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Desktop Land Capability Assessment

Parwan Precinct Structure Plan

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SMEC Company Details

Approved by:	Jenna Forbes		
Address:	Collins Square, Tower 4, Level 20, 727 Collins St, Melbourne Vic 3008		
Signature:			
Tel:	+61 3 9514 1673		
Email:	jenna.forbes@smec.com	Website:	www.smec.com

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This report is confidential and is provided solely for the purposes of assessing the existing environmental condition of the study area and to identify areas of potential soil and/or groundwater contamination, geotechnical and hydrological variables, existing adverse amenity land uses and buffers that may affect the viability of developing land and provide recommendation on the existence and management of sodic soils within the Parwan Precinct Structure Plan. This report is provided pursuant to a Consultancy Agreement between SMEC Australia Pty Limited ("SMEC") and Victorian Planning Authority, under which SMEC undertook to perform a specific and limited task for Victorian Planning Authority. This report is strictly limited to the matters stated in it and subject to the various assumptions, qualifications and limitations in it and does not apply by implication to other matters. SMEC makes no representation that the scope, assumptions, qualifications and exclusions set out in this report will be suitable or sufficient for other purposes nor that the content of the report covers all matters which you may regard as material for your purposes.

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Abbreviations and Acronyms

Abbreviation/ Acronym	Description
ACM	Asbestos Containing Material
ASS	Acid Sulfate Soils
DEECA	Department of Energy, Environment and Climate Action
DELWP	Department of Environment, Land, Water, and Planning
EPA	Environment Protection Authority (Victoria)
ERS	Environmental Reference Standard
GQRUZ	Groundwater Quality Restricted Use Zones
GWW	Greater Western Water
HEMP	Health and Environment Management Plan
LGA	Local Government Area
MBC	Maddingley Brown Coal
NEPM	National Environment Protection Measure
PAN	Pollution Abatement Notice
PEP	Parwan Employment Precinct
PBID	Parwan Balliang Irrigation District
PRSA	Preliminary Risk Screening Advice
PSR	Priority Sites Register
PSP	Precinct Structure Plan
RWP	Recycled Water Plant
VPA	Victorian Planning Authority
WIN	Western Irrigation Network

1 Introduction

The Victorian Planning Authority (VPA) engaged SMEC Australia Pty Ltd (SMEC) to conduct a Desktop Land Capability Assessment (LCA) for the Parwan Precinct Structure Plan (PSP).

Note that the information in this updated report (third revision) largely reflects the status of conditions for the precinct at the time the first edition of this report was originally issued in October 2020 to VPA.

The key changes made in each revision of this report are summarised as follows:

- Revision 0 – Draft report provided to VPA
- Revision 1 – Minor amendments to draft report
- Revision 2 – Expanded discussion regarding potential impact of sodic soils and lava caves on Parwan PSP and facilities requiring a buffer to manage odour risks
- Revision 3 – This report has been updated to provide further information regarding management of sodic soils, discuss the potential impacts of the draft EPA Publications 1949 and 1950 (*Landfill Buffer Guideline* and *Separation Distance Guideline*) and the proposed Western Irrigation Network in the vicinity of the Parwan PSP.

1.1 Background

The Parwan PSP applies to an area of approximately 492 hectares of land as shown in Figure 1-1. The precinct is directly north of the Parwan Employment Precinct boundary and south of the Bacchus Marsh town centre. It currently comprises of a mix of rural living and individual homesteads, as well as a range of rural activities (source VPA website link: [Parwan Precinct)]).

Figure 1-1 Parwan PSP Site Investigation Area

1.2 Objectives

The objectives of the desktop LCA presented within this report were to:

- Assess the existing land uses and environmental conditions within the study area;

- Within the Parwan PSP, and surrounding buffer zones, identify:
  - Areas of potential soil and/or groundwater contamination;
  - Geotechnical and hydrological variables;
  - Existing adverse amenity land use;
  - Buffers that may affect the viability of developing land; and
  - Provide recommendation on the existence and management of sodic soils.

1.3 Scope

The following scope of works was conducted to address the objectives of this LCA.

