Appendix W

Preliminary site investigation

REPORT

Preliminary Site Investigation

Woodlawn Advanced Energy Recovery Centre

Submitted to:

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1.0 INTRODUCTION

Veolia Environmental Services (Australia) Pty Ltd (Veolia) engaged Golder Associates Pty Ltd (Golder) to perform geotechnical and contamination investigations at the Woodlawn Eco Precinct. Veolia proposes to develop and operate the Woodlawn Advanced Energy Recovery Centre (ARC) (the Project), an energy recovery facility (ERF), at the Eco Precinct. This involves the development of an additional waste management technology at the Eco Precinct, treating a portion of the waste stream that is already approved to be received as part of integrated waste management operations, and recovering energy from the process.

This Preliminary Site Investigation report (PSI) includes the key findings of a desktop study which collated published site information to assess whether the development footprint for the Project is likely to be contaminated as a result of current or former land uses. The PSI includes the contamination results from a 2021 ground assessment (Golder, 2021) and the findings of a site walkover inspection completed to complement the desktop review.

The Project is classified as State Significant Development (SDD), and this PSI has been prepared to support the Environmental Impact Statement (EIS). Planning Secretary's Environmental Assessment Requirements (SEARs) relating to land contamination have been issued by the Secretary of the Department of Planning and Environment (DPE) (Application number SSD-21184278, issued 2 July 2021). The PSI has been prepared having regard to the SEARs pertaining to the assessment of site contamination, the documents referred to in Section 1.3.1 below and clause 4.6 of *State Environmental Planning Policy (Resilience and Hazards) 2021* (the *RH SEPP*) (which has replaced *State Environmental Planning Policy 55 Contamination of Land*). The SEARs require the following in relation to contamination:

"*a site contamination assessment in accordance with relevant EPA guidelines*".

This PSI constitutes a preliminary investigation of land that has been prepared pursuant to the statutory requirement in clause 4.6 of the *RH SEPP*.

1.1 Background

The Woodlawn Eco Precinct is located on Collector Road in Tarago, New South Wales and is primarily bounded by agricultural (grazing) land. The development footprint is located within (but does not comprise the entirety of):

- Lots 1 and 2 DP1179305;
- Lots 4, 5 and 6 DP830765; and
- Lot 30 DP754919.

The locations of the investigation areas and proposed ARC development are on Plate 1 (below).

Plate 1: Woodlawn Eco Precinct (EMM, 2022)

The Project involves:

- Development of the ARC, comprising an ERF for the thermal treatment of residual municipal solid waste and commercial and industrial waste (the residual waste feedstock) that will otherwise be disposed of to landfill;
- Thermal treatment in the ARC of approximately 380,000 tonnes per annum (tpa) of the residual waste feedstock;
- The capacity to generate 30 megawatts (MW) of electrical energy;
- On-site management of residual by-products generated by the ARC including staged development of a lined and engineered landfill for the encapsulation of air pollution control residues (the encapsulation cell); and
- Construction of ancillary infrastructure to facilitate construction and operation of the project, including a new access road.

The primary components of the Project are:

- The ARC – portion of the development footprint encompassed by the main ARC building and ancillary infrastructure, incinerator bottom ash (IBA) area and new access road and intersection. This area currently contains former mine plant infrastructure, water management infrastructure (plant collection dam) and other disturbed areas; and
- Encapsulation cell – the area encompassed by the dedicated lined and engineered landfill for the encapsulation of air pollution control residues (APCr) from the flue gas treatment system. The encapsulation cell is proposed within the footprint of the existing Evaporation Dam 1 (known as ED1).

A plan showing the concept design for the ARC provided by Veolia is presented on Plate 2 below.

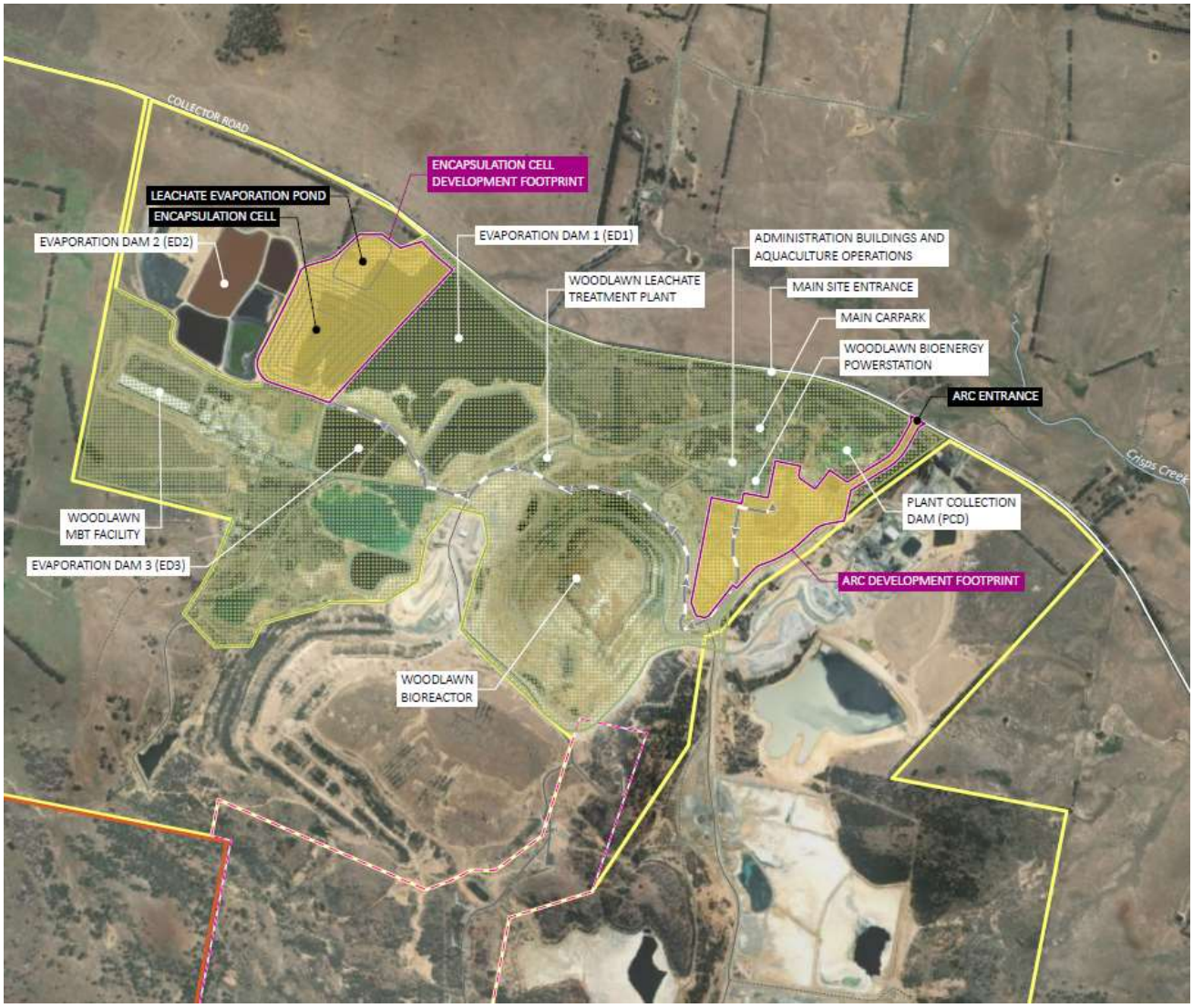

Plate 2: Concept design of proposed ARC development (EMM, 2022)

1.2 Objectives

The objectives of this PSI include:

- To identify areas of the site which have the potential to impact on the Project with respect to contamination;
- To highlight the contamination risks to the Project and provide recommendations, if applicable, based on the findings. Recommendations may include identification of what further assessments (e.g., intrusive investigations) might be required to be completed in accordance with current guidelines or required under the SEARs. Recommendations may also include outlining requirements for mitigation and management measures for potential impacts associated with contamination during detailed design, construction, and operation of the Project (e.g., development of surplus fill assessment and management strategies); and
- To meet the statutory requirements.

The PSI considers the proposed Project land use exposure scenario to be commercial/industrial land use.

1.3 Preliminary Site Investigation Methodology

1.3.1 Approach

The PSI has generally been completed with reference to relevant State and National guidance documents endorsed under the *Contaminated Land Management Act 1997* (the *CLM Act*), and the *RH SEPP* including, but not limited to:

- *Guidelines for the NSW Site Auditor Scheme (3rd Edition)*, New South Wales Environment Protection Authority (EPA, 2017);
- *Consultants Reporting on Contaminated Land*, New South Wales Environment Protection Authority (EPA, 2020);
- *National Environment Protection (Assessment of Site Contamination) Measure 1999*, National Environment Protection Council (NEPC, 2013); and
- *Managing Land Contamination Planning Guidelines, SEPP 55 – Remediation of Land*. Department of Urban Affairs and Planning & Environment Protection Authority (DUAP & EPA, 1998).

This approach is consistent with the SEARs issued for the Project.

1.3.2 Scope of Works Completed

The PSI involved a review of the broader Woodlawn Eco Precinct as well as the development footprint (shown in Plate 1) and included the following key tasks:

- Completion of a desktop review of published maps and databases to establish the site setting and likely surface and subsurface conditions in the area of the Project including geology, hydrogeology, soil landscape, topography and likelihood of acid sulfate soils (ASS);
- A desk top review of publicly available information to identify potentially existing and historical contaminating land uses for the Woodlawn Eco Precinct, comprising:
  - Historical and recent aerial photography;
  - Review of registers maintained by the NSW Environment Protection Authority (EPA) under either Sections 58 or 60 of the *CLM Act*;
  - Review of the public register maintained under Section 308 of the *Protection of the Environment Operations Act 1997* (the *POEO Act*);
  - A review of the Waste Management and Liquid Waste Facilities register, with source information from Geoscience Australia;
  - Review of selected historical certificates of title;
  - Search and review of NSW Department of Primary Industries (DPI) registered groundwater bore database within the vicinity of the proposed ARC development;
  - A search of the records held by the Department of Defence, including Department of Defence unexploded ordnance (UXO) records;
  - Review of readily available environmental permits / licenses related to Woodlawn Eco Precinct; and
  - Review of previous environmental assessment reports and existing data prepared for the Woodlawn Eco Precinct (provided by Veolia);

- A site walkover inspection to verify the findings of the desktop study and site historical review and to identify any additional relevant site information. This included recording the current site conditions and land use, identification of potential sources of contamination in the form of site facilities or infrastructure and surface indicators of contamination. This inspection included interviews with knowledgeable site personnel;
- Identification of potential human health and environmental receptors of site contamination at or near the development footprint;
- Development of a preliminary Conceptual Site Model (CSM) identifying the potential sources, pathways, and receptors of potential contamination; and
- Preparation of this PSI Report for the Project, including a summary of the scope of works completed above and outline of recommendations for further assessment of potential contamination and/or mitigation and management measures for potential impacts associated with contamination.

To facilitate the some of the above searches a third-party contractor (Lotsearch) was engaged to provide the relevant environmental related and publicly available information. This information is contained within a Project specific report for the entire Woodlawn Eco Precinct site is located in Appendix A.

No intrusive investigation works were completed specific to this PSI. However, the results of a previous intrusive investigation of the Eco Precinct (Golder, 2009a) and of soil sampling from a series of test pits and geotechnical boreholes across the proposed ARC development to assist with assessment of contamination (Golder, 2021) and are discussed in Section 3.5 of this report.

2.0 SITE DESCRIPTION

2.1 Site Identification

The development footprint is located within the Woodlawn Eco Precinct, which currently operates as a landfill/waste recovery facility. The surrounding area is primarily agricultural (grazing) and undeveloped. Table 1 summarises the identification, location, and setting of the site. A Site Plan showing the location of the development footprint is included as Plate 1.

Table 1: Site identification, location, and setting

Item	Details
Street Address	609 Collector Road, Tarago NSW 2580
Legal Description	Part of Lots 1 and 2 of DP 1179305 (ARC development footprint including IBA area) Parts of Lots 4, 5, 6 of DP 830765 and part of Lot 30 of DP 754919 (encapsulation cell)
Current Land Use	Bioreactor landfill, bioenergy plant, agriculture, aquaculture and horticulture, mechanical and biological treatment, wind farm, and solar farm.
Approximate Geographic Coordinates	734651 mE 6116865 mN
Local Government Area and Land Use Zoning	Goulburn Mulwaree IN3 Heavy Industrial (Goulburn Mulwaree LEP, 2009)

2.1.1 On-Site Land Use

The Woodlawn Eco Precinct is owned and managed by Veolia. Veolia has converted the former open-cut mine void into a bioreactor landfill, where biogas is extracted from the waste to produce renewable energy for export to the power grid.

The Woodlawn Eco Precinct houses infrastructure including a bioreactor landfill, bioenergy plant, agriculture and horticulture, a wind farm, a solar farm, a Mechanical Biological Treatment (MBT) facility that produces a compost-like product from the organic fraction of residual waste that is suitable for use in mine site rehabilitation, and mining operations adjacent to the proposed ARC. At the time of preparation of this report mining operations had ceased with the mine in care and maintenance mode.

2.1.2 Surrounding Land Use

The Project is surrounded by the wider Woodlawn Eco Precinct, providing a buffer between operational areas and surrounding properties. The Woodlawn Eco Precinct is located in an undeveloped area predominantly used for livestock grazing. The development footprint is bounded by the Tarago-Collector Road to the north, with Veolia's landholdings extending in all directions, including Woodlawn farm to the north, Pylara farm to the south-east and south, and largely undeveloped land to the west. The village of Tarago is located approximately seven kilometres (km) to the east.

2.2 Environmental Setting

2.2.1 Topography

The Woodlawn Eco Precinct is located in the headwater of the Lake George (west) and Wollondilly River (east) catchments. The terrain rises to the south into a series of low, steep-sided hills and merges to the north with the broad, west to east trending valley and flood plain of Crisps Creek. Two shallow creek gullies formerly crossed the site. During periods of wet weather, surface flows and ponding of surface water would occur in these drainage gullies (Golder, 2009a).

The original drainage patterns across the Woodlawn Eco Precinct have been altered by excavation of the mine void, emplacement of the waste rock dump, and the presence of evaporation and storage dams. The former Woodlawn mine operated historically as a “nil-discharge” site (Golder, 2009a). All surface water drainage from the proposed ARC Development site is directed to the Plant Collection Dam.

2.2.2 Regional and Local Geology

A review of the *Canberra 1:250,000 Metallogenic Map Sheet S1 55-16* (Gilligan, 1975) indicates that the Woodlawn Eco Precinct is situated within the Lachlan Fold Belt on the Great Dividing Range. The bedrock in the vicinity of the site consists of complex sequences of volcanic and low-grade metamorphic rocks of Ordovician and Silurian-Devonian age. The rock types anticipated to be encountered on site include:

- Long Flat Volcanics (quartz feldspar porphyry, rhyolite, toscanite, and tuff) of the Captains Flat Trough;
- Basalt, pillow lavas and dolerite dykes of the Captains Flat Trough;
- Undifferentiated greywacke, sandstone, slate, chert, limestone, and quartzite of the Monaro Slope and Basin;
- Ellenden Granite of the Orogenic Granites group;
- Intrusive porphyries; and
- Intrusive dolerite sills and dykes.

Additionally, the *Canberra 1:250,000 Metallogenic Map Sheet S1 55-16* shows a series of inferred faults running north-south is located approximately 10 km to the east and west of the site.

Based on historical and publicly available information, the following subsurface conditions may be encountered on the site:

- Fill / topsoil, associated with the existing site earthwork activities;
- Natural / residual soil, with a variable thickness likely across the site;
- Interbedded sandstone, siltstone, claystone, and shale; and
- Dolerite and dolerite sills, but this can be sporadic.

2.2.3 Hydrogeology

The Great Dividing Range roughly bisects the Woodlawn Eco Precinct with the westward flowing streams entering Lake George, located approximately 8 km west of the site; and the eastward flowing streams joining Crisps Creek and the Mulwaree River, located approximately 6 km east of the site.

The regional groundwater regimes can be broadly divided into basement Ordovician and Silurian-Devonian aged volcanics, intrusive sedimentary rocks and overlying fluvial and hill wash sequences. The local groundwater regime can also be influenced by man-made structures such as tailings ponds and/or evaporation ponds surrounding Woodlawn Eco-Precinct.

It is anticipated that within the development footprint, the inferred groundwater flow direction is generally in a northeasterly direction, which then joins the flow of the intersecting Crisps Creek, subsequently flowing in an east to southeasterly direction. The inferred groundwater flow direction of the bedrock aquifer, however, is to the south/southwest, toward the bioreactor void.

A search of online records held by the NSW Department of Primary Industry Office of Water was performed by Lotsearch (see Appendix A). Eighteen registered bores were identified within the search buffer of 2,000 m. All the bores are registered as monitoring wells. A summary of the groundwater bores within 2,000 m of the Woodlawn Eco Precinct is presented in Table 2**.**

Table 2: Groundwater bores summary

GW ID	Approximate Distance from Site	Purpose	Total Depth (m bgl)	SWL (m bgl)	Yield (L/s)	Salinity (mg/L)
GW102321	0	-	12.50	-	0.30	-
GW102323	0	-	7.30	-	0.050	-
GW109359	0	Monitoring	8.00	-	-	-
GW109360	0	Monitoring	7.00	-	-	-
GW068467	0	Mineral exploration	-	-	-	-
GW109355	0	Monitoring	6.50	-	-	-
GW109358	0	Monitoring	10.40	-	-	-
GW109361	0	Monitoring	9.10	-	-	-
GW102876	0	Monitoring	20.80	0.30	-	-
GW102877	0	Monitoring	13.20	1.14	-	-
GW102324	142 m east	Monitoring	15.40	-	0.10	-
GW102322	354 m south	Monitoring	23.50	-	0.40	-
GW102351	959 m north	Monitoring	13.00	-	0.50	-
GW405046	1.1 km southwest	Stock Watering	41.00	30.0	0.94	Good
GW102878	1.3 km southwest	Monitoring	29.00	1.35	-	-
GW109357	1.5 km southeast	Monitoring	11.00	-	-	-
GW109356	1.5 km southeast	Monitoring	5.00	-	-	-
GW502158	1.9 km northeast	-	9.40	-	-	-

3.0 DOCUMENT REVIEW

3.1 Phase I Environmental Site Assessment (Golder, 2006)

Golder completed a Phase I Environmental Site Assessment (ESA) in June 2006 to assess an area of the Woodlawn Eco Precinct northeast of the open-cut mine void which operated as a mine plant area (referred to as the former mine plant area). The former mine plant area comprised approximately 22 hectares located immediately northeast of the bioreactor void and is shown on Plate 3. The area subject of the Phase 1 ESA investigation area forms part of the ARC development footprint.

The broader former mine site had been redeveloped as the Woodlawn Bioreactor Facility with the bioreactor being constructed within the mine void. The former mine plant area was being redeveloped as a power generating station utilising landfill gas from the bioreactor (now known as the Bioenergy Power Station). The objective of the Phase I ESA was to identify potential areas of environmental concern related to the redevelopment of the former mine plant area.

The Phase 1 ESA investigation area was further divided into Area 1 and Area 2 (shown on Plate 3) with several areas of concern identified below. The ARC development footprint includes parts of Areas 1 and 2.

Table 3: Areas of concern

Area	Potential Contamination Issue(s)
Stockpile area in western side of Area 2	Dredge material potentially contaminated with heavy metals stored on primary crusher pad. Potential source of acid mine drainage based on observations of discoloured water ponding at base of embankment.
Above ground storage tanks (ASTs) in Area 2	Potential spills/leaks of waste oil.
Former diesel tanks in Area 1	Potential spills/leaks of diesel from former tanks.
Demolition materials in Area 1	Friable asbestos sheeting identified in demolition waste from former building in the Study Area. Potential for residual ore concentrates to be present in soils.
Plant collection dam in Area 1	Runoff from former mine plant area. Potentially impacted by high metal concentrations and low pH.
Tailings dam in Area 2	Potential for high metal and sulfide concentrations and low pH. Tailings stored in this area have been reported to have high silver concentrations.
Water storage ponds in Area 1	Water and sediment in several ponds potentially containing high metal concentrations and low pH.

Golder (2006) recommended a Detailed Site Investigation (DSI) to assess the areas of concern identified above. Areas 1 and 2 are shown in detail on Plate 3 and Figure 1 of Appendix B (Golder, 2006).

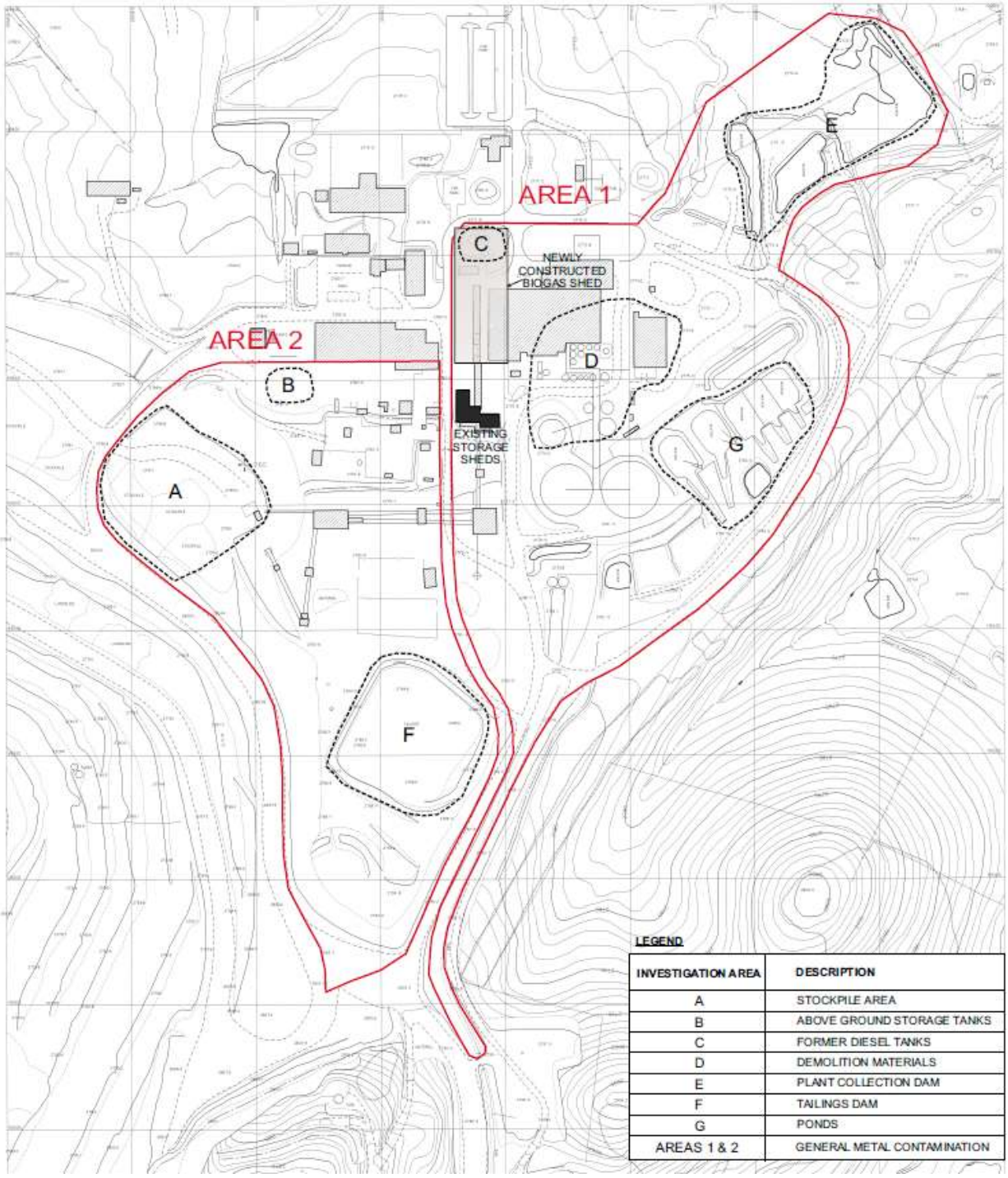

Plate 3: Phase I ESA areas of concern (Golder, 2006)

3.2 Detailed Site Investigation (Golder, 2009a)

Golder completed a DSI within the former mine plant area, the subject of the 2006 Phase 1 ESA, in August 2008 to collect sufficient information on the contamination status to develop a rehabilitation plan to support ongoing redevelopment. The DSI included the collection of 301 soil samples, 16 surface water samples, and 7 groundwater samples. Soil samples were collected from a combination of soil bores and test pits within the former mine plant area. In addition to the Areas of Concern identified in Table 3, two underground storage tanks (USTs) were identified immediately north of the former mine plant area. The USTs reportedly stored

petroleum products and were included as an Area of Concern. Samples collected as part of the DSI were analysed for combinations of the following constituents of concern:

- Soil
  - Metals (arsenic, cadmium, chromium, copper, nickel, mercury, lead and zinc);
  - pH;
  - Electrical conductivity (EC);
  - Net acid generation (NAG);
  - Net acid producing potential (NAPP) including acid neutralisation capacity (ANC);
  - Sulfur/sulfide/sulfate;
  - Total petroleum hydrocarbons (TPH);
  - Benzene, toluene, ethylbenzene; total xylenes (BTEX);
  - Polycyclic aromatic hydrocarbons (PAH);
  - Asbestos;
  - Cyanide; and
  - Polychlorinated biphenyls (PCB).
- Surface and Groundwater
  - Metals (as per soil);
  - pH;
  - EC;
  - Sulfur/sulfide/sulfate;
  - TPH;
  - BTEX;
  - PAH;
  - Cations/anions;
  - Total dissolved solids (TDS); and
  - PCB.

Results from the DSI indicated that contamination from previous site works was present across the former mine plant area as summarised in the following subsections.

3.2.1 Acid Mine Drainage

Interpretation of acid base accounting tests indicated that the majority of fill, sediments and some natural soils could be considered acid-producing through the oxidation of pyrite, and pyrrhotite. The ANC of the soils was low due a lack of carbonites, calcite, and dolomite (Golder, 2009a).

3.2.2 Surface Water

Surface water samples collected for the DSI exceeded the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000[1]) for metals at all locations by several orders of magnitude. pH was acidic at all locations and EC was generally high.

3.2.3 Groundwater

Groundwater samples collected across the Study Area indicated concentrations of cadmium, copper and zinc exceeded the ANZECC (2000) screening criteria. pH was generally neutral, and EC variable. The shallow groundwater flow direction was inferred to be to the northeast and concentrations of constituents of concern decreased in the expected direction of groundwater flow. Further assessment was recommended to determine if concentrations were attenuating (Golder, 2009a).

3.2.4 Soil

Widespread metal impact in soils and fill was identified during the DSI. The average concentrations for copper and lead were above the National Environment Protection Measure (NEPM) Health Investigation Level (HIL) for commercial/industrial land use (NEPM HIL F[2]). Arsenic, cadmium, and zinc were also widely detected with maximum concentrations typically an order of magnitude above the NEPM HIL F screening criteria (Golder, 2009a).

It should be noted that the NEPM was revised in 2011 and approved for use in 2013. NEPM (2013) HIL D replaced the NEPM (1999) HIL F for commercial and industrial land use. When applying NEPM (2013) HIL D screening criteria, three soil samples exceed screening criteria for cadmium and six samples exceed for copper. 60 samples exceed the lead criteria which was not changed from the NEPM (1999) HIL F value.

TPH in the C_{10}-C_{35} range was detected in several soil samples at concentrations exceeding the nominated NSW EPA Service Station Guidelines (EPA, 1994[3]) screening criteria. Some BTEX constituents were detected at concentrations exceeding the service station guidelines in one sample location outside the area of the DSI. Sample locations indicating detectable petroleum hydrocarbon concentrations were associated with fuel storage tanks and nearby dams (Golder, 2009a).

It should be noted that the NSW EPA Service Station Guidelines (EPA, 1994) were superseded by the revised NEPM and replaced with NEPM (2013) Health Screening Levels (HSLs) for vapour intrusion. Compared to the NEPM (2013) HSLs, none of the petroleum hydrocarbon concentrations detected during the DSI exceeded the contemporary screening criteria.

3.3 Human Health and Ecological Risk Assessment (Golder, 2009b)

Golder completed human health and ecological risk assessments based on the results of the Phase I ESA and subsequent DSI. The objectives of the risk assessments were to assess whether residual soil contamination posed an unacceptable risk to future site users and if extracted groundwater, surface water from Crisps Creek, or fugitive dust emissions posed an unacceptable risk to ecological receptors.

The human health risk assessment focused on metal impacts in soil due to planned works by Veolia to address TPH impact identified during the DSI. Identified receptors were limited to on-site workers and ecological receptors including grazing livestock (sheep), aquatic communities around Crisps Creek and native

[1] ANZECC (2000) guidelines have been superseded by ANZG (2018) *Australian and New Zealand Guidelines on Fresh and Marine Water Quality*, Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia.

[2] The NEPM was revised in 2011 (approved in 2013) and Health Investigation Levels have amended. HIL F has been superseded by HIL D under the 2013 NEPM revision.

[3] The NSW EPA Service Station Guidelines (EPA, 1994) have been superseded by the NEPM (2013) Health Screening Levels (HSLs).

fauna (wombats, dunnarts, wedge-tailed eagles, and great egrets) in the vicinity of the Woodlawn Eco Precinct.

3.3.1 Human Health Risk Assessment

For the HHRA, the chemicals of interest were found to be arsenic, cadmium, copper, lead, and zinc. Consideration was also given to impacts from sulfate and low pH conditions.

The daily dose for human receptors associated with the concentration of an individual chemical in soil and was estimated for each of the potential exposure routes were based upon United States Environmental Protection Agency (US EPA) and Australian health risk assessment frameworks. The exposure pathways of interest included the incidental ingestion of soils, dermal contact with soils, and the inhalation of dust from soils. The estimated daily dose from exposure to soils in the area assessed was added to the estimated background exposure to give an estimated daily intake and risks from each exposure pathway are assessed on the basis of the ratio between estimated and acceptable exposure.

The estimated dose by pathway indicated that the exposure was dominated by the ingestion and dermal absorption routes. The inhalation of dusts was not a major pathway of exposure. The results indicated that the maximum concentrations of zinc may present an unacceptable risk to the health of workers as the hazard quotient was greater than one. For the other constituents of concern, the hazard quotient was less than one, therefore the maximum reported concentrations of arsenic, cadmium, copper, and lead in the area assessed were not considered to present an unacceptable risk to human health.

The assessment of adverse effects from zinc in soil was examined and re-calculated using the 95% upper confidence limit of the mean (UCLM) concentration. From this re-calculation, the hazard quotient was found to be less than one, therefore zinc did not appear to present an unacceptable risk to human health. Based on these findings and the available data from the area assessed, chemical concentrations in soils were determined to be unlikely to pose unacceptable health risks to adult workers at the site.

The soils in the area assessed are also noted to have low pH and high sulfate concentrations. There is little information on the direct health effects of acidic or high sulfate content soils. There are cases of industrial dermatitis caused by the handling of or skin contact with acid soils (Golder, 2009b).

3.3.2 Ecological Risk Assessment

The objective of the ecological risk assessment was to evaluate the likelihood of adverse effects from soil (dust) and water at the site to wildlife and livestock. Limited data was available for this process. Notwithstanding the uncertainties, the available data indicated the potential for adverse risks to livestock and wildlife; however, these risks appear to result from contaminants of interest in background soil concentrations, rather than from soils from the area assessed, or other sources such as water from Crisps Creek or extracted groundwater. Soil and water from the area assessed did not appear to pose adverse risks to ecological receptors. On this basis, further assessment of these receptors was not recommended.

Potential risks were identified for piscivorous bird species associated with the consumption of fish from Crisps Creek. It was acknowledged that the modelling was conservative, with uncertainties in the water quality data and the absence of sediment data to validate the modelling (Golder, 2009b).

3.4 Remediation Feasibility Study (Golder, 2010)

Golder completed a feasibility study for rehabilitation of the former mine plant area such that risks identified in the *Human Health and Ecological Risk Assessment* (Golder, 2009b) would no longer pose an unacceptable risk to identified receptors. Up to 2009, the following rehabilitation works had occurred within the former mine plant area:

- Approximately 650 tonnes of demolition debris (concrete and steel) were removed from the Plant Area to the South Tailings Dam and used to cover the former landfill area east of the dam;
- Two diesel ASTs, an earthen bund and the upper layers of hardstand were removed from what is now the biogas flare area;
- Seven concrete silos were demolished from the former processing plant, with the concrete being disposed of in the South Tailings Dam;
- Contaminated fill from the plant area was placed in the South Tailings Dam.

The objectives of remediation according to Golder (2010) were to:

- Remediate the site to be suitable for future commercial/industrial land uses;
- Restore the site to reflect the natural surroundings;
- Minimise risk to site workers from physical hazards;
- Minimise release of contaminants from site to the surrounding environment;
- Minimise maintenance; and
- Secure the site for the indefinite future.

The feasibility study considered on-site treatment, ex-situ and in-situ encapsulation, acid rock drainage management, water management and natural attenuation. Each approach was evaluated based on technical feasibility, environmental impact, relative cost benefit, timeframe, and ongoing management requirements. The remedial options and evaluation results are included in Table 4 below (Golder, 2010).

