision and strategic direction for Blacktown over the next 20 years. The LSPS recognises the role of Blacktown City as critical part of Western Sydney and seeks to achieve a future which is sustainable, liveable and productive.

The LSPS divides the Blacktown local government area into four districts, each serviced by a strategic centre, with its own economic, social and environmental characteristics. The proposal site is located in the southwestern corner of the 'Mount Druitt' precinct which is identified as an 'employment area' in the LSPS. The Mount Druitt precinct will provide logistics, distribution and warehousing development with connections to Sydney's arterial roads and motorway network (Blacktown City Council, 2020, p.20-21).

Blacktown City Council also places importance on the protection of 'scenic and cultural landscapes' and is committed to an increase in 'urban tree canopy cover' to manage urban heat through landscaping (p.70-72). It identifies the Ropes Creek corridor (west of the proposal site) as a potential green grid investigation area (p.64).

Blacktown Local Environmental Plan 2015

The proposal site is located entirely within the WSEA SEPP area and therefore the provisions of the *Blacktown Local Environmental Plan 2015* (LEP) do not apply to the proposal however the LEP has been considered for guidance. The LEP generally aims 'to encourage development opportunities for business and industry so as to deliver local and regional employment growth' (Blacktown City Council, 2015a, cl. 1.2.2d). The land to the immediate west of the proposal site is zoned Public Recreation (RE1), and land further west associated with Ropes Creek is zoned Environmental Conservation (E2) (Refer to Figure 2-2 which shows the combined Blacktown and Penrith land use zoning surrounding the proposal site).

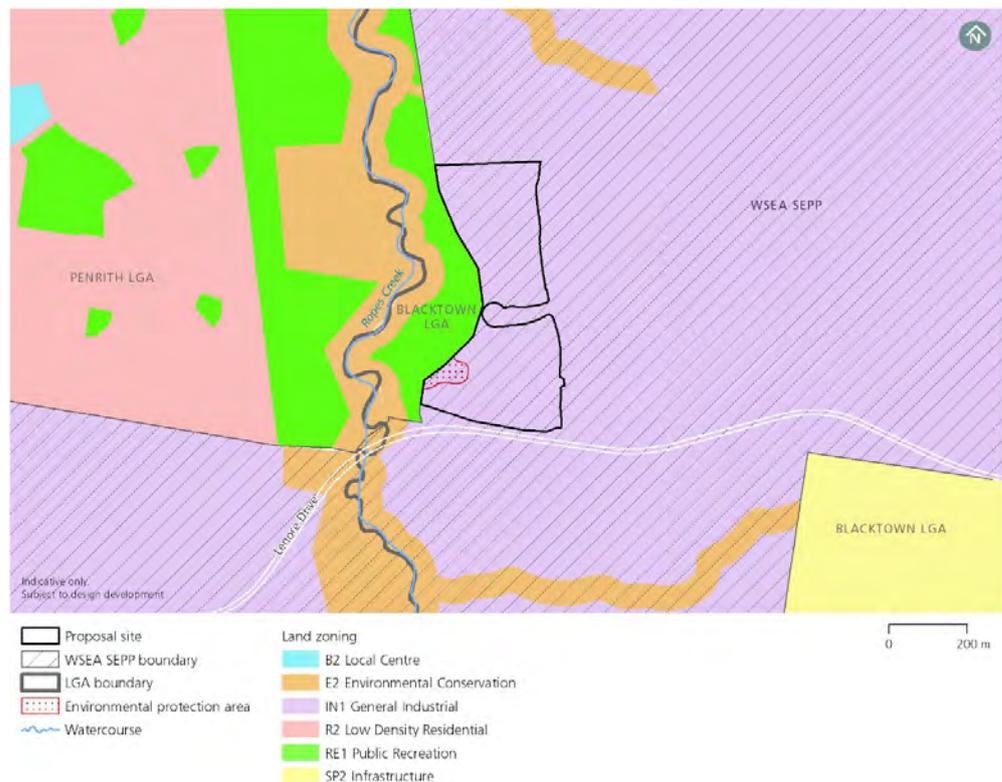


Figure 2-2 Combined Penrith and Blacktown LGA area land zoning

Blacktown Development Control Plan 2015

The proposal site is located entirely within the WSEA SEPP and as such the *Blacktown Development Control Plan 2015* (DCP) is not applicable to the proposal site. However, the DCP includes more detailed provisions to guide development, ensuring that development contributes to the quality of the natural and built environments and positively responds to the character of the surrounding area.

Several design guidelines contained within the DCP are relevant, including: use of 'landscaping and other beautification works on the site's street frontages', ensuring buildings 'present an acceptable scale and bulk when viewed from the street', and consideration of the 'appearance of the development from elevated residential areas', for example through 'use of non-reflective building materials or the use of materials which blend with the landscape' (Blacktown City Council, 2015a, PART E, s.4.1-4.3).

Other relevant design guidelines that relate to the visual amenity of new development in the industrial zone include:

- *'To complement landscaping and ensure a high standard of visual and environmental quality, Council encourages high aesthetic standards for building designs' such as 'variations in fascia treatments, roof lines and selection of building materials'.* (Blacktown City Council, 2015a, s.4.5)
- *'Open storage areas are to be effectively screened and sealed. Such areas are to be located preferably behind buildings. No storage should occur above the height of proposed screening.'* (Blacktown City Council, 2015a, s.4.6)
- *'Ensure that car parking areas are attractive through the provision of landscaping'* (Blacktown City Council, 2015a, s.4.8)

Following the adoption of this DCP a Draft DCP was released for the Ropes Creek Precinct, which includes the proposal site. If adopted, the Ropes Creek Precinct DCP would supersede the Blacktown DCP.

Ropes Creek Precinct draft Development Control Plan 2016

The *Ropes Creek Precinct draft* DCP relates to lands within the Ropes Creek Precinct of the WSEA SEPP and includes the proposal site. If this draft DCP were to be adopted, the proposal would also be exempt from the requirements of the draft DCP. Despite this, the draft DCP provides an understanding of the objectives and development controls that Blacktown City Council have developed to guide the future development in the wider Ropes Creek Precinct.

The draft DCP aims to *'promote high quality urban design outcomes'*, ensure that *'development will not detrimentally affect the environment'* and that *'satisfactory measures are incorporated to ameliorate any impacts arising from the proposed development'* (NSW Government Department of Planning & Environment, 2016, cl.1.2).

The vision for the precinct is to *'support a range of industrial uses, potentially including transport depots and freight transport facilities, industrial retail outlets, warehouse or distribution centres and other industries'* (cl.2.1). The draft DCP encourages future built form in locations which are located to *'respond to the constraints of the site, including the tributaries and riparian land, and the transmission line easement'* (cl.2.1).

The draft DCP includes a concept plan (refer to Figure 2-3), which identifies potential development areas, vegetation protection zones, and a proposed road network.

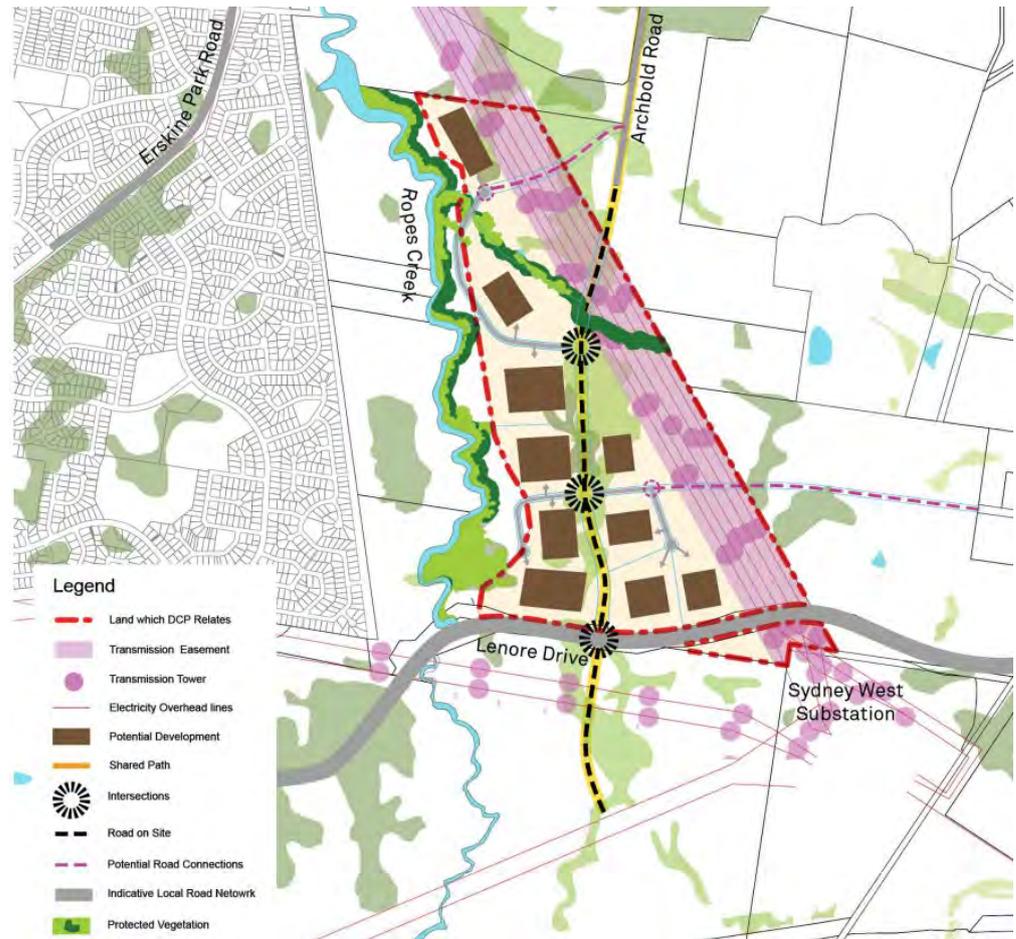


Figure 2-3 Ropes Creek Indicative Concept Plan

A range of development controls have been identified to support the concept plan. These include:

- *‘Provide an internal road network that supports the role of Archbold Road as a north-south link road between Ropes Creek Precinct and the Great Western Highway’ (cl.3.2)*
- *‘Provide suitable separation between environmentally sensitive areas and development’ (cl.3.2)*
- *‘Ensure that allotments provide high quality landscape treatment within setbacks to all public roads’ (cl.3.3)*
- *‘Achieve the appropriate minimum building line setbacks and consistency in street frontages’, including 10m from Lenore Drive and Archbold Road (cl.3.3)*
- *‘Ensure that development presents an acceptable bulk and scale as viewed from adjacent sites and the public domain’ and ‘encourage visual interest in the design of buildings’ whilst ensuring that ‘any reflective materials are used with sensitivity to neighbouring development’ (cl.3.3)*
- *‘Development fronting Lenore Drive and Archbold Road is encouraged to provide open style fencing, which does not obstruct the view of landscaping from the street’ (cl.3.3.5)*

- *‘Contribute to a high quality landscape character and built form for the site’ through use of hard and soft landscaping treatments, and ‘retention of existing landscape elements and native vegetation’ (cl.3.4)*
- *‘Ensure that the alteration of ground levels does not cause a negative visual impact from more sensitive vistas’ (cl.3.5)*
- *‘Minimise the visual impact of development of land at higher elevations on adjacent sites or public roads at lower elevations’ (cl.6.5).*

2.2.2. Penrith City Council planning guidance

The proposal site is located over 150 metres east of the Penrith City Council area, however, the Penrith LEP and DCP provides an understanding of the objectives and development controls that apply to the areas west of the proposal site, an area which influences the character of, and includes potential visual receptors of the proposal.

Penrith Local Strategic Planning Statement, 2020

The purpose of the *Penrith Local Strategic Planning Statement* (LSPS) is to outline Penrith’s economic, social and environmental land use needs over the next 20 years. It highlights those characteristics that make the Penrith area special and outlines how growth and change will be managed into the future.

While the proposal site is located outside the Penrith local government area, the adjacent Ropes Creek corridor is partially within Penrith. This creek corridor is identified in the LSPS as a *‘Significant Green Space’* (Penrith City Council, 2020, p.21). It is also part of the *‘Greater Penrith to Eastern Creek Growth Area’*, identified as a corridor of economic activity with the potential to capitalise on significant transport and infrastructure investment (Penrith City Council, 2020, p.31).

Penrith Local Environmental Plan 2010

A key aim of the Penrith LEP is to *‘protect and enhance the environmental values’* of Penrith, including places of *‘visual’* significance and to manage *‘development in sensitive areas’* (Penrith City Council, 2010, cl.1.2.2). Although the proposal site is not within the Penrith LGA, Ropes Creek (adjacent to the proposal site) and land immediately west of Ropes Creek is zoned for Environmental Conservation and Public Recreation, respectively. (Refer to Figure 2-2 which shows the land use zoning surrounding the proposal site).

It also identifies Ropes Creek as having *‘Land with Scenic and Landscape Values’*. The clause for the *‘Protection of scenic character and landscape values’* aims to *‘ensure development in these areas is located and designed to minimise its visual impact’* (cl.7.5.1b), from *‘major roads and other public places’* (cl.7.5.3).

Penrith Development Control Plan 2014

There are several design principles in the *Penrith DCP 2014* DCP which provide guidance that would be relevant to Ropes Creek, which forms the boundary between Penrith and Blacktown local government areas.

The design principles that relate to the visual amenity of new development include:

- Ensuring development responds to *'the site's context, the desired scale and character of an area, and minimising impacts on key views, scenic values and where applicable, rural character'*. (Penrith City Council, 2014, PART B, s.1.2).
- Ensuring the *'building's height, bulk and scale will avoid or minimise negative impacts on an area's landscape, scenic or rural character'* (Penrith City Council, 2014, PART B, s.1.2.3b)
- To *'protect and enhance native vegetation for its scenic values and to retain the unique visual identity of the landscape'* (Penrith City Council, 2014, PART C2, 2.1B).

A number of *'key precincts'* have been identified within the Penrith LGA, which have unique characteristics or development potential that warrant development of specific controls. The proposal site is located about 200 metres from the northern area of the *'E6 Erskine Business Park'* precinct. Several design objectives for this precinct relate to the visual amenity, including to minimise the *'impact of development on views from adjoining residential areas'* and *'ensure a scale of buildings which minimises the impact of development on adjoining residential areas'* (Penrith City Council, 2014, PART E6, 6.3.1). It also identifies Ropes Creek as a *'Biodiversity Conservation Area'* and requires a 10 metre setback of development from this area (Penrith City Council, 2014, PART E6, s. 6.3.3).

Penrith Scenic and Cultural Landscapes Study

The purpose of this document is to identify, protect and manage Penrith's scenic and cultural landscapes. Eight broad landscape character units were identified in the Penrith local government area, based on characteristics such as landform, land use and vegetation cover. The proposal site is adjacent to the *'Central Urban Area'*, which includes Ropes Creek. The Ropes Creek corridor is identified as a *'valued green corridor'* that breaks up the urban area (Penrith City Council, 2019b, p.12). Views of Ropes Creek corridor, including from the Main Western Rail Line, M4 and Great Western Highway, are identified as an important element of the *'Central Urban Area'* (Penrith City Council, 2019b, p.33).

There are no *'highly visually sensitive landscapes'* or *'significant landscapes'* near the site (Penrith City Council, 2019b, p.43), nor are there any *'major viewpoint locations'*, *'important regional vistas and view corridors'* or *'visually important tree stands'* (Penrith City Council, 2019b p.29, 34). The proposal may be visible from the M4 but would not obstruct the *'scenic and green break views'* to the Ropes Creek Corridor from this location (Penrith City Council, 2019b p.29). The proposal would, however, be visible from the *'major ridgeline'* running north-south through Erskine Park, about one kilometre west of the site (Penrith City Council, 2019b p.29). This ridge is not identified as a major viewpoint location or part of any view corridor, however, views from this location have been considered within this assessment.

3. Assessment methodology

3.1. Overall assessment approach

This assessment identifies the landscape and visual impacts of the proposal during construction and operation. The process of the assessment involved the following steps:

- Identification of the existing landscape and visual conditions of the proposal site and visual study area
- An assessment of potential landscape impact during construction and operation
- An assessment of the potential daytime visual impact during construction and operation
- An assessment of potential night-time visual impact during construction and operation
- Identification of mitigation and management measures.

These steps are described in the following sections.

3.2. Existing environment

The existing environment has been described in terms of the key landscape and visual features of the proposal site and visual study area. The visual study area extends to include the areas from which the proposal may be seen and any landscape features that are important to the landscape character and functioning of the proposal site.

The proposal site was visited during April and June 2020, and the existing character, landscape elements and views were recorded with photographs.

3.3. Landscape impact assessment

Landscape as defined by Transport for NSW (2020) is ... *'All aspects of a tract of land, including landform, vegetation, buildings, villages, towns, cities and infrastructure.'* It also defines landscape character as the ... *'combined quality of built, natural and cultural aspects which make up an area and provide its unique sense of place'.*

The landscape assessment was carried out by identifying the sensitivity of the landscape, and the likely magnitude of change expected as a result of the proposal. These factors were combined to make an overall assessment of the level of impact.

3.3.1. Landscape sensitivity

Landscape sensitivity refers to the value placed on a landscape and the level of service it provides to the community. The sensitivity of a landscape may reflect the frequency and volume of users. It may also reflect other valued characteristics such

as tranquillity, visual relief and contribution to microclimate. The value of landscapes is often described in local and NSW Government masterplans and planning guidance documents, reflecting the importance of landscape resources to the local, regional and state-wide community.

Landscape sensitivity in this assessment is therefore considered in the broadest possible context (refer to Table 3-1), from those landscapes of national importance through to those considered to be landscapes of neighbourhood importance.

Table 3-1 lists the landscape sensitivity levels that applies to this assessment.

Table 3-1: Landscape sensitivity levels

Landscape sensitivity	Description
National	Landscape feature protected under national legislation or international policy, e.g. the World Heritage Listed Parramatta Park. There are no nationally sensitive landscapes within this assessment.
State	Landscape feature that is heavily used and/or is iconic to the State, e.g. Sydney Olympic Park stadium plaza. There are no state sensitive landscapes within this assessment.
Regional	Landscape feature that is heavily used and valued by residents of a major portion of a city or a non-metropolitan region, e.g. Prospect Reservoir, Sydney Motorsport Park. There are no regionally sensitive landscapes within this assessment.
Local	Landscape feature valued and experienced by concentrations of residents and/or local recreational users. Provides a considerable service to the community, for example, it provides a place for local gathering, recreation, sport, street use by cafes and/or shade and shelter in an exposed environment. Local examples include Ropes Creek or Peppertree Reserve, Erskine Park.
Neighbourhood	Landscape feature valued and appreciated primarily by a small number of residents e.g. street trees in a local street. Provides a minor service to the community, for example, it provides a seat or resting place, passive recreation and/or some shade and shelter in a local street.

3.3.2. Magnitude of change to the landscape

The changes to the landscape that would occur as a result of the proposal are assigned a magnitude of change level. This considers direct impacts on the landscape such as the removal of trees and tree canopy, open space and public realm areas, as well as indirect impacts, such as changes to the function of an area of open space or the public realm. The magnitude of change can result in adverse or beneficial effects.

Table 3-2 lists the magnitude of change levels that have been used in this assessment.

Table 3-2: Landscape magnitude of change levels

Magnitude of change	Description
Considerable reduction or improvement	Substantial portion of the landscape is changed. This may include substantial changes to vegetation cover (trees and canopy), landform, the area of open space, accessibility, permeability, legibility and wayfinding, comfort and amenity, activation and safety, and diversity of the public realm.
Noticeable reduction or improvement	A portion of the landscape is changed. This may include some alteration to vegetation cover (trees and canopy), landform, the area of open space, accessibility, permeability, legibility and wayfinding, comfort and amenity, activation and safety, and diversity of the public realm.
No perceived reduction or improvement	Either the landscape quality is unchanged or if it is, it is largely mitigated by public realm improvements. Does not alter or not noticeably alter the vegetation cover (trees and canopy), landform, the area of open space, accessibility, permeability, legibility and wayfinding, comfort and amenity, activation and safety, and diversity of the public realm.

3.4. Daytime visual impact assessment

This visual impact assessment considers visual amenity as experienced by various people and aims to identify the range of views to the site which may be impacted, including views from adjacent roads, residential and industrial areas.