1.3.1 Environmental and Contaminated Land Assessment

A desktop review was undertaken, applying the principles of Schedule B2 of the National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 1999 (amended 2013). The purpose of the desktop assessment was to identify potential contamination source areas, potential affected media and potential receptors of contamination. As part of the desktop review, SMEC undertook the following:

- A project kickoff meeting between SMEC, VPA and Moorabool Shire Council to discuss known existing and historic land uses and planning permits in the study area as well as surrounding properties, where relevant that may result in soil and groundwater contamination and adverse amenity land uses.
- A review of available geotechnical, hydrological and environmental information (i.e. geological maps, historical aerial photography, planning overlays, etc.).
- Review of relevant regulatory and planning guidelines and applicable Australian Standards.
- Review of relevant regulatory information, including:
  - EPA records including the 'Priority Sites Registry', the list of issued 'Certificates and Statements of Environmental Audit' and to determine any identify any known Existing land uses or developments that may result in significant impacts on the environment, amenity and human health due to pollution and waste.
  - Department of Environment, Land, Water, and Planning (DELWP) records. Note DELWP is now called Department of Energy, Environment and Climate Action (DEECA).
  - Melbourne Water and Greater Western Water (GWW, previously called Western Water).
  - Department of Jobs, Precincts and Regions regarding the location of existing and past quarries or earth resources.
- Review of any previous or current reports commissioned by Council, the VPA, GWW and/or Melbourne Water regarding contamination, adverse amenity uses, and geological and hydrological conditions, in or within the vicinity of the study area.
- Review and validation of any previous or current publicly available reports regarding contamination, adverse amenity land uses and buffers established in the Bacchus Marsh Urban Growth Framework and Maddingley Planning Study, as well as buffers outside the Parwan PSP area. Note that the buffer for GWW's Bacchus Marsh Recycled Water Plant (RWP) defines the southern boundary of Parwan PSP.
- Review of Australian Heritage Databases specifically for historic uses related to the potential for contamination.
- Identification of the presence and implications of sodic soils within the precinct based on available mapping.
- The identification of natural waterway and wetland features (and any other surface water features).
- A review of current and historical titles for land within the Parwan PSP.

1.3.2 Geotechnical Assessment

To determine the potential for geotechnical constraints, SMEC undertook a desktop study of the study area. No invasive geotechnical investigations were conducted.

The desktop study included a review of published information relating to the site including published geological and soil zoning maps, lithological and groundwater data available in the Victorian Groundwater database and our experience in the area. Aerial imagery and contour mapping was reviewed to assess any potential topographic or geomorphological features which may be a constraint to development. The results of the assessment are presented in Section 5.

2 General Site Information

The general information for the Parwan PSP is summarised below.

Table 2-1: Site Details Parwan PSP

Site name:	Parwan PSP
Site location:	The PSP is bound by Parwan Creek to the north and Werribee River (Melton Reservoir) to the north east, Geelong-Bacchus Marsh Road and Woolpack Road to the west, boundary to Melton Local Government area (LGA) to the eastern and the southern boundaries are not delineated by property boundaries or roads. The site boundary is provided in Appendix A, Figure 1.
Total site area:	504 hectares (approximately)
Local Government Area:	Moorabool Shire Council
Current zonings:	• Farming Zone • Public Use Zone – Service and Utility (PUZ1) • Public Use Zone – Transport (PUZ4)
Current overlays:	• Design and Development Overlay – Schedule 2 • Environmental Significance Overlay – Schedule 2 • Environmental Significance Overlay – Schedule 8 • Significant Landscape Overlay – Schedule 1 • Heritage Overlay (HO194)
Current site uses:	• Agriculture and associated incidental Land Uses: o Gravel Roads o Storage o Machinery Maintenance o Residential housing • Roads and Road Reserves • Trucking and logistics company • Intensive animal husbandry • Horse training • Country Fire Authority base
Proposed site uses:	• Residential • Other proposed uses including: – Commercial – Education – Child-care centres/pre-school/primary school

Previous known environmental Audits:	No Record Available at the Time of Reporting

2.1 Precinct Description

The Parwan PSP is located at the eastern extent of Moorabool Shire Council, directly north of the Parwan Employment Precinct (PEP). The area is bound by Parwan Creek to the north and Werribee River (Melton Reservoir) to the north-east, the border of the Moorabool Shire Council area to the east, Geelong-Bacchus Marsh Road and Woolpack Road to the west and the southern boundary is not defined by property boundaries or roads. A single track railway line intersects the centre of the site, running in a northwest-southeast direction.

The surrounding land use consists of:

- North – agriculture
- East – residential and agricultural;
- South – agricultural;
- West – agricultural and natural resources;

2.2 Inspection of Precinct

A drive-over inspection was undertaken on 3 September 2020 to examine properties from roadways and publicly accessible areas. Private properties were not accessed as part of the site inspection. The site inspection was only conducted for specific properties where the desktop assessment of site history information identified a potential risk of contamination. Records and photographs from the inspection are presented in Appendix B.