Table 4: Remediation feasibility evaluation

Remedial Option	Technical Feasibility	Environmental Impact	Relative Cost Benefit	Timeframe	Ongoing Management	Comments
1: No Action	N/A	Low	High	Low	Low	Does not comply with mine closure objectives.
2: Mineral Recovery	High	High	N/A	Medium	High	Limited to remediation of tailings. High environmental impact rating does not account for disposal of residual materials post-treatment.
3: In-Situ Waste Treatment	Medium	Medium to High	Medium	Medium	Medium	Applicable to waste an impacted soil. Would enhance natural attenuation and reduce contaminants leaching to the environment. Further study required to assess available treatment technologies/dosage.
4: Encapsulation	Medium	High	Low	Low	Medium	Minimises metal leaching and acid generation.
5: Cover	Medium	High	Low to Medium	Medium	Medium	Reduces leachate generation and contamination of

Remedial Option	Technical Feasibility	Environmental Impact	Relative Cost Benefit	Timeframe	Ongoing Management	Comments
						surface water and groundwater.
6: Excavation and off-site Disposal	Medium	Medium to High	Low	Medium	High	Will eliminate contaminant loads but require significant volumes of contaminated soil and waste.
7: Water Collection/Diversion	Medium	High	Medium	Low	Low	Will control surface water discharge and minimise leachate generation.
8: Acid Rock Drainage Treatment	Medium	High	Medium	Low	Low to Medium	Will reduce discharge of contaminated water to Crisps Creek.

Golder (2010) recommended Option 5 (cover) as the preferred remediation method. The recommendation was based on consolidating and compacting waste and utilising a clay and topsoil cover over the waste areas. This option was recommended based on its ability to reduce contaminant loading to the environment, minimise the waste footprint in the plant areas and minimise infiltration of surface water into the contaminated material.

3.5 Stage 1 – Preliminary Ground Assessment (Golder, 2021)

Golder completed a preliminary geotechnical and contamination assessment for the proposed ARC development footprint in 2021. The purpose of the preliminary ground assessment was to investigate and detail the anticipated geotechnical, geological, and contamination parameters of the ARC development footprint and assess the feasibility of the proposed infrastructure and included the following scope of works:

- Drilling of three cored boreholes to between about 16 m and 20 m below ground level (bgl);
- Standard Penetration Test (SPT) at 1.5 m depth intervals in soils / weathered rock in the boreholes to assess the strength / density of the surficial materials;
- Installation of one groundwater monitoring well to assess groundwater levels;
- Point Load Index tests at approximately 1 m intervals (where possible) on retrieved rock cores to assess rock strength;
- Collection of 12 bulk samples for geotechnical assessment of potential material re-use; and
- Collection of 16 surface samples within the ARC development footprint and 10 grab samples from contamination stockpiles for contamination assessment.

The results of the contamination analyses showed that lead exceeded the adopted HIL of 1,500 milligrams per kilogram (mg/kg) for commercial/industrial land use in the majority of samples analysed. With the exception of the results reported for samples collected from the Tipper Stockpile, the lead concentrations were lower than those reported in Golder (2009a) and the maximum value used in Golder (2009b). All other reported soil concentrations for metals were below the adopted assessment criteria. The Tipper Stockpile is located in the area proposed for the IBA Maturation Pad construction (Plate 1).

In 2015 the National Health and Medical Research Council (NHMRC) published the results of a review of the health effects of lead in humans and management of potential exposures. This review recommended the decrease of the trigger for investigation of lead exposure to a person from 10 micrograms per decilitre (µg/dL) in blood to 5 µg/dL. It is understood that enHealth reviewed the blood lead model used to derive the

investigation levels adopted in the NEPM, but considered that the model was sufficiently conservative, and as such the guideline values for lead documented in the NEPM remain unchanged.

Although a contemporary human risk assessment would be performed slightly differently than Golder (2009b), the outcomes would not change significantly. In addition, the maximum value of lead documented in this report, excluding the Tipper Stockpile results, is approximately 70% of that used in Golder (2009b). As such, it was considered that the conclusion of the risk assessment (that the concentrations of contaminants in site soils did not present an unacceptable risk to adult workers) remained valid for the reuse of material on-site (excluding that in the Tipper Stockpile) (Golder, 2021).

Interpretation of the acid-based accounting results indicated that the majority of soil material analysed from both the ARC development footprint and from the various fill sources can be considered as acid producing or potentially acid producing.

As the ARC development footprint includes the placement of fill and construction of buildings and associated roads and pavements, it is considered that the containment of metal-impacted material below the structures and pavements would be an appropriate form of management for metal-impacted material (Golder, 2021).

3.6 Mine Operations Plan (Heron, 2015)

Heron Resources Limited (Heron) prepared a *Mining Operations Plan* (MOP) in accordance with Condition 3 of Special Mining Lease 20 (SML20). The MOP relates to all mining and rehabilitation of the former Woodlawn Mine site excluding the Veolia bioreactor facility and Infigen Energy Windfarm. The area covered by the MOP is shown on Figure 2 of Appendix B (Heron 2015). This MOP was created to allow for continued exploration/mining operations under SML20. A previous (Veolia) MOP envisaged no further surface mining activities and focus on rehabilitation and construction/operation of the bioreactor facility. This MOP is valid through 30 November 2021 (Heron, 2015).

Key features of Heron's MOP include:

- Re-treating material stored in three on-site tailings dams;
- Establishing a box cut to access new and existing ore bodies;
- Establishing surface ore processing in the area known as Hickory's Paddock;
- Establishing independent site access to separate Heron and Veolia operations; and
- Transporting ore concentrate off-site.

The MOP specifically excludes the bioreactor void, Evaporation Dam 3 (ED3), the Veolia bioreactor facility and associated infrastructure. The areas covered by the MOP will generally be rehabilitated rehabilitation as follows:

- Capping and/or treatment of tailings dams;
- Possible capping and/or treatment of Evaporation Dams 1 and 2 (ED1 and ED2);
- Implementation of appropriate acid mine drainage controls;
- Shaping of final slopes to be stable and capable of supporting vegetation; and
- Control of noxious weeds and vermin.

3.7 Landfill Closure and Rehabilitation Management Plan (Veolia, 2016)

Veolia's Landfill Closure and Rehabilitation Management Plan (Veolia, 2016) outlines Veolia's approach to rehabilitate areas that are covered under the existing Woodlawn Bioreactor consents (DA 31-02-99 and MP10_0012). Condition 22 of DA 31-02-99 and Condition 29 of MP10_0012 refer to the need for a Rehabilitation Management Plan as part of the Landfill Environmental Management Plan. The LCRMP was prepared to address this requirement. These include the bioreactor, water management infrastructure, areas surrounding the administration buildings for offices and other waste management and related infrastructure. Areas outside of Veolia's existing Woodlawn Bioreactor consents are covered under the MOP (Heron, 2015).

The objective of the Landfill Closure and Rehabilitation Management Plan is to address rehabilitation and management issues associated with stormwater, leachate, biogas, water management infrastructure, and revegetation of the site.

The Landfill Closure and Rehabilitation Management Plan presents three options for early closure of the Bioreactor specifically if filling activities cease prior to complete filling of the bioreactor void. The options vary in the volume and layout of surface depressions designed to keep contaminated surface water collected on un rehabilitated surfaces separate to clean surface water collected from rehabilitated surfaces. In the event of early closure, surface water collected from unrehabilitated surfaces of the bioreactor void would be directed to existing water management infrastructure.

Upon final closure, the plan specifies that bioreactor void will be contoured to match the surrounding landform and water would be permitted to drain naturally into the local water catchments.

3.8 Proposed Woodlawn Waste Exemption Technical Report (Umwelt, 2012)

Umwelt (Australia) Pty Limited (Umwelt) prepared a report to support a site specific resource recovery exemption to allow the application of compost from the then proposed alternative waste technology (AWT) facility to the mining rehabilitation areas on the site (Umwelt, 2012).

The report included the results of a program of test pitting and sample collection and analysis to determine the characteristics of the mining disturbed areas across SML20. The soil samples were analysed for a suite of metals[4], organochlorine pesticides, polychlorinated biphenyls and physical characteristics[5]. Three testpits were located within the footprint of ED1 (locations WBS02 to WBS04 inclusive). The location of the testpits is shown in Plate 4 below and analytical results for these locations and for four samples collected from undisturbed areas are summarised in Table 5.

The samples collected from ED1 had a lower pH and higher copper and zinc concentrations than those from undisturbed areas. Not-withstanding this, the results for samples collected from the southern end of ED1 were orders of magnitude lower than the HIL-D values adopted as site assessment criteria in Section 7.1.

[4] Arsenic, cadmium, copper, chromium, lead, mercury, nickel, selenium and zinc.

[5] pH, EC, TOC, cations and anions and CEC.

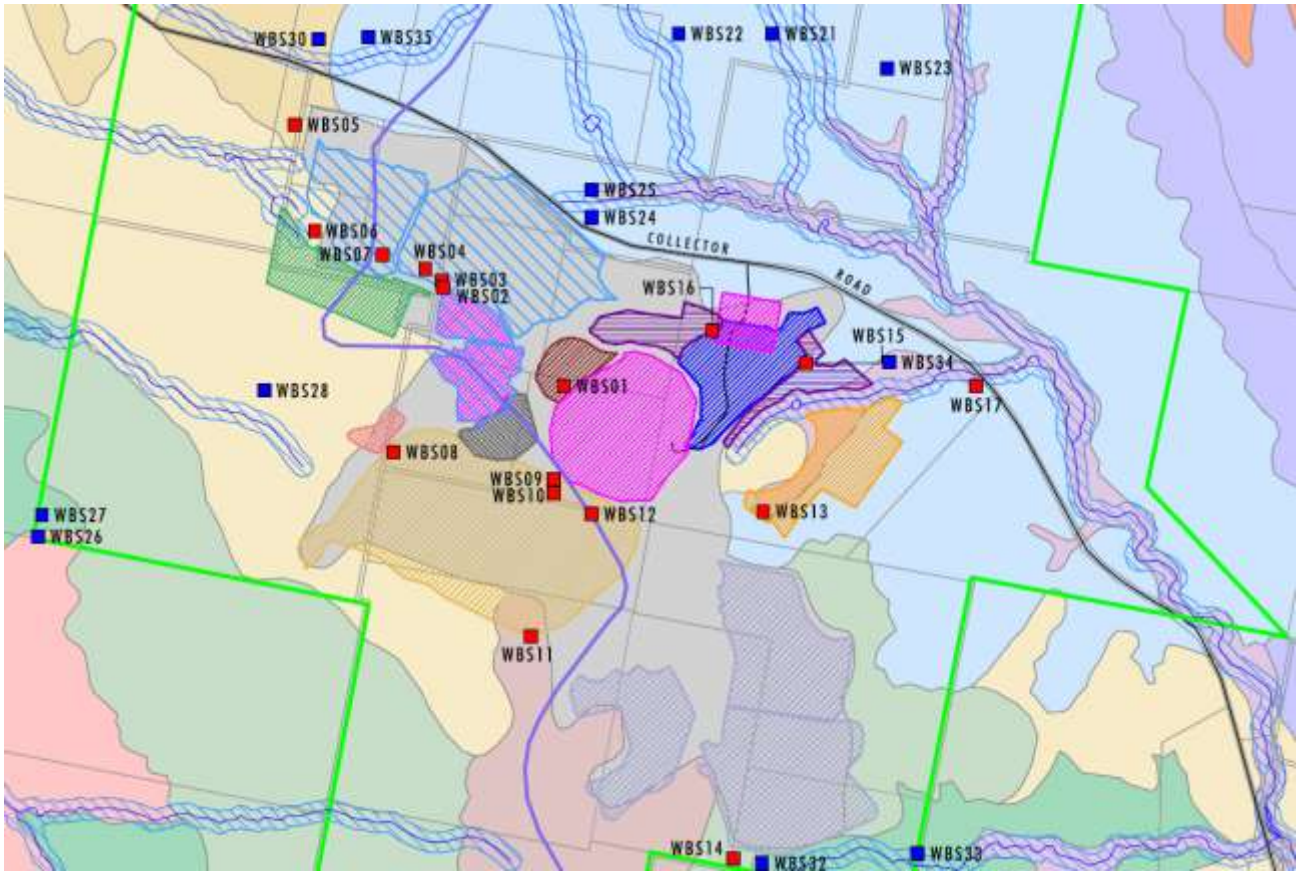

Plate 4: Umwelt 2012 investigation locations (Umwelt, 2012)

Table 5: Umwelt (2012) Soil analysis results

Location	pH	Arsenic	Cadmium	Copper	Chromium	Lead	Mercury	Nickel	Selenium	Zinc	OCP	PCB
NEPM HIL-D	-	3,000	900	240,000	3,600	1,500	730	6,000	10,000	400,000	Various	7
ED1 sample locations												
WBS02	4.6	11	2	22	54	73	<0.1	4	<5	263	<LOR	<LOR
WBS03	4	9	3	165	38	53	<0.1	10	<5	692	<LOR	<LOR
WBS04	4.2	7	3	282	15	101	<0.1	2	<5	272	<LOR	<LOR
Undisturbed areas sample locations												
WBS05	5.5	5	1	25	82	17	<0.1	31	<5	61	<LOR	<LOR
WBS11	4.9	81	1	75	10	367	<0.1	2	<5	44	<LOR	<LOR
WBS14	5.7	5	1	35	9	94	<0.1	5	<5	142	<LOR	<LOR
WBS17	5.4	5	1	57	16	96	<0.1	2	<5	92	<LOR	<LOR

Notes:
All results and HIL-Ds in mg/kg except pH in pH units
Umwelt (2011) did not include laboratory certificates to allow determination of level of reporting for organochlorine pesticides (OCPs) and polychlorinated biphenyls (PCBs)

3.9 Woodlawn Evaporation Dams ED1 and ED2 Seepage Investigation (AECOM, 2017)

AECOM completed an integrity assessment of evaporation dams ED1 and ED2 as part of Pollution Reduction Plan (PRP) for the Woodlawn Bioreactor. The PRP is a requirement of the Environment Protection License (EPL) for the bioreactor (EPL 11436).

ED1 and ED2 historically held water from the open cut mine works and later from dewatering associated with the underground mine works. Since mining ceased in 1998, ED1 and ED2 have received runoff from areas of the Woodlawn Eco Precinct that have been altered by mine activities (AECOM, 2017).

The PRP required an integrity investigation of ED1 and ED2 to assess liner integrity of the dams, assess geophysical conditions underlying the dams, assess identified breaches, assess potential contaminant pathways to ground and/or surface water, and assess potential receiving waters for contamination.

AECOM completed the following scope of works as part of the dam integrity assessment:

- Review of historical site investigation reports;
- Inspection of dam walls;
- Interview personnel knowledgeable in the dam design construction process;
- Advancement of boreholes through dam base to assess composition and permeability of base material;
- Electromagnetic survey in the vicinity of the two dams to investigate for evidence of seepage;
- Groundwater assessment; and
- Geochemical seepage assessment.

AECOM included a discussion of soils in the vicinity of the site. Soils in the surrounding area were reported to contain naturally high metal concentrations. Subsoil samples collected on the Woodlawn pastoral property to the northeast of ED2 contained up to 200 mg/kg copper, 800 mg/kg lead and 300 mg/kg of zinc. The concentrations reported are of similar magnitude to that reported in Umwelt (2012) for samples collected from within ED1.

AECOM's assessment of dam integrity indicated that seepage has occurred from both dams and may have travelled as far as 450 m from ED1 and 900 m from ED2 (AECOM, 2017). In addition to subsurface discharge, a review of historical reports has indicated some groundwater monitoring wells in the vicinity of the dams may be under artesian conditions, resulting in surface discharge of seepage water from the dams. Permeability testing of the dam bases indicated low permeability base material and all sample results were below the standard of 1×10^{-9} m/s (AECOM, 2017). However, AECOM noted that that the material tested may not be representative of in-situ conditions. AECOM (2017) suggested that historical drying of the dams may have resulted in surface cracking of the bases that subsequently introduced a migration pathway. The electromagnetic survey revealed discrete areas of higher permeability material that appear to coincide with the Crisps and Allianoyonyiga Creek beds. AECOM's assessment of groundwater conditions suggested that discharge to the creeks is likely to be low based on the generally low permeability strata and difference in elevation (hence lack of interaction) between groundwater and the streambeds (AECOM, 2017).

Groundwater gradients calculated by AECOM (2017) indicated radial flow from both dams with a very steep gradient (approximately 10 m head over 50 m distance). This suggests limited flow and seepage velocity, and surface water results have not indicated evidence of seepage water entering either Crisps or Allianoyonyiga Creeks adjacent to ED1 and ED2.

Based on the limited migration of seepage from the dams and the receiving environment being within the SML20 area, AECOM recommended an ecological risk assessment be performed to assess potential risk to ecological receptors due to seepage from ED1 and ED2 (AECOM, 2017). The location of the evaporation dams is shown in Plate 5 below.

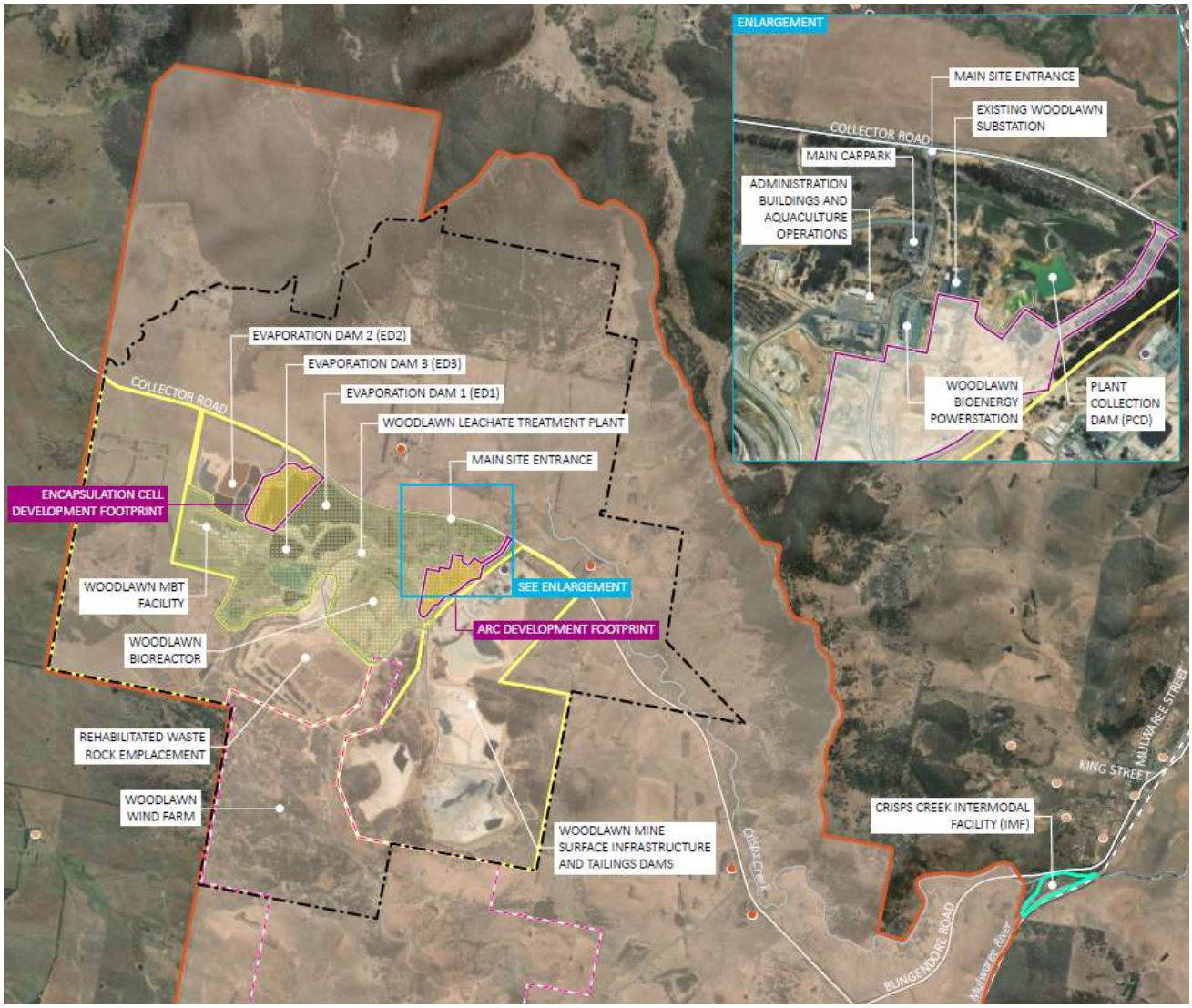

Plate 5: Evaporation dam locations (EMM, 2022)

3.10 Woodlawn Evaporation Dams ED1 and ED2 Ecological Risk Assessment (Niche, 2018)

Niche Environment and Heritage (Niche) completed an ecological risk assessment at the site based on the recommendation of AECOM (2017). The scope of the risk assessment was to conduct an aquatic ecological study of Crisps Creek and Allianoyonyiga Creek downstream of ED1 and ED2 and identify groundwater fauna below or in the vicinity of the evaporation dams. The stated objectives were to assess potential exposure of aquatic ecology to contaminants, assess ecological tolerance to toxicity and determine residual risk to identified ecological receptors (Niche, 2018).

The risk assessment consisted of a single sampling event that was conducted from discrete pools within the stream beds as neither creek was flowing at the time of sampling. Results indicated that both streams contained primarily “pollution tolerant” invertebrates, two frog species, and groundwater contained few stygofauna. Niche (2018) determined that groundwater in the vicinity of ED1 and ED2 and surface water in Allianoyonyiga Creek was at moderate risk. Surface water in Crisps Creek was assessed as low risk.

Groundwater was determined to have low ecological value and concentrations appear to attenuate to background levels within 500-900 m of the evaporation dams (Niche, 2018). Seepage water was observed entering Allianoyonyiga Creek and is assumed to be seepage from ED2 based on elevated EC concentrations. Niche (2018) estimates the impact of high EC seepage water into the creek is limited to 50 m downstream. Niche’s (2018) recommended long term mitigation measures including relining the evaporation dams and developing site-specific trigger levels for zinc, copper, lead, and EC for future monitoring.

3.11 Woodlawn Bioreactor Construction Quality Assurance for ED1c (Earth2Water, 2018)

Earth2Water (E2W) were engaged to provide a technical specification and construction quality assurance services for the construction of ED1 coffer dam (ED1C) to store treated effluent. ED1C was constructed adjacent to the eastern side of ED1 (Figure 3, Appendix B) from May to October 2018. The total area of ED1C is approximately 6.61 hectares with approximately 233 megalitres (ML) of storage capacity. The subcut volume was approximately 56,000 m^3. The dam was constructed with a 0.3 m clay liner underlaying a 1.5 mm high density polyethylene (HDPE) liner. E2W’s scope was to verify construction occurred according to the technical specification and consent conditions laid out in planning approvals MP 10-0012 (MOD 2) and DA 31-02-99 (MOD 3) (E2W, 2018).

The technical specification was based on investigation carried out by E2W in 2017 and 2018 involving installation of six groundwater monitoring wells and 61 test pits (E2W, 2018). Construction works were carried out by a number of civil contractors engaged by Veolia under E2W’s supervision. Quality control checks were undertaken at specific project milestones, including floor inspection following removal of unsuitable materials, anchor trench inspection, clay liner completion, geotechnical test of clay liner and installation of clay liner. E2W certified completion of the construction of ED1C to the required specification on 22 October 2018.

3.12 Annual Environmental Management Report (Veolia, 2021)

The Woodlawn Eco Precinct is operated under conditions listed in EPL 11436, which covers the operational areas of the bioreactor void and the evaporation dams. EPL 11436 covers waste disposal (application to land) and electricity generating activities. Veolia is required to undertake environmental monitoring to ensure potential discharges of pollutants to air or water are within the allowable limits. The number and types of monitoring points are summarised in Table 6 below. The location of each monitoring point and concentration limits are provided within EPL 11436, most recently updated on 9 June 2021 (EPA, 2021).

Table 6: EPL monitoring points

Monitoring Point Identification	Type of Monitoring Point
1, 2, 4	Subsurface Gas
5	Landfill Gas Input
6	Surface Gas
7	Air Discharge – Landfill Gas Flare
8	Air Discharge – Landfill Gas Engine
9	Meteorological
10, 11, 12	Dust
13, 14, 15, 16, 22, 59, 62	Surface Water
17	Surface Water & Discharge
18, 19	Surface Water & Volume

Monitoring Point Identification	Type of Monitoring Point
23, 24	Leachate Quality
25, 26, 27, 28, 30, 31, 33, 41, 42, 45, 46, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 60, 63, 64, 65, 66, 67, 68	Groundwater
61	Effluent from Leachate Treatment Plant

Golder has reviewed data provided on the Veolia Woodlawn Eco Precinct internet page: Woodlawn Eco Precinct, NSW | Veolia Australia and New Zealand and Veolia provided *Annual Environmental Management Reports* (AEMRs) from 2007 through 2020. The purpose of the reports was to compare the results of environmental monitoring to the thresholds permitted under the EPL. The following environmental parameters were monitored during the 2019-2020 reporting period (Veolia, 2020a).

Subsurface Gas

- Purged methane reading (%).

Landfill Gas Extraction Booster

- Temperature (°C);
- Volumetric flow (m^3/s); and
- Carbon dioxide (%).

Surface Gas

- Methane (%).

Landfill Gas Flare

- Temperature (°C); and
- Residence time (seconds).

Landfill Gas Engine Exhaust Point(s)

- Nitrogen oxides;
- Hydrogen sulfide;
- Volatile organic compounds;
- Sulfuric acid mist; and
- Sulphur trioxide.

Particulates/Dust

- Total insoluble solids (g/m^2/month).

Surface Water

- pH;
- EC;
- Ammonia (NH_3);
- Total organic carbon (TOC);
- Potassium (K);
- Sulfate (SO_4); and

- Zinc (Zn).

Leachate

- pH;
- EC;
- SO_4;
- Lead (Pb);
- Zn;
- NH_3; and
- TOC.

Groundwater

- pH;
- EC;
- SO_4;
- Pb;
- Zn;
- NH_3;
- TOC; and
- Copper (Cu).

Veolia (2020a) indicated that the majority of environmental monitoring undertaken during the 2019-2020 reporting period returned results that were generally consistent with long term trends. Surface water results from Allianoyonyiga Creek were reported as inconsistent and attributed to variability encountered when sampling ephemeral streams. Surface water results from Crisps Creek indicated increasing concentrations of EC and total dissolved solids (TDS) which was attributed to drier than normal conditions over the preceding two years. Groundwater results were generally consistent with near term previous results and historic trends with the following outliers:

- MW8S (located north of ED3N): increased EC and TDS attributed to muddy water and decreased pH attributed to dewatering of evaporation pond ED3N;
- MB33 (located within the bioreactor void): high alkalinity attributed to construction materials (cement) used during well installation; and
- SP2-MW1, MW-FRC1, and MB10S (all installed in the vicinity of ED1 and ED2 as part of the “seepage management scheme”): inconsistent metals concentrations attributed to analytical error. Total metals were analysed rather than dissolved metals.

Locations of EPL monitoring points are provided in Figure 4 of Appendix B.

3.13 Underground Storage Tank Validation Report (Envirowest, 2012)

Envirowest Consulting Pty Ltd (Envirowest) was engaged by CPS Environmental to undertake validation of two tank pits following the removal of three underground storage tanks (USTs) as summarised in the table below.

Table 7: Underground storage tanks

Tank ID	Location	Product Stored	Tank Capacity (L)	Tank Construction
1	Pit 1	Diesel	20,000	Single-walled steel
2	Pit 2	Petrol	20,000	Single-walled steel
3	Pit 2	Petrol	30,000	Single-walled steel

The two tank pits were located outside the proposed ARC development footprint (Figure 5, Appendix B). Pit 1 was located approximately 290 m northeast of the bioreactor void immediately south of administration buildings. Pit 2 was located approximately 510 m northeast of the bioreactor void, opposite the weighbridge along the road entering the Woodlawn Eco Precinct Site (Envirowest, 2012).

The three USTs were excavated and disposed of by CPS Environmental on 20 April 2012. Envirowest (2012) does not report how or where the tanks were disposed. Excavated soil and backfill sands were reportedly disposed of in the contaminated landfill on the Woodlawn site.

Envirowest collected soil samples from Pit 1 on an approximate 5 m grid including each wall and the base of the excavation as well as any locations indicating visual or olfactory signs of contamination. Pit 2 was sampled in the same manner on an approximate 10 m grid. Each sample was analysed for TPH, BTEX, naphthalene, and lead. One groundwater sample was collected from an existing monitoring well located northeast of Pit 2. The distance between the tank pit and monitoring well was not reported. The monitoring well is identified as “MW1” on Figure 5 of Envirowest (2012).

The Tank Pit 1 excavation was approximately 10 m × 6 m. The tank was reportedly in good condition with no evidence of rust or corrosion (Envirowest, 2012). Laboratory analytical results from soil samples collected from Pit 1indicated hydrocarbon concentrations were all below laboratory detection limits.

The Tank Pit 2 excavation was approximately 20 m × 15 m. Tank #3 was reportedly corroded and showed evidence of leaking. Soil samples collected on 20 April 2012 indicated detectable concentrations of petroleum hydrocarbons. Additional excavation was undertaken on 14 May 2012 to remove the impacted material despite only one result exceeding the nominated draft NEPM (2013) site criteria. The excavation was reportedly extended an additional 5 m laterally and 2 m vertically. Further vertical excavation was not possible due to groundwater ingress. The results of soil samples collected on 14 May 2012 indicated petroleum hydrocarbons were still present at concentrations above laboratory detection limits. The detected concentrations were approximately half those detected during the 20 April 2012 sampling event, and all were below applicable site criteria with the exception of a duplicate sample collected from the southwest wall.

Groundwater monitoring well MW1 was sampled on 20 April 2012. Analytical results indicated detectable concentrations of benzene (2 micrograms per litre (µg/L)) and lead (125 µg/L). The lead concentration exceeded the adopted ANZECC 2000 site criteria for freshwater aquatic ecosystems (95% species protection).

Envirowest (2012) concluded the site was suitable for ongoing commercial use but additional sampling would be required to determine the extent of impacted soil and potentially impacted groundwater.

3.14 NSW Woodlawn – Eco-Precinct Emergency Response Plan (Veolia, 2020)

Veolia maintains a *Pollution Incident Response Management Plan* (PIRMP) as required under EPL 11436. The purpose of the PIRMP is to minimise the risk of pollution derived from site activities and ensure clear and effective communication in the event of a pollution incident (Veolia (2020[2]). Appendix C of the PIRMP includes a Pollutants Inventory. Zone A is located northeast of the bioreactor void and is within the proposed ARC development footprint (Figures 6 and 7, Appendix B). Pollutants currently stored within the proposed ARC development footprint are listed in Table 8 below.

Table 8: Study area pollutants inventory

Item	Storage Type	Design Capacity (L)	Typical Quantity (L)
Diesel	Fixed Structure	70,800	30,000 – 40,000
Ferric Sulfate	IBC	5,000	3,000
Phosphoric Acid	IBC	2,000	1,000

4.0 REGULATORY SEARCH UPDATE

4.1 NSW Environment Protection Authority

A search of on-line records held by the NSW Environment Protection Authority (EPA) was completed as part of the Lotsearch (2021) published data review (Appendix A). The search findings are presented in the following subsections.

4.1.1 CLM Act Notices

The EPA maintains a “Record of Notices” which is a contaminated land public record. The record includes orders made under Part 3 of the *Contaminated Land Management Act 1997* (the *CLM Act*), notices available to the public under Section 58 of the *CLM Act*, site audit statements provided to the EPA under Section 53B of the *CLM Act*, actions taken by the EPA under Sections 25 or 36 of the *Environmentally Hazardous Chemicals Act 1985*, approved voluntary management proposals and copies of information formerly required to be part of the public record.

An on-line search for Notices under the *CLM Act* in the Goulburn Mulwaree Council Local Government Area (LGA) was performed by Lotsearch on 6 July 2021 (Appendix A). The result of the search was limited to premises within 1,000 m of the site and did not identify premises subject to a Notice within this search buffer.

4.1.2 Notifications Under Section 60 of the CLM Act

The NSW EPA maintains a "List of NSW contaminated sites notified to the EPA" under Section 60 of the *CLM Act*. Sites on this list indicate that the notifiers consider that the sites are contaminated and warrant reporting to the NSW EPA. The contamination at the site may or may not be significant enough to warrant regulation by the EPA and the EPA reviews relevant site information before making a determination as to whether or not the site warrants regulation. An on-line search for notified sites in the Goulburn Mulwaree Council LGA was performed by Lotsearch, using data from NSW EPA sourced on 6 July 2021 (Appendix A). The result of the search, limited to premises within 1,000 m of the site, did not identify premises that had been notified within this search buffer.

4.1.3 EPLs Under the POEO Act

The NSW EPA maintains a public register of premises subject to an Environment Protection Licence (EPL) under the *POEO Act*.

An online search for premises in the Goulburn Mulwaree Council LGA was performed by Lotsearch, using data from NSW EPA sourced on 6 July 2021 (Appendix A). The result of the search, limited to premises within 1,000 m of the site, is presented in Table 9.

Table 9: EPL search results

Premises	Approximate Distance from Site	Activity Type	EPL	License Status
Veolia Environmental Services Woodlawn Landfill	0	Waste disposal by application to land	11436	Active
Veolia Environmental Services	0	Composting, recovery of general waste, waste storage – other types of waste	20476	Active
Tarago Operations	0	Mining for minerals; mineral processing; mineral waste generation; crushing, grinding or separating; contaminated groundwater treatment; concrete works	20821	Active
Goulburn Mulwaree Council	0	Waste disposal by application to land	11437	Delicensed

Premises	Approximate Distance from Site	Activity Type	EPL	License Status
Luhrmann Environment Management	0	Other activities/non-scheduled activity – application of herbicides	4653	Surrendered
Robert Orchard	0	Other activities/non-scheduled activity – application of herbicides	4838	Surrendered
Sydney Weed & Pest Management	0	Other activities/non-scheduled activity – application of herbicides	6630	Surrendered

It is noted that EPLs 4653, 4838, and 6630 apply to waterways throughout NSW and are not considered relevant to the Woodlawn Eco Precinct.