Views are selected to represent the existing visual conditions and range of views to the proposal site. For each representative view, the existing features and character of the view is described, and a sensitivity level assigned. The magnitude of change that would result from the proposal is then described. These factors are then combined to determine an overall level of impact.

3.4.1. Identification of existing visual conditions

Viewpoints were selected to represent the range of views to the proposal site. These views are from the public domain (available to the public) and from a range of locations and viewing situations. Particular attention was paid to views from places where viewers are expected to congregate such as near schools, parks and major road corridors.

3.4.2. Visual sensitivity

Visual sensitivity reflects the nature, quality and duration of views. Views which would be experienced for a longer duration, where there are higher numbers of potential viewers and where visual amenity is important to viewers can generally be regarded as having a higher visual sensitivity. In addition, views recognised by local, state or federal planning regulations would, by nature of their recognition in these documents, have a higher visual sensitivity.

The sensitivity of the representative viewpoints has been considered in the broadest context of possible views, from those of national importance through to those considered to have a neighbourhood visual importance (refer to Table 3-3).

Table 3-3: Visual sensitivity levels – daytime

Visual sensitivity	Description
National	Heavily experienced view to a national icon, e.g. view to the Sydney Opera House from Circular Quay or Lady Macquarie’s Chair. There are no nationally sensitive views within this assessment.
State	Heavily experienced view to a feature or landscape that is iconic to the State, e.g. views to Old Government House from within Parramatta Park. There are no state sensitive views within this assessment.
Regional	Heavily experienced view to a feature or landscape that is iconic to a major portion of a city or a non-metropolitan region, or an important view from an area of regional open space, e.g. view from George Maunder Lookout over Prospect Reservoir. There are no regional sensitive views within this assessment.
Local	High quality view experienced by concentrations of residents and/or local recreational users, local commercial areas and/or large numbers of road or rail users. Views with local visual features and/or landmarks.
Neighbourhood	Viewers whose interest is not specifically focused on views e.g. workers. Views where visual amenity is appreciated by a small number of isolated residents, not particularly valued by the wider community.

3.4.3. Magnitude of change to views

The magnitude of change describes the extent of change that would result from the proposal and the visual compatibility of these changes within the surrounding landscape. There are some general principles which determine the ranking of magnitude of change which include factors relating to the view itself such as distance, landform, backdrop, enclosure and contrast. The characteristics of the proposal are also considered, such as scale, form, line, shape, pattern, colour or texture. The magnitude of change can result in an improvement or reduction in visual amenity.

A high magnitude of change would result if the proposal contrasts strongly and is not compatible with the existing landscape. A low magnitude of change occurs if there is minimal visual contrast and a high level of integration of form, line, shape, pattern, colour or texture between the development and the environment in which it is located.

Table 3-4 lists the terminology used to describe the magnitude of change levels.

Table 3-4: Visual magnitude of change levels – daytime

Magnitude of change	Description
Considerable reduction or improvement	A substantial part of the view is altered. The proposal is not compatible and / or contrasts substantially with the surrounding landscape.
Noticeable reduction or improvement	A small to moderate part of the view is altered. The proposal contrasts with the surrounding landscape.
No perceived reduction or improvement	Either the view is unchanged or if it is, the change in the view is unlikely to result in a change in the amenity of the view. The proposal does not contrast with the surrounding landscape.

3.5. Night-time visual impact assessment

The assessment of night-time impact has been carried out with a similar methodology to the daytime assessment. However, the assessment also draws upon the guidance contained within AS4282 *Control of the obtrusive effects of outdoor lighting* (2019) (AS4282).

AS4282 identifies four main potential effects of lighting, which are, the effects on residents, transport system users, transport signalling systems and astronomical observations. Of relevance to this assessment is the effects of lighting on the visual amenity of residents and transport system users.

AS4282 identifies environmental zones which are useful for categorising night-time landscape settings. The following assessment will use these environmental zones to describe the existing night-time visual condition and assign a sensitivity to these settings.

3.5.1. Night-time visual sensitivity

The environmental zone (defined in AS4282) which best describes the existing night-time visual condition of the site has been selected. These zones are typical night-time settings and reflect the predominant light level of the site and visual study area. Each environmental zone is assigned a level of sensitivity as described in Table 3-5.

Table 3-5: Environmental zone sensitivity – night-time

Environmental Zones (source: AS4282:2019)		
Sensitivity level	Description	Examples
Very high	A0: Intrinsically dark	UNESCO Starlight Reserve IDA Dark Sky Parks Major optical observatories No road lighting – unless specifically required by the road controlling authority
High	A1: Dark	Relatively uninhabited rural areas No road lighting – unless specifically required by the road controlling authority
Moderate	A2: Low district brightness	Sparsely inhabited rural and semi-rural areas
Low	A3: Medium district brightness	Suburban areas in towns and cities
Negligible	A4: High district brightness areas TV: High district brightness	Town and city centres and other commercial areas Residential areas abutting commercial areas

3.5.2. Night-time visual magnitude of change

Following the sensitivity assessment, the magnitude of change that would be expected within the visual study area at night is then identified. These changes are described, as relevant, in terms of:

- *Sky glow – which is the brightening of the night sky*
- *Glare – condition of vision in which there is discomfort or a reduction in ability to see*
- *Light spill – light emitted by a lighting installation that falls outside of the design area.*

Table 3-6 lists the categories used to describe the visual magnitude of change at night.

Table 3-6: Visual magnitude of change levels – night-time

Magnitude of change	Description
Considerable reduction or improvement	Substantial change to the level of skyglow, glare or light intrusion would be expected. The lighting of the proposal would contrast substantially with the surrounding landscape at night.
Noticeable reduction or improvement	Alteration to the level of skyglow, glare or light intrusion would be clearly visible. The lighting of the proposal would contrast with the surrounding landscape at night.
No perceived reduction or improvement	Either the level of skyglow, glare and light intrusion is unchanged or if it is altered, the change is generally unlikely to be perceived by viewers or compatible with the intended future use of the area.

3.6. Assigning impact levels

An assessment of landscape and visual impact has been made by combining the landscape or visual sensitivity and landscape or visual magnitude of change levels for each element and assigning an impact level (refer to Table 3-7). Assessment of night-time visual impact has been made by combining the visual sensitivity of the environmental zone with the night-time visual magnitude of change for each area generally and assigning an impact level (refer to Table 3-8).

Table 3-7: Landscape and visual impact levels – daytime

		Sensitivity				
		National	State	Regional	Local	Neighbourhood
Magnitude of change	Considerable reduction	Very high adverse	Very high adverse	High adverse	Moderate adverse	Minor adverse
	Noticeable reduction	Very high adverse	High adverse	Moderate adverse	Minor adverse	Negligible
	No perceived change	Negligible	Negligible	Negligible	Negligible	Negligible
	Noticeable improvement	Very high beneficial	High beneficial	Moderate beneficial	Minor beneficial	Negligible
	Considerable improvement	Very high beneficial	Very high beneficial	High beneficial	Moderate beneficial	Minor Beneficial

Table 3-8: Visual impact levels - night-time

		Sensitivity				
		Very high	High	Moderate	Low	Negligible
Magnitude of change	Considerable reduction	Very high adverse	Very high adverse	High adverse	Moderate adverse	Minor adverse
	Noticeable reduction	Very high adverse	High adverse	Moderate adverse	Minor adverse	Negligible
	No perceived change	Negligible	Negligible	Negligible	Negligible	Negligible
	Noticeable improvement	Very high beneficial	High beneficial	Moderate beneficial	Minor beneficial	Negligible
	Considerable improvement	Very high beneficial	Very high beneficial	High beneficial	Moderate beneficial	Minor Beneficial

The impacts identified for construction of the proposal would be experienced temporarily and those identified for operation of the proposal would be experienced for the duration of operation.

3.7. Avoidance and minimisation of impacts

Measures to mitigate potential impacts have been identified, including opportunities for mitigation on and off site, both day and night.

4. Existing environment

4.1. Proposal site

The proposal site is situated to the north of Lenore Drive in Eastern Creek. The site slopes from a small ridge to the east of the proposal site, west towards Ropes Creek in the west (refer to Figure 4-1).

The proposal site has been extensively cleared of its original vegetation, which would have included eucalypt, spotted gum and ironbark species typical of the Cumberland Plain Woodland group. While it is largely undeveloped, the proposal site shows evidence of unauthorised recreational off-road driving and motorcycling, as evidenced by the extensive network of tracks. Prior to this the proposal site would have been used for agricultural purposes.

The proposal site would be accessed via the proposed upgrade and extension of Archbold Road (subject to a separate approval), that on full completion would connect Lenore Drive to the Great Western Highway in the north, at Minchinbury. This new road would be located along the eastern boundary of the proposal site and include a Western Access Road between the northern and southern precast facilities (refer to Figure 1-1).

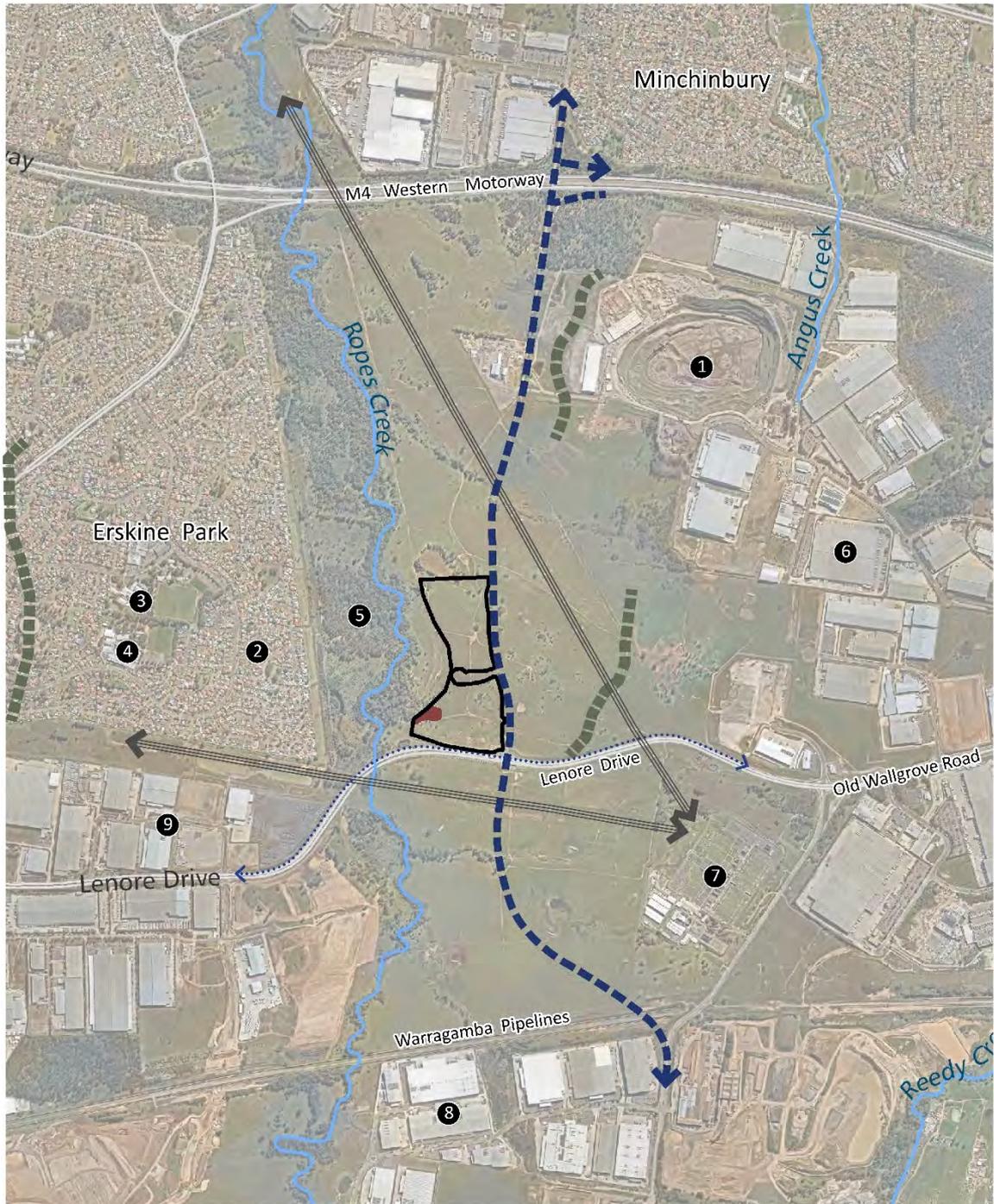


Figure 4-1 Landscape and visual features of the proposal site and surrounds

4.2. Visual study area

The landform surrounding the site is gently undulating, consisting of a series of hills and valleys created by South Creek and its tributaries (refer to Figure 4-2). A locally prominent ridgeline runs north to south, about 200 metres to the east of the proposal site. The landform falls from this ridge towards Ropes Creek which is located about 100 to 200 metres to the west of the proposal site. Ropes Creek is zoned for public recreation and environmental conservation (under the *Blacktown LEP 2015*) and is intended to be developed as a regional open space corridor. It is understood public access to this area is not currently formally available. This bushland area along the creek is relatively low-lying and provides a green buffer between the site and the residential area of Erskine Park.

This residential area is located about 375 metres to the west of the proposal site, and includes mainly low density lots on landform which rises to another local highpoint where there is a school, sporting fields and open space reserves (refer to Figure 4-1).

To the north, east and south of the proposal site, are the future industrial and commercial area of the WSEA. This area includes a wide transmission easement with several rows of transmission towers (lattice pylons) crossing the landscape in a north-south direction and connecting to the Sydney West substation to the south-east of the proposal site. The proposal site is surrounded by several industrial areas including, a working quarry and the Eastern Creek Industrial area about 700 metres to the east, the Oakdale Industrial Estate about one kilometre to the south, and Erskine Business Park about 500 metres to the south-west . These industrial areas include a range of large-scale warehouses and distribution centres with office premises.

The M4 Western Motorway is a major east west road corridor, located about 1.5 kilometres to the north of the proposal site. Lenore Drive and Old Wallgrove Road, located on the southern boundary of the Proposal site, is an east west route connecting west from the Westlink M7 (refer to Figure 4-1).

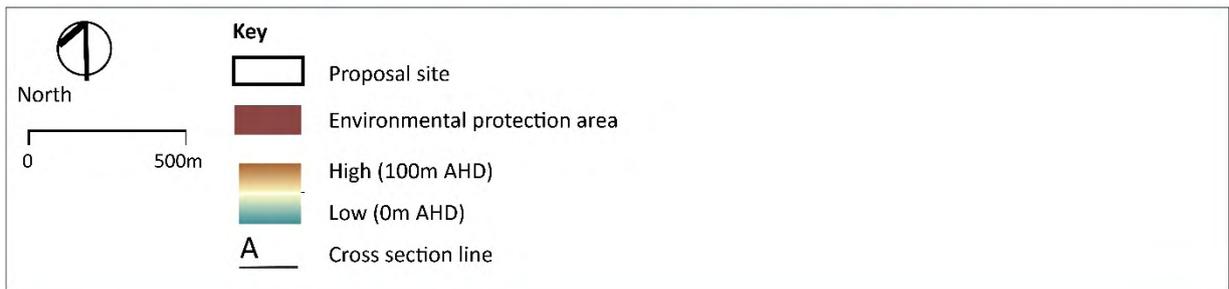
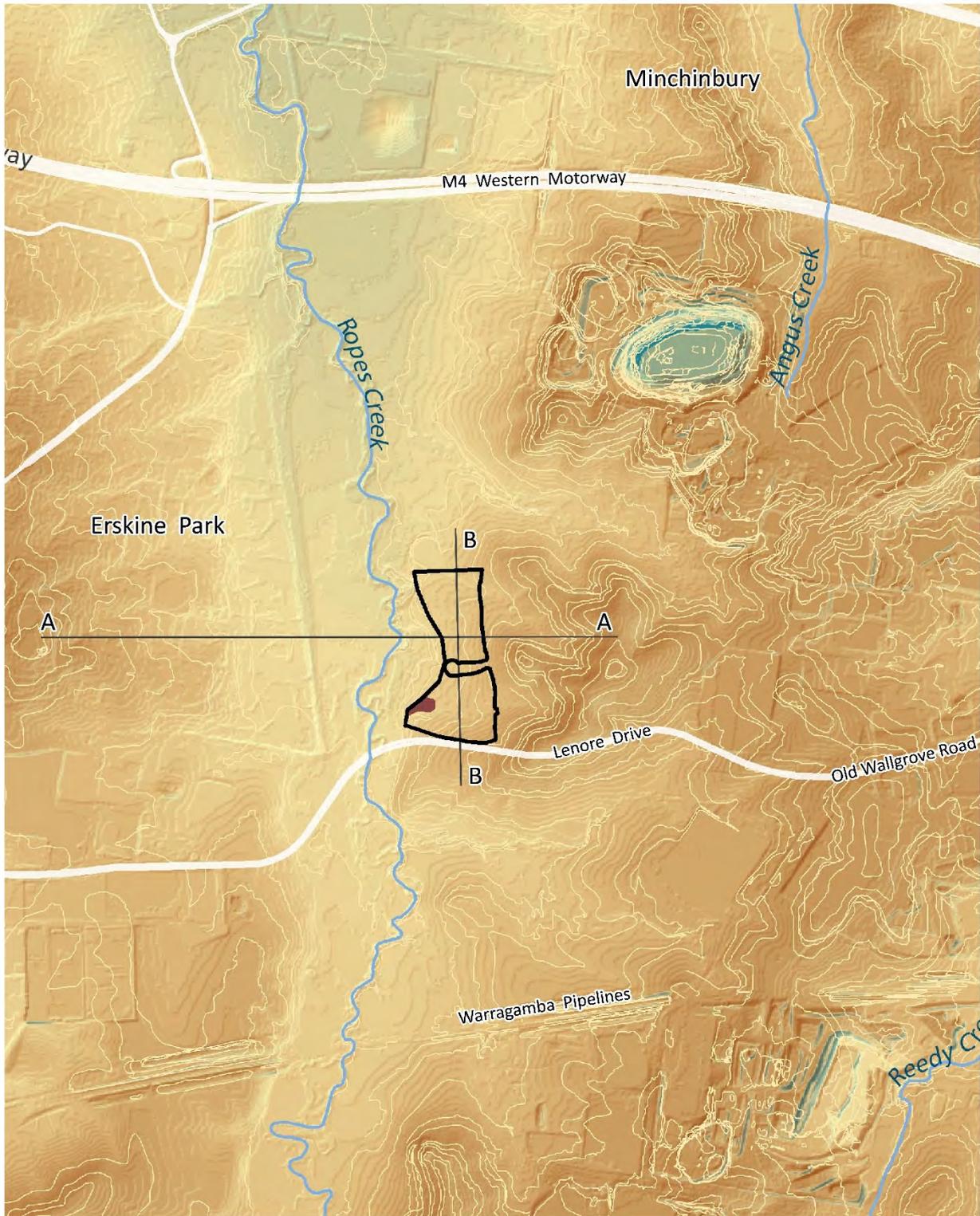


Figure 4-2 Topography

5. Impact assessment

The following section provides an assessment of the impact of the proposal on the landscape of the proposal site and surrounds (refer to Table 3-7 for impact levels).

5.1. Key assumptions

The following assumptions have informed this landscape assessment:

During construction:

- There would be earthworks required to form a series of large flat areas to accommodate the proposal
- All vegetation would be removed within the proposal site except for an area of riparian vegetation in the south-west (in the environmental protection area)
- Heavy vehicles would travel east of the proposal site along haulage routes including Lenore Drive, Old Wallgrove Road and Westlink M7
- Construction would generally occur during standard work hours (7am to 6pm Monday to Friday, 8am to 1pm Saturday, with no work on Sundays or during public holidays).

During operation:

- Sheds would enclose the pre-cast carousel and batch plant and be about eight to 10 metres tall
- The existing mound on the Lenore Drive frontage would be retained
- Concurrent operations of the northern and southern facilities has been assumed for the purposes of the assessment
- The proposal would operate 24 hours a day, seven days a week (i.e. day-time and night-time).

The cross-sections through the proposal site (refer to Figure 5-1 and Figure 5-2), illustrate the spatial relationship between elements within the proposal site and the relationship with adjacent uses.

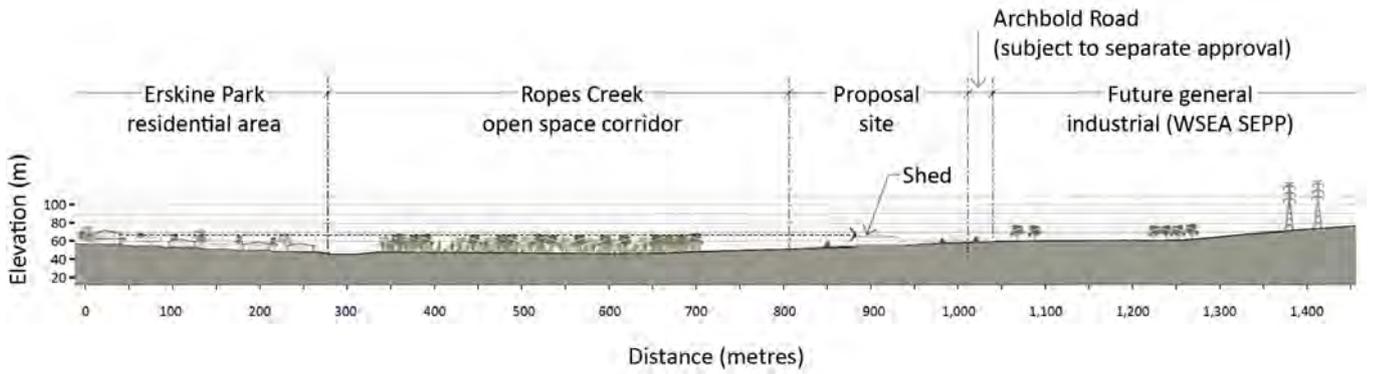


Figure 5-1 East-west cross section (A-A)

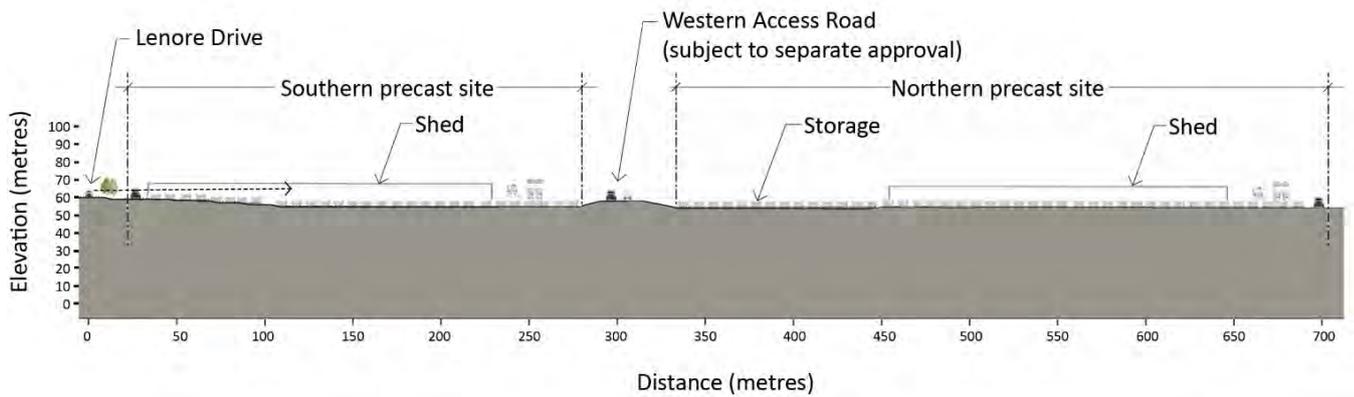


Figure 5-2 North-south cross section (B-B)

5.2. Landscape impact assessment

5.2.1. Impacts on the proposal site

Existing conditions: The proposal site has an open, undulating character with numerous tracks across the proposal site which appear to be informally used for unauthorised recreational off-road driving and motorcycling. There is no authorised public access to the proposal site. There are no buildings or structures on the proposal site, and there are some scattered trees as well as an area of the Coastal Valley Grassy Woodlands, an environmental protection area associated with Ropes Creek, which extends into the south east corner of the proposal site.

Sensitivity: The proposal site is not open to public use, however, there are some unauthorised recreational uses taking place on the site which likely attracts users from across the local area. The site is located adjacent to the Ropes Creek corridor, which encompasses '*land with scenic and landscape values*'; however, the site does not include any identified valuable scenic areas. An area of the Coastal Valley Grassy Woodlands does extend into the proposal site area and has been designated as an environmental protection area. Overall, the site has a **neighbourhood landscape sensitivity**.

Landscape impact during construction: While the vegetation within the environmental protection area in the south west of the proposal site would be retained, all other existing vegetation within the proposal site would be removed. Earthworks would be carried out across the proposal site and the landform would be shaped and levelled to create platforms to accommodate the northern and southern precast facilities and internal access roads.

Construction activities would include works to install sheds and canopies, and areas of levelled hardstand for segment storage, laydown and car parking areas.

Lenore Drive and the upgraded and extended Archbold Road (when completed by others) would be used for site access. A temporary haul road would be used prior to the completion of Archbold Road works. Heavy machinery and vehicles would be seen approaching the proposal site, loading and unloading equipment and buildings materials.

The proposal site and surrounding land to the north, south and east is zoned IN1 General industrial (under the WSEA SEPP) and would be expected to have a future character that would include large scale warehouses, depots and storage facility buildings.

The proposal site would be transformed from a predominantly open landscape to a working construction site. However, the earthworks and vegetation removal would be relatively minor, and the scale of the construction activities would be generally consistent with the adjacent working industrial areas to the east. Overall, there would be a noticeable reduction in the quality and character of this landscape, which is of neighbourhood sensitivity, and a **negligible landscape impact** during construction. Notwithstanding this, potential impacts during construction would be temporary in nature.

Landscape impact during operation: During operation, the proposal would transition from a construction site into a working industrial site with the northern and southern precast facilities operating side by side.

The proposal would include several large-scale industrial features, which would change the overall character of proposal site, including sheds, mobile gantry cranes and laydown and concrete segment storage areas. Concrete segment storage areas would include multiple stacked piles of concrete segments which would rise as they are stockpiled and then be progressively removed from proposal site.

While the sheds enclosing the precast plants would have a large footprint and visual bulk, they would be generally consistent with the large scale of the built form at nearby industrial sites at Eastern Creek. The movement of gantry cranes and loading of concrete segments onto trucks for transportation would activate the proposal site with continuous activity and movement above the proposal site. Heavy vehicles would also be seen along Lenore Drive and the identified haulage routes and also moving around the proposal site.

The introduction of two precast facilities and supporting infrastructure would change the landscape character from what currently exists, however, given the highly modified landscape character and desired future character of Ropes Creek precinct, the proposal would be consistent with the expected character of general industrial uses which is identified for the site in WSEA SEPP. Overall, there would be a noticeable reduction in the landscape character of the site, which is of neighbourhood landscape sensitivity, and a **negligible landscape impact** during operation.

5.3. Visual impact assessment

5.3.1. Impacts on daytime views

While the proposal site is somewhat open, it has a relatively limited visual catchment due to the local landform and vegetation within the visual study area.

A ridgeline to the east of the proposal site blocks views from the industrial areas in the east, which in turn limits broader views to the proposal site from further to the east.

Views across the proposal site from Lenore Drive are limited due to this ridgeline and some localised mounding along the road. There is a glimpsed view into the proposal site from the intersection of Lenore Drive and the future upgraded and extended Archbold Road, where there is a break in the mounding. Apart from this section of Lenore Drive, views from the south are limited, due to the lack of access in this location, including Sydney West Substation, transmission easements and privately owned vacant land.

The existing vegetation along Ropes Creek screens views from lower lying open space and residential areas to the east. The nearest residential properties are about 375 metres west of the proposal site, along Weaver Street and Pollux Close, in Erskine Park. These properties overlook Ropes Creek corridor, which would block

views to the ground level of the proposal site. The proposal site is likely to be visible, however, in the background of views from the more elevated residential areas to the west at Erskine Park, including properties to the west of Swallow Drive (about 675 metres from the proposal) and in the vicinity of Aquarius Crescent (about 775 metres from the proposal).

Views to the proposal site from the M4 Western Motorway, located about 1.5 kilometres to the north of the proposal site would be limited by intervening vegetation, landform and this distance.

Based on this analysis, the following viewpoints were selected as representative of views to the proposal:

- Viewpoint 1: View south from the M4 Western Motorway
- Viewpoint 2: View south-west from Hanson Place
- Viewpoint 3: View north-west from future upgraded and extended Archbold Road / Lenore Drive intersection
- Viewpoint 4: View north-east from Lenore Drive at the Ropes Creek crossing
- Viewpoint 5: View east from Aquarius Crescent, Erskine Park
- Viewpoint 6: View east from Park on Sennar Road, Erskine Park.

Figure 5-5 shows the location of the viewpoints.

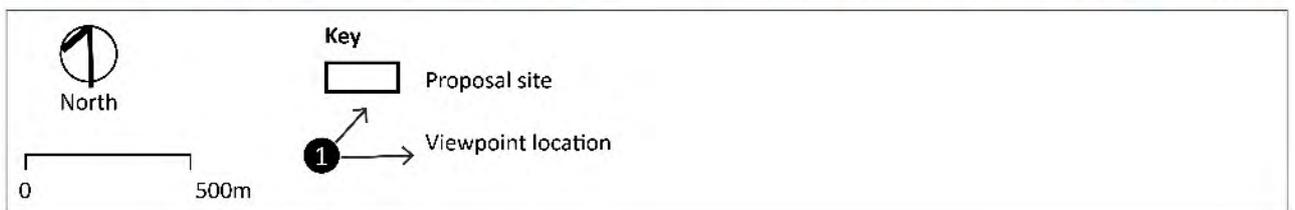
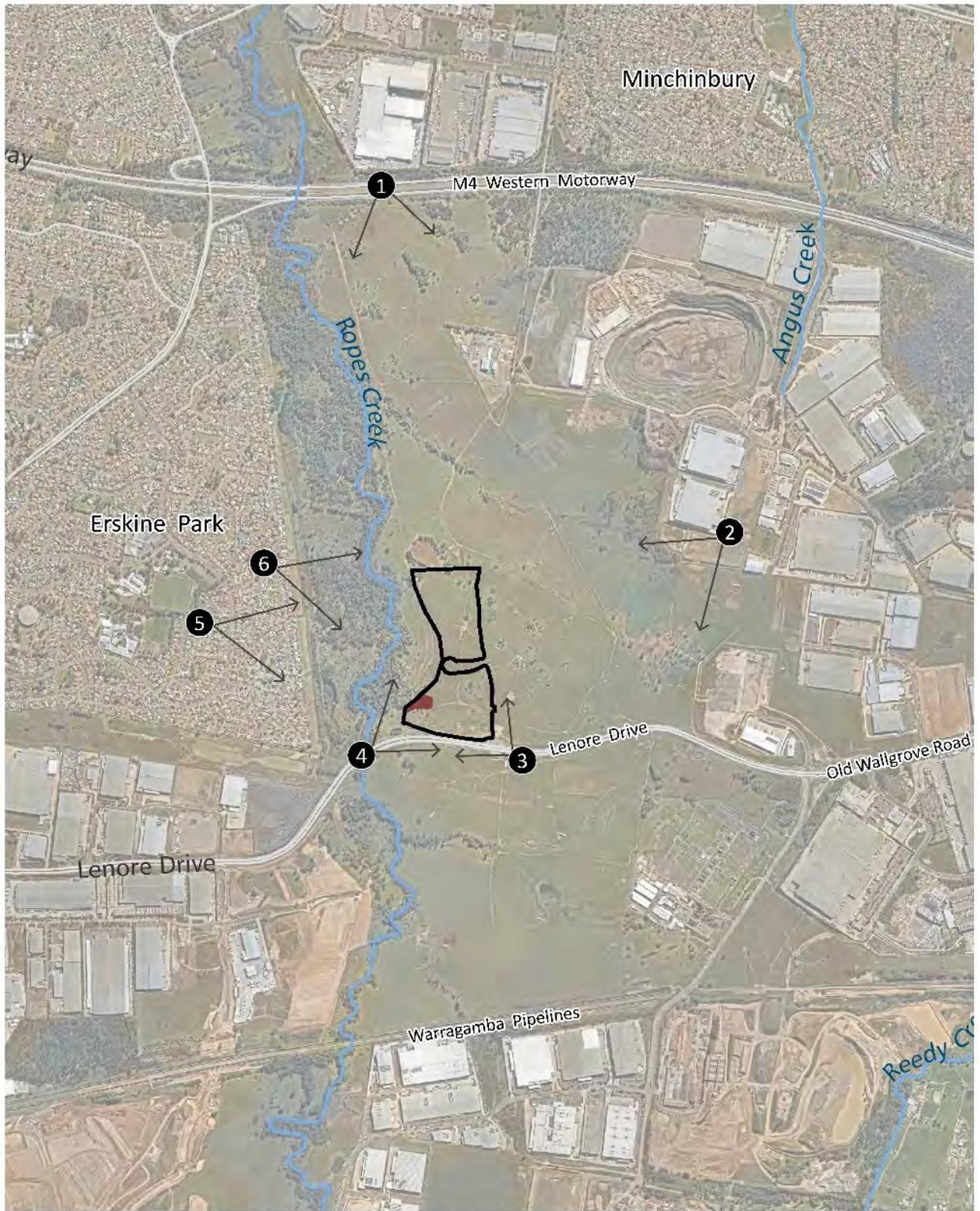


Figure 5-3 Viewpoint location plan

5.3.1.1. Viewpoint 1: View south from the M4 Western Motorway



Figure 5-4 Viewpoint 1: View south from the M4 Western Motorway

Existing conditions: This view is appreciated at speed by a large volume of road users travelling along the M4 Western Motorway. The surrounding landform is generally flat and low lying, typical of the floodplain surrounding Ropes Creek. The mature vegetation south of the road (centre of view) follows the creek and screens views into the residential areas of Erskine Park. The proposal site is located about 1.5 kilometres to the south of the motorway (left of view). A cluster of five large scale transmission line pylons can be seen in the centre of this view, forming a wide corridor of transmission lines which cross the motorway and traverse the plains beside Ropes Creek. These lines continue south towards the Sydney West Substation which is located to the south-east of the proposal site.

Sensitivity: Views from the M4 Western Motorway would be experienced by a large volume of road users moving along the highway at speed. Vegetation alongside the highway in this view is identified as having '*scenic and landscape values*' (Penrith City Council, 2010) and is zoned for environmental conservation (NSW State Government, 2009). The scenic qualities of this view are, however, considerably eroded by the visually prominent large-scale transmission infrastructure. Overall, this view is of **local visual sensitivity**.

Visual impact during construction: The proposal site would be located about 1.5 kilometres to the south of the motorway. Due to the distance and intervening vegetation and landform, views to the construction work would be limited. Any glimpses to the construction works would include the upper portions of the works to construct the sheds and other taller structures. These elements would be in the background of this view and glimpsed for a short duration from a vehicle. The

sequence of views along this motorway includes glimpses to other large-scale infrastructure and industrial development so that any visibility of the proposal site is likely to be absorbed into the character of this landscape.

Overall, due to the distance and visual compatibility of the construction work with the character of this emerging industrial precinct, there would be no perceived change in the amenity of this view. This is a view of local sensitivity and there would be a **negligible visual impact** from this location.

Visual impact during operation: The proposal may be visible in the background of this view, with the upper section of the taller elements potentially being seen in glimpsed views from the motorway. This would include the upper part of the sheds, silos and possibly the movement of gantry cranes shifting the precast segments. The vegetation along the creek in the vicinity of the motorway would remain and continue to contain views in this section of the view. Any glimpsed view would be seen for a short duration in a view that contains large scale power infrastructure and industrial development.

Due to the distance and compatibility of the proposal with the future desired character of the Ropes Creek Precinct, which is zoned for '*general industrial*' use (NSW State Government, 2009), there would be no perceived change in the amenity of this view. This is a view of local sensitivity and there would be a **negligible visual impact**.

5.3.1.2. Viewpoint 2: View southwest from Hanson Place



Figure 5-5 Viewpoint 2: View southwest from Hanson Place

Existing conditions: The middle ground of this view includes a ridgeline which conceals the proposal site. A corridor of transmission lines with multiple large-scale lattice pylons can be seen on this ridgeline, rising above the horizon and viewed amongst existing trees. The trees located along this ridge, and in the middle ground of this view, provide further filtering of views towards the site.

The view is more open to the south, (left and centre of view) where it has an industrial character, with existing industrial buildings on Old Wallgrove Road in the middle ground of the view, the Transgrid Sydney West Substation and the industrial areas of the Oakdale Industrial estate in the background. Beyond this industrial development there is a vegetated backdrop which encloses the view.

Sensitivity: Views from this location would generally be experienced by staff and visitors within the industrial estate. This is a highly modified view which includes several industrial uses and power infrastructure and therefore is considered to have a **neighbourhood visual sensitivity**.

Visual impact during construction: The precast facility site would be located about 900 metres to the southwest of this location, located mostly behind the ridgeline. Therefore, views to the ground level works, including site preparation and earthworks would not be seen from this location due to this intervening landform. Tall equipment used at the construction site, including cranes used to install the precast batch plants, boilers and sheds, may be visible rising above the ridgeline, however, these views would be filtered by patches of regrowth native trees along the ridgeline in the middle ground of view. These elements would also be seen in the context of a backdrop of industrial land uses, and the foreground which is zoned for future industry.

Overall, there is a limited visibility to the proposal site and a high visual absorption capacity for the proposed construction activity due to the existing industrial scale uses and presence of existing power infrastructure. This would result in a noticeable reduction in the amenity of this view, which is of neighbourhood visual sensitivity, and a temporary **negligible visual impact** during construction.

Visual impact during operation: The upper part of the stacked piles of concrete segments may be seen from this location, surrounding the precast shed which would include gantry cranes and sheds, boilers, aggregate bins and silos. These elements would be partly screened by the intervening landform and filtered by existing trees in the middle ground of the view. Trucks may be seen accessing the proposal site via Lenore Drive and the proposed upgrade and extension of Archbold Road, from a distance, left of view.

Due to the limited visibility of the proposal and the compatibility of the proposal with the existing and intended future industrial uses seen in the surrounding area, there would only be a noticeable reduction in the amenity of this view, which is of neighbourhood visual sensitivity, and a **negligible visual impact** during operation of the project.

5.3.1.3. Viewpoint 3: View northwest from future entry road



Figure 5-6 Viewpoint 3: Existing view northwest from future upgraded and extended Archbold Road / Lenore Drive intersection



Figure 5-7 Viewpoint 3: View northwest from future upgraded and extended Archbold Road / Lenore Drive intersection, indicative extent of proposal site (indicative location of site shown in yellow)

Existing conditions: This view is located at the intersection of Lenore Drive and the future upgraded and extended Archbold Drive, which would extend north (right of view) and connect with the M4 Western Motorway. This section of Lenore Drive consists of two lanes in each direction with a central median and a shared path for

pedestrians and cyclists along northern side of the road, adjacent to the proposal site. There are some existing street trees, mound and street lighting along this section of Lenore Drive (centre of view, behind parked truck). The southern part of the proposal site can be seen through a break in the landform (right of view) and is mostly cleared of vegetation. The landform of the proposal site falls to the west, towards Ropes Creek, and the backdrop of this view is formed by the existing vegetation along the creek corridor. The residential areas of Erskine Park are screened by this vegetation. There are glimpses to the Blue Mountains in the far background of this view along Lenore Drive (left of view).

In the future, the proposed upgrade and extension of Archbold Road would be seen to the north (right of view) with new street tree planting and native vegetation along the road batters.

Sensitivity: Views from this location would be experienced briefly from vehicles travelling at speed along Lenore Drive, and also from users of the adjacent shared path, along this road. This road is described as a '*vital east-west link connection for the Western Sydney Employment Area*' (Transport for NSW, 2017b). While this location has somewhat of a gateway function to the future Ropes Creek Precinct of Western Sydney Employment Area, and offers distant views to the Blue Mountains, it is of a large scale and passes through a predominantly industrial setting. Due to the number of potential receivers, this view is of **local visual sensitivity**.

Visual impact during construction: A construction site (for the proposal) would be established to the north of Lenore Drive, in the middle ground of this view (right of view). The existing shared pathway and street trees would be retained along Lenore Drive, providing some localised screening to the proposal site. Construction vehicles would be seen approaching the site along Lenore Drive and accessing the proposal site via the future upgraded and extended Archbold Road.