4.1.4 Penalty Notices Issued Under the POEO Act

The NSW EPA maintains a public register of Penalty Notices under the *POEO Act*.

Golder completed a search of the Penalty Notices Register issued by the NSW EPA under the *POEO Act* on 1 July 2022 for the Goulburn Mulwaree Council LGA. The Woodlawn Eco Precinct has been subjected to four of penalty notices between 2013 and 2017. The remaining premises are all located over 5 km from the Woodlawn Eco Precinct and therefore not relevant to the investigation.

4.1.5 Waste Management and Liquid Fuel Facilities

A search of the waste management and liquid waste facilities was performed on by Lotsearch on 6 July 2021, with source information provided by Geoscience Australia. No records of liquid waste facilities were detected in the 1,000 m buffer zone. The subject site was the only waste management facility identified.

4.2 SafeWork NSW

A search of the SafeWork NSW files for records relating to historical storage of hazardous chemicals (formerly known as “dangerous goods”) was not considered necessary due to having been previously performed as part of the PSI (Golder, 2007). In addition, records of UST decommissioning are available (Envirowest, 2012) and Veolia maintains an inventory of materials held on-site. A review of Veolia’s PIRMP (Veolia, 2020b) indicates that diesel, ferric sulfate, and phosphoric acid are stored in the proposed ARC development footprint.

4.3 PFAS Investigation Programs

A search of the records held on PFAS investigation programs was performed by Lotsearch on 6 July 2021, with information sourced from NSW EPA, Department of Defence and Airservices Australia. The result of the search did not identify sites assessed as part of the Defence EPA PFAS Program, the Defence PFAS Investigation Program and Airservices Australia National PFAS Management Program in the 2,000 m buffer zone (Appendix A).

5.0 SITE INSPECTION

A site inspection was performed on 21 June 2021 by a principal environmental scientist from Golder's Sydney office. The person performing the inspection had visited the site and was involved in the investigations and reporting performed by Golder in the mid-to-late 2000s.

The principal features at the Woodlawn Eco Precinct are identified below:

- Bioreactor – the former open cut void is used as municipal solid waste landfill. Methane generated by the breakdown of waste is captured and used to generated electrical power;
- Power Station (also referred to as the WBE) – located to the northeast of the Bioreactor and east of the workshop and maintenance facilities. Gas from the bioreactor is used to generate electrical power, which is exported to the external electrical supply grid;
- Administration and workshop area – located on the northern side of the Woodlawn Eco Precinct. This area houses offices, amenities, workshop and maintenance facilities and a fish farm;
- The Leachate Treatment Plant (LTP) is located on the western part of the Woodlawn Eco Precinct. Leachate from the Bioreactor is pumped to the LTP, treated, then disposed to the ED1 coffer dam. The LTP was commissioned in late 2018;
- The Mechanical Biological Treatment (MBT) plant is located at the western end of the Woodlawn Eco Precinct. The MBT plant, which commenced operation in 2017, extracts organic material from waste, which is then composted. A nearby solar farm supplies power to operate the MBT; and
- Evaporation dams (ED1, ED2, and ED3) are located at the western end of the Woodlawn Eco Precinct.

The site inspection included an inspection of the premises controlled by Veolia, with particular focus on the area of the proposed ARC development footprint including the location of the encapsulation cell development footprint. Selected photographs taken during the inspection are presented in Appendix C.

Staff and contractors with knowledge of site activities were interviewed on the day or following the inspection by teleconference. The people interviewed were:

- Tobias Stanley (Veolia, Bioreactor and WBE Manager) and Ark Du (Veolia): Mr. Stanley was the primary site contact for the inspection, and Mr. Du acted as escort for part of the inspection;
- Tim Thrower (Divalls, long term contract plant operator): Mr. Thrower provided information on demolition and earthmoving activities which occurred in the area of the proposed ARC development footprint; and
- Henry Gundry (Veolia, former Manager of the Woodlawn Eco Precinct): Mr. Gundry provided information on the decommissioning of underground storage tanks at the site.

A summary of relevant information obtained during the inspection follows:

- Veolia's principal activities at the site are operation of the Bioreactor including placement of waste and power generation from gas produced from the Bioreactor, operation of the MBT, and supporting activities;

- The condition of that part of the former Mine Plant which is the location of the proposed ARC development footprint has altered significantly since the investigations performed by Golder in the 2000s. Impacted material was excavated from the former Mine Plant Area and disposed in the Southern Tailings Dam. The depth of excavation increased from north to south, with approximately 0.6 m or 0.7 m of cut on the northern part of the area and between 2 m and 3 m of cut on the southern part of the site. As part of the work the lined water supply ponds some building slabs and foundations were broken out. Dolomite which was stockpiled in the was moved and placed at the toe of the main Crusher Pad;
- More than 90,000 m^3 of material sourced from works at the Canberra Airport was imported to the site for use as cover material. The material was imported over an approximate seven-month period over late 2019 and early 2020. This material was stockpiled on the former Mine Plant Area to the south of the Power Station. At the time of the site inspection the material had been removed from this part of the site and used as cover in the Bioreactor;
- Sediment from the “zig zag” ponds leading into the Plant Collection Dam was removed to improve drainage. This sediment was inferred to be generated from the stockpiled fill material sourced from Canberra Airport. The sediment was used as cover material;
- Concrete slabs and remnants of structures remain on part of the former Mine Plant Area. The area of the proposed ARC is used for storage of some materials;
- The USTs observed to the northeast of the gatehouse in the Golder (2007) and (2009a) investigations were not able to be located during the site inspection, and site personnel stated that the USTs had been removed. A copy of the UST removal validation report was subsequently provided (Envirowest, 2012). This report, which also documented the removal of a UST located in the existing maintenance area, is discussed in Section 3.13; and
- Since Golder’s DSI (Golder, 2009a), consent was granted in 2013 under the *Environmental Planning and Assessment Act 1979* for the Woodlawn Mine Project (project approval PA07_0143) to extract up to 1.5 mtpa of copper, lead, and zinc ore for up to 21 years from existing tailings dams and mining of underground workings under SML20. The Woodlawn Mine Project includes dewatering the underground mine workings into, and drawing process water from, evaporation dams. The mine processing plant has been constructed in the area to the east and south-east of the proposed ARC development footprint. Infrastructure includes a crushing plant, water treatment plant, tailing thickeners and a floatation building. Evaporation Dam 2 (ED2) contains water from Heron’s operations. The Woodlawn Mine Project’s operations were suspended in early 2020, with the mine and processing plant in care and maintenance mode.

6.0 SITE ACTIVITIES

Golder undertook a historical review to provide information on the site history, including land use activities on site and in the surrounding areas, which may have contributed to potential site contamination since the previous investigations in 2006 and 2009. The following sources were reviewed and consulted:

- Historical aerial photographs for the period 2011 to 2018;
- Historical topographical maps; and
- Previous environmental assessment reports.

The aerial photographs (Appendix A) were sourced from Lotsearch (2021).

The outcomes of the site historical review are provided in the following sections.

The primary components of the Project relative to existing and former site activities described in the following sections are:

- The ARC – portion of the development footprint encompassed by the main ARC building and ancillary infrastructure, incinerator bottom ash (IBA) area and new access road and intersection. This area contains former mine plant infrastructure, water management infrastructure (plant collection dam) and other disturbed areas. The ARC is located within the former Mine Plant Area; and
- Encapsulation cell – portion of the development footprint encompassed by the dedicated lined and engineered landfill for the encapsulation of air pollution control residues from the ARC's flue gas treatment system. The encapsulation cell is proposed within the footprint of the existing ED1.

6.1 Historical Aerial Photographs

Historical aerial imagery including the development footprint from 2011, 2013, 2014 and 2018 is presented in the Lotsearch (2021) document (Appendix A). The aerial imagery was sourced from Google, Inc. Additional historical aerial photography is presented in Golder (2006) and includes the years 1960, 1967, 1978, 1982, 1984, 1985, 1987, 1989, 1994, 1996, 2000, and 2004.

The aerial photograph review was conducted to establish a general history of development of the site and surrounding area. This review is summarised in Table 10. Historical site features referred to in this section are shown on Figures 8 and 9 of Appendix B (Golder, 2006).

Table 10: Review of historical aerial photographs

Date	Comment
January 1960	***Greater Woodlawn Site***: The original Mine Site, which includes the Development footprint, had been extensively cleared and appeared to be used for agricultural (grazing) purposes. No structures were present on the site. A series of drainage lines were present running across the site towards the north-east. Two small farm dams were located on the site, to the west of a local high spot with remnant trees. ***Surrounding Properties***: Collector Road was present to the north of the site. Land surrounding the site appeared to be used for grazing purposes, with some remnant trees present some 3 km to the east of the site. A number of water courses were present, including Crisps Creek located to the north of Collector Road. The water courses to the east and north of the site appeared to drain in an easterly direction, with the water courses to the west and south west of the site draining in a westerly direction. An area which had a different appearance on the aerial photograph was located to the west of the site, on either side of a running south from Collector Road, was potentially associated with more intensive grazing activities. A number of homesteads were located on the northern side of Collector Road, with one homestead and outbuildings located on the southern side of Collector Road to the south-east of the site.

Date	Comment
July 1967	***Greater Woodlawn Site***: Similar to that shown in the 1960 aerial photograph. ***Surrounding Properties***: Similar to that shown in the 1960 aerial photograph.
November 1978	***Greater Woodlawn Site***: Mining operations had commenced on the site. An open cut pit was present, along with an extensive network of haul roads. The North Tailings Dam had been constructed and had visible water covering approximately half of the dam area. Structures, probably associated with the Gold Recovery Plant, were present on the western side of the tailings dam. The former sewage treatment plant was present on the northern side of Collector Road opposite the mine site. Office and ancillary buildings, with a layout similar to that currently on site, were present. A carpark and electrical substation were present on the northern part of the Mine Plant Area. A round structure, possibly a water supply tank, was located near the southeast side of the mine void. The area further to the west of the mine void was not visible on the aerial photograph. ***Development footprint***: Structures associated with ore processing were present in the former Mine Plant Area. Plant items identified in the aerial photograph included the Primary and Secondary Crushers, the Screening Plant and the Fine Ore Bins. Three round structures, assumed to be above ground fuel tanks, were present to the north of the Fine Ore Bins. Also present was the Processing Building which housed the grinding, flotation and dewatering plants. A number of thickeners were present, along with a number of lined ponds to the north-east of the main thickeners. Water was present in the Plant Collection Dam in the northeast corner of the Mine Plant Area.
December 1982	***Greater Woodlawn Site***: The extent of the open cut pit had increased since the 1978 aerial photograph. The area to the south and the south west of the pit in the area of the existing Waste Rock Dump had been covered with material, assumed to be excavation spoil from the pit. The South Tailings Dam had been constructed, and had visible water present over approximately half of the dam area. A structure was present at the location of the existing gatehouse, and a small structure was present at the western end of the existing administration building. The workshop building had been extended. A second probable water supply tank was present near the southeast corner of the mine void. ***Development footprint***: Minor changes were visible in the former Mine Plant Area since the 1978 aerial photograph. One new structure was present on the southern side of the fine ore bins, adjacent to the conveyor system from the sieve house. A freestanding structure was present to the north of the fine ore bins. The large Processing Building had been extended to the north. A new, small thickener bed or tank was present to the north of the larger thickeners.
November 1984	***Greater Woodlawn Site***: The extent of the open cut pit had increased since the 1982 aerial photograph. A dam was present at the southeast corner of the Waste Rock Dump. ***Development footprint***: Three ponds were present on the southern side of the large thickener beds, with a fourth pond present to the east of the thickener beds. A dam had been constructed in the southern part of the area to the west of the main road running north-south through the former Mine Plant Area. Three large stockpiles were present in the area of the existing tailings dam in this part of the former Mine Plant Area. Two small dams were present located at the eastern end of the existing ED1.
December 1985	***Greater Woodlawn Site***: Stockpiling of material to the east of the northern tailings dam had occurred, and a small structure was present to the west of the laboratory building. The Site was otherwise similar to that shown in the 1984 aerial photograph. ***Development footprint***: A structure was present at the southern end of the fine ore bins. A number of tanks were visible at the southern side of the Processing Building. Two tanks were present to the south of the large thickeners. A small structure was present to the north of the Secondary Crusher. No significant changes had occurred in the vicinity of ED1.
June 1987	***Greater Woodlawn Site***: Extensive stockpiling of material was evident on the Waste Rock Dump. Additional stockpiles of material were present in the vicinity of the Gold Recovery Plant to the west of the Northern Tailings Dam. ***Development footprint***: A number of small objects/structures were visible on the aerial photograph in the area to the northeast of the thickeners. A small structure was also present to the west of the fine ore bins. Earthworks for the construction of ED1 had commenced, with the dam wall constructed near Collector Road.

Date	Comment
July 1989	***Greater Woodlawn Site***: Two small pre-existing dams had been enlarged to form the southern portion of ED3. The Western Tailings Dam had been constructed. ***Development footprint***: Red discolouration of the water in the Plant Collection Dam was visible in the aerial photograph. A tailings dam had been constructed on the southwestern portion of the Mine Plant Area. Construction of ED1 had been completed and the ED1 contained water.
September 1994	***Greater Woodlawn Site***: ED 2 and the northern portion of ED3 had been constructed and had water present. The southern portion of ED3 had been extended to the north to cover a former stockpile area. Stripping of surface material from the area to the south of ED1 & ED2 had commenced. The size of the Western Tailings Dam had been increased. A structure was present to the west of the administration building. The Waste Rock Dump had been re-vegetated. An approximate 200 m length of the windbreak near the thickener beds and ponds had been removed or had died back. ***Development footprint***: An extension to the northern side of the Processing Building had been constructed.
November 1996	***Greater Woodlawn Site***: The area of Woodlawn Mine Site was similar to that shown in the 1994 aerial photograph. ***Development footprint***: The Study Area was similar to that shown in the 1994 aerial photograph.
December 2000	***Greater Woodlawn Site***: The area of Woodlawn Mine Site was similar to that shown in the 1996 aerial photograph. The volume of water in ED2 had decreased, but water was present in the mine void. Red colouration of the water in the Tailings Dams was present. The large workshop near the existing administration buildings had been removed, with a new smaller shed located at the eastern end of the location of the former shed. ***Development footprint***: Most of the above ground structures in the Mine Plant Area had been removed. The remaining structures included the Fine Ore Bins, the structures at the southern end of the Fine Ore Bins, and the tanks located at the northern end of the Fine Ore Bins. The northern section of the Processing Building remained. Red colouration of the water in the Plant Collection Dam was observed in the aerial photograph.
September 2004	***Greater Woodlawn Site***: The volume of water visible in the Evaporation and Tailings Dams had decreased significantly from earlier aerial photographs, with no water visible in the northern portion of ED3. Red colouration of the water in the Tailings Dams was present. Lining and placement of pipework had commenced inside the mine void. A light-coloured material was present in the base of the mine void, with a drainage system visible. A black liner membrane was visible around the side of the light- coloured material. Stockpiled material was present in the north-east corner of the mine void. 11 rectangular objects, probably shipping containers, were stored to the north of the mine void. ***Development footprint***: The former Mine Plant Area was similar to that shown in the 2000 aerial photograph. The roof of the northern portion of the Process Building had been removed, showing that the building had apparently been used for the bulk storage of solid material. Red colouration of the water in the Plant Collection Dam was observed in the aerial photograph. Seventeen rectangular objects, probably shipping containers, were present to the west of the main north/south roadway through the area, with another 29 stored to the west of the Primary Ore Crusher. A large number of end-tipped stockpiles were present nearby.
2011	***Greater Woodlawn Site***: The volume of water visible in the Evaporation and Tailings Dams had increased significantly from the 2004 aerial photograph. Red colouration of the water in ED2 was present. In-filling of the mine void appeared to have commenced, and structures were present in the location of the existing leachate treatment plant. ***Development footprint***: The number of structures present in the vicinity of the ARC Development Footprint had decreased significantly. The Power Station had been constructed, and the electrical substation appeared to have been extended.
2013	***Greater Woodlawn Site***: The amount of water present in ED1 had increased while water present in ED2 and the tailings dams had decreased. The site was otherwise similar to the 2011 aerial photograph.

Date	Comment
	Development footprint: The contents of the lead reverse dam appeared to have been excavated. A large fill stockpile appeared to be present to the south of the Power Station. The amount of water present in ED1 had increased since 2011.
2014	***Woodlawn Site***: Earth works appear to have commenced in the area of the existing Leachate Treatment Plant (LTP). The site was otherwise similar to the 2013 aerial photograph. ***Development footprint***: Similar to 2013 aerial photograph.
2018	***Woodlawn Site***: ED2 appears to have been divided into five holding areas. Water stored in tailing dams was largely limited to the northern and western dams. Filling of the bioreactor was ongoing. The MBT plant LTP had been constructed. An access road, the MBT and LTP Haul Road, had been constructed running to the north of the administration area and the Bioreactor. Infrastructure associated with the Woodlawn Mine Project, approved in 2013, is present to the east of the proposed ARC development (west of Hickory's Paddock) and a new haul road has been constructed to this area around the south side of the bioreactor void. ***Development footprint***: Some earthworks or demolition activities appear to have taken place since 2014. Construction of ED1c had commenced and the liner had been partially placed.

6.2 Summary of Historical Activities to 2008

From the review of the historical aerial photographs, documents reviewed, and discussions with Site personnel, the Site has been functioning under the management of Collex (now Veolia[6]) from 2004 until present. Details of Veolia's use of the site are discussed later in Section 6.2. A summary of site use and ownership prior to Collex ownership is summarised in Table 11 below.

Table 11: Summary of site use to 2004

Year	Description
1862	Ore was first discovered in the local area.
1967	Jododex Australia Pty Ltd commenced significant investigation for minerals across the district.
1968	Jododex received an exploration licence for Woodlawn (named after the property on which the ore body discovered).
1969 – 1971	Drill holes at Woodlawn returned material rich in copper, lead, and zinc deposits.
1972 – 1973	Mine shafts were sunk at Woodlawn.
1973	Environmental Impact Statement was prepared for Woodlawn.
1973 & 1975	Feasibility studies determined that there were sufficient mineral reserves to make mining at Woodlawn economically viable.
1976	New Broken Hill Consolidation Limited entered a joint venture agreement with Jododex for the development of the project.
1977	Construction of infrastructure at Woodlawn commenced, including the initial pit stripping to provide material for the construction of tailings dams and other earthworks.
April 1978	Mining commenced.
December 1978	Woodlawn officially opened, consisting of an open cut mine, a processing mill, associated infrastructure, and a rail loading facility at Tarago.
1980	Australian Mining & Smelting Company Ltd (AM&S) took over the responsibility for the operation of the Woodlawn Mine Site.
1987	Denehurst Limited purchased Woodlawn. Open cut mining ceased, and underground operations commenced.
March 1998	Mining at Woodlawn concluded.
February 1999	An Environmental Impact Statement and Development Application for the Woodlawn Bioreactor lodged with the Minister for Urban Affairs and Planning.
February 2000	Commissioner Cleland recommended approval of the proposed Woodlawn Bioreactor, subject to strict conditions of consent.

[6] Veolia Environment formed Collex by amalgamating two waste management firms. By 2006 Collex was part of the Veolia Environmental Services group.

Year	Description
November 2000	Development consent granted to construct and operate the Woodlawn Bioreactor and rehabilitate the mine site.
2004	Collex purchased Woodlawn and opened the Woodlawn Bioreactor.

6.2.1 Summary of Historical Mining Processes and Associated Activities

The historical mining processes and associated activities which have taken place at the Eco Precinct, including the development footprint for the Project, are described in the subsections below.

6.2.1.1 Woodlawn Mining Process

The Woodlawn Mine commenced operations as an open cut mine in 1978. The open cut mine void was ultimately approximately 200 m deep and 700 m wide. Underground mining commenced in 1987, with the ore bodies mined to a depth of 460 m below the base of the pit. Blasting was performed using ANFO (ammonium nitrate fuel oil) as the explosive, with approximately 1,000 tonnes of bulk explosive used annually. Review of historical Dangerous Goods Licenses indicated that Powergel (ammonium nitrate) and AMEX (a free-flowing ammonium nitrate/fuel oil mixture) was also used on the site. Waste rock from the open cut was placed in the southwest of the mine void and this area was rehabilitated in the early 1990s by reshaping, compacting the rock surface and placing a cover of clay and/or soil to a nominal depth of 200 mm. Tailings from the processing plant has been placed in three dams (North, South, and West Tailings Dams), located to the southeast of the plant (Golder, 2006).

The underground mine was accessed via two declines in the open pit. Conventional drill and blast techniques were employed, with diesel load haul dump units used to draw ore and transport it to the surface where it was stockpiled. Haul trucks picked up the ore and conveyed it out of the pit to the primary crusher. By 1997 approximately 1.4 million m^3 of ore had been removed from the underground workings. Waste rock from the underground mining was replaced into the mine shafts. Maintenance on mobile underground equipment was completed in the workshops in the plant area.

In 1998, all mining operations at the Site were ceased due to economic pressures.

Treatment processes employed at Woodlawn separated the various base metal sulfides from one another and from the accompanying pyrite and waste rock. Final products from the treatment process were mineral concentrates of sphalerite (zinc sulfide), galena (lead sulfide), and chalcopyrite (copper iron sulfide).

Fill material, potentially including waste rock from the mine void, was placed in the vicinity of the former Primary Crusher.

6.2.1.2 Ore Treatment Process

Crushing

Ore was delivered from the mine in trucks to the primary crusher. The ore was crushed in three stages, with intermediate screening to form a product with a maximum size of 13 mm. This fine ore was delivered to the fine ore storage bins ahead of the milling process.

The crushing plant was required to handle two separate ores, a copper bearing ore and a copper/lead/zinc (complex) bearing ore, which were fed through the crushing plant. The plant capacity was 420 tonnes/hour and was operated for ten shifts/week.

Grinding

The two ores were processed separately through the grinding plant. The complex ore was ground in a rod mill followed by a ball mill in closed circuit with a cyclone so that 80% passed 60-micron size. The copper ore was ground in a single stage ball mill so that 80% passed 74-micron size.

Floatation

Floatation is a method of separating different metal sulfides. Chemical reagents, such as xanthates, were added to a slurry of finely ground ore, and air was blown through the slurry. The metal sulfide particles were carried to the surface of the slurry in a froth, where they were removed and filtered. Different reagents were used for the recovery of different metal sulfides.

After the grinding process the copper material was separated from the waste by the floatation process producing a high-grade copper concentrate.

The minerals in the complex ore were separated by selective floatation process. First a copper concentrate was produced, followed by lead, and then zinc. This process required between 12 and 18 floatation reagents to achieve the separation. Spent processing reagents were disposed of as waste to the tailings dams.

6.2.1.3 Tailings

Tailings from both the copper and complex circuits were thickened together and pumped to the tailings dams. The tailings dams were constructed as earth wall pondages. Provision was made for return of water from the dams for re-use in the ore treatment process (Golder, 2006).

6.2.1.4 Process Water/Dams/Ponds

The Woodlawn Mine was intended to operate as a zero-discharge site with respect to process or contaminated waters. In the late 1980s, after a succession of above average rainfall years, three dams were excavated to the northwest of the open pit and all contaminated water was directed into these dams for evaporation. The dams were identified as Evaporation Dams 1, 2 and 3 (ED1, ED2 and ED3).

The Plant Collection Dam for the mine plant was constructed across a broad, shallow drainage gully in the northeast of the plant area. Historically, the central portion of the gully was a wet, marshy area, bounded by shallow creek channels on either side. The remainder of the gully floor was reportedly a dry marshy area, with the eastern abutment occurring over a rocky slope covered with slope wash soils and scattered boulders. Reportedly, any spillage from the plant area was collected in a sump which drains to the Plant Collection Dam. Dredge material potentially affected by heavy metals and hydrocarbons from the Plant Collection Dam was reported to have been disposed of on the crusher stockpile.

The tailings dams were reportedly constructed from earthfill, with the larger walls also containing rockfill. Clay cores were constructed into the dam walls to prevent seepage. The tailings dams were reported to have a combined volume of 11.26 million tons of tailings and to cover an area of over 110 hectares (Golder, 2006).

6.2.1.5 End of Mine Life Plan and Rehabilitation Plan

The proposal to rehabilitate the Woodlawn Mine through use as a waste facility was originally raised in an Environmental Impact Statement prepared for the mine's proposed development in 1973 for Denehurst. In the early 1990s Denehurst began working on an end of mine strategy for Woodlawn which included plans for filling the mine void with waste from Sydney.

The End of Mine Steering Committee at that time included representatives from Woodlawn Mines, the Department of Mineral Resources, the Department of Land and Water Conservation, the Environment Protection Authority, the then Mulwaree Shire Council and Price Waterhouse Coopers (Administrators Appointed). The committee produced a rehabilitation strategy for the whole mine site in July 1999. The information in the rehabilitation strategy was supporting a submission to the Commission of Inquiry regarding the Woodlawn rehabilitation and the proposed waste management facility (Golder, 2006).

At the completion of mining operations, all plant and equipment not required for the proposed waste management facility were sold at auction in October 1998. Decommissioning and removal of buildings, steel work and other infrastructure was scheduled for completion by the end of 1999. Roads not required for the

facility were to be ripped and dozed and hardstand areas were to be covered or removed. Due to the lack of topsoil, biosolids were proposed for use to condition the remaining soils and clays prior to grass and tree planting. Water management infrastructure, including dams, pipelines and pumps would remain in place to manage water after extreme rainfall events and to divert plant catchment to the evaporation dams.

The seven large concrete silos from the processing plant were imploded during demolition works at the site on 25 October 2004. Collex reported that the silos still contained a quantity of fine ore at the time of blasting which was not extractable, but the foggy and damp conditions on the day ensured there was little dust generated. The ore that remained reportedly contaminated the concrete which made it unsuitable to use within the mine void as was originally planned. The majority of the steel reinforcing was removed by crushing the concrete, which was sold off as scrap metal. The contaminated concrete was disposed in the South Tailings Dam (Golder, 2006).

Stockpiles of demolition material (concrete and reinforced steel) were regularly transferred from within the processing plant area to the South Tailings Dam. This potentially contaminated material was used to cover the previous landfill area at the eastern boundary of the dam. By the mid-2000s approximately 650 tonnes of material were reported to have been moved (Golder, 2006).

Three large ASTs previously used for diesel storage were removed from the plant area and sold as scrap metal. The earthen bund and upper layers of the hardstand which contained hydrocarbon contamination were removed and disposed to the South Tailings Dam. The location of the former diesel tanks was then prepared to house the Bioenergy Power Station, with crushed rock from the dolerite stockpile placed to form a foundation pad approximately 1m thick. The crushed rock used as foundation material was reported to have a low pyrite concentration. The Bioenergy Power Station initially comprised one power generator with plans to expand capacity in accordance with the development consent.

6.3 Summary of Current Activities 2008 – Present

Activities at the Woodlawn Eco Precinct since 2008, with particular focus on the former Mine Plant Area, include:

- Removal of metal impacted material from the former Mine Plant Area and demolition of remnant structures in the general area of the ARC development footprint;
- Decommissioning of and removal of underground storage tanks;
- Importation of fill to site for use as cover in the Bioreactor;
- Ongoing waste placement in the Bioreactor and power generation;
- Construction and operation of the MBT plant, LTP and solar farm; and
- Construction of the ED 1 Coffer Dam.

The proposed encapsulation cell development footprint is within the footprint of ED1, which has continued to be used for water storage in the period 2008-present. ED1 currently receives water from the Plant Collection Dam shown on Plate 2 and the Waste Rock Dam located approximately 1.3 km to the south of ED1 (location shown in Appendix B2). The ED1 coffer dam was constructed in 2018 and is to the east of the proposed encapsulation cell.

7.0 ASSESSMENT OF SOIL AND GROUNDWATER RESULTS

7.1 Soil

The DSI (Golder, 2009a) indicated widespread metals impact across the former Mine Plant Area which includes the proposed ARC development footprint. The average concentration of copper and lead in soils across the area exceeded the nominated human health screening criteria for commercial and industrial land-use. Lead was also detected at concentrations exceeding the nominated criteria in some of the background soil samples collected for comparison. Arsenic, cadmium, and zinc were also detected at concentrations exceeding the nominated screening criteria, however at a lower frequency than copper and lead. It is noted that the NEPM was revised in 2011, with new HILs adopted in 2013. With the exception of lead, the revised NEPM (2013) HIL D values are higher than the NEPM (1999) HIL F values used for the DSI (Golder, 2009a). Table 12 summarises the metals impact identified in the former Mine Plant Area soils as part of the DSI (including comparison to the contemporary NEPM (2013) HIL D criteria.

Table 12: Summary of soil results from DSI (Golder, 2009a)

Metal	Number of Samples Analysed	Average Concentration (mg/kg)	Maximum Concentration (mg/kg)	NEPM 1999 HIL F Criteria (mg/kg)	Percentage of Samples Exceeding NEPM 1999 HIL F Criteria	NEPM 2013 HIL D Criteria (mg/kg)	Percentage of Samples Exceeding NEPM 2013 HIL D Criteria
Arsenic	112	171	1,340	500	7%	3,000	0%
Cadmium	112	94	1,820	100	22%	900	2%
Chromium	112	37	128	500	0%	3,600	0
Copper	112	6,880	98,200	5,000	31%	240,000	5%
Lead	112	3,340	17,400	1,500	53%	1,500	53%
Mercury	112	0.6	4.7	75	0%	730	0%
Nickel	112	20	110	3,000	0%	6,000	0%
Zinc	112	18,270	335,000	35,000	15%	400,000	0%

Source: Golder 2009

Golder (2009a) also identified petroleum hydrocarbon impact to site soils, limited to the areas utilized for fuel storage. Envirowest (2012) removed three underground storage tanks from two tank pits located outside of the ARC development footprint in March 2012. Initial validation sampling conducted at the time of UST removal indicated petroleum hydrocarbon concentrations exceeding the nominated screening criteria. Further investigation resulted in removal of soil containing hydrocarbon concentrations above screening criteria, although concentrations above laboratory detection limits remained (Envirowest, 2012).

Golder (2021) collected soil samples from the ground surface across the ARC development footprint as well as from various fill stockpiles as part of a geotechnical investigation. Results indicated a high percentage of lead results exceeding the nominated NEPM (2013) HIL, particularly from proposed fill sources.

According to Golder (2021), the results of the contamination analyses showed that lead exceeded the adopted HIL of 1,500 mg/kg for commercial/industrial land-use in the majority of samples analysed. With the exception of the results reported for samples collected from the Tipper Stockpile, the lead concentrations were lower than those reported in the DSI (Golder, 2009a) and the maximum value used in the HHERA (Golder, 2009b). All other reported soil concentrations for metals were below the respective site adopted assessment criteria. Table 13 summarises metals impact identified in the ARC development footprint soils as part of the Preliminary Ground Assessment (Golder, 2021).

Table 13: Summary of lead results from Preliminary Ground Assessment (Golder, 2021)

Location	Number of Samples Analysed	Average Pb Concentration (mg/kg)	Maximum Pb Concentration (mg/kg)	NEPM 2013 HIL D Criteria for Pb (mg/kg)	Percentage of Samples Exceeding NEPM 2013 HIL D Criteria for Pb
ARC development footprint	21	1,104	5,850	1,500	24%
Fill Sources (overall)	30	4,775	45,700		63%
Crusher Stockpile/Pad	23	2,680	12,300		61%
Tailing Dam Wall	2	-	547		0%
Temporary Stockpile	3	-	8,090		100%
Tipper Stockpile	2	-	45,700		100%

Note: - Average not calculated due to insufficient data

Although a human risk assessment commissioned in 2021 would be performed slightly differently under current approaches, the outcomes would not change significantly. In addition, the maximum value of lead documented in Golder (2021), excluding the Tipper Stockpile results, is approximately 70% of that used in the HHERA (Golder, 2009b). As such, it is considered that the conclusion of the risk assessment that the concentrations of contaminants in site soils were not an unacceptable risk to adult workers remains valid for the re-use of material excluding that in the Tipper Stockpile.

Interpretation of the acid-based accounting results indicate that the majority of soil samples collected and analysed from both the ARC Area and from the various proposed fill sources can be considered as acid producing or potentially acid producing.

7.2 Groundwater

A number of groundwater investigations have taken place at the Woodlawn Eco Precinct as part of the DSI (Golder, 2009a), the ED1/ED2 Seepage Investigation (AECOM, 2017) and ongoing EPL compliance monitoring.

The DSI (Golder, 2009a) including the installation and sampling of eight groundwater monitoring wells. Monitoring wells MW05, MW07, MW07m MW20B and MW21 were located within the ARC development footprint and monitoring wells MW01, MW02 and MW03 were located outside of the ARC development footprint to the north. All the monitoring wells with the exception of MW21 indicated exceedances of the nominated screening criteria (ANZECC 2000) for EC, cadmium, and zinc. Samples collected from MW01, MW02, MW03, MW06, MW07 and MW20B all contained concentrations of copper, lead, or nickel exceeding site screening criteria.

AECOM's seepage assessment for ED1 and ED2 included the installation of nine groundwater monitoring wells (MB23 to MB31). In addition, twelve existing monitoring bores (MW8S, MW8D, MW9S, WM6, MB10, MB14, MB19, MW20, MB12, MB11, MB2, and MB3) were utilised as part of the assessment. It should be noted that the majority of these monitoring wells are in the immediate vicinity of evaporation ponds ED1 and ED2 and only monitoring wells MB30 and MB31 are located within the proposed ARC development footprint. Groundwater samples collected from MB30 and MB31 indicated exceedances of the nominated screening criteria for cadmium, copper, nickel, and zinc as summarised in Table 14.

The Preliminary Ground Assessment (Golder, 2021) included the installation of one groundwater monitoring well (ARC-BH3) in the northeastern portion of the proposed ARC development footprint. ARC-BH3 was installed to a depth of 19.5m bgl. The monitoring well was installed to gauge groundwater depth. Groundwater depth was recorded at 2m bgl. A groundwater sample was not collected for chemical analysis.

Groundwater monitoring results from wells located within the ARC development footprint from the DSI (Golder, 2009) and ED1 & ED2 Seepage Assessment (AECOM, 2017) are summarised in Table 14.

Table 14: Summary of groundwater results from monitoring wells within proposed ARC development footprint

Well ID	Date Sampled	EC (µS/cm)	Cd (mg/L)	Cu (mg/L)	Pb (mg/L)	Zn (mg/L)
ANZG 2018 guideline	-	-	0.0002	0.0014	0.0034	0.008
MW05	1/9/2008	3,060	0.0011	0.001	<0.001	0.034
MW06	1/9/2008	9,270	0.0012	0.005	0.001	0.03
MW07	1/9/2008	3,500	0.0013	0.004	0.008	0.064
MB30	12/1/2017	5,431	<0.0001	<0.001	<0.001	<0.005
	31/1/2017	511	0.00038	0.008	<0.0002	0.039
MB31	12/1/2017	15.75	0.0002	<0.001	<0.001	0.006
	31/1/2017	0.45	0.00031	0.011	<0.0002	0.036

The results for cadmium, copper, lead, and zinc generally exceed the current ANZG 2018 water quality guidelines for freshwater (95% species protection) in wells where detections are present.

EPL 11436 requires quarterly monitoring of twenty groundwater monitoring wells located across the Woodlawn Eco Precinct. Wells monitored as part of the program include MB1, MB2, MB3, MB4, MB6, MB7, MB10, ED3B, WM1, WM5, WM6, MW8S, MW8D, MW9S, MW10S, MB28, MB33, SP2-MW1, MW-FRC1, and MB10S. Veolia conducts the required monitoring and provides Annual Environmental Management Reports (AEMRs) pursuant to the EPL. The 2019/2020 AEMR was issued on 4 November 2020 (Veolia, 2020) and the results are summarised in Table 15. The monitoring wells were sampled in November 2019, March 2020, May 2020, and August 2020 during the 2019/2020 EPL reporting period. Samples were generally only analysed for metals during the May 2020 monitoring event. It is noted that only monitoring MB4 is located in the ARC development footprint.

Table 15: Summary of May 2020 EPL groundwater monitoring results

Well ID	Date Sampled	Standing Water Level (m)	Cd (mg/L)	Cu (mg/L)	Pb (mg/L)	Zn (mg/L)
ANZG 2018 guideline	-	-	0.0002	0.0014	0.0034	0.008
MB1	12/5/20	22	0.00252	0.279	0.0368	0.258
MB2	7/5/20	3.66	0.0263	<0.001	0.0005	0.054
MB3	7/5/20	3.35	0.0001	<0.001	<0.0002	0.016
MB4	25/3/20	14	0.00232	0.068	0.005	1
MB6	25/3/20	21.6	0.014	0.028	0.0009	7.71
MB7	25/5/20	3.58	0.00192	0.015	0.0169	0.284
MB10	7/5/20	3.69	0.00005	<0.001	<0.0002	0.007
ED3B	25/5/20	3.74	0.0262	0.059	0.0146	6.19
WM1	20/5/20	38.9	0.048	0.092	0.351	5.3
WM5	12/5/20	3.65	0.000068	0.098	0.0069	0.0079
WM6	25/5/20	4.77	0.00393	0.03	0.0367	0.668
MW8S	18/5/20	Dry	-	-	-	-
MW8D	25/5/20	7.88	0.0558	0.037	0.0245	4.4
MW9S	25/5/20	3.82	0.00192	0.021	0.01532	0.374
MW10S	12/5/20	Dry	-	-	-	-
MW28	26/5/20	8.25	0.036	0.078	0.0718	13.5

Well ID	Date Sampled	Standing Water Level (m)	Cd (mg/L)	Cu (mg/L)	Pb (mg/L)	Zn (mg/L)
MB33	20/5/20	47.56	0.00789	0.085	0.212	2.1
SP2-MW1	20/12/19	2.95	0.00301	0.006	<0.0002	0.216
	4/3/20	2.25	0.00397	0.003	0.0003	0.347
	12/5/20	1.73	0.00575	0.032	0.297	0.878
	30/7/20	1.46	0.00579	0.001	<0.0002	0.58
MW-FRC1	12/12/20	3.5	0.00132	0.007	<0.0002	0.185
	9/3/20	3	0.00139	0.003	<0.0002	0.139
	12/5/20	2.92	0.0025	0.042	0.0846	0.888
	14/8/20	2.95	0.00166	0.006	0.0004	0.133
MB10S	20/12/20	2.55	0.00178	0.012	<0.0002	0.317
	9/3/20	2.6	0.00187	0.02	<0.0004	3.84
	25/5/20	2.55	0.00836	0.02	<0.0116	3.87
	31/8/20	1.34	0.0067	0.008	<0.0002	3.05

The results for cadmium, copper, lead and zinc from the May 2020 monitoring event generally exceed the current ANZG 2018 water quality guidelines for freshwater (95% species protection) in wells where detections were present.

8.0 CONCEPTUAL SITE MODEL

A Conceptual Site Model (CSM) is the qualitative description of plausible mechanisms by which human and/or environmental receptors may be exposed to contamination derived from a contaminated site. For exposure to be considered possible, a pathway must exist by which impacts from a given source can reach a given receptor. This is referred to as a source-pathway-receptor (SPR) linkage. Based on the findings of the previous investigations summarised in Section 3.0, the following subsections present a summary of potential/likely impact sources, exposure pathways, and receptors.

Environmental Setting

Key features of the Site with respect to the development of the CSM and identification of complete SPR linkages are summarised below:

- The ARC development and encapsulation cell footprints are currently occupied by Veolia and used to support the Woodlawn Bioreactor operations;
- The ARC development footprint surface is primarily unpaved, although there are some areas of hardstand;
- The encapsulation cell footprint comprises a clay-lined (unpaved) surface and is generally submerged, with water levels dependant on rainfall and run-off from other areas of the Eco Precinct;
- The source of contamination in the ARC development and encapsulation footprints is considered to be heavy metals (primarily lead) associated with former mining operations;
- Groundwater occurs beneath the Eco Precinct at depths ranging from approximately 1 mbgl to 7 mbgl (Golder, 2009a and AECOM, 2017);
- There are no registered domestic bores in the vicinity of the Woodlawn Eco Precinct. There are numerous wells that have been installed within the ARC development footprint and wider Eco Precinct for environmental monitoring purposes. There is one groundwater bore located approximately 1.1 km southwest of the ARC development footprint that is used for stock watering. The nearest surface water body to the Site is Crisps Creek, located approximately 360 m northwest of the Site; and
- Lithology beneath the Site consists of complex sequences of volcanic and low-grade metamorphic rocks of Ordovician and Silurian-Devonian age.

Potential Sources

The primary source of contamination within the ARC development and encapsulation cell footprints is heavy metals related to past mining activities. In addition to metals impact, there is potential for acid formation through the oxidation of pyrite, and pyrrhotite.

Potential Receptors

For the purposes of this assessment, ‘receptors’ includes persons, structures, utilities, ecological receptors, and abstraction wells that are or have the potential to be adversely affected by the identified impacts. The primary land use in the vicinity of the Woodlawn Eco Precinct is industrial and pastural. The potential receptors identified for the ARC development and encapsulation cell footprints include the following:

- Current Site users;
- Future on-site intrusive workers; and
- Off-site ecological receptors.

Potential Exposure Pathways

A pathway is a means by which the source can come into contact with receptors. Where no pathway exists, there is no risk to the receptor as exposure does not occur. The potential pathways identified for the ARC development and encapsulation cell footprints include the following:

- Inhalation of dust during ground disturbance works;
- Direct contact with acid-producing soils exposed during excavation works;
- Direct contact/ingestion of impacted surface or groundwater; and
- Groundwater seepage or airborne dust deposition to off-site surface water.

Potentially Complete SPR Linkages

An SPR linkage is present when a complete pathway exists connecting a source to a receptor. These linkages explain where there may be risks to the receptor either now or in the future. A detailed review of SPR linkages is provided in Table 16 below.

Table 16: Source Pathway Receptor (SPR) Linkages

Receptors	Source	Contaminated Soil		Contaminated Groundwater	Contaminated Surface Water
	Pathway	Inhalation / Ingestion	Direct Contact	Direct Contact / Ingestion	Direct Contact / Ingestion
On-site					
Personnel, intrusive maintenance workers and visitors.		**Possible** – The DSI (Golder, 2009a) and Preliminary Ground Assessment (Golder, 2021) identified concentration of lead, copper and cadmium in the ARC development footprint that exceed the NEPM HILs for commercial industrial land use. The HHERA (Golder 2009b) assessed the impact as low risk. Metal analysis results for samples collected from ED1 in the footprint of the proposed Encapsulation Cell (Umwelt 2012) were below the adopted HILs.	**Possible** – The HHERA (Golder 2009b) is inconclusive on the potential effects of contact with acidic or high sulfate content soils.	**No** – There are no extraction bores located at the Site. Staff, visitors, and maintenance workers are not likely to contact groundwater. Groundwater that is used on-site is sourced from the Willeroo borefield (located to the west) and is not likely to be impacted by current or historical use of the Woodlawn Eco Precinct.	**Unlikely** – Surface water features on-site include evaporation ponds associated with the former mining operations and raw process water from the Willeroo borefield. Interactions with the surface water are limited to compliance monitoring/maintenance works and likely to be conducted by qualified personnel with appropriate PPE for the task.
Off-site					
Off-site ecological receptors		N/A	N/A	**Possible** – Various investigations including Golder (2009a), AECOM (2017) and ongoing EPL compliance monitoring indicate metals concentrations exceeding ANZG (2018) screening criteria. Surface water runoff from the mine-impacted areas of the Eco Precinct are diverted to the ED1 and ED2 storage dams. Niche (2018) concluded that Allianoyonyiga Creek is at moderate risk and Crisps Creek is at low risk due to groundwater seepage from the encapsulation dam footprints.	**Unlikely** – Niche (2018) concluded that impacts to Allianoyonyiga and Crisps Creeks originating from the evaporation ponds attenuate within 500-900m. Niche (2018) further indicated that groundwater in the area has low ecological value and aquatic fauna in Allianoyonyiga and Crisps Creeks are unlikely to be impacted.
Abstraction bores (domestic, irrigation and/or stock)		N/A	N/A	**Possible** – There are no registered groundwater abstraction bores within a 1 km radius of the	N/A

Receptors	Source	Contaminated Soil		Contaminated Groundwater	Contaminated Surface Water
	Pathway	Inhalation / Ingestion	Direct Contact	Direct Contact / Ingestion	Direct Contact / Ingestion
				Woodlawn Eco Precinct. However, there is the potential for the presence of unregistered groundwater bores.	

9.0 EXISTING CONSENTS AND REHABILITATION REQUIREMENTS

The rehabilitation of the Bioreactor site and surrounding licensed areas, including the development footprint covering the ARC and encapsulation cell, are ultimately required under the existing Woodlawn Bioreactor consents (DA 31-02-99 and MP10_0012, as modified). Condition 22 of DA 31-02-99 and Condition 29 of MP10_0012 refer to the need for a Rehabilitation Management Plan as part of the Landfill Environmental Management Plan. Veolia's Landfill Closure and Rehabilitation Management Plan (Veolia, 2016) addresses these requirements.

The Landfill Closure and Rehabilitation Management Plan will need to be updated to reflect the proposed rehabilitation activities within the development footprint for the Project. These rehabilitation works will be managed under the provision of the existing consents (DA 31-02-99 and MP10_0012, as modified).

Contaminants of concern within the development footprint of the Project are largely associated with heavy metals from mining activities undertaken at the site from 1978 to 1998. As metal contamination is non-volatile and risks to site users in a commercial/industrial setting has been assessed as low (Golder, 2009b), on-site containment of the impacted material is considered appropriate as it is a preferred management strategy under the NEPM (NEPC, 2013) and is identified in ANZECC (1999) as an appropriate form of management of non-volatile contaminants.

A remedial strategy is being prepared for the ARC development footprint based on previous site contamination and monitoring investigations and defines environmental and technically justifiable remedial methods, such as a 'cap and contain' approach, to remove and encapsulate impacted material. The remedial strategy will consider the potential for the remediation works to be considered as lead risk work and the measures required to protect foundations and structures from aggressive ground conditions.

Veolia is currently working with a NSW EPA Accredited Site Auditor and an external environmental consultant to develop a scope of works including a Sampling Analysis and Quality Plan and detailed site contamination investigation for the ARC development footprint. Based on the metal results reported for soil samples collected from ED1 and the proposed used of this area as an encapsulation cell it is considered that a DSI for this part of the proposed development is not required. The DSI contamination investigation for the ARC development footprint will involve soil sampling, surface water and groundwater sampling in accordance with NEPM 2013 HIL D and ANZG guidelines to identify and quantify contaminant concentrations across the development footprint to enable preparation of a site-specific Remediation Action Plan (RAP) outlining requirements of the selected remedial approach and ongoing management of residual contamination encountered. Veolia will seek approvals for the RAP and associated management plans from the site auditor and other relevant authorities as part of its existing development consent. This is further described in Section 10.0.

Once both the RAP and updated Landfill Closure and Rehabilitation Management Plan are approved, designs will be prepared in accordance with these plans and remedial works will be undertaken and validated to enable a site audit report and Section A site audit statement to be issued to declare the ARC site adequately remediated and suitable for commercial and industrial land use.

10.0 CONCLUSIONS AND RECOMMENDATIONS

Areas with the Woodlawn Eco Precinct that have been subject to historical mining activities have been impacted with heavy metals from mining activities undertaken at the site from 1978 to 1998. As metal contamination is non-volatile and risk to site users in a commercial/industrial setting has been assessed as low (Golder, 2009b), on-site containment of the impacted material is considered appropriate as it is a preferred management strategy under the NEPM (NEPC, 2013) and is identified in ANZECC (1999) as an appropriate form of management of non-volatile contaminants.

Groundwater around the site is likewise affected by concentrations of heavy metals that exceed relevant ecological guidelines. The primary source of impacted groundwater appears to be via seepage from evaporation dams ED1 and ED2. AECOM (2017) suggests radial groundwater flow from the evaporation dams and a low seepage velocity due to low permeability strata. AECOM (2017) further indicates that metals concentrations in groundwater attenuate to background levels within 400 m to 900 m of the evaporation dams which suggests it is unlikely that groundwater impacted by the seepage dams will affect the ARC development footprint. It is noted that the Woodlawn Eco Precinct is located in a metalliferous geologic setting and background concentrations of metals are generally at or above the nominated ecological screening criteria used for this assessment.

It is noted that much of the historical soil data generated by the DSI (Golder, 2009a) may not be relevant as parts of the development footprint (notably the ARC development footprint where the ARC building, IBA area and other infrastructure is proposed), have undergone significant excavation and reforming since the DSI was completed in 2009. The soil data indicates that material excavated as part of the ARC development will not be suitable for surface cover, however there is insufficient data to determine the volume of impacted material.

Metal results for samples collected from the footprint of ED1 were between two and four orders of magnitude lower than the health-based investigation levels for commercial/industrial land use and have been considered as part of this investigation. The encapsulation cell proposed to be constructed in this area as part of the development will have a double composite liner including primary and secondary geomembranes and geosynthetic clay liners, with the clay liners required to have a permeability of $<5 \times 10^{-11}$ m/s. Once constructed the cell would act as a barrier to prevent surface infiltration of, and physical contact exposure with residual impact, if any, below the cell. It is expected that the construction environmental management plan required for the encapsulation cell will include an unexpected finds protocol to address the potential exposure of suspected impacted material during construction. Having regard to the requirements of the *RH SEPP* it is considered that a DSI for this part of the development is not required and that the encapsulation cell land will be suitable in its current state for the intended land use (subject to the design controls and unexpected finds protocol being constructed and in place).

The following recommendations are considered appropriate to address the information gaps identified and should be undertaken by Veolia in accordance with the recommended general process for assessment of site contamination as detailed in Schedule A of the NEPM (NEPC, 2013) to ensure the ARC site is suitable, or can be made suitable, for the proposed development:

- Prepare a Sampling and Analysis Quality Plan (SAQP) to inform a proposed DSI in the ARC development footprint (shown on Plate 2);
- Conduct a DSI to:
  - Delineate known metals impacts within the ARC development footprint;
  - Conduct additional groundwater monitoring to understand the likely volume and rate of groundwater inflow to areas of deeper excavation for the ARC building during construction;

- Obtain additional information on the acid generating potential of the fill and residual material to ensure appropriate design of foundations and structures;
- Obtain information on the leachability of fill material proposed to be used as part of the development and the potential for mobilisation of metal impacts to ensure appropriate management and material handling measures can be implemented;
- Further assess the material in the Tipper Stockpile or other fill sources with lead concentrations higher that that considered in the 2009 Risk Assessment, and/or revise the human health risk assessment portion of the 2009 Risk Assessment to confirm the suitability of this material;

- Prepare a Remedial Action Plan (RAP) for the proposed ARC development footprint based on the outcomes of the DSI to provide a framework for appropriate removal or management of remnant contamination that poses an unacceptable risk to the proposed development; and
- Obtain a Site Audit Statement from a NSW EPA accredited Site Auditor including a statement of site suitability and certifying that the investigation and remediation of the proposed ARC development footprint has been completed in accordance with relevant environmental legislation and guidelines prior to the development commencing.

This PSI has been prepared in respect of the Project and in accordance with the documents, guidelines and legislation referred to in Section 1.3.1 above including the *RH SEPP*. It is concluded that for land within the proposed ARC development footprint:

a) where any land is contaminated, it is suitable in its current state for the intended use, or will be suitable after any remediation or development controls are in place should planning approval be granted for the Project; and/or

b) where applicable, the implementation of the RAP and the obtaining of the Site Audit Statement provide assurance that the lands the subject of the RAP and Site Audit Statement will be made suitable for the proposed waste to energy use.

11.0 IMPORTANT INFORMATION

Your attention is drawn to the document “Important Information”, which is included in Appendix D of this report. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be and to present you with recommendations on how to minimise the risks associated with the services provided for this project. The document is not intended to reduce the level of responsibility accepted by Golder, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

12.0 REFERENCES

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https://golderassociates.sharepoint.com/sites/142538/project files/6 deliverables/21455895-003-r contamination assessment/21455895-003-r-rev1.docx

APPENDIX A

Lotsearch report

LOTSEARCH

LOTSEARCH ENVIRO PROFESSIONAL

Date: 06 Jul 2021 14:51:04

Reference: LS021924 EP

Address: 609 Collector Road, Tarago, NSW 2580

Dataset Listing

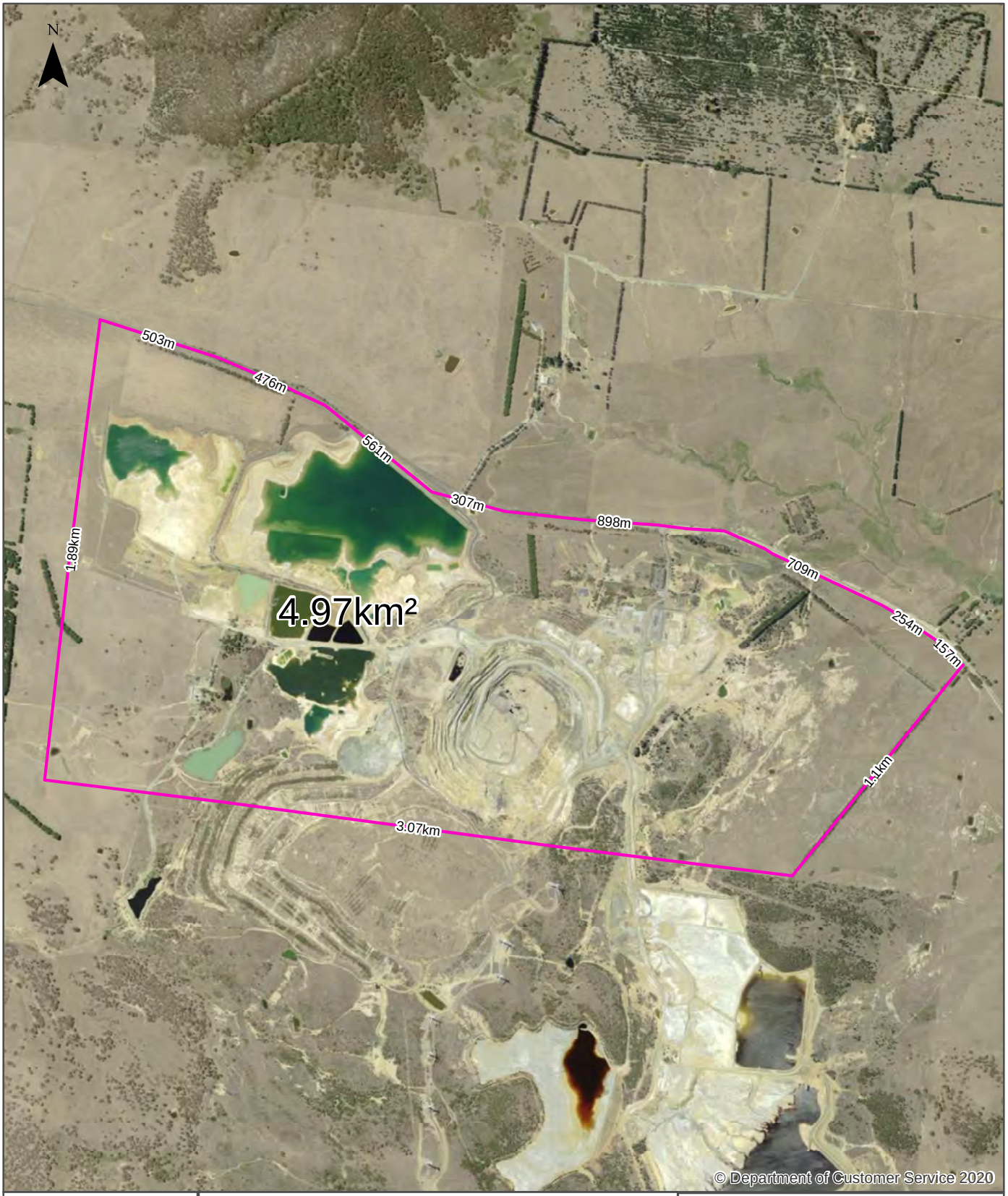
Datasets contained within this report, detailing their source and data currency:

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	30/06/2021	30/06/2021	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	15/06/2021	10/06/2021	Monthly	1000m	0	0	0
Contaminated Land Records of Notice	Environment Protection Authority	10/06/2021	10/06/2021	Monthly	1000m	0	0	0
Former Gasworks	Environment Protection Authority	11/05/2021	11/10/2017	Quarterly	1000m	0	0	0
National Waste Management Facilities Database	Geoscience Australia	12/05/2021	07/03/2017	Annually	1000m	1	1	1
National Liquid Fuel Facilities	Geoscience Australia	15/02/2021	13/07/2012	Annually	1000m	0	0	0
EPA PFAS Investigation Program	Environment Protection Authority	21/06/2021	28/04/2021	Monthly	2000m	0	0	0
Defence PFAS Investigation & Management Program - Investigation Sites	Department of Defence	01/07/2021	01/07/2021	Monthly	2000m	0	0	0
Defence PFAS Investigation & Management Program - Management Sites	Department of Defence	01/07/2021	01/07/2021	Monthly	2000m	0	0	0
Airservices Australia National PFAS Management Program	Airservices Australia	07/07/2021	07/07/2021	Monthly	2000m	0	0	0
Defence 3 Year Regional Contamination Investigation Program	Department of Defence	11/05/2021	11/05/2021	Quarterly	2000m	0	0	0
EPA Other Sites with Contamination Issues	Environment Protection Authority	02/02/2021	13/12/2018	Annually	1000m	0	0	0
Licensed Activities under the POEO Act 1997	Environment Protection Authority	15/06/2021	15/06/2021	Monthly	1000m	3	3	3
Delicensed POEO Activities still regulated by the EPA	Environment Protection Authority	15/06/2021	15/06/2021	Monthly	1000m	1	1	1
Former POEO Licensed Activities now revoked or surrendered	Environment Protection Authority	15/06/2021	15/06/2021	Monthly	1000m	3	3	3
UBD Business Directories (Premise & Intersection Matches)	Hardie Grant			Not required	150m	0	0	0
UBD Business Directories (Road & Area Matches)	Hardie Grant			Not required	150m	-	0	0
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Premise & Intersection Matches)	Hardie Grant			Not required	500m	0	0	0
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Road & Area Matches)	Hardie Grant			Not required	500m	-	0	0
Points of Interest	NSW Department of Finance, Services & Innovation	14/05/2021	14/05/2021	Quarterly	1000m	1	1	5
Tanks (Areas)	NSW Department of Customer Service - Spatial Services	14/05/2021	14/05/2021	Quarterly	1000m	0	0	0
Tanks (Points)	NSW Department of Customer Service - Spatial Services	14/05/2021	14/05/2021	Quarterly	1000m	0	0	0
Major Easements	NSW Department of Finance, Services & Innovation	14/05/2021	14/05/2021	Quarterly	1000m	2	2	2
State Forest	Forestry Corporation of NSW	25/02/2021	14/02/2021	Annually	1000m	0	0	0
NSW National Parks and Wildlife Service Reserves	NSW Office of Environment & Heritage	22/01/2021	11/12/2020	Annually	1000m	0	0	0
Hydrogeology Map of Australia	Commonwealth of Australia (Geoscience Australia)	08/10/2014	17/03/2000	As required	1000m	2	2	2
Temporary Water Restriction (Botany Sands Groundwater Source) Order 2018	NSW Department of Planning, Industry and Environment	26/10/2020	21/02/2018	Annually	1000m	0	0	0
Groundwater Boreholes	NSW Dept. of Primary Industries - Water NSW; Commonwealth of Australia (Bureau of Meteorology)	24/07/2018	23/07/2018	Annually	2000m	10	10	18

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features Onsite	No. Features within 100m	No. Features within Buffer
Geological Units 1:250,000	NSW Department of Planning, Industry and Environment	20/08/2014		Annually	1000m	5	5	8
Geological Structures 1:250,000	NSW Department of Planning, Industry and Environment	20/08/2014		Annually	1000m	0	0	2
Naturally Occurring Asbestos Potential	NSW Dept. of Industry, Resources & Energy	04/12/2015	24/09/2015	Unknown	1000m	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	1000m	2	2	2
Soil Landscapes of Central and Eastern NSW	NSW Department of Planning, Industry and Environment	14/10/2020	27/07/2020	Annually	1000m	6	6	10
Environmental Planning Instrument Acid Sulfate Soils	NSW Department of Planning, Industry and Environment	01/07/2021	28/06/2021	Monthly	500m	0	-	-
Atlas of Australian Acid Sulfate Soils	CSIRO	19/01/2017	21/02/2013	As required	1000m	2	2	2
Dryland Salinity - National Assessment	National Land and Water Resources Audit	18/07/2014	12/05/2013	None planned	1000m	0	0	0
Mining Subsidence Districts	NSW Department of Customer Service - Subsidence Advisory NSW	14/05/2021	28/04/2021	Quarterly	1000m	0	0	0
Current Mining Titles	NSW Department of Industry	01/07/2021	01/07/2021	Monthly	1000m	2	2	3
Mining Title Applications	NSW Department of Industry	01/07/2021	01/07/2021	Monthly	1000m	0	0	0
Historic Mining Titles	NSW Department of Industry	01/07/2021	01/07/2021	Monthly	1000m	13	14	19
Environmental Planning Instrument SEPP State Significant Precincts	NSW Department of Planning, Industry and Environment	01/07/2021	07/12/2018	Monthly	1000m	0	0	0
Environmental Planning Instrument Land Zoning	NSW Department of Planning, Industry and Environment	01/07/2021	28/06/2021	Monthly	1000m	1	1	3
Commonwealth Heritage List	Australian Government Department of the Agriculture, Water and the Environment	18/05/2021	20/11/2019	Annually	1000m	0	0	0
National Heritage List	Australian Government Department of the Agriculture, Water and the Environment	18/05/2021	20/11/2019	Annually	1000m	0	0	0
State Heritage Register - Curtilages	NSW Department of Planning, Industry and Environment	14/05/2021	26/03/2021	Quarterly	1000m	0	0	0
Environmental Planning Instrument Local Heritage	NSW Department of Planning, Industry and Environment	01/07/2021	28/06/2021	Monthly	1000m	0	0	0
Bush Fire Prone Land	NSW Rural Fire Service	05/07/2021	08/06/2021	Weekly	1000m	2	2	3
Vegetation of Southern Forests	NSW Office of Environment & Heritage	09/12/2014	10/10/2011	Unknown	1000m	0	0	4
Ramsar Wetlands of Australia	Australian Government Department of Agriculture, Water and the Environment	24/02/2021	19/03/2020	Annually	1000m	0	0	0
Groundwater Dependent Ecosystems	Bureau of Meteorology	14/08/2017	15/05/2017	Annually	1000m	0	0	3
Inflow Dependent Ecosystems Likelihood	Bureau of Meteorology	14/08/2017	15/05/2017	Unknown	1000m	0	0	4
NSW BioNet Species Sightings	NSW Office of Environment & Heritage	05/07/2021	05/07/2021	Weekly	10000m	-	-	-

Site Diagram

609 Collector Road, Tarago, NSW 2580



Legend

- Site Boundary
- Internal Parcel Boundaries

Total Area: 4.97km²

Total Perimeter: 9.92km

Scale: 0 100 200 400 600 800 1,000 Meters

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

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.