Construction of the southern part of the proposal would be seen in the middle ground of this view and would include site preparation activities including earthworks and civil construction activities, including the construction of roads and large areas of hardstand. The precast plant would be established in the centre of the southern facility site, including cranes and machinery used to install the acoustic sheds, boiler, aggregate bins and silos. These elements would obstruct views to the vegetation along Ropes Creek in the background of the view.

This view to a relatively open landscape with a vegetated backdrop would be converted into a large construction site. Due to the proximity and intensity of the construction activity, this would result in a noticeable reduction in the amenity of this view, which is of local sensitivity, and a temporary **minor adverse visual impact**.

Visual impact during operation: The construction site would become a working industrial site. Heavy and light vehicles would be seen approaching the proposal site from Lenore Drive and accessing the proposal site from the future upgraded and extended Archbold Road with new signalised intersections. The southern precast facility site would be seen in the middle ground of this view and include a shed in the centre of the proposal site, surrounded by outdoor storage areas with stacked

concrete segments. The upper part of silos may be seen rising above and beyond the sheds, in the background of view. The movement of gantry cranes shifting the precast segments and movement of trucks would activate this view. A site office and parking at the southern precast site would be seen at the entrance from the future upgraded and extended Archbold Road (refer to Figure 5-7).

The proposal would be seen within the context of existing and future industrial development and generally compatible with the scale and character of these uses. Due to the proximity of the proposal site, constant movement created by machinery and vehicles, and obstruction of the vegetated background to this view, there would be a noticeable reduction in visual amenity. This is a view of local visual sensitivity and this would result in a **minor adverse visual impact** during operation.

5.3.1.4. Viewpoint 4: View northeast from Lenore Drive at the Ropes Creek crossing



Figure 5-8 Viewpoint 4: View northeast from Lenore Drive at the Ropes Creek crossing



Figure 5-9 Viewpoint 4: View northeast from Lenore Drive at the Ropes Creek crossing (indicative location of site shown in yellow)

Existing conditions: In this location Lenore Drive includes two east bound lanes with a shared pedestrian and cycle pathway and two westbound lanes on twin bridges. The landform rises from Ropes Creek towards a local ridgeline in the background of view. This ridge conceals the existing low-rise industrial development located to the east of the proposal site. Existing transmission pylons and lines can be seen on this ridgeline and some scattered trees. Streetlights follow the road and there are some street trees on the northern verge of Lenore Drive along the proposal site. The existing vegetation alongside Ropes Creek is dense and screens views to most of the northern areas of the proposal site.

Sensitivity: Views from this location would be experienced from the footpath, bicycles and vehicles travelling along Lenore Drive. This route is identified as a '*vital east-west link connection for the Western Sydney Employment Area*' (Transport for NSW, 2017b). Vegetation alongside Ropes Creek seen in the foreground of this view, is identified as having '*scenic and landscape values*' (Penrith City Council, 2010) and zoned is for environmental conservation (NSW State Government, 2009). Due to the number of potential receivers on the road and pathway, and visual values of the existing vegetation, this view is of **local visual sensitivity**.

Visual impact during construction: A construction site for the southern precast facility would be established in the middle ground of view, north of Lenore Drive (centre of view). Construction vehicles would be seen travelling along Lenore Drive and accessing the site via the future upgraded and extended Archbold Road which would extend north along the eastern boundary of the proposal site. The existing street trees along Lenore Drive would filter views into the proposal site, however, earthworks and the construction of precast segment storage areas and the

southern shed in the centre on the southern precast site would be seen in the centre of this view. The northern areas of the proposal site would be screened by the existing vegetation alongside Ropes Creek which encloses this view.

Much of the proposal site would not be seen from this location due to the intervening vegetation, and construction activity on the proposal site would be consistent with the character expected in an area of general industrial zoning. Overall, there would be a noticeable reduction in the amenity of this view, which is of local visual sensitivity, and a temporary **minor adverse visual impact** during construction.

Visual impact during operation: The southern areas of the precast facility would be seen from this location, with much of the site screened by existing vegetation along Ropes Creek. The upper section stacked precast segments within the southern precast facility site would be seen to the north of Lenore Drive, and the upper section of the shed in this area of the site would rise above these segment storage areas. Heavy and light vehicles would be seen travelling along Lenore Drive and accessing the proposal site via the future upgraded and extended Archbold Road, which would be constructed and follow the eastern boundary of the proposal site. The northern precast facility would be screened from this view by intervening vegetation along Ropes Creek.

These elements would be seen in the context of existing large-scale power infrastructure, in the background of the view, and be generally consistent with the character expected of a general industrial land use.

Overall, due to the limited visibility and visual compatibility of the proposal with the intended future industrial use of the proposal site, there would be a noticeable reduction in the amenity of this view. This view is local visual sensitivity, and this would result in a **minor adverse visual impact** during operation.

5.3.1.5. Viewpoint 5: View east from Aquarius Crescent, Erskine Park



Figure 5-10 Viewpoint 5: View east from Aquarius Crescent, Erskine Park

Existing conditions: This view along Aquarius Crescent is framed by single and two storey houses set within leafy gardens. Aquarius Crescent rises to a local high point, near the local school, and offers elevated easterly views over Ropes Creek corridor towards the proposal site. The vegetation along Ropes Creek conceals a large part of the proposal site. The higher land (ridgeline) to the east of the proposal site can be seen in the background of this view, glimpsed between and above the existing vegetation. Transmission lines and pylons are located on this ridgeline, visible rising above the skyline.

Sensitivity: This view would be experienced by a concentration of residents and their visitors, in the vicinity of the adjacent schools. The vegetation along Ropes Creek corridor is a visual feature in the background of this view. This view is of **neighbourhood visual sensitivity**.

Visual impact during construction: The ground level works on the proposal site, including earthworks, civil works, building foundations, roads and hardstand area construction would be screened from view, however, the taller elements, including cranes and the acoustic sheds, would be seen in the gaps and rising above the vegetation along Ropes Creek, in the background of this view.

Overall, due to the distance and small extent of works that would be visible, there would be a noticeable reduction in the amenity of this view. This view is of neighbourhood visual sensitivity and there would be a temporary **negligible visual impact** during construction.

Visual impact during operation: During operation, the southern precast facility would be visible in the background of view, glimpsed through the gaps in the vegetation along Ropes Creek. The activity at ground level, and lower sections of the structures would be screened by the vegetation along Ropes Creek. However, the gantry cranes and upper part of the proposed shed may be seen above the tree

canopy. The northern precast facility would be screened from this view by intervening built form (houses within Erskine Park) and vegetation along Ropes Creek.

As the proposal is located in WSEA and zoned general industrial (WSEA SEPP); the scale of the proposal is consistent with the intended future use of the proposal site. The proposal is also seen in the context of the existing transmission lines and pylons which rise above the ridgeline, beyond the proposal site, and seen above the vegetation along the creek, crossing the view.

Due to the limited visibility and compatibility of the proposal with the surrounding context, there would only be a small magnitude of change which would result in a noticeable reduction in the amenity of this view. This view is of neighbourhood visual sensitivity and there would be a **negligible visual impact** during operation. Refer to Figure 5-1 which shows a cross section between Aquarius Crescent and the proposal site.

5.3.1.6. Viewpoint 6: View east from Park on Sennar Road, Erskine Park

Existing conditions: This locally elevated location offers views over the single and two storey houses within Erskine Park, towards Ropes Creek and the proposal site. The vegetation along Ropes Creek conceals a large part of the proposal site. The higher land (ridgeline) to the east of the proposal site can be seen in the background of this view, glimpsed above the existing vegetation. The existing transmission lines and pylons are located on this ridgeline and are a prominent feature visible on the skyline.

Sensitivity: This view would be experienced by recreational users of the park and playground. While the vegetation along Ropes Creek corridor is a visual feature in the background of this view, the character of the existing transmission lines detract from the amenity of this view. This view is of **local visual sensitivity**.

Visual impact during construction: The ground level works on the proposal site, including earthworks, civil works, building foundations, roads and hardstand area construction would be screened from view, however, the taller elements, including cranes and the acoustic sheds, would be seen in the gaps and rising above the vegetation along Ropes Creek, in the background of this view.

Overall, due to the distance and small extent of works that would be visible, there would be a noticeable reduction in the amenity of this view. This view is of local visual sensitivity and there would be a **minor adverse visual impact** during construction.

Visual impact during operation: During operation, the southern precast facility would be visible in the background of view, glimpsed through the gaps in the vegetation along Ropes Creek. The activity at ground level, and lower sections of the structures would be screened by the vegetation along Ropes Creek. There would be a glimpse to the gantry cranes and upper part of the proposed shed seen through the gaps in the tree canopy (refer to Figure 5-12).



Figure 5-11 Viewpoint 6: View east from Park on Sennar Road, Erskine Park



Figure 5-12 Viewpoint 6: View east from Park on Sennar Road, Erskine Park, indicative extent of the proposal site (indicative location of site shown in yellow)

As the proposal is located in WSEA and zoned general industrial (WSEA SEPP); the scale of the proposal is consistent with the intended future use of the proposal site, and areas to the east and north of the proposal site, which may also be seen in this view in the future. The proposal would also be seen in the context of the existing transmission lines and pylons which rise above the ridgeline, beyond the proposal site and detract from the amenity of this view.

Due to the limited visibility and compatibility of the proposal with the surrounding context, there would only be a noticeable reduction in the amenity of this view. This view is of local visual sensitivity and there would be a **minor adverse visual impact** during operation.

5.3.2. Assessment of night-time visual impact

Existing conditions: The proposal site is located in a setting of medium district brightness (A3) (refer to section 3.5.1 of this technical paper). While the proposal site is currently vacant, a range of light sources exist in the local area. These include security and outdoor lighting associated with the industrial development within Western Sydney Employment Area to the east and north of the site together with headlights from moving traffic and lighting along Lenore Drive in the south and the M4 Western Motorway to the north. There is a lower level of lighting within the residential areas of Erskine Park with local street lighting and lights from residences adding light to this area.

Some of the lighting would be contained by the existing vegetation along Ropes Creek, somewhat separating the lighting levels between the industrial areas and roads from the residential areas to the west. However, there would be a skyglow above the industrial areas that would be visible from within the industrial areas as well as from the residential areas of Erskine Park.

Visual impact during construction: Construction works would generally be carried out during standard construction hours. Generally, there would be low-level security lighting within the proposal site at night.

Overall, the construction site would result in new lighting at an unlit site. Although this additional lighting would be seen in the context of nearby lit industrial sites to the north, east and south, there would be no perceived reduction in the amenity of views in the local area at night. As this is a location of medium district brightness (A3) and of low sensitivity, this would result in a **negligible visual impact** at night.

Visual impact during operation: The proposal would operate 24 hours a day, seven days a week. Some lighting would be contained within the sheds, however, there would be additional light sources within the proposal site, at ground level, that would add to the brightness of the site. This would include the lighting from vehicles within the site and lighting along the internal access roads, car park and pathways. There would be directional task lighting in areas including the segment storage and gantry crane loading areas. There would also be general security lighting within the proposal site, such as around buildings and sheds, where required. This additional lighting would be viewed in the context of lighting along Lenore Drive and along the future upgraded and extended Archbold Road.

In views from the residential areas of Erskine Park there may be additional skyglow visible above the proposal site. However, this additional lighting would be seen in the context of the surrounding industrial areas and brightly lit roads such as Lenore Drive. It is not likely that there would be a perceived change in the amenity of views from this location.

Overall, there would be a noticeable reduction in the amenity of views at night during the operation of the proposal. As this is a location of medium district brightness (A3) and is of low sensitivity, this would result in a **minor adverse visual impact** at night.

5.3.3. Summary of landscape and visual impact

Table 5-1, Table 5-2 and Table 5-3 summarise the potential landscape and visual impacts of the proposal.

Table 5-1: Landscape impact summary

No.	Landscape	Sensitivity	Construction		Operation	
			Magnitude	Impact	Magnitude	Impact
1	Proposal site	Neighbourhood	Noticeable reduction	Negligible	Noticeable reduction	Negligible

Table 5-2: Daytime visual impact summary

	Location	Sensitivity	Construction		Operation	
			Magnitude	Impact	Magnitude	Impact
1	View south from the M4 Western Motorway	Local	No perceived change	Negligible	No perceived change	Negligible
2	View southwest from Hanson Place	Neighbourhood	Noticeable reduction	Negligible	Noticeable reduction	Negligible
3	View northwest from future entry road	Local	Noticeable reduction	Minor adverse	Noticeable reduction	Minor adverse
4	View northeast from Lenore Drive creek crossing	Local	Noticeable reduction	Minor adverse	Noticeable reduction	Minor adverse
5	View east from Aquarius Crescent, Erskine Park	Neighbourhood	Noticeable reduction	Negligible	Noticeable reduction	Negligible
6	View east from park on Sennar Road, Erskine Park	Local	Noticeable reduction	Minor adverse	Noticeable reduction	Minor adverse

Table 5-3: Night-time visual impact summary

	Location	Sensitivity	Construction		Operation	
			Magnitude	Impact	Magnitude	Impact
1	Proposal site	Low	No perceived change	Negligible	Noticeable reduction	Minor adverse

6. Mitigation and management measures

6.1. Construction management

Environmental management measures to be implemented during the construction phase of the proposal are listed in Table 6-1.

Table 6-1 Construction environmental management measures

No.	Impact	Mitigation measure
LV1	Visual impact	Where feasible and reasonable, the elements within construction site would be located to minimise visual impact (for example storing materials and machinery behind fencing).

6.2. Operational management

Environmental management measures to be implemented during the operational phase of the proposal are listed in Table 6-2.

Table 6-2 Operational environmental management measures

No.	Impact	Mitigation measure
LV2	Landscape and visual impact	Sheds would be finished in a colour which aims to minimise visual impacts, if visible from areas external to the site.
LV3	Lighting impacts	Lighting of the sites would be orientated to minimise glare and light spill impacts on adjacent receivers in accordance with AS4282:2019.

7. Conclusion

7.1. Impacts during construction

7.1.1. Landscape impact

There would be a **negligible landscape impact** during construction due to the limited vegetation removal and relatively minor earthworks that would be required across the proposal site for construction.

7.1.2. Visual impacts

The site has a relatively limited visual catchment due to a ridgeline to the east of the site, mounding along Lenore Drive and vegetation along Ropes Creek to the west of the proposal site.

During construction there would be temporary **negligible** visual impacts in views from the M4 Western Motorway in the north (refer to Viewpoint 1), and industrial areas to the east of the site (refer to Viewpoint 2). Views from the M4 Western Motorway would be limited by the distance, intervening vegetation and landform. Similarly, in views from the industrial areas to the east, the existing landform limits views to construction works on the proposal site. Furthermore, in these views, the proposal would be seen in the context of industrial land uses and existing energy infrastructure, increasing the capacity of these views to absorb the proposal.

There would also be temporary **minor adverse to negligible visual impacts** in views from the residential areas of Erskine Park due to the distance and screening effect of the vegetation along Ropes Creek (refer to Viewpoints 5 and 6).

There would be a temporary **minor adverse visual impact** in views from Lenore Drive, adjacent to the site (refer to Viewpoints 3 and 4). While the construction activity would be seen in close proximity of the site from this location, the existing mounding and proposed landscaping would screen the site, and the construction of the proposal would be seen in the context of industrial land uses and existing energy infrastructure, increasing the capacity of these views to absorb the proposal.

At night there would be a temporary **negligible visual impact** during construction as there would be limited night works required during construction and any minor lighting associated with the proposal would be absorbed into the setting which has a medium district brightness (A3) and low sensitivity.

7.2. Impacts during operation

7.2.1. Landscape impact

During operation there would be a **negligible landscape impact**. While the landscape character would be changed, given the highly modified landscape character and desired future character of Ropes Creek precinct, the proposal would be consistent with the general industrial uses identified for the proposal site.

7.2.2. Visual impacts

During operation there would be **minor adverse** and **negligible visual impacts** in views from the M4 Western Motorway in the north (refer to Viewpoint 1), and industrial areas to the east of the proposal site (refer to Viewpoint 2), and from the residential areas of Erskine Park (refer to Viewpoints 5 and 6). This is due to the mitigating effects of distance, landform and vegetation which would limit views to the operational proposal.

There would be a **minor adverse visual impact** in closer range views where more activity would be visible, such as from Lenore Drive, adjacent to the proposal site (refer to Viewpoint 3 and 4). Again, the local landform would restrict views into the site and the proposal would be seen in the context of industrial land uses and existing energy infrastructure, increasing the capacity of these views to absorb the proposal during its operation.

At night there would be a **minor adverse visual impact** during operation as the proposal would operate 24 hours a day, seven days a week. Some lighting would be contained in the sheds, however, the lighting within the proposal site would be seen from some locations and also add to the existing skyglow above this area.

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Appendix F

Statement of Heritage Impact

Sydney Metro West Eastern Creek Precast Facilities

Statement of Heritage Impact
FINAL

Report to Sydney Metro

Blacktown LGA

October 2020



 artefact

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EXECUTIVE SUMMARY

This Statement of Heritage Impact (SoHI) has been prepared by Artefact Heritage Services Pty Ltd (Artefact) on behalf of Sydney Metro (the proponent) in relation to construction and operation of two precast facilities and associated ancillary infrastructure (the proposal). The facilities would support the construction of Sydney Metro West.

A Review of Environmental Factors is being prepared for the proposal seeking approval under Part 5 of the *Environmental Planning and Assessment Act 1979*. The purpose of this SoHI is to support the Review of Environmental Factors for the proposal.

It was found that:

- There are no listed or potential items of heritage significance identified within the proposal site. As such, there would be no physical or visual impacts to heritage items as a result of the proposal
- The potential for archaeological remains has been identified within the north-east corner of the proposal site which is expected to be subject to physical impact by the proposed works, however these remains are not expected to reach the threshold for local significance
- The remainder of the proposal site has been assessed as having nil to low potential for twentieth century archaeological remains. Potential archaeological remains within the remainder of the proposal site are not expected to reach the threshold for local significance

The following recommendations are made:

- Archaeological remains identified within the north-east corner of the proposal site may be removed as required without further assessment or mitigation
- Unexpected finds must be managed in accordance with the Sydney Metro unexpected heritage finds procedure

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1.0 INTRODUCTION

1.1 Proposal background

This Statement of Heritage Impact (SoHI) has been prepared by Artefact Heritage Services Pty Ltd (Artefact) on behalf of Sydney Metro (the proponent) in relation to construction and operation of two precast facilities and associated ancillary infrastructure (the proposal). The facilities would support the construction of Sydney Metro West.

A Review of Environmental Factors is being prepared for the proposal seeking approval under Part 5 of the *Environmental Planning and Assessment Act 1979*. The purpose of this SoHI is to support the Review of Environmental Factors for the proposal.

1.2 Proposal site

The proposal site for this assessment consists of a portion of Lot 10 DP1157491. The proposal site is bounded by Lenore Drive to the south, Ropes Creek to the west and open grassland to the north and east (See Figure 1 and Figure 2).

1.3 Proposal description

Sydney Metro propose to construct and operate two adjacent precast facilities (the proposal) to support the construction of the proposed Sydney Metro West. The precast facilities which are the subject of this proposal would manufacture precast concrete segments for the purpose of lining the Sydney Metro West tunnels. The precast facilities would be able to be operated independently of each other. The proposal would comprise the following key features and activities:

- Site establishment at the proposal site at Eastern Creek including vegetation clearing, remediation, and earthworks
- The establishment and operation of two separate and adjacent precast facilities on the proposal site, the northern and southern precast facilities. Each precast facility would include:
 - A precast yard including a shed for construction of precast concrete segments and storage laydown areas
 - Boiler, aggregate bins and consumables
 - Office facilities
 - On-site parking for up to 60 light vehicles
- Internal roads with entrances to each facility from the Western Access Road located between the northern and southern precast facilities (external roads would be subject to separate approvals)
- Ancillary supporting infrastructure, including utilities installation (power, water, sewerage, gas and communications), lighting, signage and landscaping.

The northern and southern precast facilities would operate concurrently, 24 hours a day, seven days a week for the majority of the lifespan of the project.