Coordinate System: GDA 1994 MGA Zone 56

Date: 06 July 2021

Contaminated Land

609 Collector Road, Tarago, NSW 2580

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	Direction
N/A	No records in buffer								

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

Contaminated Land

609 Collector Road, Tarago, NSW 2580

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

Terms of use and disclaimer for Contaminated Land: Record of Notices, please visit
http://www.epa.nsw.gov.au/clm/clmdisclaimer.htm

Former Gasworks

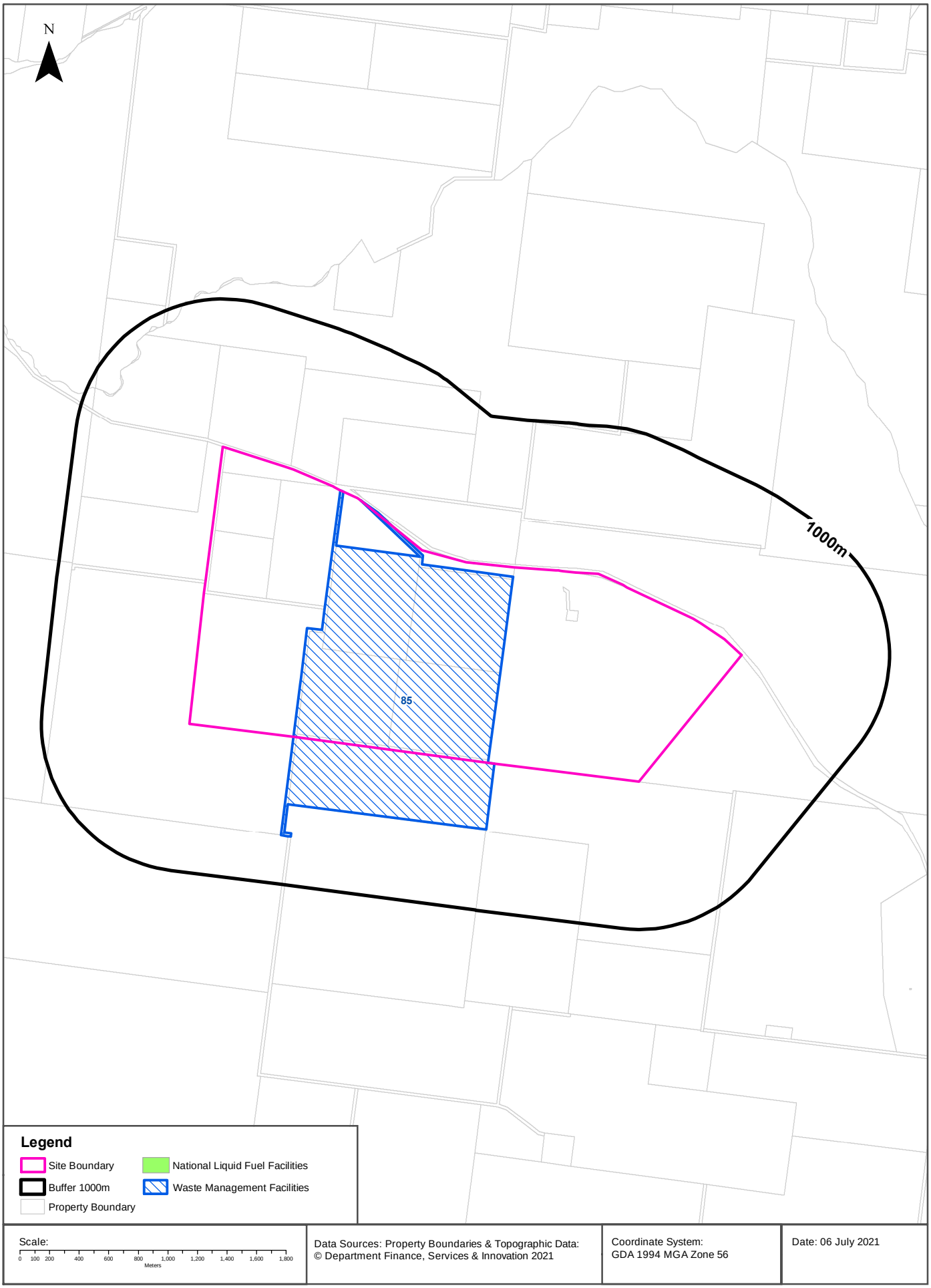
Former Gasworks within the dataset buffer:

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

Former Gasworks Data Source: Environment Protection Authority

Waste Management & Liquid Fuel Facilities

609 Collector Road, Tarago, NSW 2580



Waste Management & Liquid Fuel Facilities

609 Collector Road, Tarago, NSW 2580

National Waste Management Site Database

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

Site Id	Owner	Name	Address	Suburb	Class	Landfill	Reprocess	Transfer	Comments	Loc Conf	Dist	Direction
85	Veolia Environmental Services (Australia) Pty Ltd	Woodlawn Landfill	716 Collector Road	Tarago	Landfill	Operational			Original information on waste management site collected by DEWHA in 2009	Premise Match	0m	On-site

National Liquid Fuel Facilities

National Liquid Fuel Facilties within the dataset buffer:

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

PFAS Investigation & Management Programs

609 Collector Road, Tarago, NSW 2580

EPA PFAS Investigation Program

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

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

EPA PFAS Investigation Program: 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

609 Collector Road, Tarago, NSW 2580

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

609 Collector Road, Tarago, NSW 2580

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
- Pasminco Lead Abatement Strategy Area

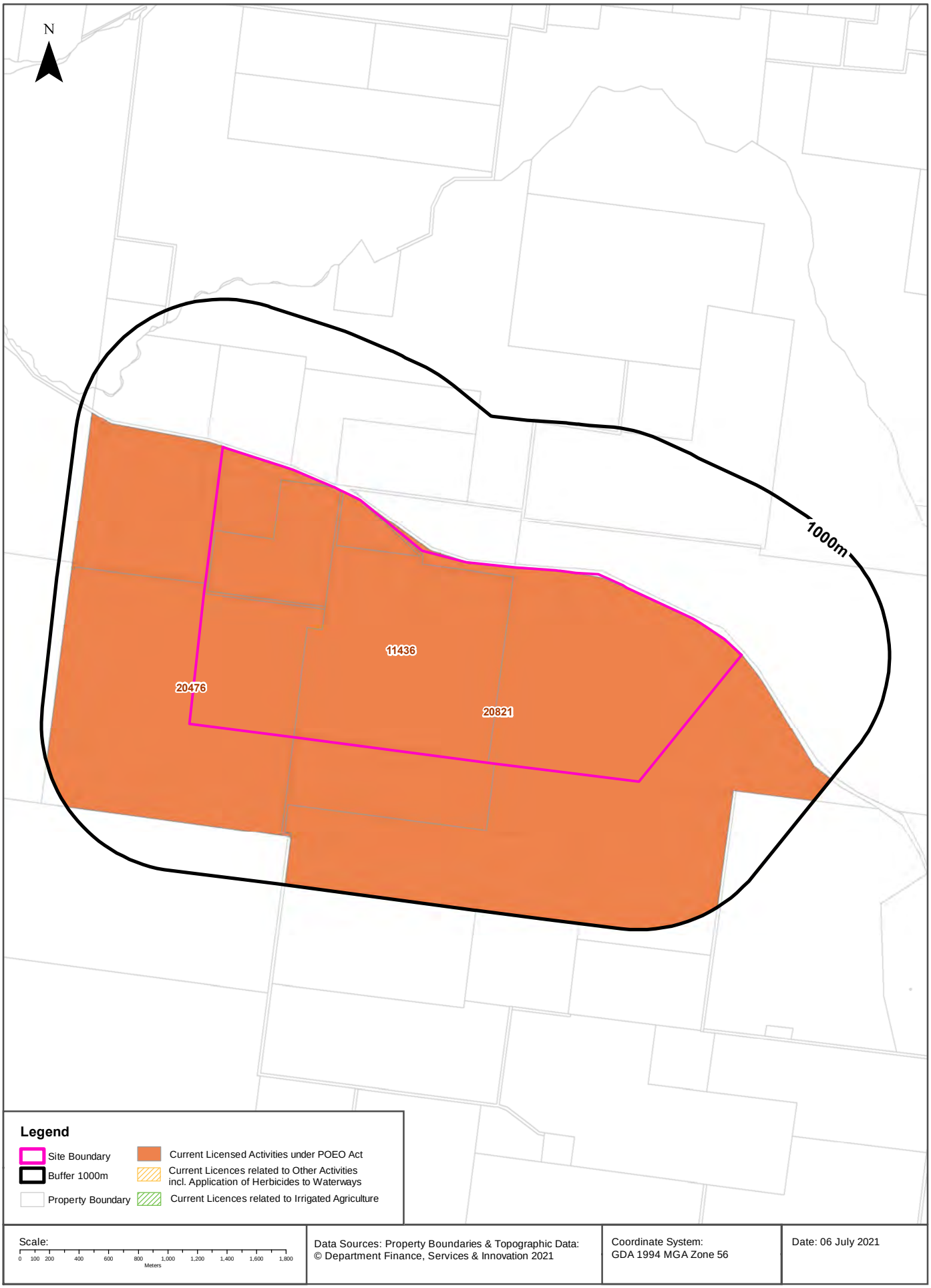
Sites within the dataset buffer:

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

Current EPA Licensed Activities

609 Collector Road, Tarago, NSW 2580



EPA Activities

609 Collector Road, Tarago, NSW 2580

Licensed Activities under the POEO Act 1997

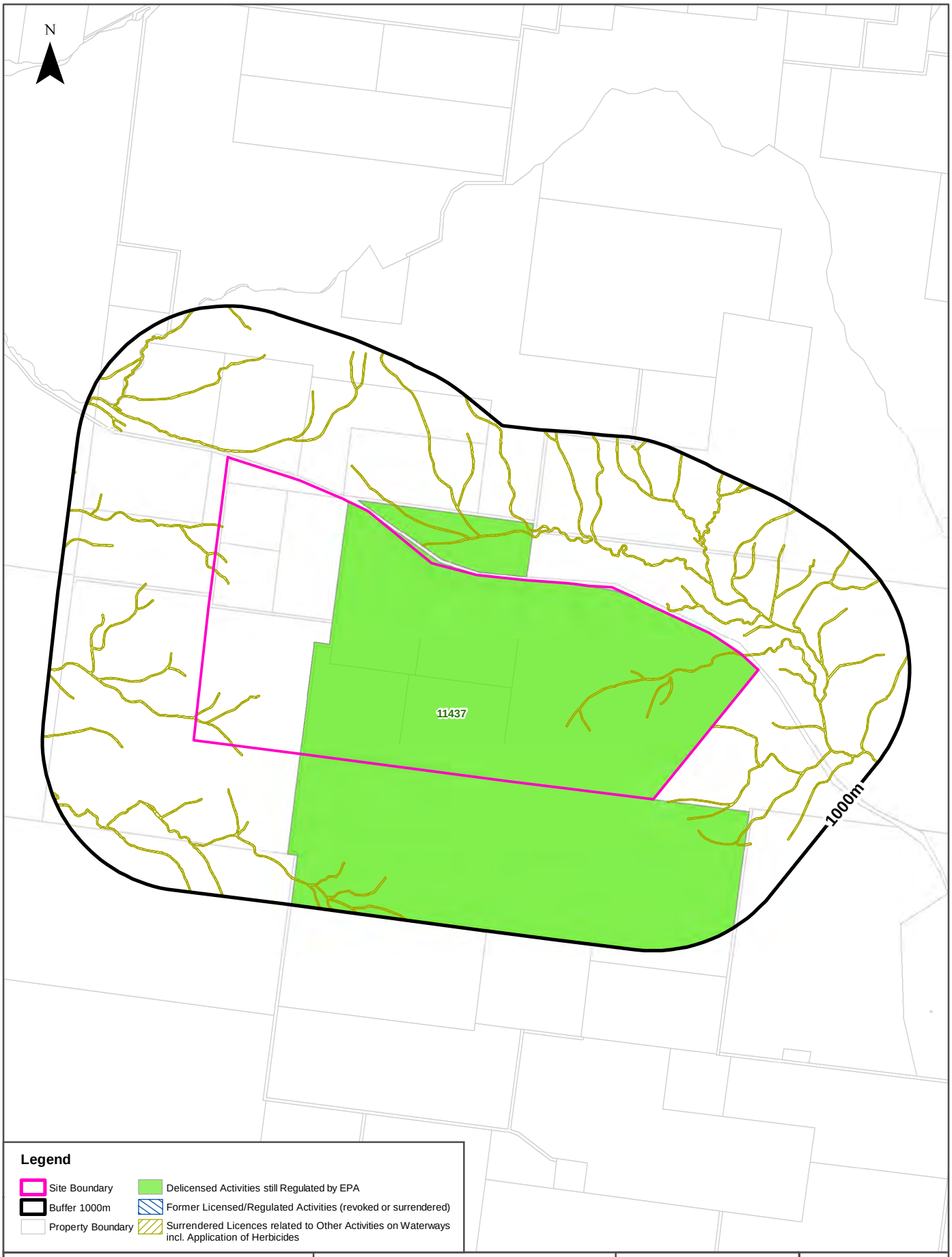
Licensed activities under the Protection of the Environment Operations Act 1997, within the dataset buffer:

EPL	Organisation	Name	Address	Suburb	Activity	Loc Conf	Distance	Direction
11436	VEOLIA ENVIRONMENTAL SERVICES (AUSTRALIA) PTY LTD	WOODLAWN LANDFILL	COLLECTOR ROAD	TARAGO	Waste disposal by application to land	Premise Match	0m	On-site
20476	VEOLIA ENVIRONMENTAL SERVICES (AUSTRALIA) PTY LTD		619 Collector Road, TARAGO, NSW 2580		Composting, Recovery of general waste, Waste storage - other types of waste,	Premise Match	0m	On-site
20821	TARAGO OPERATIONS PTY LTD		507 Collector Road, TARAGO, NSW 2580		Mining for minerals; Mineral processing; Mineral waste generation; Crushing, grinding or separating; Contaminated groundwater treatment; Concrete works	Premise Match	0m	On-site

POEO Licence Data Source: Environment Protection Authority

Delicensed & Former Licensed EPA Activities

609 Collector Road, Tarago, NSW 2580



EPA Activities

609 Collector Road, Tarago, NSW 2580

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
11437	GOULBURN MULWAREE COUNCIL		COLLECTOR ROAD		Waste disposal by application to land	Premise Match	0m	On-site

Delicensed Activities Data Source: 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	On-site
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	On-site
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	On-site

Former Licensed Activities Data Source: Environment Protection Authority

Historical Business Directories

609 Collector Road, Tarago, NSW 2580

Business Directory Records 1950-1991
Premise or Road Intersection Matches

Universal Business Directory records from years 1991, 1982, 1970, 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
N/A	No records in buffer						

Business Directory Records 1950-1991
Road or Area Matches

Universal Business Directory records from years 1991, 1982, 1970, 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
N/A	No records in buffer					

Historical Business Directories

609 Collector Road, Tarago, NSW 2580

Dry Cleaners, Motor Garages & Service Stations 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.

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

Dry Cleaners, Motor Garages & Service Stations 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.

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

Aerial Imagery 2018

609 Collector Road, Tarago, NSW 2580

Scale:
0 280 560 840 1,120
Meters

Data Source Aerial Imagery: © 2021 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.

Coordinate System:
GDA 1994 MGA Zone 56

Date: 02 July 2021

Aerial Imagery 2014

609 Collector Road, Tarago, NSW 2580

Scale:
0 280 560 840 1,120
Meters

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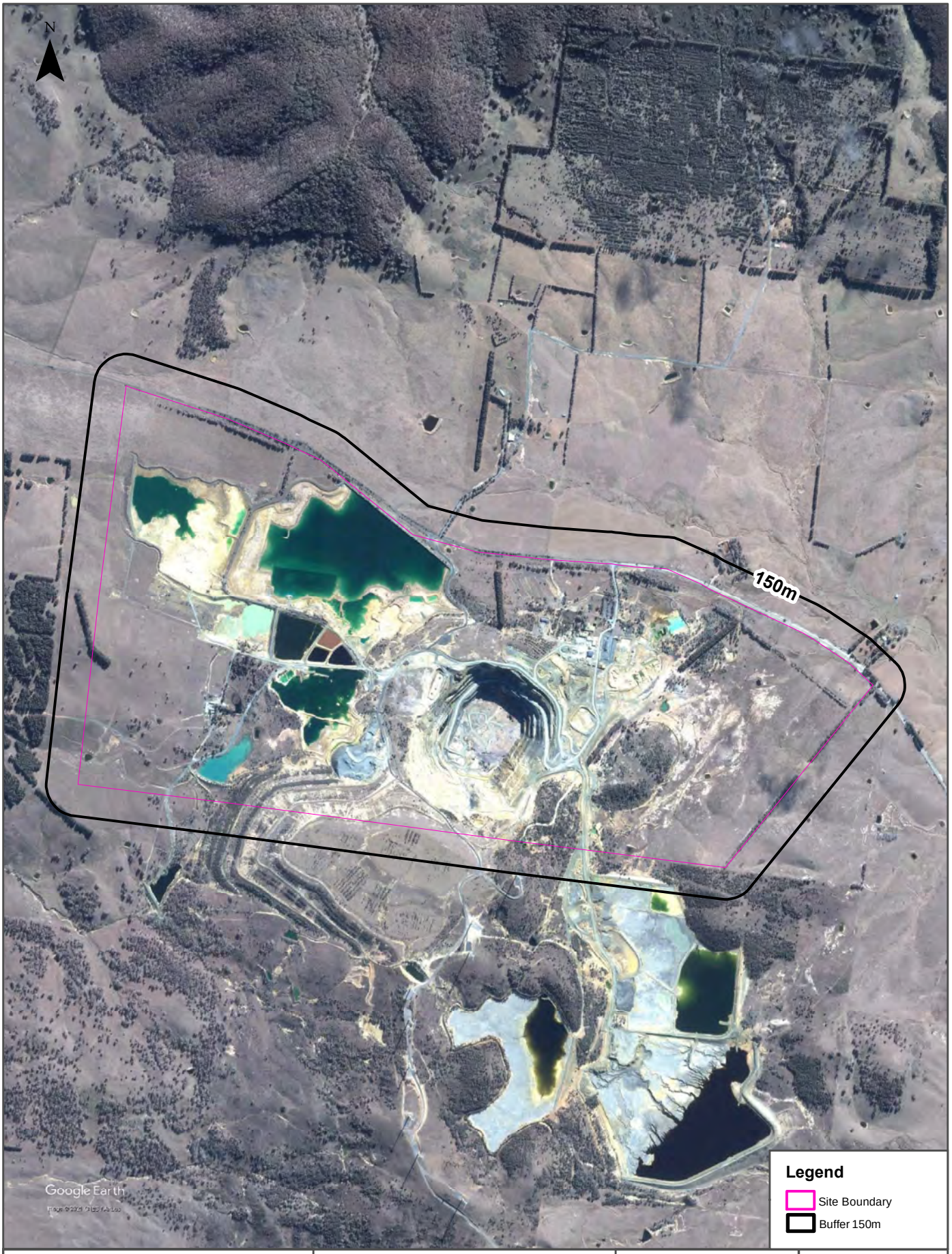
Coordinate System:
GDA 1994 MGA Zone 56

Date: 02 July 2021

Aerial Imagery 2013

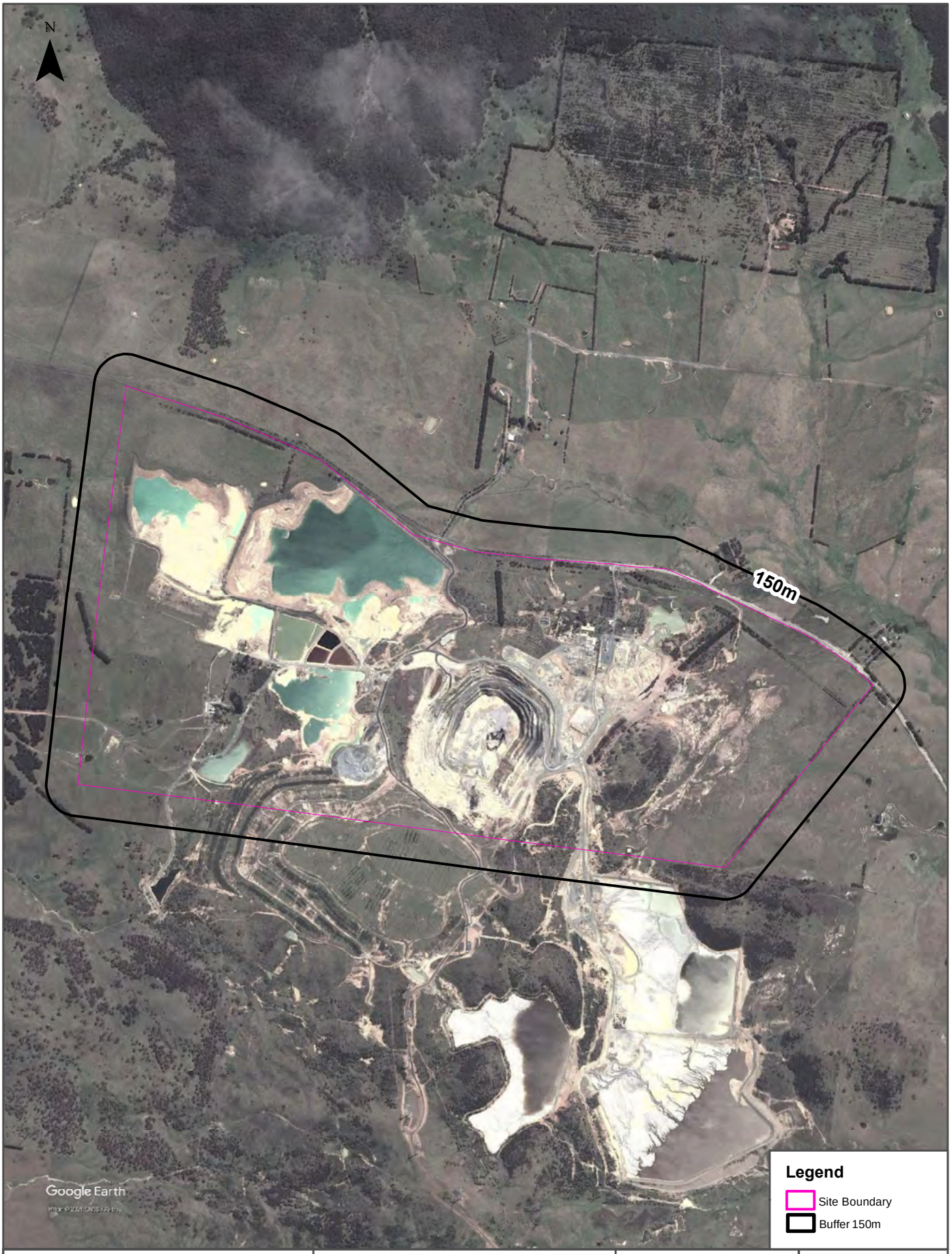
609 Collector Road, Tarago, NSW 2580



Scale: 0 280 560 840 1,120 Meters	Data Source Aerial Imagery: © 2021 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.	Coordinate System: GDA 1994 MGA Zone 56	Date: 02 July 2021

Aerial Imagery 2011

609 Collector Road, Tarago, NSW 2580



Scale:
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Meters

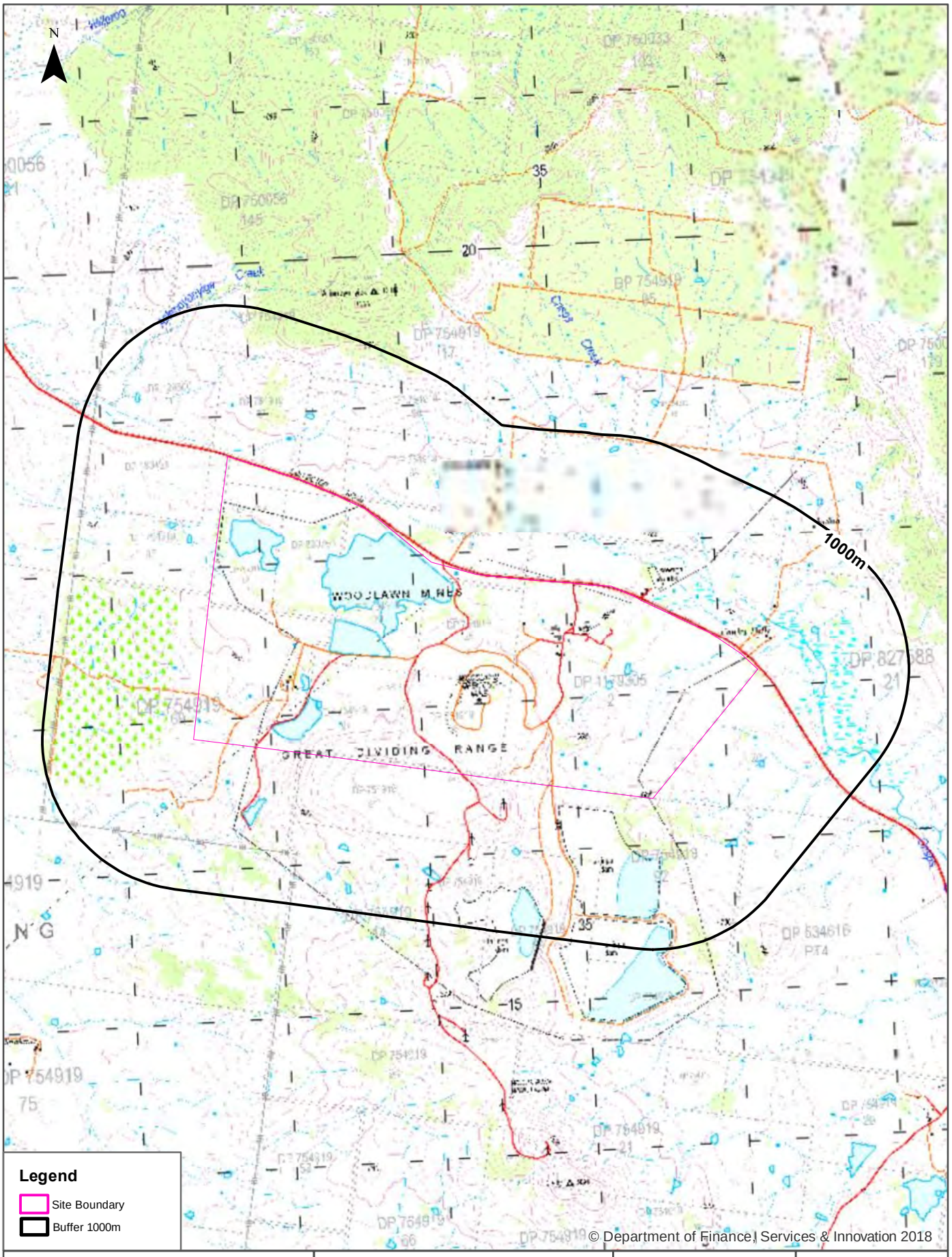
Data Source Aerial Imagery: © 2021 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.

Coordinate System:
GDA 1994 MGA Zone 56

Date: 02 July 2021

Topographic Map 2015

609 Collector Road, Tarago, NSW 2580



Scale: 0 400 800 1,200 1,600 Meters

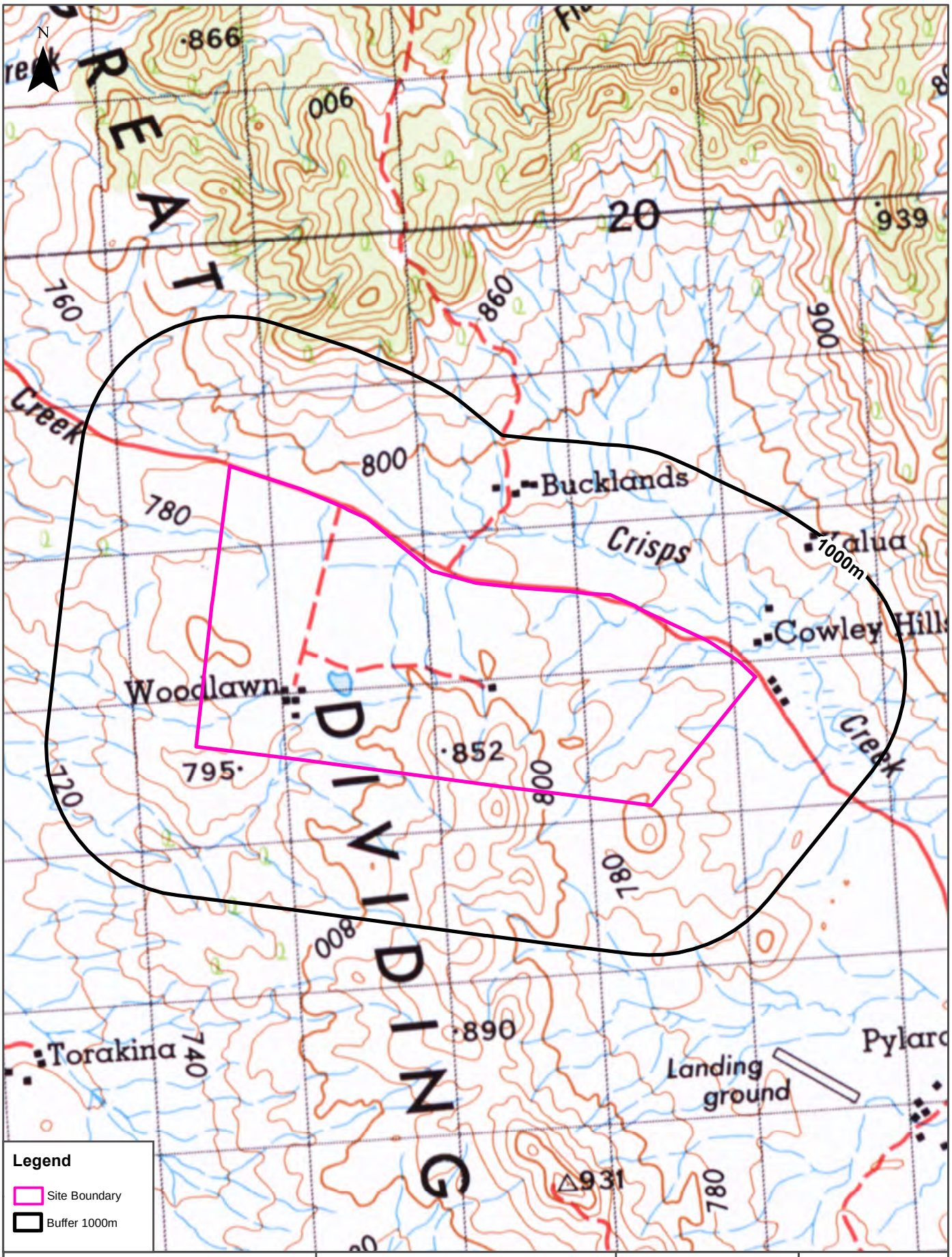
Data Sources: Topographic Map Data
© NSW Land and Property Information

Coordinate System:
GDA 1994 MGA Zone 56

Date: 06 July 2021

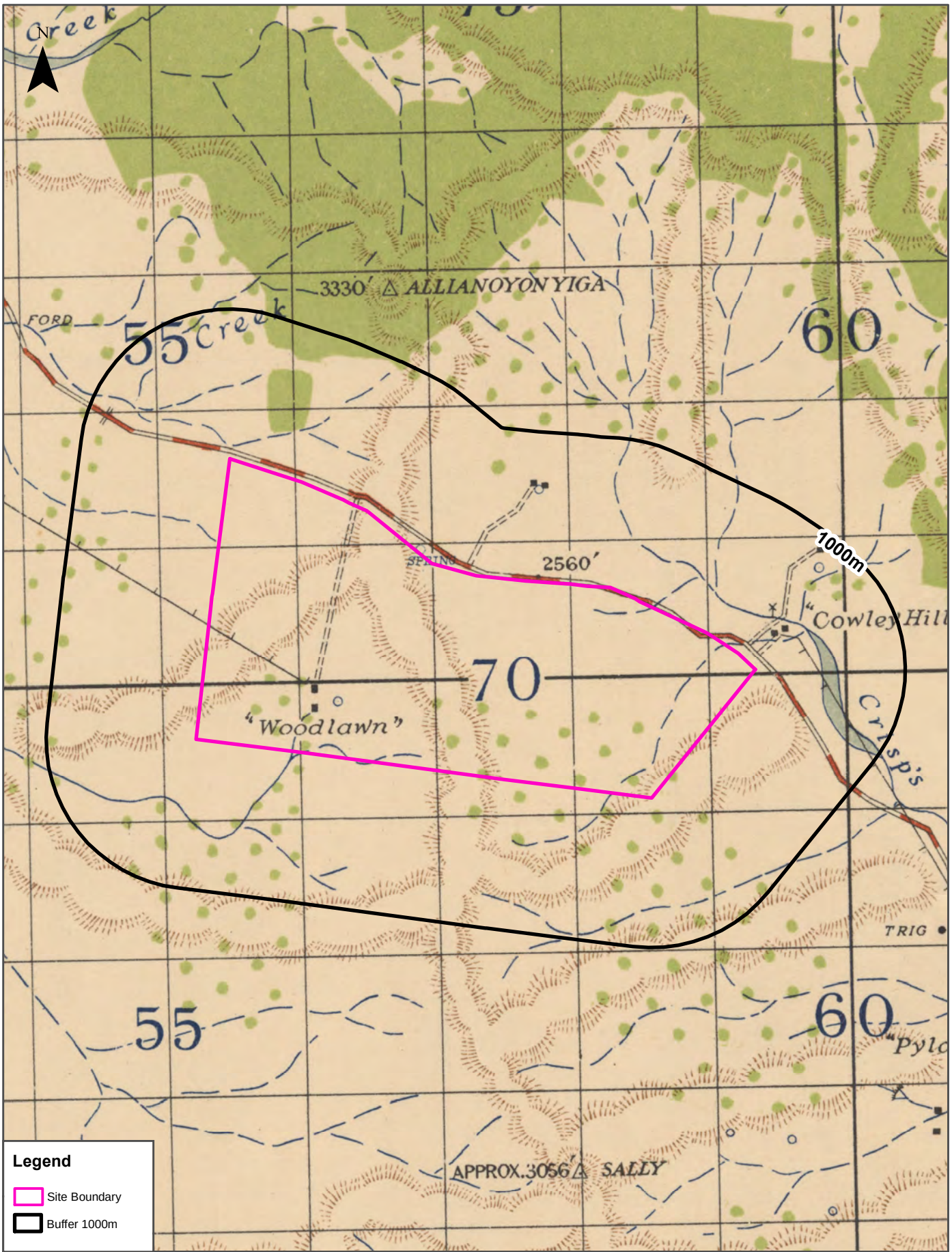
Historical Map 1970

609 Collector Road, Tarago, NSW 2580



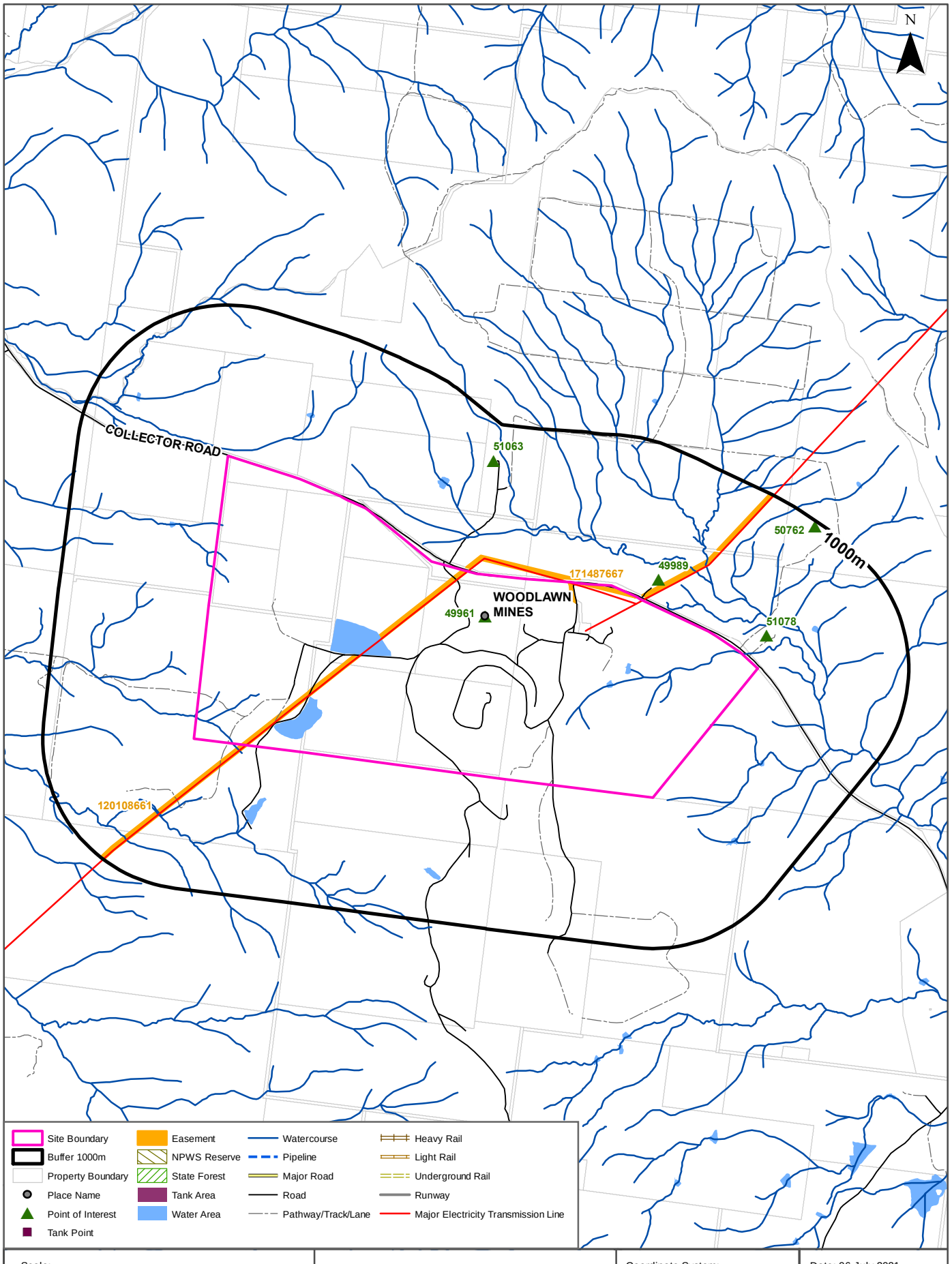
Historical Map c.1942

609 Collector Road, Tarago, NSW 2580



Topographic Features

609 Collector Road, Tarago, NSW 2580



Topographic Features

609 Collector Road, Tarago, NSW 2580

Points of Interest

What Points of Interest exist within the dataset buffer?

Map Id	Feature Type	Label	Distance	Direction
49961	Rural Place	WOODLAWN MINES	0m	On-site
49989	Sewage Works	Sewage Works	170m	East
51078	Homestead	COWLEY HILLS	199m	East
51063	Homestead	WOODLAWN FARM	754m	North
50762	Homestead	KALUA	969m	East

Topographic Features

609 Collector Road, Tarago, NSW 2580

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
N/A	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
N/A	No records in buffer					

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
171487667	Primary	Right of way	20m Var.	0m	On-site
120108661	Primary	Undefined		0m	On-site

Topographic Features

609 Collector Road, Tarago, NSW 2580

State Forest

What State Forest exist within the dataset buffer?

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

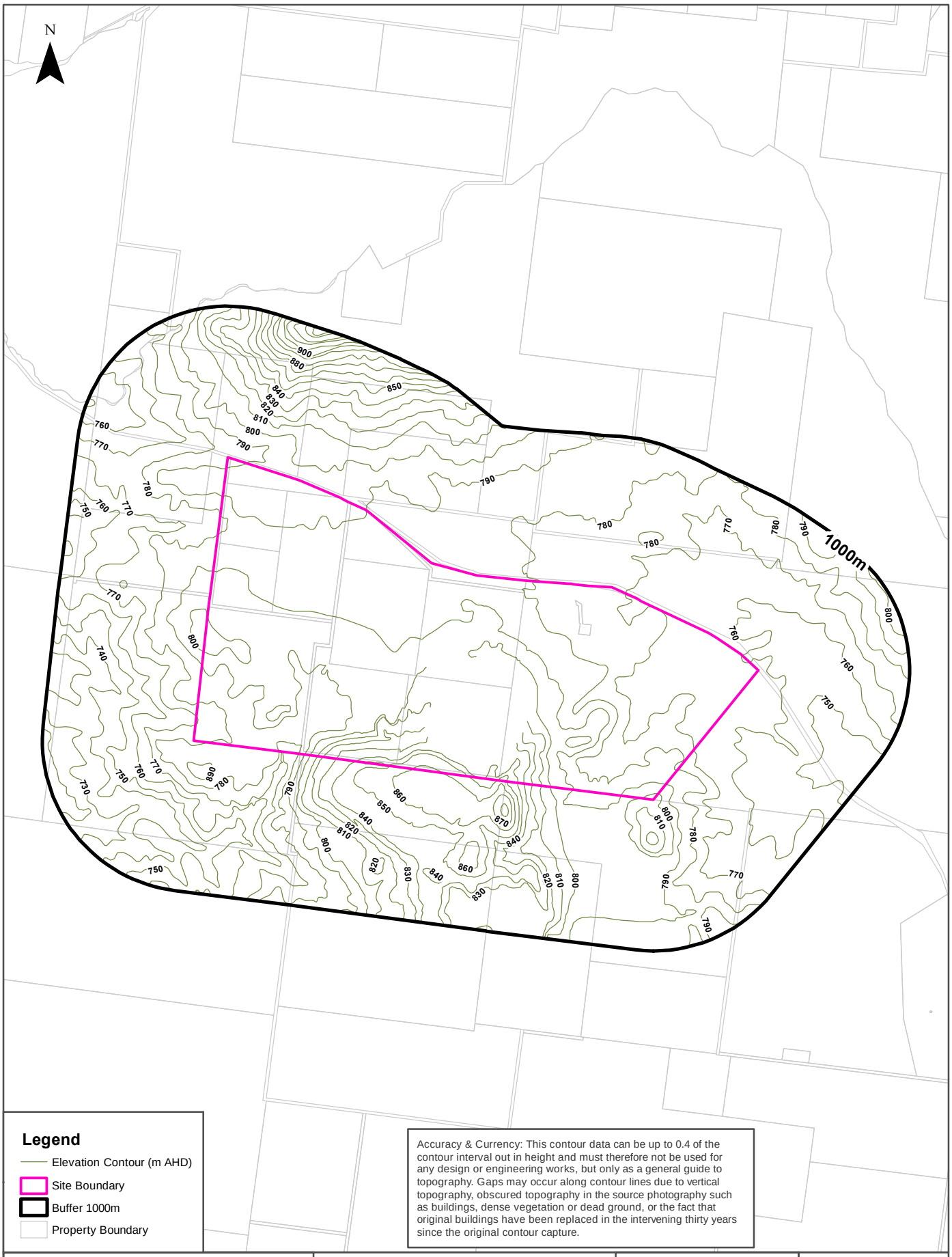
National Parks and Wildlife Service Reserves

What NPWS Reserves exist within the dataset buffer?

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

Elevation Contours (m AHD)

609 Collector Road, Tarago, NSW 2580



Hydrogeology & Groundwater

609 Collector Road, Tarago, NSW 2580

Hydrogeology

Description of aquifers within the dataset buffer:

Description	Distance	Direction
Fractured or fissured, extensive aquifers of low to moderate productivity	0m	On-site
Porous, extensive highly productive aquifers	0m	On-site

Hydrogeology Map of Australia : Commonwealth of Australia (Geoscience Australia)

Temporary Water Restriction (Botany Sands Groundwater Source) Order 2018

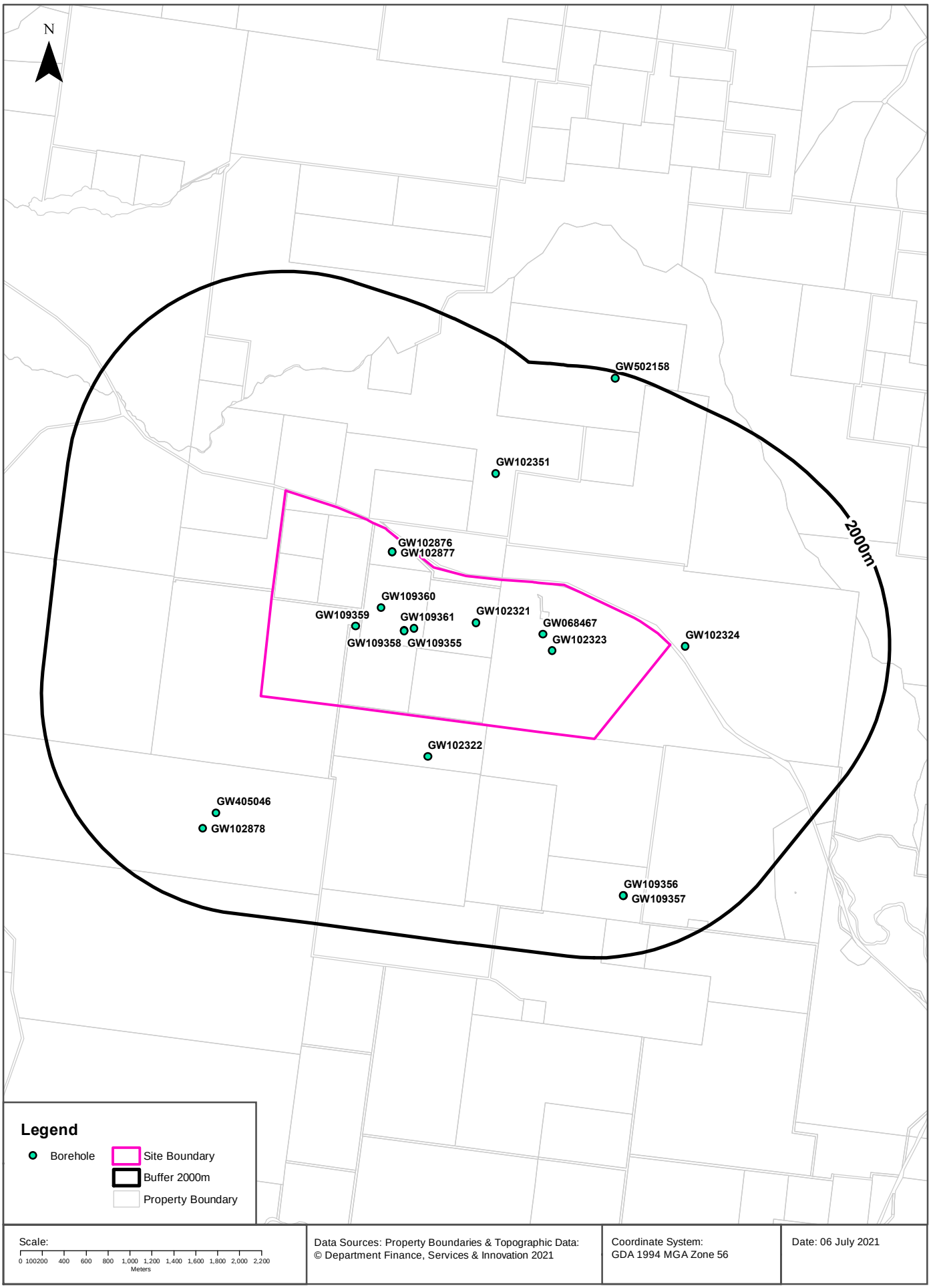
Temporary water restrictions relating to the Botany Sands aquifer within the dataset buffer:

Prohibition Area No.	Prohibition	Distance	Direction
N/A	No records in buffer		

Temporary Water Restriction (Botany Sands Groundwater Source) Order 2018 Data Source : NSW Department of Primary Industries

Groundwater Boreholes

609 Collector Road, Tarago, NSW 2580



Hydrogeology & Groundwater

609 Collector Road, Tarago, NSW 2580

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 bgl)	Yield (L/s)	Elev (AHD)	Dist	Dir
GW109360	10BL602223	Bore	Private	Monitoring Bore	Monitoring Bore		19/09/2008	7.00	7.00					0m	On-site
GW102323	10BL157943	Bore		Monitoring Bore			23/06/1997	7.30	7.30			0.050		0m	On-site
GW109359	10BL602223	Bore	Private	Monitoring Bore	Monitoring Bore		19/09/2008	8.00	8.00					0m	On-site
GW102321	10BL157939	Bore	Mines	Monitoring Bore			12/06/1997	12.50	12.50			0.300		0m	On-site
GW068467		Bore	Private		Mineral Xplore		01/06/1989	21.00						0m	On-site
GW109358	10BL602223	Bore	Private	Monitoring Bore	Monitoring Bore		19/09/2008	10.40	10.40					0m	On-site
GW109355	10BL602223	Bore	Private	Monitoring Bore	Monitoring Bore		19/09/2008	6.50	6.50					0m	On-site
GW109361	10BL602223	Bore	Private	Monitoring Bore	Monitoring Bore		22/09/2008	9.10	9.10					0m	On-site
GW102876	10BL157940	Bore	Private	Monitoring Bore	Monitoring Bore		01/01/1996	20.80	20.80		0.30			0m	On-site
GW102877	10BL157940	Bore	Private	Monitoring Bore	Monitoring Bore		01/01/1996	13.20	13.20		1.14			0m	On-site
GW102324	10BL157944	Bore	Mines	Monitoring Bore			23/06/1997	15.40	15.40			0.100		142m	East
GW102322	10BL157942	Bore	Mines	Monitoring Bore			20/06/1997	23.50	23.50			0.400		354m	South
GW102351	10BL157938	Bore		Monitoring Bore			19/06/1997	13.00	13.00			0.500		959m	North
GW405046	40BL192175	Bore	Private	Stock	Stock		26/04/2009	41.00	41.00	Good	30.00	0.940		1145m	South West
GW102878	10BL157941	Bore		Monitoring Bore	Monitoring Bore		02/12/1996	29.00	29.00		1.35			1319m	South West
GW109357	10BL602223	Bore	Private	Monitoring Bore	Monitoring Bore		19/09/2008	11.00	11.00					1456m	South East
GW109356	10BL602223	Bore	Private	Monitoring Bore	Monitoring Bore		19/09/2008	5.00	5.00					1458m	South East
GW502158		Bore					20/11/2000	9.40	9.40				64.35	1941m	North East

Hydrogeology & Groundwater

609 Collector Road, Tarago, NSW 2580

Driller's Logs

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

Groundwater No	Drillers Log	Distance	Direction
GW102321	0.00m-0.50m SOIL 0.50m-3.00m CLAYS 3.00m-12.50m SILTSTONE (WEATHERED)	0m	On-site
GW102323	0.00m-0.40m SOIL 0.40m-3.00m CLAYS 3.00m-7.30m SILTSTONE WEATHERED	0m	On-site
GW102876	0.00m-2.00m CLAY/SAND/GRAVEL 2.00m-3.30m CLAY/MINOR GRAVEL 3.30m-12.50m SAND/CLAY/MINOR GRAVEL 12.50m-19.80m GRAVEL 19.80m-20.80m DOLERITE	0m	On-site
GW102877	0.00m-3.50m CLAY/SHALE 9.00m-13.20m DOLERITE	0m	On-site
GW109355	0.00m-0.20m GRAVELLY CLAY,BROWN10%GRAVEL-TUFF COHESIVE, FIRM, MOIST. 0.20m-6.50m TUFF,SILTSTONE,L/TO MEDIUM BROWN,WEATHERED,HARD TO SOFT,CLAY LAYERS	0m	On-site
GW109358	0.00m-1.50m GRAVELLY CLAY,BROWN10%GRAVEL-TUFF COHESIVE, FIRM,MOIST. 1.50m-10.40m TUFF/SILTSTONE:L/MED BROWN,WEATHERED,HARD TO SOFT,CLAY LAYERS	0m	On-site
GW109359	0.00m-1.00m GAVELLY CLAY,BROWN20%TUFF WITH DOLERITE,COHESIVE,MOIST 1.00m-3.00m DOLERITE,L/TO MED GREY,BROWN,WEATHERED,CLAY LAYERS 3.00m-8.00m TUFF, SILTSTONE,L/TO MED. BROWN WEATHERED,HARD TO SOFT,CLAY,QUARTZ	0m	On-site
GW109360	0.00m-0.40m GRAVELLY CLAY.BROWN20% GRAVEL.TUFF.COHESIVE.MOIST 0.40m-7.00m TUFF/SILTSTONE,L/TO MED BROWN WEATHERED,CLAY LAYERS	0m	On-site
GW109361	0.00m-0.50m GRAVELLY CLAY,BROWN20% GRAVEL TUFF,COHESIVE,MOIST. 0.50m-9.10m TUFF/SILTSTONE,L/TO MED BROWN WEATHERED,CLAY LAYERS	0m	On-site
GW102324	0.00m-0.70m SOIL 0.70m-6.00m CLAY 6.00m-15.40m SILTSTONE WEATHERED	142m	East
GW102322	0.00m-0.20m SOIL 0.20m-3.00m CLAYS 3.00m-18.00m SILTSTONE WEATHERED 18.00m-23.50m SILTSTONE HARD	354m	South
GW102351	0.00m-1.00m SOIL 1.00m-4.00m CLAY 4.00m-13.00m SILTSTONE WEATHERED	959m	North
GW405046	0.00m-0.50m TOPSOIL 0.50m-17.00m SHALE - BROWN 17.00m-20.00m GRANITE 20.00m-30.00m SHALE - BLUE 30.00m-41.00m DOLARITE	1145m	South West
GW102878	0.00m-2.00m CLAY, SILTY/YELLOW/BROWN 2.00m-25.00m SHALE, DARK BROWN/GREY 25.00m-29.00m TUFF, SILICIOUS,COURSE GRAINED	1319m	South West
GW109357	0.00m-0.05m GRAVELLY CLAY,BROWN10% GRAVEL TUFF,COHESIVE,FIRM,MOIST 0.05m-11.00m TUFF,SILTSTONE,LIGHT TO MED BROWN WEATHERED,SILTY CLAY LAYERS	1456m	South East
GW109356	0.00m-0.05m GRAVELLY CLAY,BROWN,COHESIVE,FIRM MOIST 0.05m-5.00m TUFF,SILTSTONE,LIGHT TO MED BROWN,WEATHERED,CLAY LAYERS	1458m	South East

Geology

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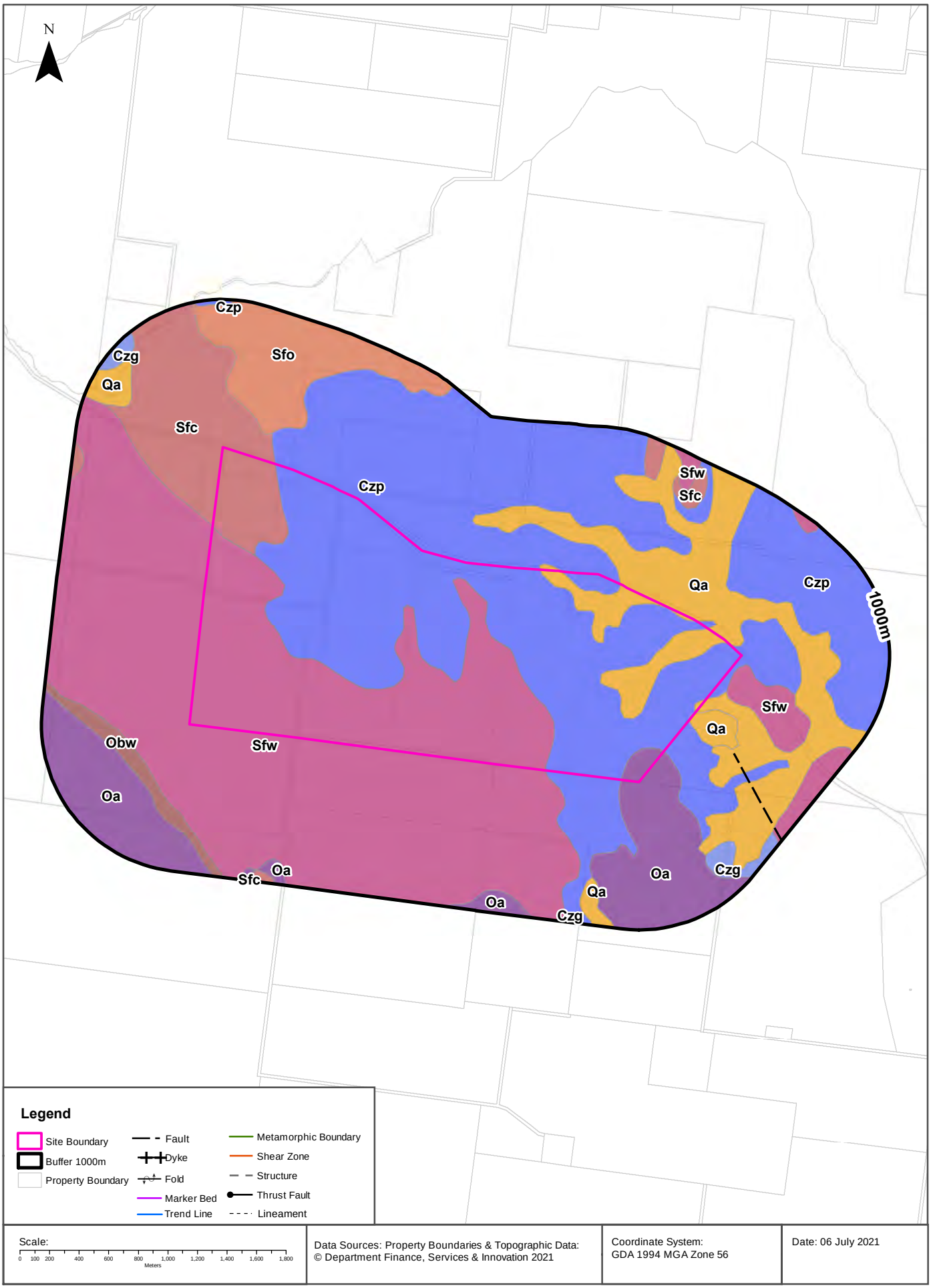


Geology

609 Collector Road, Tarago, NSW 2580

Geological Units 1:250,000

What are the Geological Units within the dataset buffer?

Symbol	Description	Unit Name	Group	Sub Group	Age	Dist	Dir
Czp	Piedmont deposits - gravel, sand, silt				Cainozoic	0m	On-site
Sfw	Rhyodacitic ignimbrite, tuffaceous shale and minor ashstone	Woodlawn Volcanics	Mount Fairy Group		Palaeozoic	0m	On-site
Qa	Alluvium, fluvial deposits: gravel, sand, silt and clay	undifferentiated			Cainozoic	0m	On-site
Sfc	Basalt with interbedded shale and minor quartz sandstone, chert and felsic tuff	Currawang Basalt	Mount Fairy Group		Palaeozoic	0m	On-site
Oa	Turbiditic sequence; sandstone, mudstone, shale; quartzite, quartz phyllite, phyllite, slate	Adaminaby Group	Adaminaby Group		Palaeozoic	0m	On-site
Sfo	Sandstone, siltstone and shale (proximal quartz turbidites)	Covan Creek Formation	Mount Fairy Group		Palaeozoic	168m	North West
Obw	Black graptolitic siliceous shale	Warbisco Shale	Bendoc Group		Palaeozoic	398m	South West
Czg	Gravel, sand, silt and clay				Cainozoic	670m	South East

Geological Structures 1:250,000

What are the Geological Structures within the dataset buffer?

Feature	Name	Description	Map Sheet	Distance	Direction
Fault		Fault, Concealed	SCRA	376m	East
Fault		Fault, Accurate	SCRA	955m	South East

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

Naturally Occurring Asbestos Potential

609 Collector Road, Tarago, NSW 2580

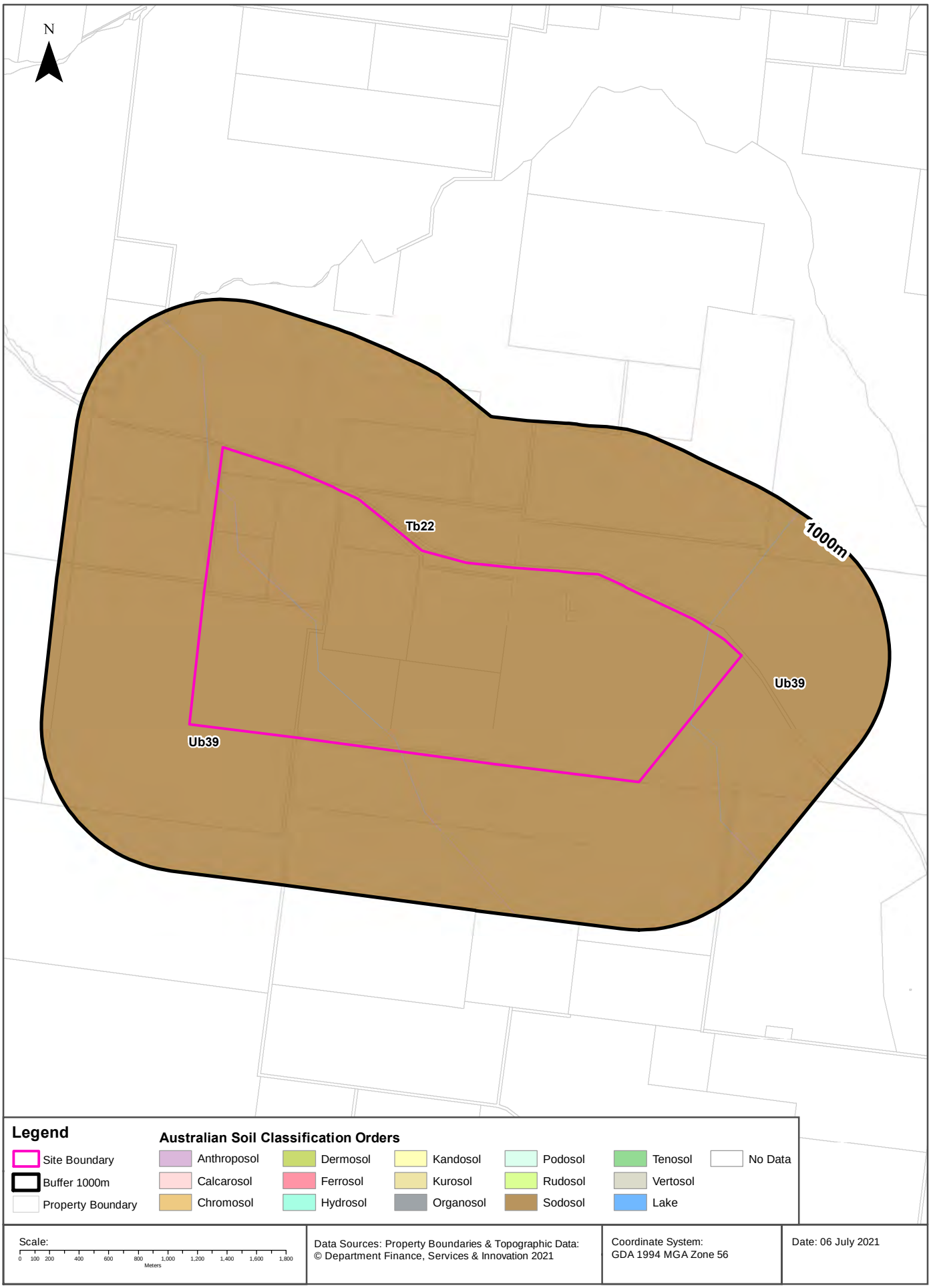
Naturally Occurring Asbestos Potential

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												

Atlas of Australian Soils

609 Collector Road, Tarago, NSW 2580



Soils

609 Collector Road, Tarago, NSW 2580

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	Direction
Tb22	Sodosol	Hilly to steep hilly ranges with rock outcrops: chief soils are shallow stony hard acidic yellow mottled soils (Dy3.41), (Dy3.21), with (Dr2) and (Um4.1) soils. As mapped, areas of unit Ub39 are included. Data are limited.	0m	On-site
Ub39	Sodosol	Undulating to hilly country: chief soils are hard neutral and acid yellow mottled soils (Dy3.42 and Dy3.41) in a general pattern as follows: (i) undulating to hilly slopes of various (Dy) and (Dr) soils, including (Dy3.41), (Dy3.42), (Dy3.2), (Dr2.2), (Dr2.4); (ii) (Dy3.42) and sometimes (Dr3.42) soils in basins which merge with unit Va21 and lower-lying sites generally; and (iii) less frequently (Gn2. 15) and (Gn2.25) soils on gently undulating areas, usually situated between (i) and (ii). As mapped, small areas of units Tb22 and Va22 are included. Data are limited.	0m	On-site

Soil Landscapes of Central and Eastern NSW

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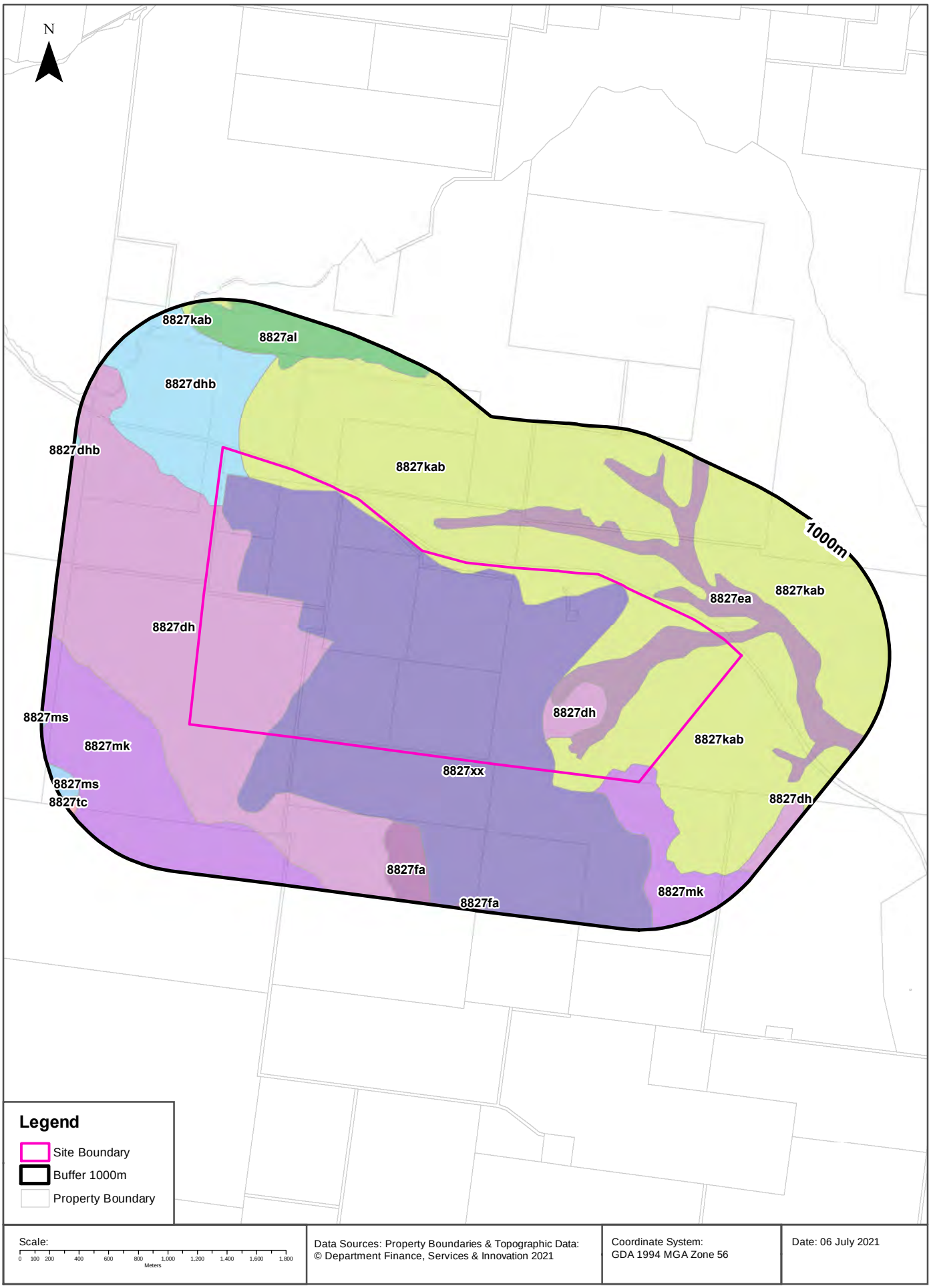

Soils

609 Collector Road, Tarago, NSW 2580

Soil Landscapes of Central and Eastern NSW

Soil Landscapes of Central and Eastern NSW within the dataset buffer:

Soil Code	Name	Distance	Direction
8827xx	Disturbed Terrain	0m	On-site
8827dh	Duckfield Hut	0m	On-site
8827kab	Kalbili variant b	0m	On-site
8827ea	Eastfields Creek	0m	On-site
8827dhb	Duckfield Hut variant b	0m	On-site
8827mk	Moura Creek	0m	On-site
8827fa	Fairy	476m	South
8827al	Allianoyonyiga	629m	North West
8827ms	Morass	857m	West
8827tc	Taylors Creek	891m	South West

Acid Sulfate Soils

609 Collector Road, Tarago, NSW 2580

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				

Atlas of Australian Acid Sulfate Soils

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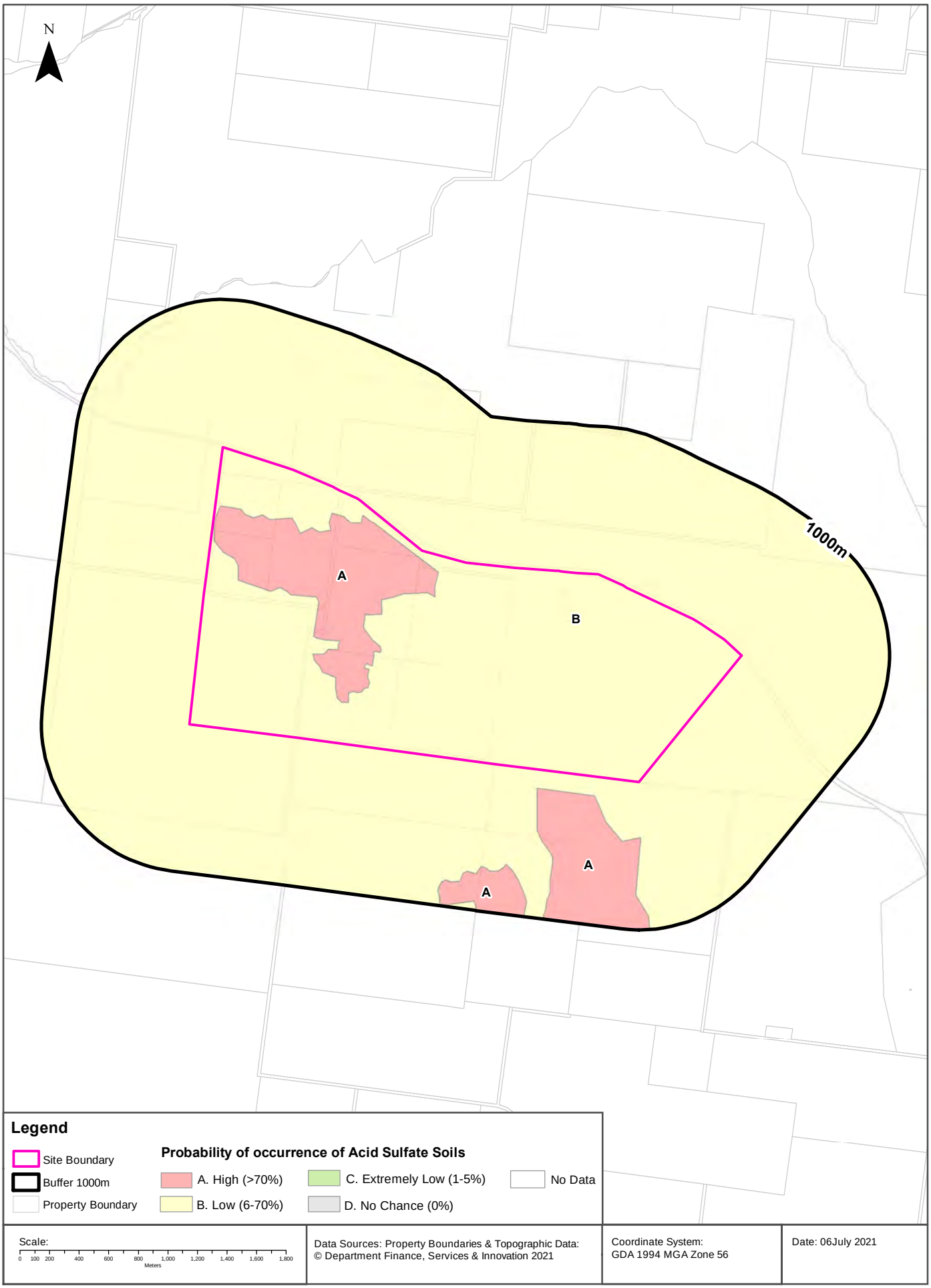

Acid Sulfate Soils

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Atlas of Australian Acid Sulfate Soils

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

Class	Description	Distance	Direction
B	Low Probability of occurrence. 6-70% chance of occurrence.	0m	On-site
A	High Probability of occurrence. >70% chance of occurrence.	0m	On-site

Dryland Salinity

609 Collector Road, Tarago, NSW 2580

Dryland Salinity - National Assessment

Is there Dryland Salinity - National Assessment data onsite?