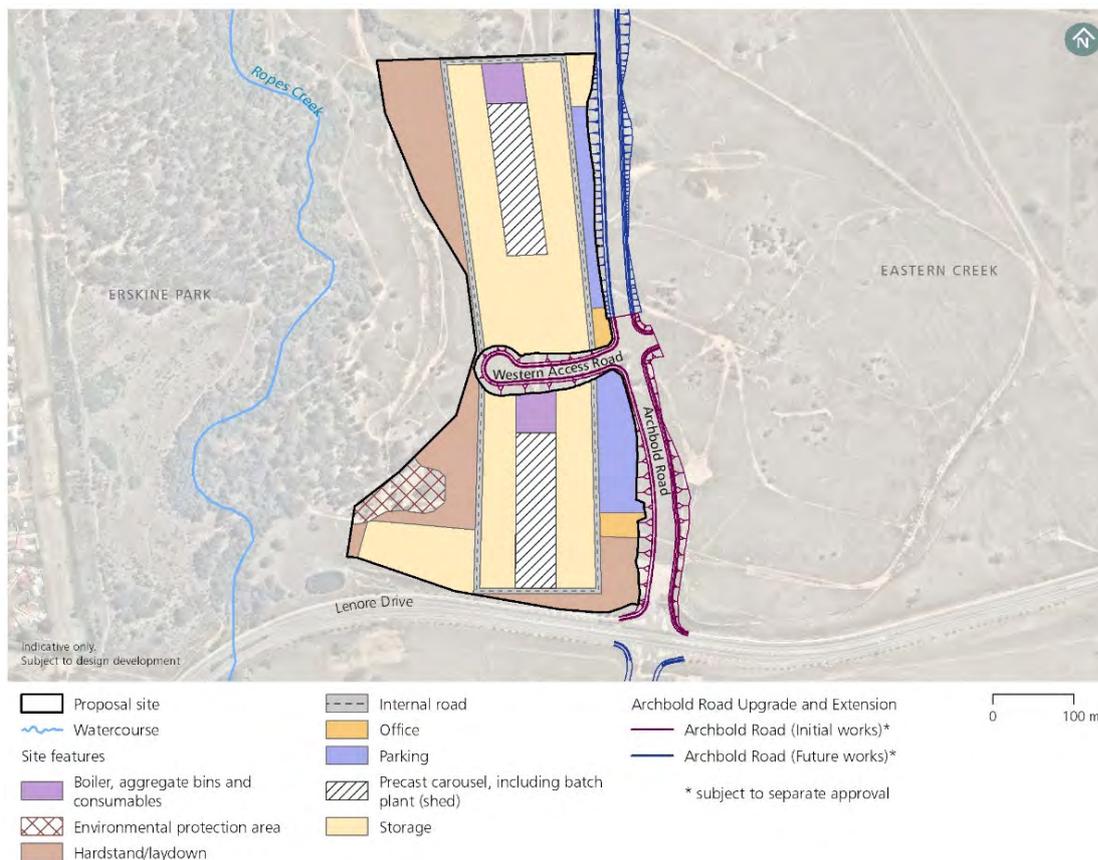


Figure 1: Overview of the proposal

1.4 Purpose and scope of this report

This technical paper is one of a number of technical papers that form part of the Review of Environmental Factors. The purpose of this technical paper is to identify and assess the potential impacts of the proposal in relation to non-Aboriginal heritage.

This report includes the following:

- Description of the proposal and identification of the proposal site
- Outline of relevant legislative context in relation to the proposal site
- Description of the methodology for heritage and archaeological assessment
- Overview of the historical context within the proposal site
- Assessment of historical archaeological potential
- Heritage impact assessment for heritage items and historical archaeological resources within the proposal site
- Conclusions and recommendations for heritage sites within the proposal site.

1.5 Authorship

This report was prepared by Jessica Horton (Heritage Consultant) and Alyce Haast (Senior Heritage Consultant). Management input and review was provided by Josh Symons (Principal) and Sandra Wallace (Director).



 **Proposal site**
20038 Pre-cast Facility
LGA: Blacktown

Scale: 1:4850
Size: A4
Date: 26-08-2020

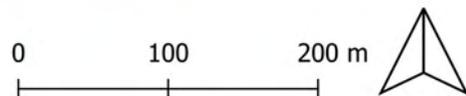


Figure 2: Proposal site

2.0 LEGISLATIVE CONTEXT

2.1 Introduction

A number of planning and legislative documents govern how heritage is managed in NSW and Australia. The following section provides an overview of the requirements under each as they apply to the proposal.

2.2 The World Heritage Convention

The Convention Concerning the Protection of World Cultural and National Heritage (the World Heritage Convention) was adopted by the General Conference of the United Nations Educational, Scientific and Cultural Organisation (UNESCO) on 16 November 1972, and came into force on 17 December 1975.

The World Heritage Convention aims to promote international cooperation to protect heritage that is of such outstanding universal value that its conservation is important for current and future generations. It sets out the criteria that a site must meet to be inscribed on the World Heritage List and the role of State Parties in the protection and preservation of world and their own national heritage.

No sites within or near the proposal site are included on the World Heritage List.

2.3 National and Commonwealth Legislation

2.3.1 *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places. These are defined in the EPBC Act as matters of national environmental significance. Under the EPBC Act, nationally significant heritage items are protected through listing on the Commonwealth Heritage List or the National Heritage List.

2.3.1.1 *Commonwealth Heritage List*

The Commonwealth Heritage List has been established to list heritage places that are either entirely within a Commonwealth area, or outside the Australian jurisdiction and owned or leased by the Commonwealth or a Commonwealth Authority. The Commonwealth Heritage List includes natural, Indigenous and historic heritage places which the Minister for Sustainability, Environment, Water, Population and Communities is satisfied have one or more Commonwealth Heritage values.

No sites within or near the proposal site are included on the Commonwealth Heritage List.

2.3.1.2 *National Heritage List*

The National Heritage List was established under the EPBC Act, which provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places.

No sites within or near the proposal site are included on the National Heritage List.

2.4 State Legislation

2.4.1 Heritage Act 1977

The *NSW Heritage Act 1977* (Heritage Act) is the primary piece of State legislation affording protection to heritage items (natural and cultural) in New South Wales (NSW). Under the Heritage Act, 'items of environmental heritage' include places, buildings, works, relics, moveable objects and precincts identified as significant based on historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic values. State significant items can be listed on the NSW State Heritage Register and are given automatic protection under the Heritage Act against any activities that may damage an item or affect its heritage significance.

The Heritage Act also provides protection for 'relics', which includes archaeological material or deposits. The protection of 'relics' under the Heritage Act is further explained in Section 2.4.1.2.

2.4.1.1 State Heritage Register

The State Heritage Register was established under Section 22 of the Heritage Act and is a list of places and objects of particular importance to the people of NSW, including archaeological sites. The State Heritage Register is administered by the Department of Premier and Cabinet – Heritage. This includes a diverse range of over 1,500 items, in both private and public ownership. To be listed, an item must be deemed to be of heritage significance for the whole of NSW.

No sites within or near the proposal site are included on the State Heritage Register.

2.4.1.2 Relics Provisions

The Heritage Act also provides protection for 'relics', which includes archaeological material or deposits. According to Section 139 (Division 9: Section 139, 140-146):

- (1) A person must not disturb or excavate any land knowingly or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, damaged or destroyed unless the disturbance is carried out in accordance with an excavation permit.
- (2) A person must not disturb or excavate any land on which the person has discovered or exposed a relic except in accordance with an excavation permit.
- (3) This section does not apply to a relic that is subject to an interim heritage order made by the Minister or a listing on the State Heritage Register.
- (4) The Heritage Council may by order published in the Gazette create exceptions to this section, either unconditionally or subject to conditions, in respect of any of the following:
 - a. Any relic of a specified kind or description,
 - b. Any disturbance or excavation of a specified kind or description,
 - c. Any disturbance or excavation of land in a specified location or having specified features or attributes,
 - d. Any disturbance or excavation of land in respect of which an archaeological assessment approved by the Heritage Council indicates that there is little likelihood of there being any relics in the land.

Section 4 (1) of the Heritage Act (as amended in 2009) defines a relic as:

...any deposit, artefact, object or material evidence that:

relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and is of State or local heritage significance

A relic has been further defined as:

Relevant case law and the general principles of statutory interpretation strongly indicate that a 'relic' is properly regarded as an object or chattel. A relic can, in some circumstances, become part of the land be regarded as a fixture (a chattel that becomes permanently affixed to land).¹

Excavation permits are issued by the NSW Heritage Council, or its delegate, under Section 140 of the Heritage Act for relics not within State Heritage Register listed curtilages or under Section 60 for significant archaeological remains within State Heritage Register curtilages. An application for an excavation permit must be supported by an Archaeological Research Design and Archaeological Assessment prepared in accordance with the NSW Heritage Council archaeological guidelines. Minor works that will have a minimal impact on archaeological relics may be granted an exception under Section 139 (4) or an exemption under Section 57 (2) of the Heritage Act.

2.4.1.3 Works

The Heritage Act implies that 'works' are a separate category to archaeological 'relics'. 'Works' refer to remnants of historical structures which are not associated with artefactual material that may possess research value. 'Works' may be buried, and therefore archaeological in nature, however, exposure of a 'work' does not require approved archaeological excavation permits under the Heritage Act.

The following examples of remnant structures have been considered to be 'works' by the Department of Premier and Cabinet – Heritage:

- Former road surfaces or pavement and kerbing.
- Evidence of former drainage infrastructure, where there are no historical artefacts in association with the item.
- Building footings associated with former infrastructure facilities, where there are no historical artefacts in association with the item.
- Evidence of former rail track, sleepers or ballast.

Where buried remnants of historical structures are located in association with historical artefacts in controlled stratigraphic contexts (such as intact historic glass, ceramic or bone artefacts), which have the potential to inform research questions regarding the history of a site, the above items may not be characterised as 'works' and may be considered to be 'relics'. The classification of archaeological remains as a 'work' therefore is contingent on the predicted remains being associated with historical structures as well as there being no prediction of the recovery of intact artefactual deposits which may be of research interest.

2.4.1.4 Section 170 registers

Under the Heritage Act all government agencies are required to identify, conserve and manage heritage items in their ownership or control. Section 170 (s170) requires all government agencies to maintain a Heritage and Conservation Register that lists certain classes of heritage assets identified

¹ *Assessing Significance for Archaeological Sites and 'Relics'*, Heritage Branch, Department of Planning, 2009:7.

in Section 22(1) of the Heritage Regulation 2012. They must ensure that these assets are maintained with due diligence in accordance with State Owned Heritage Management Principles approved by the Government on advice of the Department of Premier and Cabinet – Heritage. These principles serve to protect and conserve the heritage significance of items and are based on NSW heritage legislation and guidelines.

No s170 listed heritage items have been located within or in proximity to the proposal site.

2.4.2 *Environmental Planning and Assessment Act 1979*

The *Environmental Planning and Assessment Act 1979* (EP&A Act) establishes the framework for cultural heritage values to be formally assessed in the land use planning and development consent process. The EP&A Act requires that environmental impacts are considered prior to land development; this includes impacts on cultural heritage items and places as well as archaeological sites and deposits.

The EP&A Act also requires that local governments prepare planning instruments (such as Local Environmental Plans) in accordance with the EP&A Act to provide guidance on the level of environmental assessment required.

The proposal site is within the Blacktown Local Government Area (LGA) and is subject to the Blacktown Local Environment Plan 2015 and the *State Environmental Planning Policy (Western Sydney Employment Area) 2009*.

No heritage listed items located on the Blacktown Local Environment Plan have been located within or in the vicinity of the proposal site.

2.5 Non-Statutory Considerations

2.5.1 *Register of the National Estate*

The Register of the National Estate is a list of natural, Aboriginal and historic heritage places throughout Australia. It was originally established under the *Australian Heritage Commission Act 1975*. Under that Act, the Australian Heritage Commission entered more than 13,000 places in the register. The Register of the National Estate is no longer a statutory list; however, it remains available as an archive.

There are no heritage listed items listed on the Register of the National Estate located within or in the vicinity of the proposal site.

2.5.2 *National Trust of Australia (NSW)*

The National Trust of Australia is a community-based, non-government organisation committed to promoting and conserving Australia's Indigenous, natural and historic heritage. The National Trust Register was established in 1949. It is a non-statutory register.

There are no items listed on the National Trust of Australia register located within or in the vicinity of the proposal site.

3.0 ASSESSMENT METHODOLOGY

3.1 The proposal site

The proposal site encompasses the extent of both precast facilities (Figure 2).

3.2 Identification of heritage listed items

A heritage register search was carried out on 8 April 2020. A search of the following State and Commonwealth statutory registers was undertaken, including:

- World Heritage List
- Commonwealth Heritage List
- National Heritage List
- State Heritage Register
- Blacktown Local Environment Plan 2015
- Section 170 Heritage and Conservation Registers for Sydney Water, Roads and Maritime, RailCorp, Department of Health, NSW Police Service
- NSW State Heritage Inventory database

No listed heritage items are located within or in the vicinity of the proposal site.

A search of nominated heritage places for the World Heritage List, National Heritage List and Commonwealth Heritage List was undertaken on 8 March 2020. No nominated heritage places or items are located within or in the vicinity of the proposal site.

3.3 Site inspection

Two site inspections were undertaken of the proposal site to identify potential unlisted heritage items and identify evidence of archaeological remains. The inspections were undertaken on foot, using physical maps and GPS. Photographs were taken to record different aspects of the site including vegetation, levels of disturbance and any areas of archaeological sensitivity.

A summary of the site inspection is provided in Section 5.

3.4 Significance assessments

3.4.1 NSW heritage assessment criteria

Cultural significance is defined in Article 1.2 of the *Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance 2013* (Burra Charter) (ICOMOS (Australia), 2013) as meaning “aesthetic, historic, scientific, social or spiritual value for past, present or future generations”. Cultural significance may be derived from a place’s fabric, association with a person or event, or for its research potential. The significance of a place is not fixed for all time, and what is of significance to us now may change as similar sites are located, more historical research is undertaken, and community tastes change.

Determining the significance of heritage items or a potential archaeological resource is undertaken by utilising a system of assessment centred on the Burra Charter by the International Council on

Monuments and Sites (ICOMOS). The principles of the Burra Charter are relevant to the assessment, conservation and management of sites and relics. The assessment of heritage significance is outlined through legislation in the Heritage Act and implemented through the *NSW Heritage Manual* and the *Archaeological Assessment Guidelines* (NSW Heritage Office and NSW Department of Urban Affairs and Planning 1996).²

If an item meets one of the seven heritage criteria, and retains the integrity of its key attributes, it can be considered to have heritage significance. The significance of an item or potential archaeological site can then be assessed as being of local or state significance. If a potential archaeological resource does not reach the local or state significance threshold, then it is not classified as a relic under the Heritage Act.

'State heritage significance', in relation to a place, building, work, relic, moveable object or precinct, means significance to the State in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item.

'Local heritage significance', in relation to a place, building, work, relic, moveable object or precinct, means significance to an area in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item.³

The overall aim of assessing archaeological significance is to identify whether an archaeological resource, deposit, site or feature is of cultural value. The assessment will result in a succinct statement of heritage significance that summarises the values of the place, site, resource, deposit or feature.

The heritage significance assessment criteria were taken into consideration during the preparation of the non-Aboriginal heritage impact assessment for the proposal.

Where identified, each listed or unlisted potential heritage item, or potential archaeological remain is assessed against the seven criteria outlined in Table 1.

Table 1: NSW heritage assessment criteria

Criteria	Description
A – Historical significance	An item is important in the course or pattern of the local area or states cultural or natural history.
B – Associative significance	An item has strong or special associations with the life or works of a person, or group of persons, of importance in the local area's or State's cultural or natural history.
C – Aesthetic significance	An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in the local area or state.
D – Social significance	An item has strong or special association with a particular community or cultural group in the local area or state for social, cultural or spiritual reasons.
E – Research potential	An item has potential to yield information that will contribute to an understanding of the local area's or State's cultural or natural history.

² Heritage Office and Department of Urban Affairs and Planning 1996. *NSW Heritage Manual*; 25-27

³ This section is an extract based on the Heritage Office Assessing Significance for Historical Archaeological Sites and Relics 2009:6.

Criteria	Description
F – Rarity	An item possesses uncommon, rare or endangered aspects of the local area's or State's cultural or natural history.
G - Representativeness	An item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places of cultural or natural environments (or the cultural or natural history of the local area or state).

3.5 Heritage impact assessment

This heritage impact assessment has been prepared using the *Statement of Heritage Impact* (NSW Heritage Office 2002) guideline, contained within the *NSW Heritage Manual*.

Impacts on heritage significance are identified as either:

- Physical impacts, resulting in the demolition or alteration of fabric of heritage significance or significant archaeological remains
- Visual impacts, resulting in changes to the setting or curtilage of heritage items or places, historic streetscapes and landscapes, visual amenity or views
- Impacts from vibration, subsidence, architectural noise treatment and demolition of adjoining structures.

Once levels of all three types of impacts are assessed, adverse and positive impacts to aspects of significance are balanced to assess an overall level of impact to the heritage significance of the listed item as a result of the proposal. Where impacts to heritage significance are assessed as major, discussion is provided on whether the item would continue to meet the threshold of significance necessary for heritage listing.

Specific terminology and corresponding definitions are used in this assessment to consistently identify the magnitude of the proposal's physical or visual impact or the potential for vibration and settlement to impact on heritage items or archaeological remains. The terminology and definitions are based on those contained in guidelines produced by the ICOMOS⁴ and are shown in Table 2.

Table 2: Terminology for assessing the magnitude of heritage impact

Magnitude	Definition
Major	Actions that would have a long-term and substantial impact on the significance of a heritage item. Actions that would remove key historic building elements, key historic landscape features, or significant archaeological materials, thereby resulting in a change of historic character, or altering of a historical resource. These actions cannot be fully mitigated.
Moderate	This would include actions involving the modification of a heritage item, including altering the setting of a heritage item or landscape, partially removing archaeological resources, or the alteration of significant elements of fabric from historic structures. The impacts arising from such actions may be able to be partially mitigated.

⁴ Including the document *Guidance on Heritage Impact Assessments for Cultural World Heritage Properties*, ICOMOS, January 2011.

Magnitude	Definition
Minor	Actions that would result in the slight alteration of heritage buildings, archaeological resources, or the setting of an historical item. The impacts arising from such actions can usually be mitigated.
Negligible	Actions that would result in very minor changes to heritage items.
Neutral	Actions that would have no heritage impact.

3.6 Non-Aboriginal archaeological assessment

An overview approach to the identification of potential archaeological resources has been adopted in this SoHI. Historical archaeological potential is defined as the potential of a site to contain significant archaeological remains, including works or relics as identified in the Heritage Act. The assessment of historical archaeological potential is based on the identification of former land uses and evaluating whether subsequent actions (either natural or human) may have impacted on archaeological evidence for these former land uses. Knowledge of previous archaeological investigations, understanding of the types of archaeological remains likely to be associated with various land uses, and the results of site inspection are also taken into consideration when evaluating the potential of an area to contain archaeological remains.

3.6.1 Assessment of archaeological potential

The potential for the survival of archaeological relics in a particular place is significantly affected by activities which may have caused ground disturbance. These processes include the physical development of the site (for example, phases of building construction) and the activities that occurred there. The likelihood for the survival of these relics (i.e. their archaeological potential) is distinct from the archaeological/heritage significance of these remains, should any exist. For example, there may be 'low potential' for certain relics to survive, but if they do, they may be assessed as being of State significance.

Identification of the potential historical archaeological resource of the proposal site is based on the review and understanding of its land use and development (site formation processes) through historical research, and evaluating whether subsequent actions (either natural or human) may have impacted on evidence of former land use phases.

The grades of archaeological potential are outlined below in Table 3.

Table 3: Grades of archaeological potential⁵

Grading	Justification
Nil	No evidence of historical development or use, or where previous impacts such as deep basement structures would have removed all archaeological potential
Low	Research indicates little or low intensity historical development, or where there have been substantial previous impacts, disturbance and truncation in locations where some archaeological remains such as deep subsurface features may survive
Moderate	Analysis demonstrates known historical development and some previous impacts, but it is likely that archaeological remains survive with some localised truncation and disturbance
High	Evidence of multiple phases of historical development and structures with minimal or localised twentieth century development impacts, and it is likely the archaeological resource would be largely intact.

3.6.2 Research potential and archaeological significance

Archaeological assessments of significance presented here are preliminary in nature and based on the potential archaeological remains present within the proposal site. Where potential archaeological remains have been identified the archaeological significance of the remains has been assessed against the NSW Heritage Assessment Criteria. The assessment is informed by the NSW Heritage Division's *Assessing Significance for Historical Archaeological Sites and Relics* (NSW Heritage Division 2009).

Assessing significance for archaeological sites can be difficult, in that the extent and nature of the remains is generally unknown and value judgements based on potential or expected attributes need to be made. Heritage significance in NSW is assessed using the Heritage Council of NSW's seven specific criteria based on the principles of the Burra Charter. How these apply to archaeological heritage assessment is further explained in *'Assessing Significance for Historical Archaeological Sites and Relics'* guidelines from the NSW Heritage Manual (2009). Consideration of the research potential of an archaeological resource is necessary in determining archaeological significance. In addition, the expected intactness or integrity of an archaeological resource influences the evaluation of research potential and significance.

In 1984, Bickford and Sullivan examined the concept and assessment of archaeological research potential; that is, the extent to which archaeological resources can address research questions. They developed three questions which can be used to assess the research potential of an archaeological site:

- Can the site contribute knowledge that no other resource can?
- Can the site contribute knowledge that no other site can?
- Is this knowledge relevant to:
 - General questions about human history?
 - Other substantive questions relating to Australian history?
 - Other major research questions?

In the 2009 guidelines *Assessing Significance for Historical Archaeological Sites and 'Relics'*, the NSW Heritage Division has since provided a broader approach to assessing the archaeological significance of sites, which includes consideration of a site's intactness, rarity, representativeness,

⁵ Heritage Division, 2009. *Assessing Significance for Historical Archaeological Sites and Relics*.

and whether many similar sites have already been recorded, as well as other factors. This document acknowledges the difficulty of assessing the significance of potential subsurface remains, because the assessment must rely on predicted rather than known attributes.⁶

⁶ NSW Heritage Branch 2009

4.0 HISTORICAL CONTEXT

4.1 Aboriginal occupation and early European contact

Prior to the appropriation of their land by Europeans, Aboriginal people lived in small family or clan groups that were associated with particular territories or places. It seems that territorial boundaries were fairly fluid, although details are not known. The language group spoken on the Cumberland Plain is known as Darug (Dharruk – alternative spelling).

This term was used for the first time in 1900⁷ as before the late 1800s language groups or dialects were not discussed in the literature.⁸ The Darug language group is thought to have extended from Appin in the south to the Hawkesbury River, west of the Georges River, Parramatta, the Lane Cove River and to Berowra Creek.⁹ This area was home to a number of different clan groups throughout the Cumberland Plain.

British colonisation had a profound and devastating effect on the Aboriginal population of the Sydney region, including Darug speakers. In the early days of the colony Aboriginal people were disenfranchised from their land as the British claimed areas for settlement and agriculture. The colonists, often at the expense of the local Aboriginal groups, also claimed resources such as pasture, timber, fishing grounds and water sources. Overall, the devastation of the Aboriginal culture did not come about through war with the British, but instead through disease and forced removal from traditional lands. It is thought that during the 1789 smallpox epidemic over half of the Aboriginal people of the Sydney region died. The disease spread west to the Darug of the Cumberland Plain and north to the Hawkesbury. It may have in fact spread much further afield, over the Blue Mountains.¹⁰ This loss of life meant that some of the Aboriginal groups who lived away from the coastal settlement of Sydney may have disappeared entirely before Europeans could observe them or record their clan names.¹¹

The British initially thought that Aboriginal people were confined to the coast taking advantage of the abundant marine resources available. The first major recorded expeditions west of Sydney did not witness any Aboriginal people, but evidence of their existence was noted. In April 1788, Governor Philip led an expedition west to Prospect Hill, approximately ten kilometres east of the proposal site. It was noted,

...that these parts are frequented by the natives was undeniably proved by the temporary huts which were seen in several places. Near one of these huts, the bones of kangaroo were found, and several trees were seen on fire.¹²

It wasn't until rural settlement began in the western Cumberland Plain, during the 1790s, that Aboriginal groups in this region came into regular and permanent contact with British colonists. Relations quickly disintegrated, and tensions over land and resources spilled over. Governor King

⁷ Matthews, R.H. and Everitt, M.M. 1900. "The organisation, language and initiation ceremonies of the Aborigines of the south-east coast of N.S. Wales." *Journal and Proceedings of the Royal Society of NSW* 34: 262-281.

⁸ Attenbrow, V. 2010. *Sydney's Aboriginal Past: Investigating the Archaeological and Historical Records* University of New South Wales Press Ltd, Sydney.

⁹ *ibid*

¹⁰ Butlin, N. G. (Noel George) & Australian National University (1985). *Australian national accounts 1788-1983*. Australian National University, Canberra

¹¹ Karskens, G. 2010. *The Colony: a history of early Sydney*. Crow's Nest, N.S.W., Allen & Unwin.

¹² (1788). *Historical records of New South Wales*. [Vol.1, part 2]. Phillip, 1783-1792. Lansdown Slattery & Co, Mona Vale, N.S.W

sanctioned the shooting of Aboriginal peoples in a General Order made in 1801.¹³ Intermittent killings on both sides continued for over 15 years, including the Appin massacre and attacks at South Creek in 1816.^{14,15}

4.2 Early European exploration and land grants

European exploration in the Prospect area began on 26 April 1788, when Governor Arthur Phillip led an expedition party west from Sydney Cove, climbing what would later be known as Prospect Hill (approximately ten kilometres east of the proposal site).¹⁶ From here, Phillip stated that he was able to view 'for the first time since we landed, Carmarthen Hills'¹⁷, later known as the Blue Mountains. At this time, Phillip named the hill 'Bellevue'. The hill was an exceptional vantage point, used by expedition parties as a reference point.

In 1789, Captain Watkin Tench made an official journey west, using Prospect Hill as a reference. He was taken by the beauty of the rugged Blue Mountains to such a degree that the hill became known as Tench's Prospect Hill, later shortened to Prospect.¹⁸

Following the agricultural success at James Ruse and Rose Hill within the early years of settlement, Phillip placed a farming settlement of at least twelve families encircling Prospect Hill in 1791.¹⁹ The grants were mostly 30 acres each and settlers included William Butler, James Castle, Samuel Griffiths, John Herbert, George Lisk, Joseph Morely, John Nicols, William Parish and Edward Pugh.

Land parcels in and around the proposal site were also granted during this time. The land in which the proposal site resides forms part of the original 1100-acre land granted to John Thomas Campbell in 1819 (Figure 3).²⁰ Campbell would go on to name the property 'Mount Philo', presumably after the Philo Free trial of 1817, which saw Campbell sued by Reverend Samuel Marsden after a letter vilifying the Reverend was published in the first issue of the Sydney Gazette. Rev. Marsden accused Campbell of penning and publishing the letter under an alias ('Philo Free'), an accusation that saw damages paid to Rev. Marsden in the amount of 200 pounds.²¹

Other notable grants included James Erskine's 3000 acres to the west of the proposal site and across Ropes Creek in 1818.²² Additional grants surrounding the proposal site included 50 acres to Joseph Kearns, George Smith, Pearce Collets, Thomas Howard and John Watts; and 60 acres to Richard Partridge. By 1820, much of the land within the area had been cleared, and a number of further land grants made.

¹³ Kohen, J.L. 1986. An Archaeological Study of Aboriginal Sites Within the City of Blacktown, Blacktown City Council.

¹⁴ Kohen 1986: 23

¹⁵ Karskens 2010: 225

¹⁶ OEH, 2001. 'Prospect Reservoir and surrounding area'. Accessed online 27 February 2020, <https://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=5045336>

¹⁷ Governor Arthur Phillip 'Sydney Cove New South Wales', Letter to Lord Sydney, 15 May 1788.

¹⁸ Frances Pollon, 1991. *The Sydney Book of Suburbs*. NSW: Collins Angus & Robertson Publishers Australia, p. 210.

¹⁹ Pollon, 1991. *The Sydney Book of Suburbs*, p. 210.

²⁰ NSWLRS. RPA52819

²¹ MAGAZINE (1992, September 5). The Canberra Times (ACT: 1926 - 1995), p. 4 (Saturday Magazine).

Retrieved April 1, 2020, from <http://nla.gov.au/nla.news-article126940871>

²² Navin Officer. 2006. Cultural Heritage Assessment. Historic Site EPRCH5 Ropes Creek, Western Sydney.



Figure 3: Melville parish map, n.d. Approximate location of the proposal site highlighted in red. Source: Historical Land and Property Viewer.

4.3 The Campbell Estate

In 1832, the parcel was sold on to Charles Roberts and his wife Margaret.²³ The Roberts' retained the land for over 20 years, until 1856 when they sold the property to Thomas William Shepherd, David Shepherd and Patrick Lindsay Crawford Shepherd.²⁴ The Shepherd brothers would go on to combine the land with their portion of the Erskine Park Estate to the west of Ropes Creek and opened "Chatsworth Nursery", a family extension from Darling Nursery in Chippendale which was opened by the family patriarch, Thomas Shepherd.²⁵

The early years of the nursery were prosperous, and the land harvested an array of fruits, vegetables, plants and flowers.²⁶ An 1887 newspaper account (Figure 4) of the nursery paints the surrounding landscape as:²⁷

The nursery gardens are some three miles from the station, and are reached by a bush track, which, crossing the now-deserted Western road, meanders through half-cleared country that rolls greenly underfoot, rising and falling like the broad

²³ NSWLRS. 145656-48252-1

²⁴ *ibid*

²⁵ Darling Nursery and Chatsworth. (1872, July 20). Australian Town and Country Journal (Sydney, NSW: 1870 - 1907), p. 12. Retrieved April 1, 2020, from <http://nla.gov.au/nla.news-article70495913>

²⁶ Shepherd and Co.'s Catalogue. (1894, March 17). The Sydney Mail and New South Wales Advertiser (NSW: 1871 - 1912), p. 530. Retrieved April 1, 2020, from <http://nla.gov.au/nla.news-article163331385>

²⁷ THE CHATSWORTH NURSERY. (1887, December 3). The Daily Telegraph (Sydney, NSW: 1883 - 1930), p. 5. Retrieved April 1, 2020, from <http://nla.gov.au/nla.news-article236771081>

waves of the Pacific, in undulating lines as far as the eye can reach.... Wonderfully fruitful is the red soil which is found on the 16a of nursery land before us. Emerging from a pretty house on the estate, Mr F.W.Creswick... welcomes us to the spot... Not far away we find a greenhouse specially built for the accommodation of the camellia... another 10,000 specimens of various ages (are) stored in a bush house, which covers an acre of ground.

The Planting Season, 1896.

Chatsworth Nursery, Rooty Hill; Darling Nursery, Sydney;
 The Oldest and Largest Establishments in Australia, are the Best and Cheapest places to get everything for Orchards, Gardens, and Pleasure Grounds.

Shepherd and Co. HAVE A LARGE STOCK OF
FRUIT TREES well grown, clean and healthy,
 Comprising—Apples, Apricots, Peaches, Pears, Plums, Nectarines, Cherries, Quinces, Walnuts, Currants, Gooseberries, Raspberries, Japanese Plums, Persimmons, etc.
 Also Oranges, Lemons, Citrons, Limes.

Our Stock of ORNAMENTAL TREES and SHRUBS cannot be Surpassed,
 Suitable for any purpose, viz.: Magnolias, Camellias, Azaleas, Roses, Carnations, Ferns, Bouvardias, Pelargoniums, Daphnes, Fuchsias, Palms, Petunias, Chrysanthemums, etc.
 Also Planes, Elms, Oaks, Ash, Limes, Sycamore, Poplar, Birch, Maple, Cedars, Pines, Cupressus, Larch, etc.

BULBS, A FINE LOT,
 Viz.: Narcissus, Hyacinths, Lilliums, Gladioli, Anemones, Tulips, Ranunculus, Crocus, etc.

NEW SEEDS OF EVERY DESCRIPTION:
 Flower Seeds, Vegetable Seeds, Grass Seeds, Fodder Seeds, etc.
 Nothing is too Small, Nothing is too Large for us to attend to,
 Honest advice given to all—gratis. CATALOGUES Post FREE on application.

SHEPHERD AND CO.,
 (Established 69 Years)
Darling Nursery, Lachlan-street, Waterloo (No other City Address); Chatsworth Nursery, Rooty Hill.
 MESSRS. JUDGES BROS., PENBITH AGENTS, from whom Catalogues may be obtained.

Figure 4: Chatsworth Nursery, Rooty Hill advertisement, 1896. Source: Trove

The Shepherds renamed the Mount Philo property 'Chatsworth' and built a house of the same name, located outside of the proposal site.²⁸ The Shepherd Brothers nursery was one of the earliest (if not the earliest) commercial nurseries in Australia. They were instrumental in the development of landscape gardening and horticulture and promoted a wide range of exotic plants for use in Australian colonial gardens. Olives were a variety of plant particularly promoted by the Shepherds and grown at the Chatsworth Nursery. By the 1870s, the Chatsworth nursery was well stocked with large numbers of fruit trees including plantations of apple trees, pear trees, quinces, peaches, apricots, medlars and mulberries, which were shipped throughout New South Wales, Queensland, New Zealand, Melbourne and Western Australia. The estate also produced various kinds of beans intended for supplying the seed trade, while a variety of maize was planted for the purpose of proving them, and also for making the place self supporting for stock.

²⁸ Ecological 2016, Lot 10 DP1157491, Eastern Creek, NSW – Historical and Aboriginal Heritage Study. p. 55.

By the 1880s, the remaining brothers, David and Patrick, were in dispute over the operation of the family business and each began trading separate businesses, using the Chatsworth nursery for their commercial stock. Patrick became proprietor of PLC Shepherd and Son, Seed Merchants. However, by the end of the nineteenth century, the nursery was in decline and with the onset of the 1890s economic depression in NSW, the Shepherd brothers decided to sell the business, which was now largely supplying packeted seeds, to Yates Ltd. Shepherd's Seed Merchants continued to trade under the same name, albeit as a subsidiary of Yates, until the late 1940s.²⁹

In 1909, the land on which the proposal site is located was sold to Thomas Baker, a grazier.³⁰ Baker passed away in 1934,³¹ leaving the land to his widow and children. Portions of the land were then sold off and later amalgamated. Burfield Pty Ltd (renamed Ray Fitzpatrick Pty Ltd) bought the land on which the proposal site is located in the mid-1950s.³²

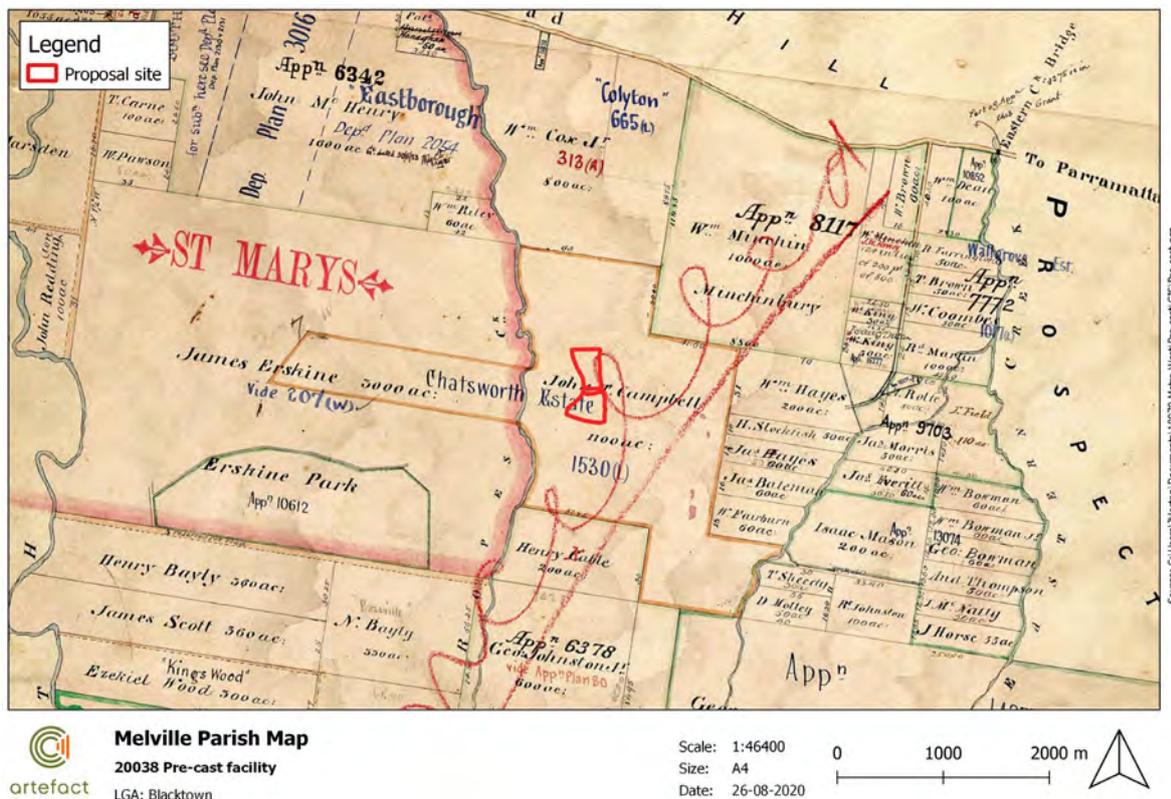


Figure 5: Melville Parish map showing John Campbell's original grant now included within the Chatsworth Estate³³

4.4 Land Development

The early land grants at Prospect were extremely successful, and led to an influx of free settlers living in the area. Infrastructure and transport were developed, particularly following the establishment of a route over the Blue Mountains to the Western Plains.³⁴ A coach service crossing the Blue

²⁹ MR. F. W. CRESWICK (1937, April 29). The Cumberland Argus and Fruitgrowers Advocate (Parramatta, NSW: 1888 - 1950), p. 14. Retrieved April 1, 2020, from <http://nla.gov.au/nla.news-article106155672>

³⁰ BIG ESTATES (1934, August 27). The Sun (Sydney, NSW : 1910 - 1954), p. 6 (FINAL EXTRA). Retrieved April 1, 2020, from <http://nla.gov.au/nla.news-article229562434>

³¹ Rich Estates. (1934, September 4). Dungog Chronicle : Durham and Gloucester Advertiser (NSW : 1894 - 1954), p. 3. Retrieved April 1, 2020, from <http://nla.gov.au/nla.news-article141481418>

³² NSWLRS. RPA52819

³³ Land Registry Services, n.d. 'Melville Parish Map'. Accessed online 1 April 2020, <https://hlrv.nswlrs.com.au/>

³⁴ Morrison, 2005. CMP. p. 52.

Mountains, passing through Prospect was established in 1832, shortly followed by the railway in 1860. In addition, St Bartholomew's Anglican Church was consecrated in 1841 and several inns began to appear along the newly established roadways.³⁵

Following the collapse of the cereal grain industry during the 1870s, the area shifted from crop growing industry to livestock rearing. Many of the earliest structures made by the first settlers had been demolished by this point and land at Prospect and Rooty Hill continued to be used for agricultural purposes up until the construction of the Prospect Reservoir.

Land within the proposal site, and around Prospect continued to be utilised for agricultural purposes throughout the remainder of the nineteenth and into the twentieth century. William Freame, in his 1923 book 'A Delectable Parish: Prospect and Seven Hills', described the area as:

*'largely a land of rural homes...they are gregarious at respectable distances, with garden and orchard plots intervening. They appreciate the personal importance which comes from the private ownership of the land they occupy...cultivated fields and green meadows [are] bisected by long winding red roads.'*³⁶

Aerial imagery from the c1950s indicates that this description of Prospect remained accurate. Historical development in the vicinity of the proposal site was limited to a number of rural properties with the proposal site used for open paddocks and crop fields (Figure 6 – Figure 14). As depicted in the below figures, no significant structures are noted within the proposal site from the 1950s, though two modern structures can be seen in the 2004 and 2007 aerial imagery, and some fence lines may be present.

A shed and yard complex is visible directly north-east of the proposal site within these aerials. This shed structure appears to have been demolished by 2007 (Figure 13). The north-eastern corner of the proposal site is located within paddocks associated within this complex (Figure 15). Visible remains of the shed and yard complex were identified on the site inspection undertaken by Artefact Heritage on 18 June 2020 and are discussed in Section 5.

Previous heritage assessments of the shed and yard complex are discussed below in Section 4.5.

³⁵ Morrison, 2005. *CMP*, p. 53.

³⁶ Freame, 1923. *A Delectable Parish*, p. 29.