No

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

No

What Dryland Salinity assessments are given?

Assessment 2000	Assessment 2020	Assessment 2050	Distance	Direction
N/A	N/A	N/A		

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.

Mining

609 Collector Road, Tarago, NSW 2580

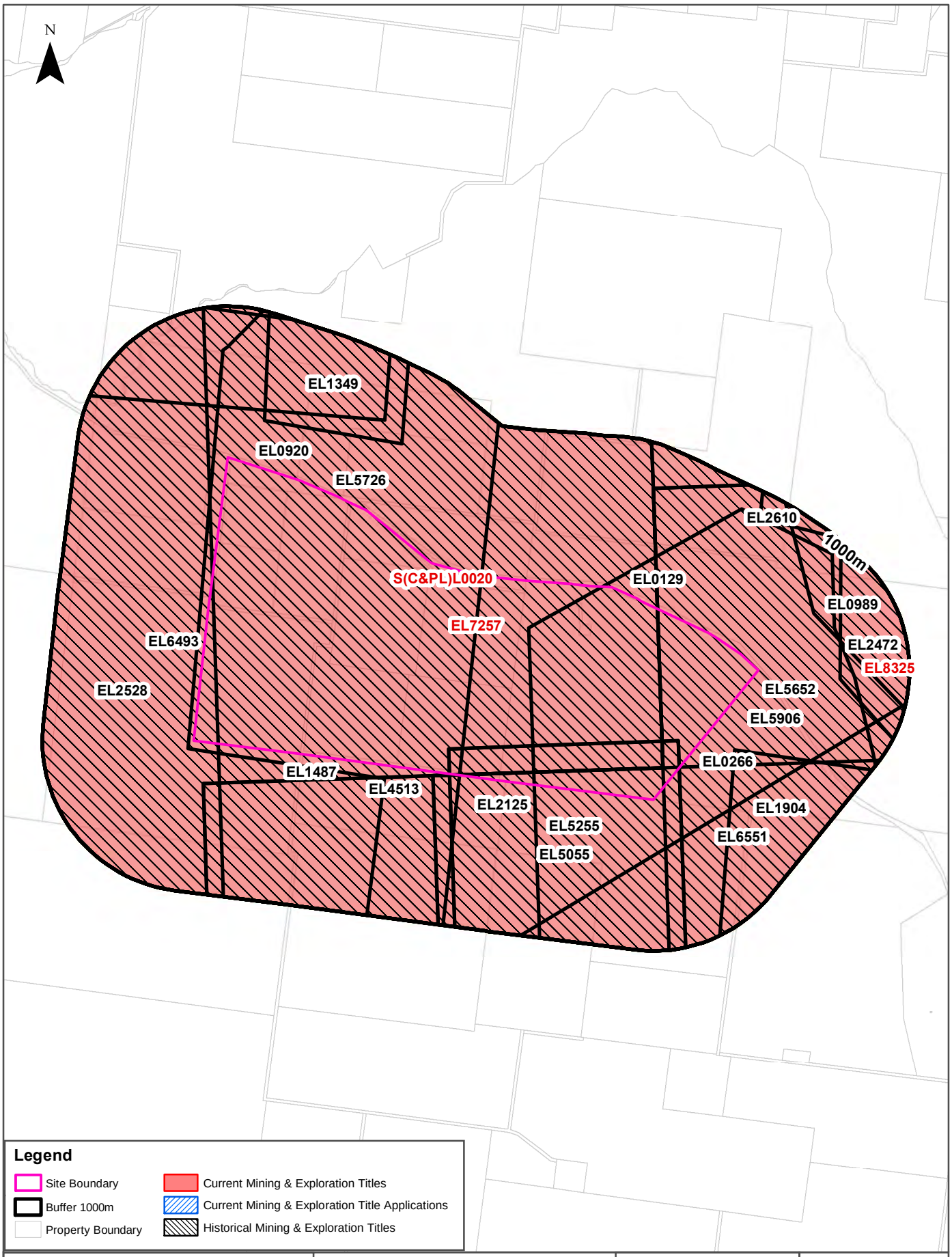
Mining Subsidence Districts

Mining Subsidence Districts within the dataset buffer:

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

Mining & Exploration Titles

609 Collector Road, Tarago, NSW 2580



Data Sources: Property Boundaries & Topographic Data: © Department Finance, Services & Innovation 2021

Coordinate System: GDA 1994 MGA Zone 56

Date: 06 July 2021

Mining

609 Collector Road, Tarago, NSW 2580

Current Mining & Exploration Titles

Current Mining & Exploration Titles within the dataset buffer:

Title Ref	Holder	Grant Date	Expiry Date	Last Renewed	Operation	Resource	Minerals	Dist	Dir
EL7257	TARAGO EXPLORATION PTY LTD	14/11/2008	14/11/2026	16 Mar 2021	EXPLORING	MINERALS	Group 1, Group 2, Group 5	0m	On-site
S (C&PL)L 0020	TARAGO OPERATIONS PTY LTD	16/11/1973	16/11/2029	21 Jan 2015	MINING	MINERALS	Antimony, Arsenic, Barite, Bismuth, Cadmium, Caesium, Chromite, Cobalt, Columbium, Copper, Fluorite, Galena, Garnet, Germanium, Gold, Ilmenite, Indiu	0m	On-site
EL8325	TARAGO EXPLORATION PTY LTD	02/12/2014	02/12/2023	13 Feb 2018	EXPLORING	MINERALS	Group 1, Group 2	868m	East

Current Mining & Exploration Titles Data Source: © State of New South Wales through NSW Department of Industry

Current Mining & Exploration Title Applications

Current Mining & Exploration Title Applications within the dataset buffer:

Application Ref	Applicant	Application Date	Operation	Resource	Minerals	Dist	Dir
N/A	No records in buffer						

Current Mining & Exploration Title Applications Data Source: © State of New South Wales through NSW Department of Industry

Mining

609 Collector Road, Tarago, NSW 2580

Historical Mining & Exploration Titles

Historical Mining & Exploration Titles within the dataset buffer:

Title Ref	Holder	Start Date	End Date	Resource	Minerals	Dist	Dir
EL6493	TRI ORIGIN MINING PTY LIMITED	08 Dec 2005	07 Dec 2009	MINERALS	Ag Au Cu Pb Zn Limestone Clay shale	0m	On-site
EL5726	TRI ORIGIN MINERALS LTD	10 May 2000	09 May 2010	MINERALS	Cu Pb Zn	0m	On-site
EL2125	CANYON RESOURCES PTY LIMITED	01 Nov 1983	01 May 1984	MINERALS	Cu Pb Zn	0m	On-site
EL1487	JODODEX AUSTRALIA PTY LIMITED	01 Nov 1980	01 Jun 1982	MINERALS	Cu Pb Zn	0m	On-site
EL0129	ST JOE AUSTRALIA PTY LIMITED	01 Jan 1968	01 May 1973	MINERALS	Cu Pb Zn	0m	On-site
EL0266	JODODEX AUSTRALIA PTY LIMITED	01 Mar 1970	01 Mar 1972	MINERALS	Cu Pb Zn Ni	0m	On-site
EL5906	PYRMONT RAW MATERIALS PTY LTD	22 Nov 2001	16 May 2006	MINERALS	Dolerite Dimension Stone	0m	On-site
EL0920	JODODEX AUSTRALIA PTY LIMITED	01 Sep 1976	01 Mar 1979	MINERALS	Cu Pb Zn	0m	On-site
EL6551	TRI ORIGIN MINING PTY LIMITED	31 Mar 2006	30 Mar 2008	MINERALS	Limestone Marble Fe2O3 Construction Material	0m	On-site
EL4513	PLATSEARCH NL	03 Jun 1993	02 Jun 1995	MINERALS	Au	0m	On-site
EL5652	TRI ORIGIN MINERALS LTD	06 Dec 1999	14 Nov 2008	MINERALS	Au Cu Pb Ag Zn Base Metals Precious Metals	0m	On-site
EL5055	PLATSEARCH NL	10 Jul 1996	09 Jul 1998	MINERALS		0m	On-site
EL5255	PLATSEARCH NL	14 Mar 1997	09 Jul 1998	MINERALS		0m	On-site
EL2528	DENEHURST LIMITED	16 Dec 1985	15 Dec 1993	MINERALS	Ag Au Cu Pb Zn	34m	West
EL1904	JODODEX AUSTRALIA PTY LIMITED	01 Jun 1981	01 Jun 1988	MINERALS	Au Cu Pb Zn	209m	South East
EL1349	SAMEDAN OIL CORPORATION	01 Apr 1980	01 Jun 1983	MINERALS	Cu Pb Zn	305m	North
EL0989	SAMEDAN OIL CORPORATION	01 Jun 1977	01 Jun 1983	MINERALS	Cu Pb Zn Ag	524m	East
EL2472	NORTH BROKEN HILL LIMITED	01 Sep 1985	01 Sep 1988	MINERALS	Au Cu Pb Zn	542m	East
EL2610	NEW BROKEN HILL CONSOLIDATED LIMITED	01 Jun 1986	01 May 1988	MINERALS	Au Cu Pb Zn	834m	East

State Environmental Planning Policy

609 Collector Road, Tarago, NSW 2580

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							

EPI Planning Zones

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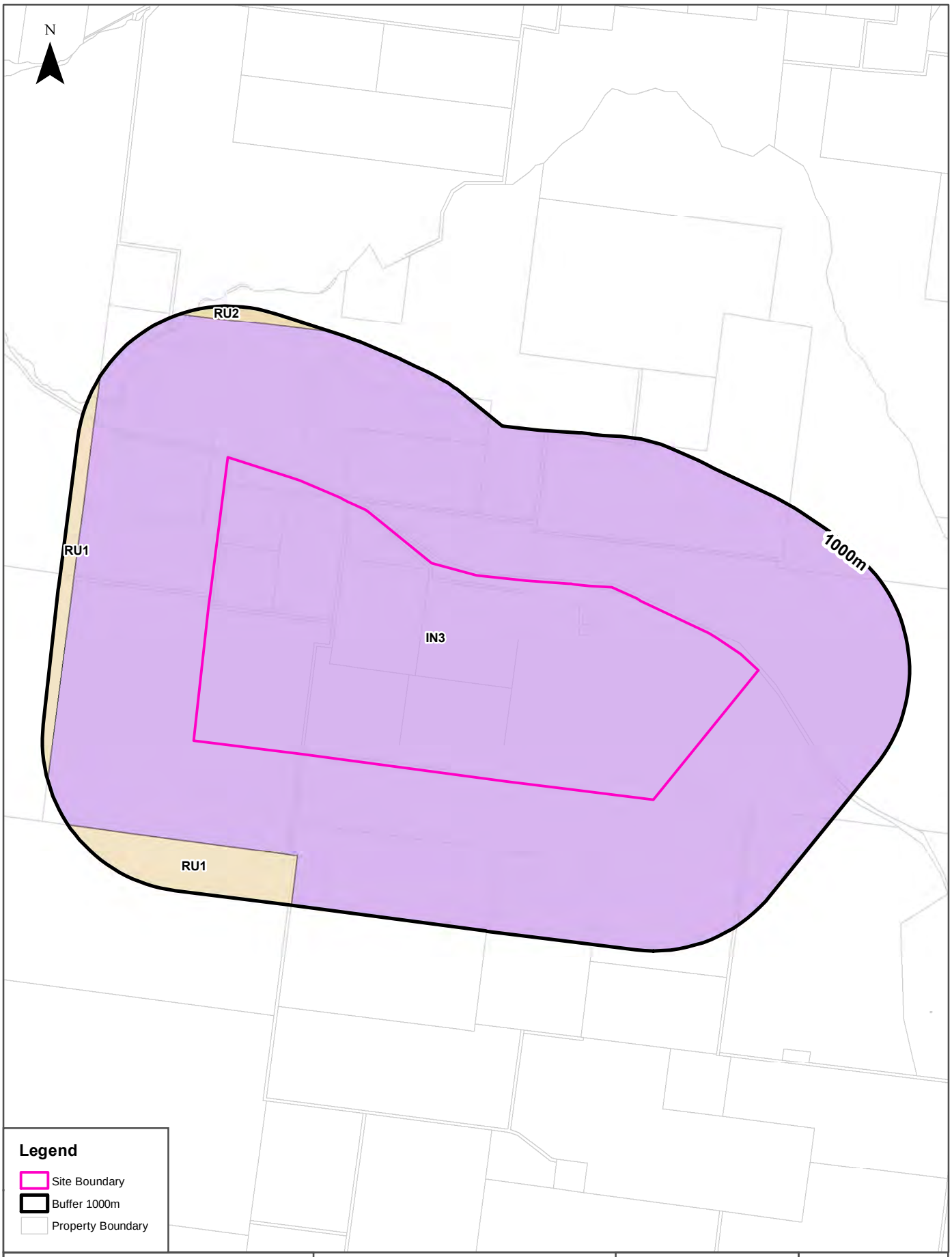

Environmental Planning Instrument

609 Collector Road, Tarago, NSW 2580

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
IN3	Heavy Industrial		Goulburn Mulwaree Local Environmental Plan 2009	13/07/2012	13/07/2012	18/06/2021	Amendment No 2	0m	On-site
RU1	Primary Production		Palerang Local Environmental Plan 2014	15/05/2020	15/05/2020	30/10/2020	Amendment No 9	663m	South West
RU2	Rural Landscape		Goulburn Mulwaree Local Environmental Plan 2009	13/07/2012	13/07/2012	18/06/2021	Amendment No 2	904m	North West

Heritage

609 Collector Road, Tarago, NSW 2580

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

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

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
Creative Commons 4.0 © Commonwealth of Australia https://creativecommons.org/licenses/by/4.0/

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

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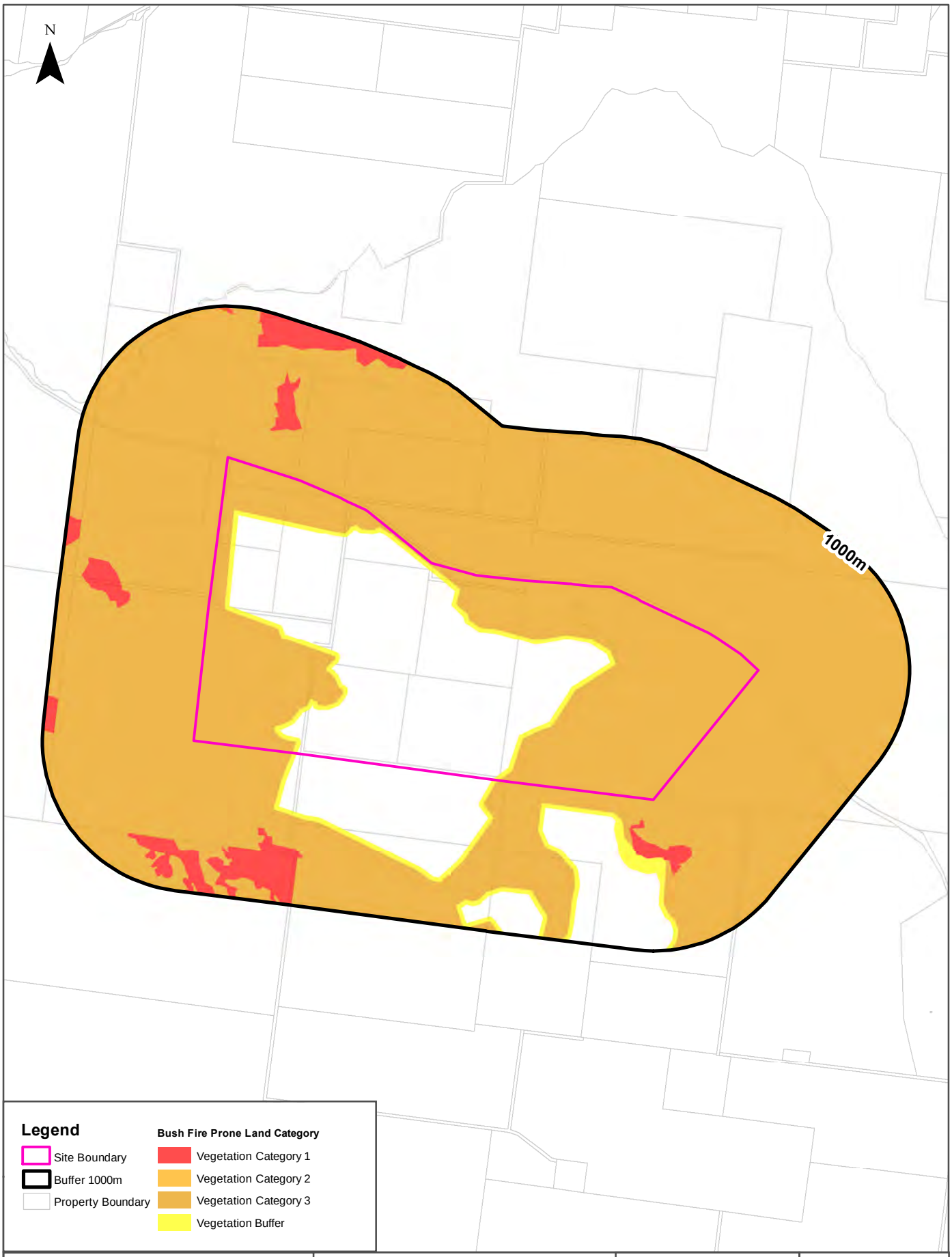

Data Sources: Bush Fire Prone Land: © NSW Rural Fire Service 2021. Property Boundaries: © Department Finance, Services & Innovation 2021

Coordinate System: GDA 1994 MGA Zone 56

Date: 06 July 2021

Natural Hazards

609 Collector Road, Tarago, NSW 2580

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 Category 3	0m	On-site
Vegetation Buffer	0m	On-site
Vegetation Category 1	140m	South East

Ecological Constraints - Vegetation & Ramsar Wetlands

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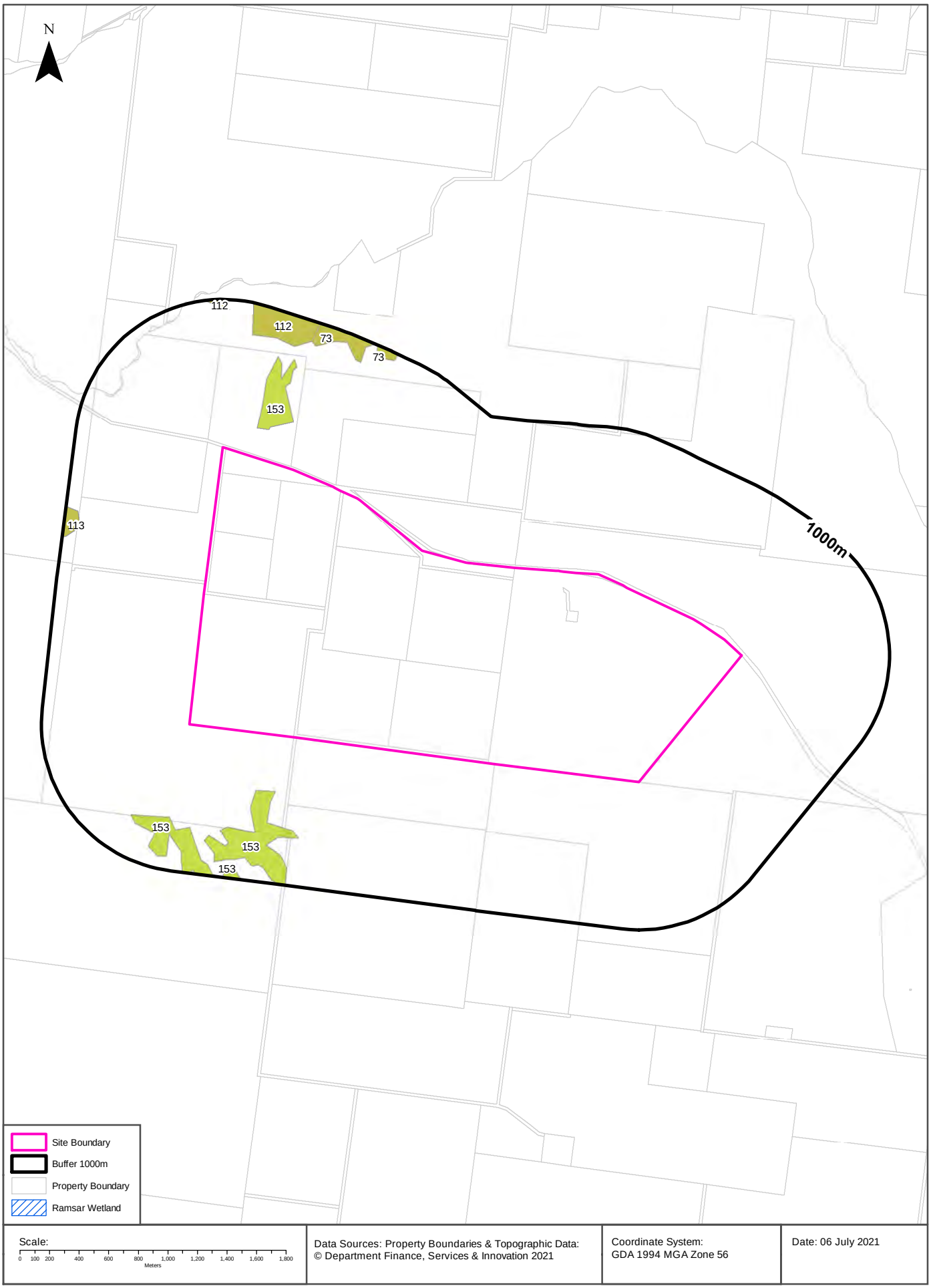

Ecological Constraints

609 Collector Road, Tarago, NSW 2580

Vegetation of the Southern Forests

What vegetation of the Southern Forests exists within the dataset buffer?

Veg Code	Formation	Class	Group	Distance	Direction
153	06 Grassy Woodlands/Grasslands	06d ST Temperate Grasslands	Tablelands and Slopes Herb Grassland/Woodland	194m	North West
112	05 Dry Grass/Shrub Forests	07g North-eastern ST Dry Shrub Forests	Eastern Tablelands Dry Shrub Forest	784m	North West
73	05 Dry Grass/Shrub Forests	05d Central ST Dry Grass/Shrub Forest	Eastern Tableland Dry Shrub-Grass Forest	842m	North
113	05 Dry Grass/Shrub Forests	07g North-eastern ST Dry Shrub Forests	North East Southern Tablelands Dry Shrub-Grass Forest	887m	West

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					

Ecological Constraints - Groundwater Dependent Ecosystems Atlas

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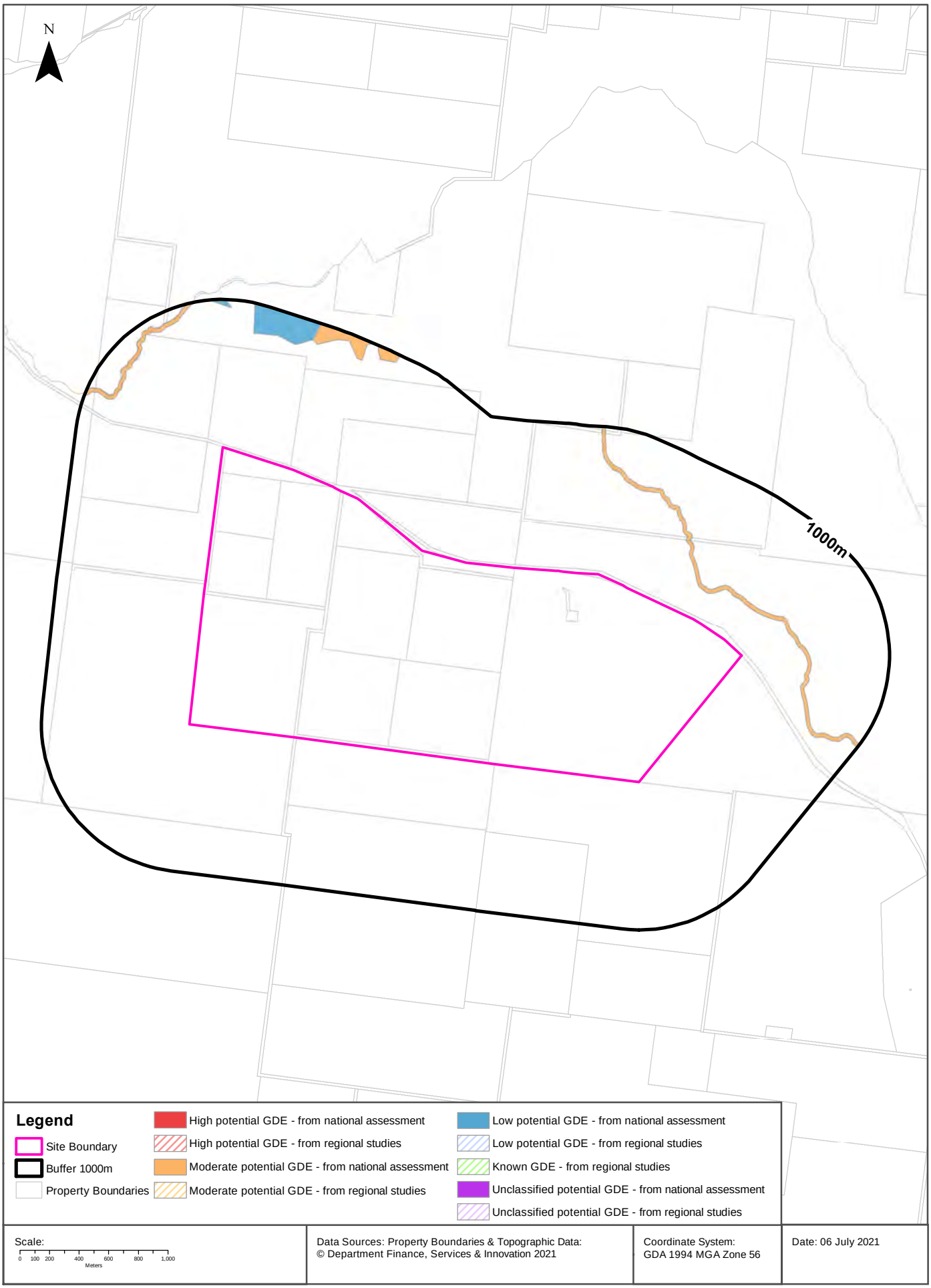

Ecological Constraints

609 Collector Road, Tarago, NSW 2580

Groundwater Dependent Ecosystems Atlas

Type	GDE Potential	Geomorphology	Ecosystem Type	Aquifer Geology	Distance	Direction
Aquatic	Moderate potential GDE - from national assessment	Upland plains with separating strike-aligned hills, closed lake basins.	River		204m	East
Terrestrial	Low potential GDE - from national assessment	Upland plains with separating strike-aligned hills, closed lake basins.	Vegetation		798m	North West
Terrestrial	Moderate potential GDE - from national assessment	Upland plains with separating strike-aligned hills, closed lake basins.	Vegetation		857m	North

Ecological Constraints - Inflow Dependent Ecosystems Likelihood

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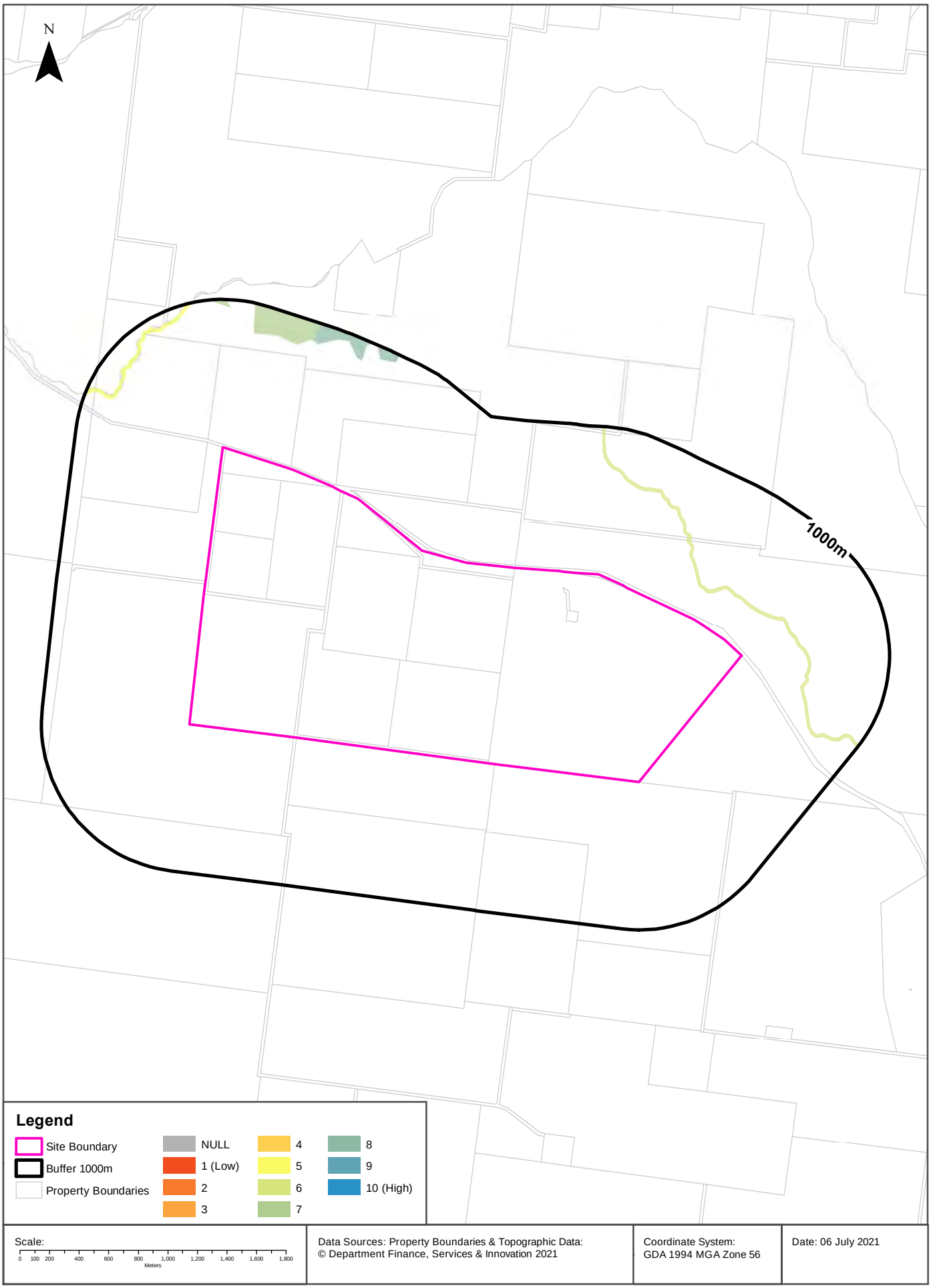

Ecological Constraints

609 Collector Road, Tarago, NSW 2580

Inflow Dependent Ecosystems Likelihood

Type	IDE Likelihood	Geomorphology	Ecosystem Type	Aquifer Geology	Distance	Direction
Aquatic	6	Upland plains with separating strike-aligned hills, closed lake basins.	River		204m	East
Aquatic	5	Upland plains with separating strike-aligned hills, closed lake basins.	River		792m	North West
Terrestrial	7	Upland plains with separating strike-aligned hills, closed lake basins.	Vegetation		798m	North West
Terrestrial	8	Upland plains with separating strike-aligned hills, closed lake basins.	Vegetation		857m	North

Inflow Dependent Ecosystems Likelihood Data Source: The Bureau of Meteorology

Ecological Constraints

609 Collector Road, Tarago, NSW 2580

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	Actitis hypoleucos	Common Sandpiper	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Anseranas semipalmata	Magpie Goose	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Arenaria interpres	Ruddy Turnstone	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Artamus cyanopterus cyanopterus	Dusky Woodswallow	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Calidris acuminata	Sharp-tailed Sandpiper	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Calidris ferruginea	Curlew Sandpiper	Endangered	Not Sensitive	Critically Endangered	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Calidris melanotos	Pectoral Sandpiper	Not Listed	Not Sensitive	Not Listed	ROKAMBA;JAMBA
Animalia	Aves	Callocephalon fimbriatum	Gang-gang Cockatoo	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Calyptorhynchus lathami	Glossy Black-Cockatoo	Vulnerable	Category 2	Not Listed	
Animalia	Aves	Chlidonias leucopterus	White-winged Black Tern	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Circus assimilis	Spotted Harrier	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Daphoenositta chrysoptera	Varied Sittella	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Epthianura albifrons	White-fronted Chat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Falco subniger	Black Falcon	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Gelochelidon nilotica	Gull-billed Tern	Not Listed	Not Sensitive	Not Listed	CAMBA
Animalia	Aves	Haliaeetus leucogaster	White-bellied Sea-Eagle	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Hieraaetus morphnoides	Little Eagle	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Hirundapus caudacutus	White-throated Needletail	Not Listed	Not Sensitive	Vulnerable	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Limosa lapponica	Bar-tailed Godwit	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Numenius minutus	Little Curlew	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Oxyura australis	Blue-billed Duck	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Petroica boodang	Scarlet Robin	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Pluvialis fulva	Pacific Golden Plover	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Pluvialis squatarola	Grey Plover	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Stagonopleura guttata	Diamond Firetail	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Stictonetta naevosa	Freckled Duck	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Tringa nebularia	Common Greenshank	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Aves	Tringa stagnatilis	Marsh Sandpiper	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Mammalia	Cercartetus nanus	Eastern Pygmy-possum	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Phascolarctos cinereus	Koala	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Diuris aequalis	Buttercup Doubletail	Endangered	Category 2	Vulnerable	
Plantae	Flora	Dodonaea procumbens	Creeping Hop-bush	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Eucalyptus aggregata	Black Gum	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Melichrus sp. Newfoundland State Forest		Endangered	Not Sensitive	Endangered	
Plantae	Flora	Pelargonium sp. Striatellum	Omeo Storksbill	Endangered	Not Sensitive	Endangered	
Plantae	Flora	Rutidosis leptorrhynchoides	Button Wrinklewort	Endangered	Not Sensitive	Endangered	
Plantae	Flora	Swainsona sericea	Silky Swainson-pea	Vulnerable	Not Sensitive	Not Listed	
Plantae	Flora	Wilsonia rotundifolia	Round-leafed Wilsonia	Endangered	Not Sensitive	Not Listed	

Data does not include NSW category 1 sensitive species.