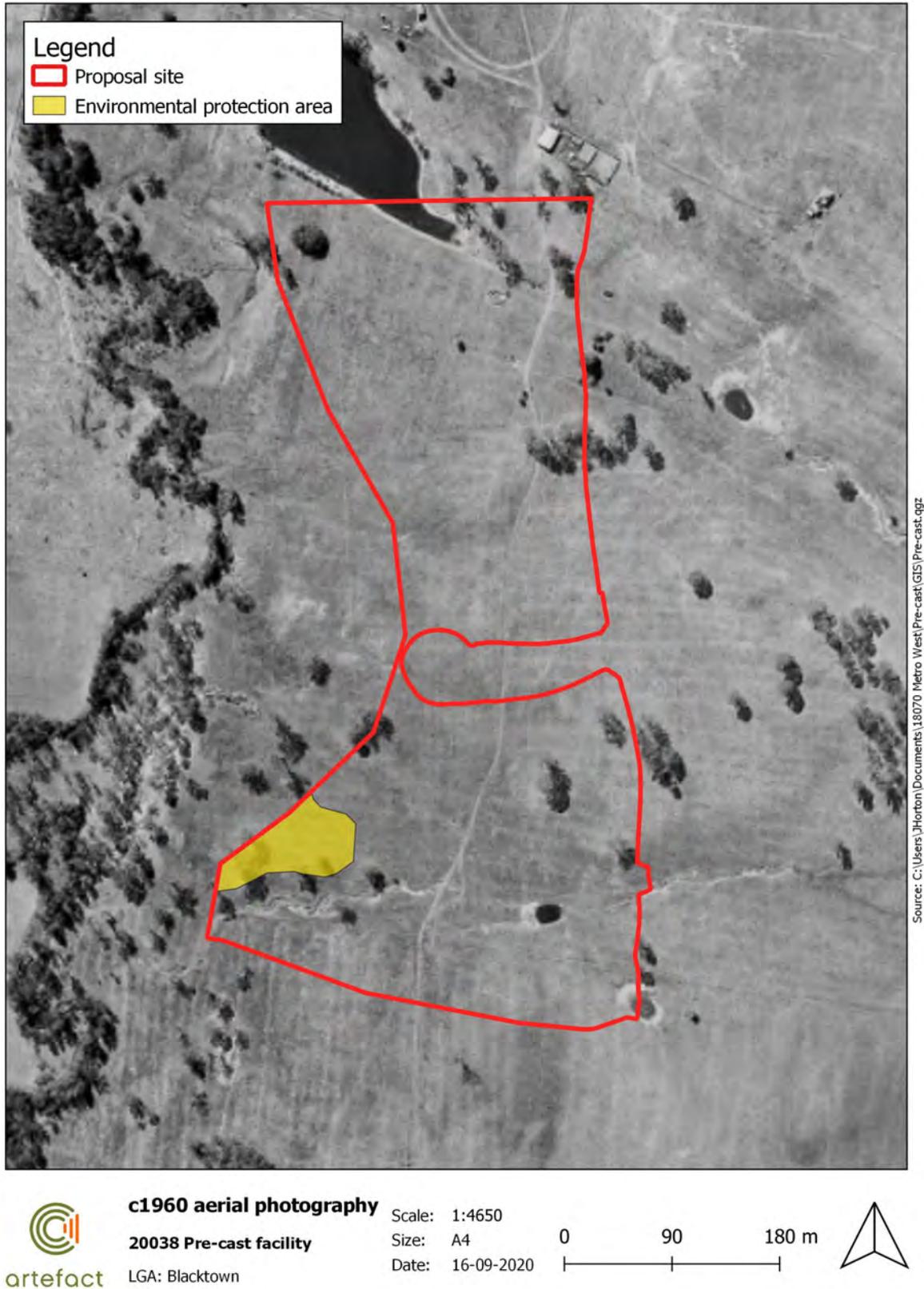


Figure 6: c1960s aerial imagery depicting the proposal site and surrounding landscape, Source: NSW Department of Finance, Services and Innovation



Figure 7: 2004 aerial imagery. Note structure to the north-east of the proposal site and structures to the north of the proposal site boundary (outline in red). Source: Google Earth

4.5 Relevant heritage assessments

Navin Officer Heritage Consultants, 2006. *Historic Site EPRCH5: Cultural Heritage Assessment. Report to FDC Building Services Pty Ltd.*

In 2005, Navin Officer Heritage Consultants undertook a cultural heritage assessment for the Erskine Park Employment Area, Ropes Creek, Western Sydney. The project was located on the western side of Ropes Creek, approximately 400 metres south west of the proposal site.

The assessment identified the remains of a wooden slab hut with sandstock brick chimney, approximately dating to the late nineteenth century (Figure 8). The historical context of the remains remain unknown; however, they may have been associated with the original Erskine Park Estate or original Erskine Park Homestead.

The remains were classified as a relic under The Heritage Act, yet it was considered to have little heritage significance and did not fulfil the criteria for local or State heritage listing.



Figure 8: Slab hut remains as identified by Navin Officer Heritage Consultants, 2006.

Artefact Heritage, 2016. *Archbold Road: Statement of Heritage Impact. Report to Parsons Brinkerhoff.*

Artefact Heritage prepared a SoHI for the upgrade and southern extension of Archbold Road between the Great Western Highway, Minchinbury and to the Southern Link Road, Eastern Creek. A portion of the assessment area falls within the proposal site. The assessment found that the area was associated with the early nineteenth century estates of William Cox, John Thomas Campbell and Henry Kable. It has typically been associated with pastoralism and horticulture, including orchards of the Chatsworth Estate during the mid-nineteenth century. By the late twentieth century, the area had become highly urbanised and industrialised.

The SoHI identified an area within the proposal site with potential to contain archaeological remains of a shed and yard complex on land originally belonging to the former Chatsworth Estate. However, historical resources and imagery indicate that the yards were developed post-1900, and the shed was constructed between 1950 and 1960. This would indicate that these remains would not have been associated with the development of Chatsworth Estate; rather twentieth century development. The paddocks associated with these remains are partially located within the proposal site, in the north-east corner (Figure 15). In addition, the SoHI noted that the location of Chatsworth House was likely to be located between Ropes Creek and the shed and yard complex, outside the proposal site.

The development of the shed and yard complex is detailed within Figure 9 – Figure 15. The yard areas are visible within the c1950s aerial imagery (Figure 9), however, the shed does not appear until the c1960s (Figure 10). The complex appears to have been utilised throughout the late twentieth and into the twenty-first century, with the shed demolished c2007 (Figure 13).

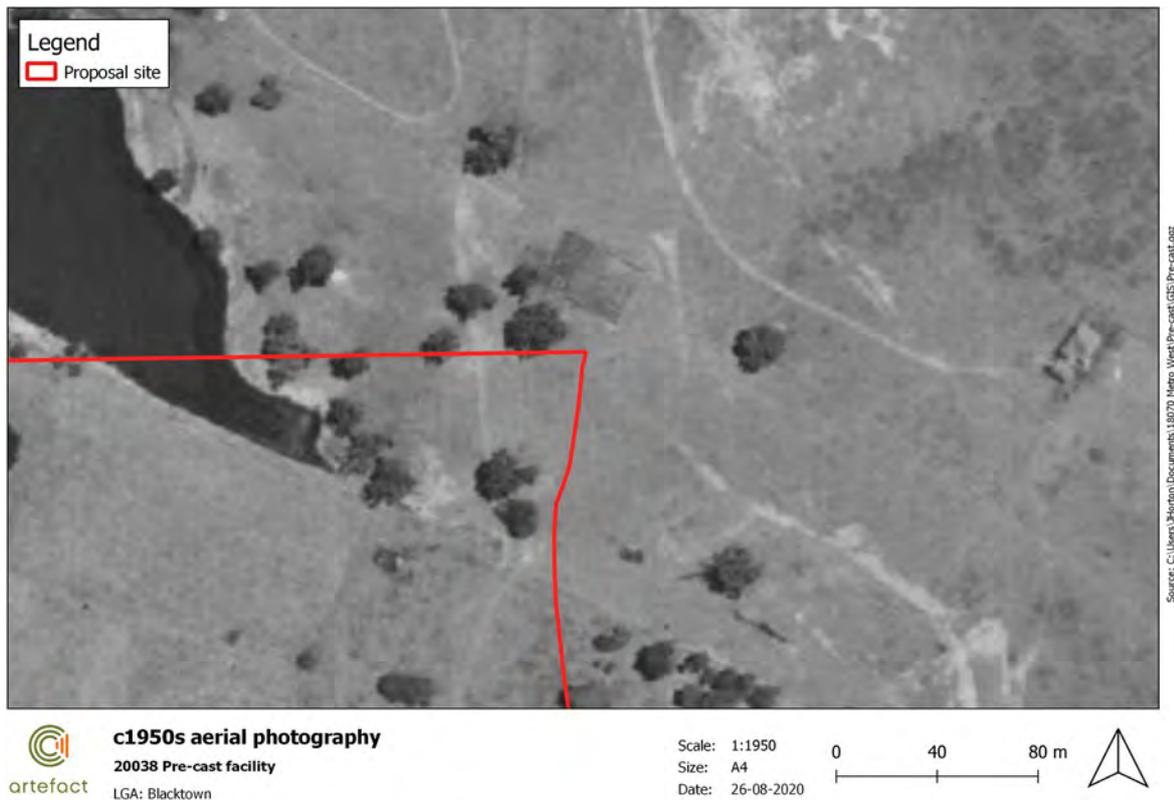


Figure 9: Detail of shed and yard complex to the north-east of the proposal site on c1950s aerial imagery.



Figure 10: Detail of shed and yard complex to the north-east of the proposal site on c1960s aerial imagery. Proposal site outlined in red.



Figure 11: Detail of shed and yard complex to the north-east of the proposal site on c1970s aerial imagery. Proposal site outlined in red.



Figure 12: Detail of shed and yard complex to the north-east of the proposal site, 2004 aerial imagery. Source: Google Earth



Figure 13: Detail of shed and yard complex to the north-east of the proposal site, note demolitions, 2007 aerial imagery. Source: Google Earth



Figure 14: Detail of shed and yard complex to the north-east of the proposal site (outlined in red), present-day aerial imagery. Source: Google Earth

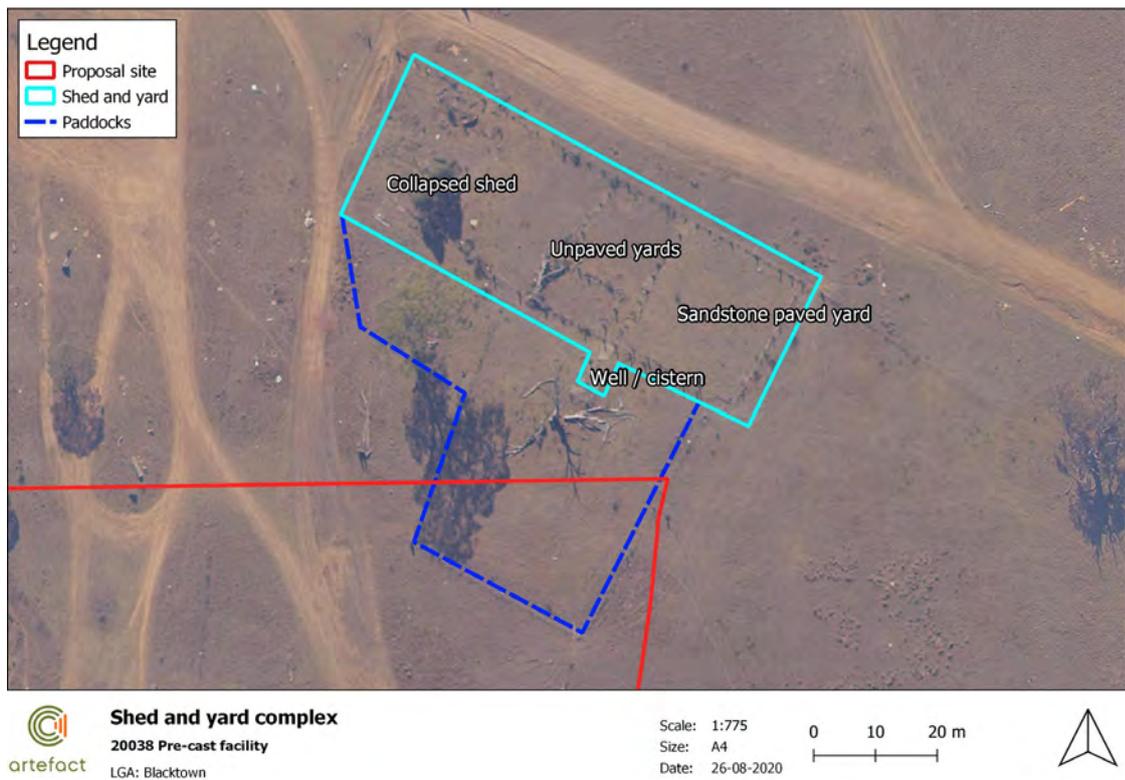


Figure 15: Present day aerial imagery showing remains of former shed and yard complex, potentially associated with the Chatsworth Estate. Note proposal site within associated paddock area

Ecological, 2016. Lot 10 DP 1157491, Eastern Creek, NSW: Aboriginal and Historical Heritage Study. Report to Department of Planning and Environment.

Ecological were commissioned to prepare a Historical and Aboriginal Heritage Study to inform a Development Control Plan for Lot 10 DP1157491 at Eastern Creek, NSW which includes the current proposal site. The report found that the area contained high potential for the survival of an archaeological resource relating to the occupation and development of the Chatsworth homestead site over time. The archaeological resource was assessed as possessing local significance for association with the Chatsworth nursery and the Shepherd family. The Chatsworth homestead is indicated in Figure 16 and is located outside the proposal site.

The other historical archaeological areas identified by Ecological, including the shed and yard complex were not considered to reach the threshold for local significance. These items are common on rural properties and were all constructed around or after 1900.

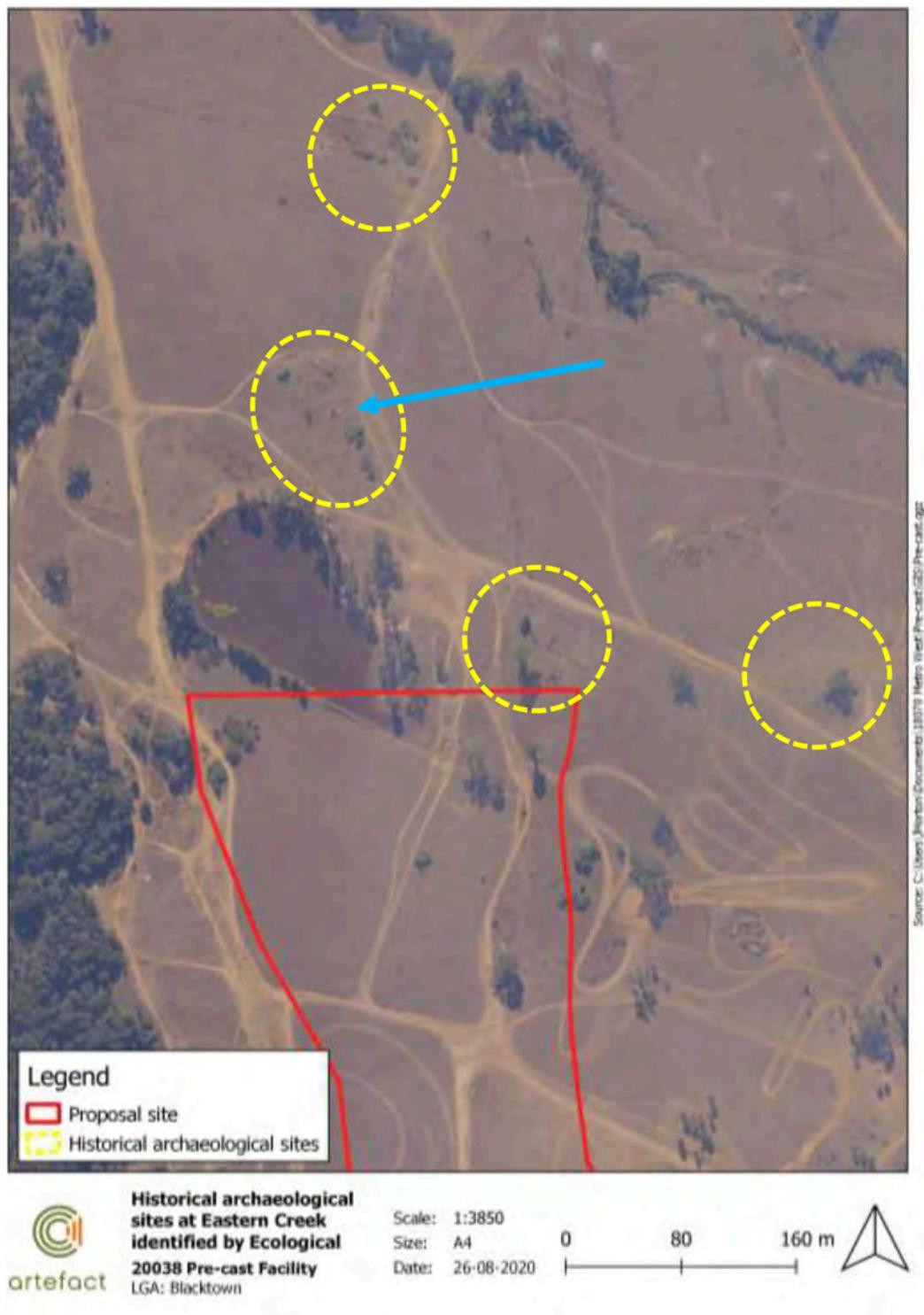


Figure 16: Historical archaeological sites at Eastern Creek identified by Ecological. The Chatsworth homestead is located directly north of the reservoir, at the centre of the image (blue arrow).³⁷

³⁷ Ecological 2016, *Lot 10 DP1157491, Eastern Creek, NSW – Historical and Aboriginal Heritage Study*. p. 55.

5.0 SITE INSPECTION

An inspection of the proposal site and immediate surrounds was undertaken by Jessica Horton (Heritage Consultant, Artefact Heritage) and Alyce Haast (Senior Heritage Consultant, Artefact Heritage) on 8 April 2020. An additional site inspection was undertaken on 18 June 2020 by Alyce Haast and Josh Symons (Principal, Artefact Heritage).

The proposal site is comprised of a 16 hectare area of open paddock which is bound by open paddock to the north and east; Ropes Creek to the west; Lenore Drive to the south, and the industrial and commercial development further to the east. The proposal site is defined by open grassed paddock interspersed with vegetation. A number of dirt tracks extend throughout the proposal site; however, vegetation and grass has also grown over a number of these tracks (Figure 17 – Figure 18).

Visible archaeological remains within the proposal site were limited to the north-eastern corner of the proposal site and include the remains of the shed and yard complex and a small partially subsurface rubbish dump.

Identified remains of the shed and yard complex included a sandstone paved yard feature, sandstone edging, several former fence lines and a concrete structure (Figure 19 – Figure 22). The sandstone paved yard feature included hand cut sandstone blocks which have been roughly paved across the yard structure. Based on the rough nature of these sandstone blocks it is considered likely that these features may have been re-used as part of construction of the yard feature. An additional fenced yard was located to the north-west of the sandstone paved feature with no evidence of sandstone or other formalisation of the surface identified. The two yard features were separate from the remainder of the paddock area by consistent and relatively closely spaced rectangular wooden fence posts. Minimal remains associated with the shed structure were noted with small pieces of corrugated iron noted in the north-western portion of the structure.

Additional remains to the south of the yard structures include a concrete pad feature which measures approximately 10 m x 3 m. The concrete feature is comprised of three sections, including a central rounded portion which dips slightly into the centre of the feature. The central portion included portions of brick lining which appeared to extend to some depth into the ground surface.

Both the yard features and shed feature are located outside of proposal site. Portions of the shed and yard complex within the proposal site were limited to a paddock fence line which was comprised of a mixture of star pickets and circular wooden fence posts.

Further historic remains were identified in a small rubbish dump (Figure 23- Figure 24) approximately 75 m south of the shed and yard complex. The rubbish dump included a variety of metal and brick debris including remains of a metal fridge as well as several fence posts and star pickets. Material within the rubbish dump appears to date to the mid twentieth century.



Figure 17: View within proposal site showing dirt accessway and grasses. Artefact Heritage, 2020.



Figure 18: View within proposal site showing vehicle tracks and dense grasses



Figure 19: Sandstone paved yard surface north-east of the proposal site. Artefact Heritage, 2020.



Figure 20: Former fence line north-east of the proposal site. Artefact Heritage, 2020.



Figure 21: Concrete surface north-east of the proposal site. Artefact Heritage, 2020.



Figure 22: Raised sandstone paddock boundary north-east of the proposal site. Artefact Heritage, 2020.



Figure 23: Rubbish dump within north-east corner of proposal site. Artefact Heritage, 2020.



Figure 24: Rubbish dump within north-east corner of proposal site. Artefact Heritage, 2020.

6.0 ARCHAEOLOGICAL ASSESSMENT

6.1 Introduction

Non-Aboriginal archaeological potential is defined as the potential of a site to contain historical archaeological 'relics', as classified under the Heritage Act.

Non-Aboriginal archaeological potential is assessed by identifying former land uses and associated features through historical research and evaluating whether subsequent actions (either natural or human) may have impacted on evidence for these former land uses. The following section constitutes a preliminary archaeological assessment within the proposal site, where ground disturbing activities are anticipated.

6.2 Archaeological assessment

The following assessment of archaeological potential has been divided into the following historical phases:

- Phase one – early land use and grants (c1819 – mid-19th century)
- Phase two – horticultural and agricultural development, the Chatsworth Estate (mid-19th century – mid-20th century)
- Phase three – current landscape and cattle grazing (mid-20th century – present).

6.2.1 Phase one: c1819 – mid-19th century

There are no records of any significant developments taking place within the proposal site during Phase one.

Localised vegetation removal and preparation of the land for agricultural use are likely to have been the earliest land-use activities, however historical descriptions of the site indicate that much of the proposal site remained under heavy bushland into the 1890's. Potential archaeological remains typically associated with nineteenth century clearing and agricultural use are ephemeral in nature. Activities such as tree clearance, fence construction, the development of unsealed tracks and agricultural planting leave little material evidence and are not likely to be identified. There is no evidence of any structures being located within the proposal site during this phase.

Phase one is associated with localised land clearance, low intensity pastoral / agricultural uses, early subdivisions and animal rearing.

There is nil potential for archaeological remains associated with Phase one to be present within the proposal site.

6.2.2 Phase two: Mid-19th century – mid-20th century

Historical descriptions of the proposal site during this phase, as detailed in Section 4 above, note that much of the proposal site retained heavy bushland up to the 1890s, by which point a number of dwellings and buildings associated with horticultural practices began to be developed.

Archaeological remains associated with this phase may include evidence of former access ways, roads, fence lines, and evidence of horticultural and farming practices.

Archaeological remains of a shed and yard complex were identified to the north-east of the proposal site (Figure 15). Historical aerials identify that a distinctive paddock and yard shape was present at

the location of the shed and yard complex by the 1950's. The yard area is unlikely to pre-date c1900 as grazing activities were limited at the site prior to this time. Use of the yard appears to be expanded during phase three with construction of the shed identified as being between 1950 to 1960 in historical aerials. Use of the shed and yard facility in phase two is likely to have been associated with less extensive structures. Potential remains associated with this phase are likely associated with postholes and former yard surfaces.

There is high potential for the area around the shed and yard complex to contain archaeological remains associated with phase two. These remains may include structural remains (footings and postholes associated with yard fencing), evidence of water collection and storage (drains, wells, cisterns) and former yard surfaces. The majority of these features are likely to be located immediately north of the proposal site (see Figure 15 – Figure 16), however there is potential for former yard surfaces, postholes associated with yard fencing, and evidence of water collection to be present within the proposal site. As the site was primarily associated with agricultural use, there is low potential for occupation deposits to be present. The proposal site does have the potential to contain discarded artefacts associated with its former use, including horse shows, nails and tools.

There is high potential for archaeological remains associated with Phase two to be present within a portion of the proposal site.

6.2.3 Phase three: Mid-20th century – present

Historical aerial imagery from c1950 to present day (Figure 9 – Figure 14) show that by this time the majority of the land with the proposal site had been cleared with remaining landscape elements such as dams and heavy vegetation spread throughout the proposal site. The proposal site is primarily associated with cattle grazing during this period.

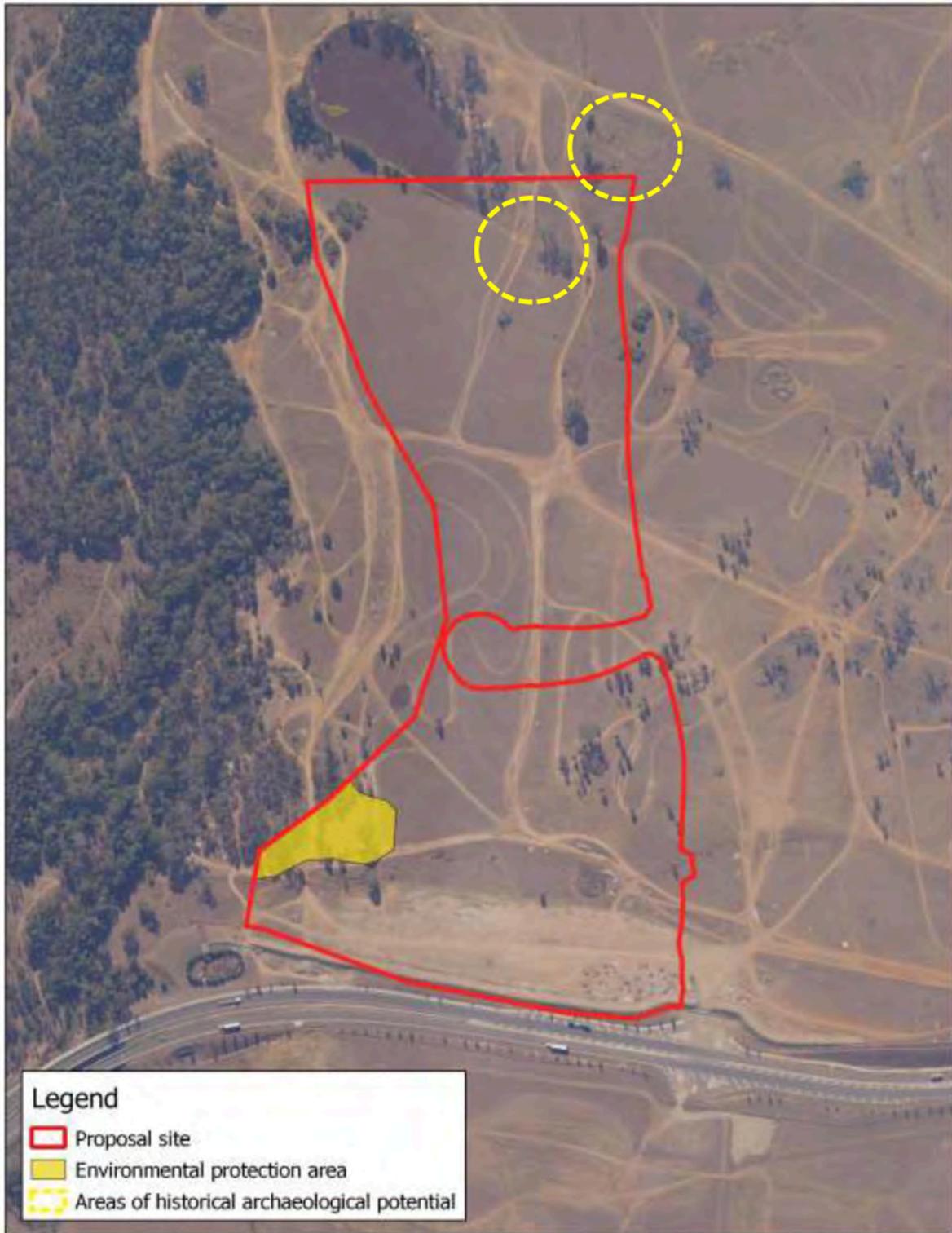
Historical aerials identify that the shed and yard complex underwent substantial expansion between 1950 and 1960 with the shed structure and more substantial fence lines constructed in the main yard area.

Extant remains associated with the shed and yard complex, which were identified during a site inspection undertaken by Artefact Heritage on 18 June 2020, included the remnants of three yards, a collapsed shed, two circular well / cistern structures and a concrete pad. The easternmost yard features a sandstone block floor which has been loosely laid as a paving structure. This construction technique is considered to represent the opportunistic use of the sandstone materials (potentially reuse) which are considered to have been associated with the wider expansion of the structure in the 1950's. The presence of the concrete surface would further suggest the continued modification of the shed and yard structure into the later twentieth century. These features are located to the north-east of the proposal site.

The site inspection undertaken by Artefact Heritage on 18 June 2020 also identified the remains of a rubbish dump dating to phase three. Remains included refuse material such as star pickets, fence posts and a fridge.

Archaeological evidence of smaller structures (possibly sheds or outbuildings) identified on the eastern boundary of the proposal site, and constructed between the 1950s and 2004, may also survive within the proposal site.

There is high potential for archaeological remains associated with Phase three to be present within a portion of the proposal site.



Source: C:\Users\JHorbin\Documents\18070 Metro West\Pre-cast\GIS\Pre-cast.gpx

 **Areas of archaeological potential**
20038 Pre-cast Facility
LGA: Blacktown

Scale: 1:4850
Size: A4
Date: 16-09-2020

0 100 200 m 

Figure 25: Areas of historical archaeological potential relating to Phases two and three at the proposal site. The northernmost area of historical archaeological potential relates to the shed and yard complex, whilst the southernmost relates to the rubbish dump.

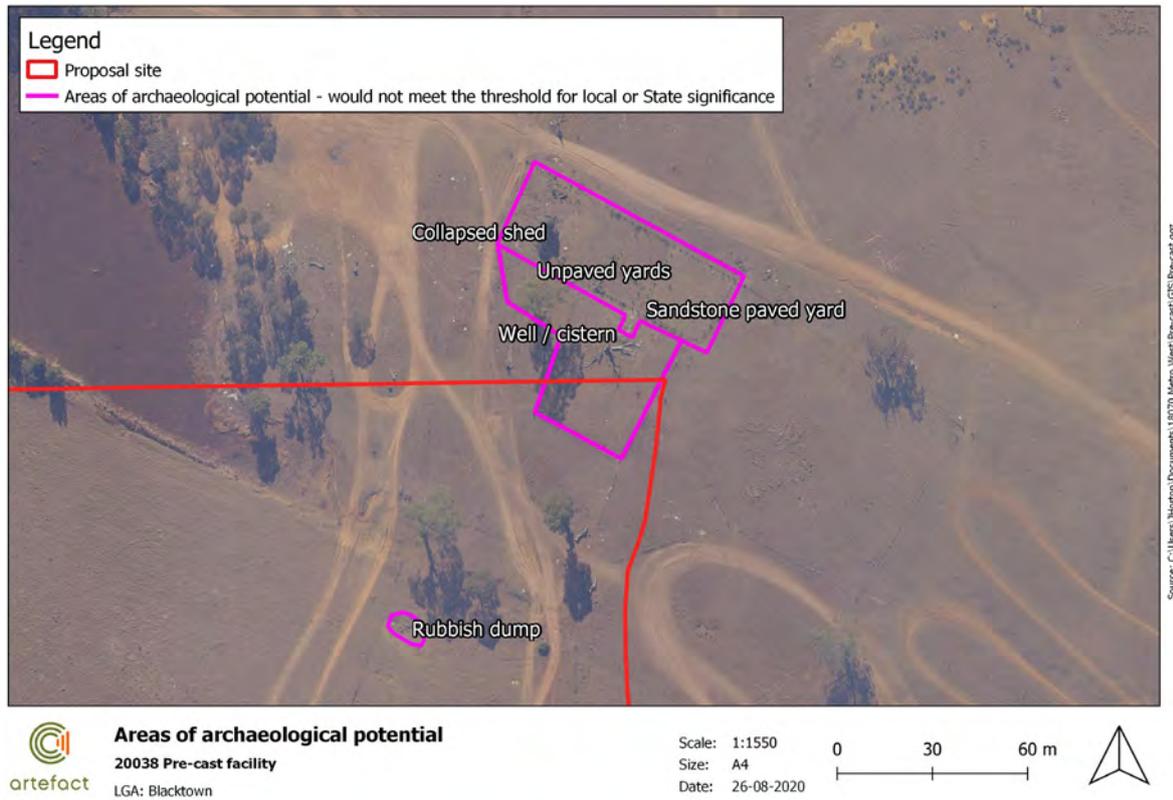


Figure 26: Areas of historical archaeological potential relating to Phases two and three at the proposal site.

6.3 Assessment of archaeological significance

6.3.1 NSW Heritage Significance Criteria

The methodology for this assessment of archaeological significance has been outlined in Section 3.

The significance assessment for the archaeological potential of the potential significant archaeological remains is outlined in Table 4.

Table 4: Heritage significance of the shed and yard complex potential archaeological remains

Criteria	Description
A – Historical Significance	<p>The proposal site is located within the original Mount Philo Estate (later known as the Chatsworth Estate). The area was later acquired by Charles Roberts who established a stud farm on the property. The Chatsworth Estate was established during the 1850s. The land encompassing the proposal site was sold in 1909. The former fenced paddocks within the proposal site, associated with the shed and yard complex, would have been constructed post-1900 as grazing activities were limited at the site prior to this time. The appearance of the item in the c1950s - c1960s aerials indicates that it was maintained up until the mid-20th century. Therefore, the use of the item is related to Phase 2 and Phase 3. Although potential archaeological remains within the proposal site are associated with the local area's history, development, and rural economy, they are unlikely to provide information not available from any other source.</p> <p>The potential archaeological resources for phases 2 and 3 do not meet the local significance threshold for this criterion.</p>
B – Associative Significance	<p>The proposal site is located within the former estates of John Thomas Campbell, Charles Roberts and the Chatsworth Estate. It is unlikely that the archaeological resource would contain remains directly associated with these land owners.</p> <p>The potential archaeological remains for phases 2 and 3 do not meet the local significance threshold for this criterion.</p>
C – Aesthetic Significance	<p>Although it is recognised that exposed in situ archaeological remains may have distinctive/attractive qualities, only rarely are these considered 'important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW'.</p> <p>The potential archaeological remains for phase 2 and 3 do not meet the local significance threshold for this criterion.</p>
D – Social Significance	<p>Community consultation was not undertaken for this assessment. It is unlikely the remains would have social significance as their whereabouts are not well known to the public.</p> <p>The potential archaeological remains for phase 2 and 3 do not meet the local significance threshold for this criterion.</p>
E – Research Potential	<p>The former fenced paddocks within the proposal site, associated with the shed and yard complex, would have been constructed post-1900 as grazing activities were limited at the site prior to this time. Although there is potential for the archaeological resource to provide information on former pastoral practices within the region, it is unlikely to provide information not available from any other source.</p> <p>The potential archaeological remains for phase 2 and 3 do not meet the local significance threshold for this criterion.</p>
F – Rarity	<p>The archaeological resource is not considered rare as there are many similar archaeological sites in rural NSW.</p> <p>The potential archaeological remains do not meet the local significance threshold for this criterion.</p>
G - Representativeness	<p>The archaeological resource is unlikely to demonstrate any particular characteristics of NSW's cultural or natural places of cultural or natural environments or for the local area.</p> <p>The potential archaeological remains do not meet the local significance threshold for this criterion.</p>

6.3.2 Preliminary Statement of Significance

The former shed and yard complex site is connected with the twentieth century rural history and development of the local area. Depending on the nature of the archaeological remains, in particular if there were artefacts or remains indicating specific activities within the complex, they could provide evidence of the site's former uses and answer research questions regarding rural practices of the local area. The majority of the shed and yard complex is located outside of the proposal site. The former fenced paddocks associated with the shed and yard complex within the proposal site are unlikely to contain archaeological remains which could provide information regarding rural farming practices which other sources could not. Therefore, potential archaeological remains of the former fenced paddocks associated with the shed and yard complex are unlikely to reach the threshold of local significance.

Potential archaeological remains associated with Phase two and three (i.e. 20th century rural structures and the identified rubbish dump) may be present within the proposal site. However, these remains are not expected to reach the threshold for local significance, as they do not fulfil the heritage significance criteria as outlined in Table 4.

6.4 Summary of archaeological potential and significance

A summary of archaeological potential and significance of potential remains is outlined in Table 5.

Table 5: Summary of archaeological potential and significance

Phase	Potential remains	Significance	Potential
Phase one	Evidence of early land grants and subdivisions, land clearance, agricultural use	n/a	Nil
Phase two	Evidence of horticultural and agricultural activities, evidence of fence lines	n/a	Nil
	Former fenced paddocks associated with the shed and yard complex	Nil	High
Phase three	Shed feature, formalised and continued use at the shed and yard complex, rubbish dump, Nil existing development	Nil	High

7.0 HERITAGE IMPACT ASSESSMENT

7.1 Heritage impact assessment

The proposed works would comprise the construction and operation of two precast facilities to support tunnelling for Sydney Metro West. There are no heritage listed items in or within the vicinity of the proposal site therefore there would be neutral physical and visual impacts to listed items. Impacts to listed items associated with vibration or settlement would also be neutral.

7.2 Archaeological impact assessment

The proposal site overlaps with the paddocks associated with a former shed and yard complex in the north-eastern corner of the site as well as a small rubbish dump. This complex is associated with twentieth century rural history and development of the local area. However, these potential archaeological remains are not expected to reach the threshold for local significance.

The remainder of the proposal site has been assessed as having nil to low potential for archaeological remains. Potential archaeological remains which may be identified across the remainder of the proposal site associated with twentieth century agricultural use of the site are not expected to reach the threshold for local significance.

There would be no non-Aboriginal archaeological impacts as a result of the proposal.

7.3 Statement of heritage impact

There are no listed or unlisted items of heritage significance identified within or within the vicinity of the proposal site. As such, there would be neutral physical and visual impact as a result of the proposal. While the potential for archaeological remains within the proposal site has been identified, the current assessment has identified that these remains are unlikely to meet the threshold for local significance.

A statement of heritage impact has been prepared in accordance with the model provided in the NSW Heritage Division guidelines which delineates a statement of heritage impact into three key component questions³⁸ in Table 6.³⁹

Table 6: Statement of heritage impact for the proposal

Development	Discussion
What aspects of the proposal respect or enhance the heritage significance of the proposal site?	The proposal site is situated in a location which avoids locally significant structural remains associated with the former Chatsworth Estate homestead to the north. No areas of heritage significance have been identified within the proposal site. No heritage items have been identified as subject to visual impacts associated with the proposed development.

³⁸ NSW Heritage Division, *Statements of Heritage Impact*. Accessed online

<https://www.environment.nsw.gov.au/resources/heritagebranch/heritage/hmstatementsofhi.pdf>

³⁹ The guidelines also provide examples of further assessment questions which may be appropriate in relation to modification to existing identified Heritage items. As no heritage listed items or unlisted items of local significance were identified within the proposal site, further consideration of these questions is not required.

Development	Discussion
What aspects of the proposal could have a detrimental impact on the heritage significance of the proposal site?	The proposed works would have a physical impact on potential archaeological remains within the north-eastern corner of the proposal site, however these remains are not expected to reach the threshold for local significance. No listed heritage items or areas of archaeological potential which may reach the local significance threshold have been identified. Consequently there would be no detrimental impacts to the heritage significance of the proposal site.
Have more sympathetic options been considered and discounted?	The proposed works would not have a physical or visual impact on heritage listed items or significant remains so consideration of more sympathetic options was not required.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

It was found that:

- There are no listed or potential items of heritage significance identified within the proposal site. As such, there would be neutral physical and visual impacts to heritage items as a result of the proposal
- The potential for archaeological remains have been identified within the north-east corner of the proposal site and are expected to be subject to physical impacts by the proposed works, however these remains are not expected to reach the threshold for local significance
- The remainder of the proposal site has been assessed as having nil to low potential for twentieth century archaeological remains. Potential archaeological remains within the remainder of the proposal site are not expected to reach the threshold for local significance.

8.2 Recommendations

The following recommendations are made:

- Archaeological remains identified within the north-east corner of the proposal site may be removed as required without further assessment or mitigation
- An Unexpected Finds Procedure, to be implemented in the event that potential non-Aboriginal heritage objects are exposed during construction, would be prepared that complies with the Heritage Act 1977.

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