Location Confidences

Where Lotsearch has had to georeference features from supplied addresses, a location confidence has been assigned to the data record. This indicates a confidence to the positional accuracy of the feature. Where applicable, a code is given under the field heading “LC” or “LocConf”. These codes lookup to the following location confidences:

LC Code	Location Confidence
Premise Match	Georeferenced to the site location / premise or part of site
Area Match	Georeferenced to an approximate or general area
Road Match	Georeferenced to a road or rail corridor
Road Intersection	Georeferenced to a road intersection
Buffered Point	A point feature buffered to x metres
Adjacent Match	Land adjacent to a georeferenced feature
Network of Features	Georeferenced to a network of features
Suburb Match	Georeferenced to a suburb boundary
As Supplied	Spatial data supplied by provider

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APPENDIX B

Figures

Appendix B1
(Source: Golder 2006)

AREA 1

AREA 2

A

B

C

NEWLY CONSTRUCTED BIOGAS SHED

D

E

F

G

EXISTING STORAGE SHEDS

N

LEGEND

INVESTIGATION AREA	DESCRIPTION
A	STOCKPILE AREA
B	ABOVE GROUND STORAGE TANKS
C	FORMER DIESEL TANKS
D	DEMOLITION MATERIALS
E	PLANT COLLECTION DAM
F	TAILINGS DAM
G	PONDS
AREAS 1 & 2	GENERAL METAL CONTAMINATION

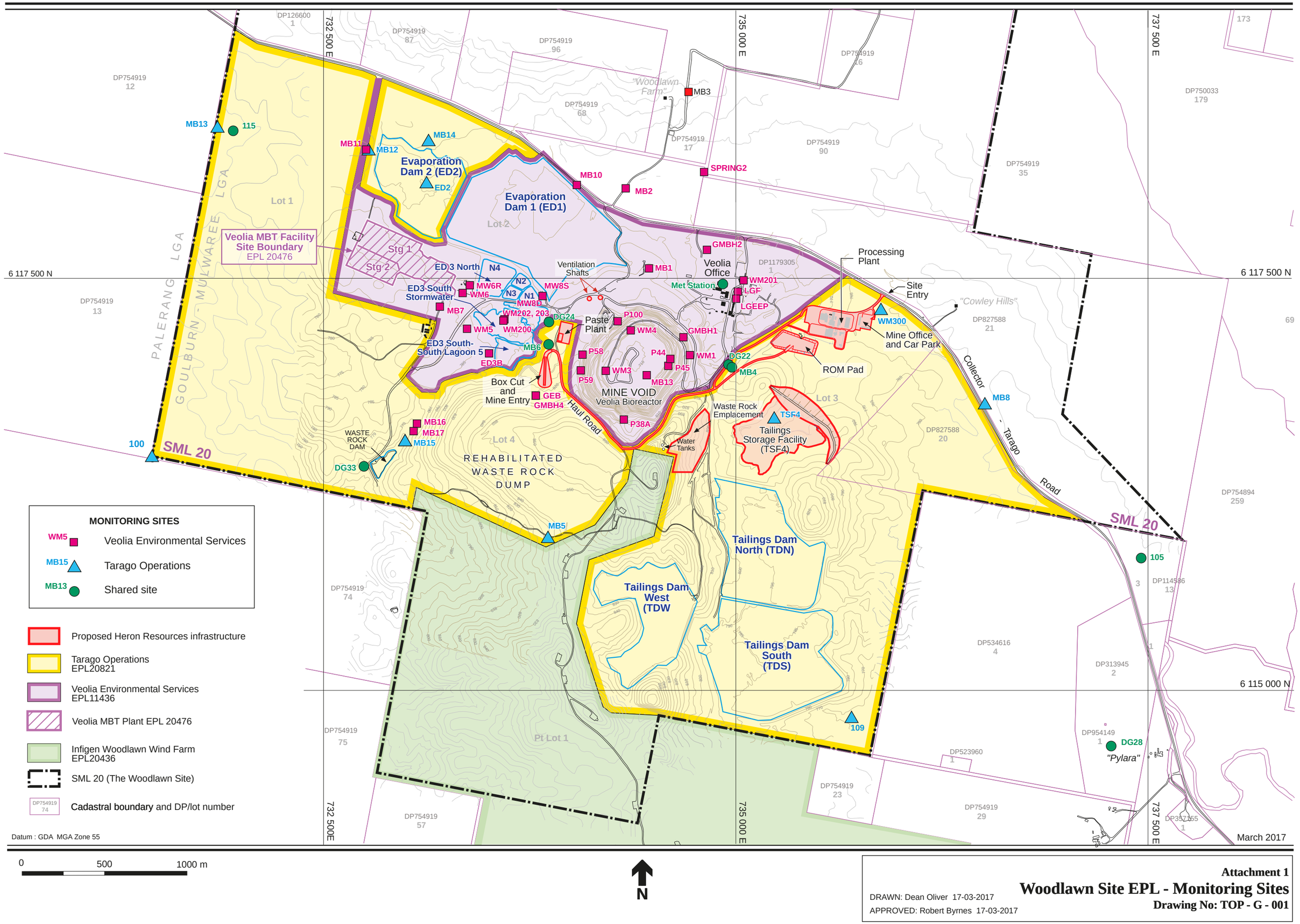
SOURCE: Base plan -BHP Engineering, Woodlawn Mines Drawing No: WL-010-088

Golder Associates

CLIENT: VEOLIA ENVIRONMENTAL SERVICES		PROJECT: PHASE I ENVIRONMENTAL SITE ASSESSMENT FORMER WOODLAWN MINE SITE	
DRAWN: DKT	DATE: 20.06.06	TITLE: **STUDY AREA AREAS OF CONCERN**	
CHECKED:	DATE:		
SCALE: N.T.S		PROJECT No: 06623075	FIGURE No: 5 / REV No: 0 / A3

FILE LOCATION: J:\06Proj\051-100\06623075_Veolia_Woodlawn\Figures

Appendix B2
(Source: Heron 2015)



Attachment 1

Woodlawn Site EPL - Monitoring Sites

Drawing No: TOP - G - 001

DRAWN: Dean Oliver 17-03-2017

APPROVED: Robert Byrnes 17-03-2017

Appendix B3
(Source Earth2Water 2018)

earth2water Pty Ltd
Environmental & Groundwater Consulting

Site Location (ED1C; 2017)

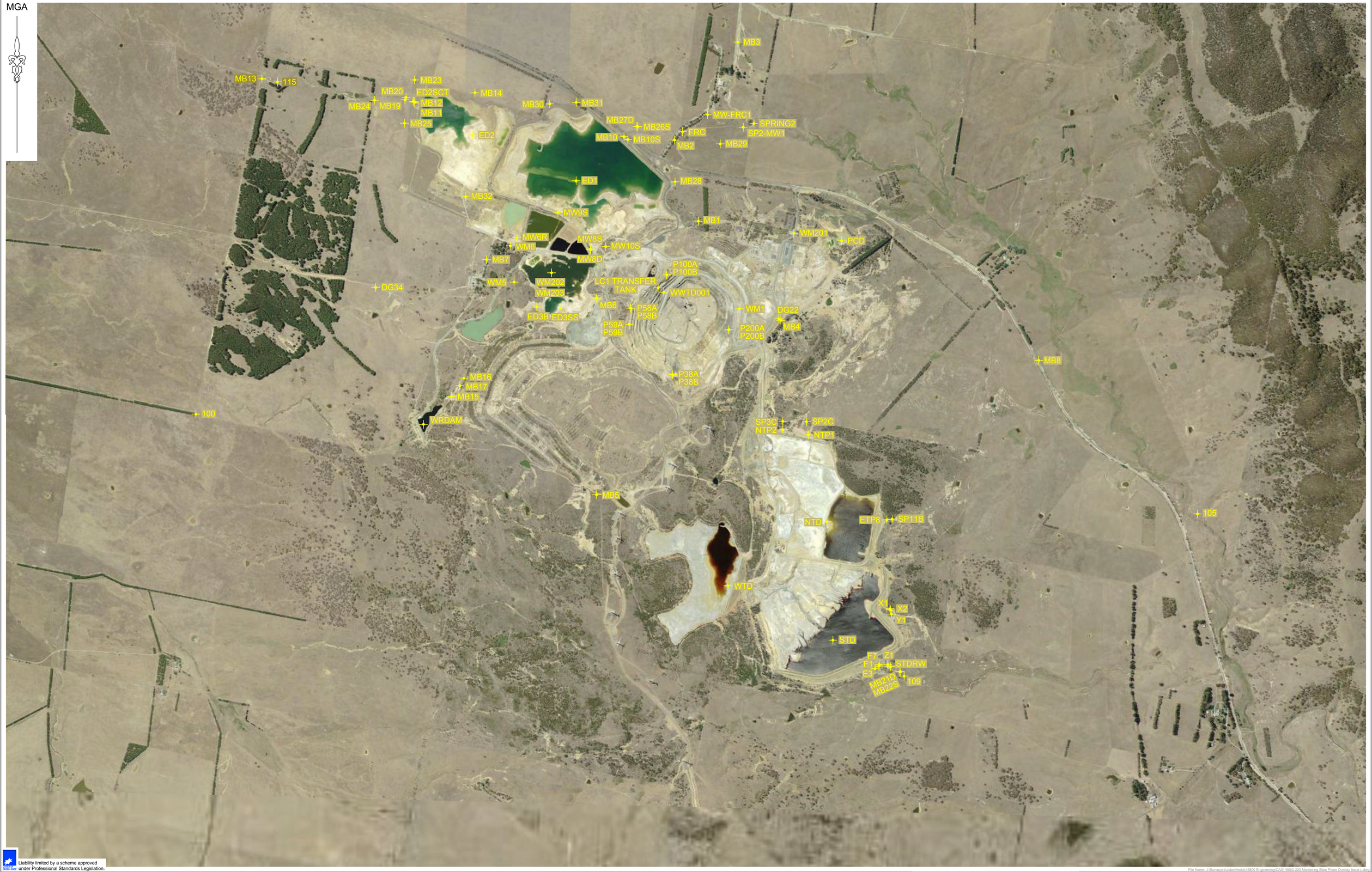
Date: *September 2018*

Reference: *E2W_281_01.cdr*

VEOLIA Woodlawn Bioreactor- Construction of ED-1c (200ML, 2018)

Figure 1

Appendix B4
(Source: Veolia 2020b)



Liability limited by a scheme approved under Professional Standards Legislation.

File Name: J:\Surveyors\Jobs\Veolia\16800 Engineering\CAD\16800-220 Monitoring Sites Photo Overlay Issue L.dwg

VEOLIA ENVIRONMENTAL SERVICES

SCALE 1:10,000

0 200 400 600 800 1000

Metres

ISSUE	AMENDMENT	DRAWN	DATE
F	MONITORING SITE ED3SS ADDED	MK	24/10/2017
G	DG34, LC1 ADDED & DG24 REMOVED	MK	30/01/2018
H	P200A, P200B, WWTD001 ADDED P44A, P44B, P45A, P45B REMOVED	MK	30/05/2018
J	MB23 - MB25, MB26S, MB27D, MB28 - MB32 ADDED	MK	31/05/2018
K	SP2-MW1, MW-FRC1, MB10S ADDED	MK	13/03/2019
L	MB13 (VOID) & WM3 REMOVED. MW9 RENAMED MW9S	MK	13/01/2020

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Integrated Management System

LandTeam

A1 SHEET

VEOLIA ENVIRONMENTAL SERVICES

WOODLAWN BIOREACTOR
COLLECTOR ROAD, TARAGO

WOODLAWN BIOREACTOR
SITE MONITORING
LOCATIONS

DESIGNED: N/A
DRAWN: MK
CHECKED: JK
ISSUE L

DRAWING No. 16800-220

DATUM N/A | CONTOUR INTERVAL N/A | DATE 13/01/2020

Appendix B5
(Source: Envirowest Consulting 2012)

North

Site assessed (Pit 2)

Site assessed (Pit 1)

Figure 2. Aerial photograph

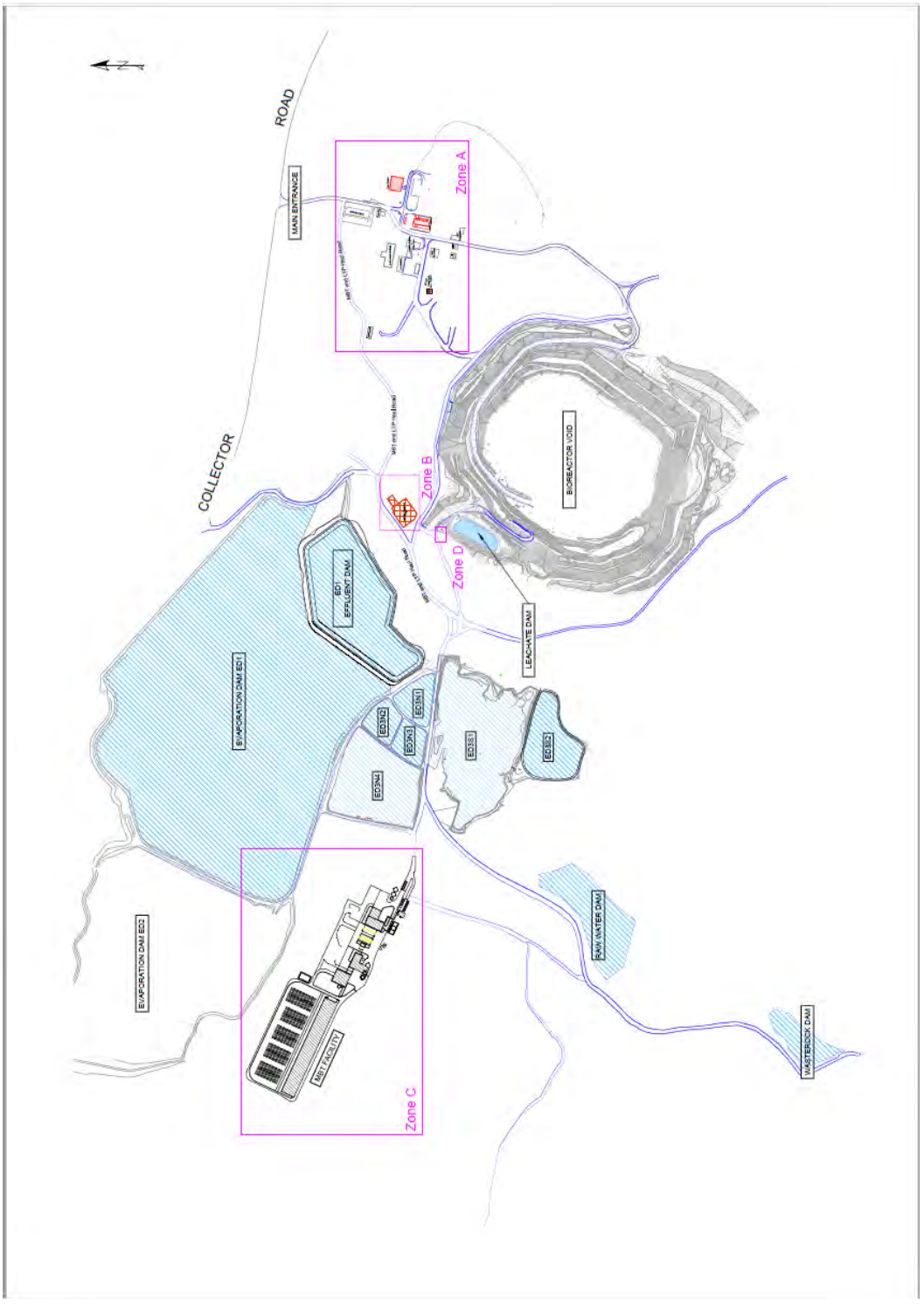
Veolia Woodlawn Bioreactor
619 Collector Road, Tarago NSW

Envirowest Consulting Pty Ltd

Job: R12134val	Drawn by: JM	Date: 1/5/2012

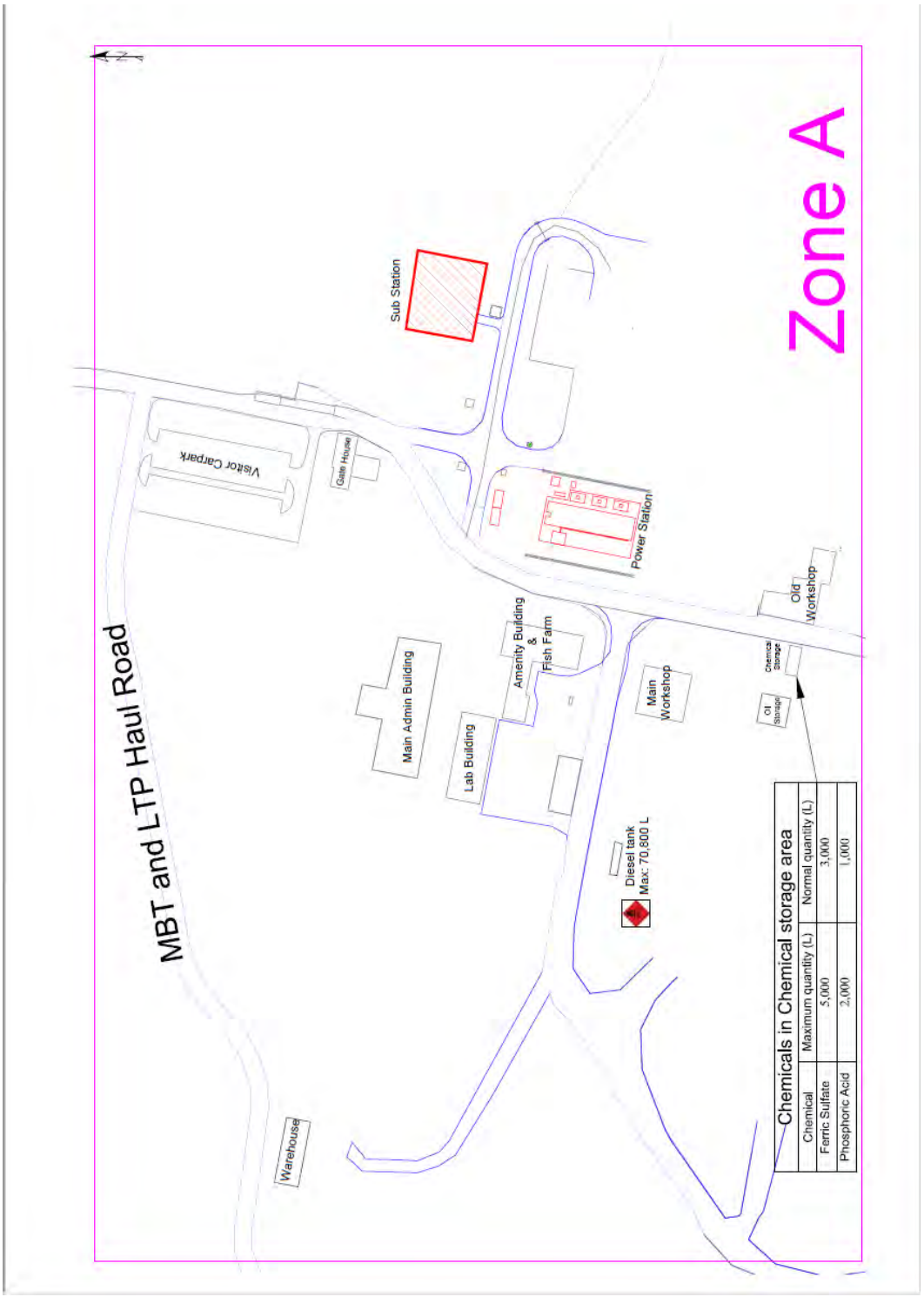
Appendix B6
(Source: Veolia 2020b)

Woodlawn Eco Precinct Site Layout and Dangerous Goods (DG) Locations (Subsequent enlarged Zone Maps identify DG Storage Areas)

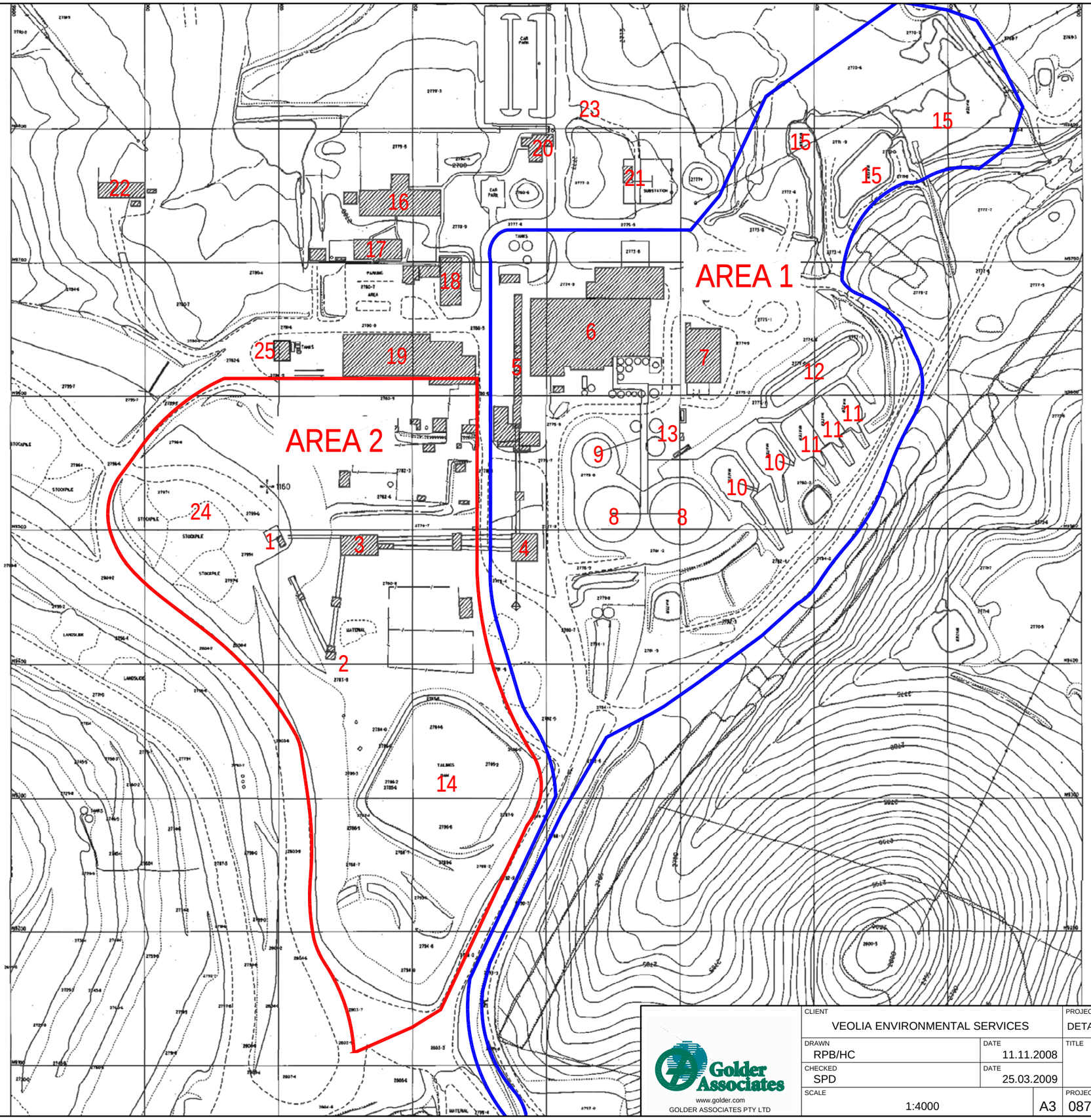


Appendix B7
(Source: Veolia 2020b)

Zone A - Bioreactor and Bioenergy Buildings (DG Storage Areas)



Appendix B8
(Source: Golder 2009a)



AREA 1	
4	SCREENING PLANT
5	FINE ORE BINS
6	PROCESS BUILDING
7	REAGENT STORE
8	THICKENERS
9	CONCENTRATOR TANK
10	WATER STORAGE
11	EMERGENCY WATER STORAGE
12	DECANTATION POND
13	FORMER ABOVE GROUND STORAGE TANKS
15	PLANT COLLECTION DAM
AREA 2	
1	PRIMARY ORE CRUSHER
2	PRIMARY ORE STORAGE BIN
3	SECONDARY ORE CRUSHER
14	LEAD REVERSE TAILINGS DAM
24	PRIMARY CRUSHER PAD
25	ABOVEGROUND STORAGE TANKS
EXTERNAL AREAS	
16	ADMINISTRATION BUILDING
17	LABORATORY
18	AMENITIES BUILDING
19	WORKSHOP BUILDING
20	GATEHOUSE
21	ELECTRICAL SUBSTATION
22	MAGAZINE
23	UNDERGROUND STORAGE TANKS

DRAWING TAKEN FROM BHP ENGINEERING PTY LTD
DRG. No. WL-010-088 DATED SEPTEMBER 1991

1:3000 0 30 60 90 120 150m

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CLIENT	VEOLIA ENVIRONMENTAL SERVICES	PROJECT	DETAILED SITE INVESTIGATION OF THE FORMER WOODLAWN PLANT AREA
DRAWN	RPB/HC	DATE	11.11.2008
CHECKED	SPD	DATE	25.03.2009
SCALE	1:4000	A3	TITLE: FORMER AND CURRENT STUDY AREA FEATURES
PROJECT No	087623073	DOC No	008
DOC TYPE	RPT	FIGURE No	F0003
REV No	0		Figure 3

Plot Date: 25 March 2009 Time:4:13:22 PM By: Campbell, Helen Path: J:\env\2008\51-100\087623073_Veolia_Woodlawn\Technical Doc\CADD\FIGURES - File Name:087623073_008_R_F0003_REV0.dwg

Appendix B9
(Source: Golder 2009a)

LEGEND

- GS40 GRAB SAMPLE LOCATION
- HA112 HAND AUGER LOCATION
- TP37 TEST PIT LOCATION
- BH16 BOREHOLE LOCATION
- MW03 COMBINED BOREHOLE/ MONITORING WELL
- AREA 2
- AREA 1

1:4000 0 40 80 120 160 200m

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CLIENT: VEOLIA ENVIRONMENTAL SERVICES				PROJECT: DETAILED SITE INVESTIGATION OF THE FORMER WOODLAWN PLANT AREA				
DRAWN: RPB/HC	DATE: 10.11.2008			TITLE: SOIL SAMPLE LOCATIONS				
CHECKED: SPD	DATE: 25.03.2009							
SCALE: 1:4000	A3	PROJECT No: 087623073	DOC No: 008	DOC TYPE: RPT	FIGURE No: F0004	REV No: 1	Figure 4	

Plot Date: 25 March 2009 Time:3:20:27 PM By: Campbell, Helen Path: J:\env\2008\51-100\087623073_Veolia_Woodlawn\Technical Doc\CADD\FIGURES - File Name:087623073_008_R_F0004_Rev1.dwg

APPENDIX C

Site inspection photographs

Photo 1: View to west across former Lead Reverse Dam with Primary Crusher Pad visible in background.

Photo 2: View to the north across the former Mine Plant Area. The former Lead Reverse Dam is visible in the foreground. The main haul road running north south through the site is visible. To the west of the haul road in the background are the site offices and workshop/maintenance area. To the east of the haul road in the background is the Power Station and electrical substation.

Photo 3: View to the northwest across the former Mine Plant Area. Structures associated with the former Thickeners are visible in the foreground and foundations and remnants of the former Process Building are visible in the midground. The Power Station and the electrical substation are visible in the background.

Photo 4: View to the north across the former Mine Plant Area. Foundations and remnants of the former Process Building are visible in the midground and the electrical substation in the background.

Photo 5: View to the northeast across the former Mine Plant Area and proposed location of the ARC. The former Lead Reverse Dam is visible in the foreground, storage sheds and part of the Power Station in the left midground. The electrical substation, Plant Collection Dam and Collector Road are visible in the background.

Photo 6: View to the northeast across the former Mine Plant Area showing use as a laydown area, with infrastructure associated with the Heron operations on the adjacent site visible in the background.

Photo 7: View to the east across part of the location of the proposed ARC. The excavated areas in the mid ground was the former location of the water storage dams. Material has reported to have been excavated from the bank in the background for use as cover on the site.

Photo 8: View to the southwest across the location of the proposed ARC. Concrete structures associated with the former Thickeners and the Primary Crusher Pad are visible in the background.

Photo 9: View to the north across the former location of two USTs.

Photo 10: View to south across the Plant Collection Dam.

Photo 11: View to the northwest across the Plant Collection Dam. Parts of the low-lying area to the north of the dam were marshy at the date of the inspection.

Photo 12: View to the south from the Collector Road boundary of the site. The area in the foreground is located to the north of the Plant Collection Dam.

Photo 13: View of the LTP from the MBT haul road.

Photo 14: View to the northwest across the lined Evaporation Dam 1 Coffer Dam, with part of the remainder of Evaporation Dam 1 visible in the background.

Photo 15: View to the southeast across Evaporation Dam 1. The location of the proposed waste encapsulation cell is in the foreground. The LTP is visible in the right background.

Photo 16: View to the south across the western side of Evaporation Dam 1. The location of the proposed waste encapsulation cell is in the foreground. The MBT facility is visible in the right background.

Photo 17: View to the northwest from the Bioreactor. Evaporation Dams 3 and 1 are visible in the right background. The MBT facility and a solar farm are visible on the left background. The structures in the right midground are associated with Heron's underground mining operations.

APPENDIX D

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