The outcomes of the site inspection and properties where a potential contamination risk was observed are summarised in Table 2-2 and full inspection records and photographs are provided in Appendix B.

Table 2-2 Outcomes of Parwan PSP Inspection

Site ID. and Land Use	Property Address	Identified Land Use and Potential Sources of Contamination
1.Broiler Farms	51 Browns Lane Maddingley Vic	Large shed structures behind house, poultry/intensive agriculture
2.Parwan CFA	Corner of Whelans Rd and Parwan-Exford Rd Parwan (north side)	Small portable office, shed (assumed to house truck), shipping container, concrete slab and two small stockpiles at back of building (concrete/gravel). No evidence of chemical storage other than small Intermediate Bulk Container (IBC) possibly used for water. Site may have been used for fire training, potential risk of Per- and polyfluoroalkyl substances (PFAS) contamination.
3.Uptime Truck & Trailer Services/Graeme Spargo Transport	4300 Geelong-Bacchus Marsh Rd	Transport trucking operations, potential for fuel storage and workshop activities.
4.Uncontrolled Waste Disposal	35 Whelans Rd, Parwan Vic	Residential property with scrap metal, disused cars, shipping containers and other unlicensed waste disposal.
5.Uncontrolled Waste Disposal	10 Whelans Rd, Parwan Vic CP105087	Residential property with trucks, shipping containers, concrete blocks/base, multiple IBCs, multiple small stockpiles of soil/gravel.

Site ID. and Land Use	Property Address	Identified Land Use and Potential Sources of Contamination
6.Uncontrolled Waste Disposal	170 Whelans Rd, Parwan Vic	Residential dwelling at front of property. Old portable buildings, scrap metal, metal structures at rear.
7.Uncontrolled Waste Disposal	71 Whelans Rd, Parwan Vic 3~9\PP3375	House, buildings, sheds & shipping containers appeared in distance. Uncontrolled disposal of waste.
8.Uncontrolled Waste Disposal	81 Browns Lane, Parwan Vic	Property has signage to say part of Parwan Landcare group and Land for Wildlife. Horticulture evident from aerials.
9.Uncontrolled Waste Disposal	9 Parwan-Exford Rd Maddingley	Cnr of Geelong-Bacchus March and Parwan-Exford Rd & opposite GST transport. Property has machinery, numerous stockpiles of waste
10.Agricultural Spray Services (Hardi Spraying Systems)	4256 Geelong-Bacchus Marsh Rd	Residential property with minor sheds/structures. No signage/evidence identifying land use/company name

2.3 Acid Sulphate Soils

Acid Sulfate Soils (ASS) are naturally occurring soils, sediments and peats that contain iron sulphides, predominantly in the form of pyrite materials. In an undisturbed and waterlogged state these soils are harmless, but when disturbed and exposed to oxygen through drainage or excavation, a process of oxidation can produce sulfuric acid in large quantities.

A search of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) 'Atlas of Acid Sulfate Soils' was conducted to assess the presence of acid sulphate soils within the Precincts or 1 km investigation buffers around each Precinct Part.

There is an extremely low (1-5%) probability of occurrence of acid sulphate soils within the site area. Areas in the Werribee Creek streambed directly adjacent to the site to the east have a high (>70%) probability of occurrence of acid sulphate soils.

2.4 Hydrogeology

2.4.1 Groundwater Depth

Groundwater depth at the site varies from less than 5m to 50m. The watertable depth is 20m to 50m in the majority (51%) of the site. Shallow groundwater (<5m) accounts for only 3% of the site. Groundwater depth is greatest in the vicinity of the Parwan Creek and Werribee River, at the northern extent of the site. It is understood that groundwater flows north towards the Parwan Creek and Werribee River (Melton Reservoir). Information regarding the depth to groundwater is presented in Appendix C.

2.4.2 Groundwater Salinity

In accordance with the *Environmental Reference Standard (ERS),* gazetted 26 May 2021, concentration of Total Dissolved Solids (TDS) in groundwater, a measure of salinity is used to determine potential environmental values of groundwater and are required to be protected.

A review of Visualising Victoria's Groundwater indicated groundwater TDS within the precinct ranges from 7,000 to 13,000mg/L.

Based on the review of publicly available data for TDS the potential environmental values (beneficial uses) of groundwater required to be protected are associated with Segment D as indicated in Table 2-3.

The Segment D environmental values of groundwater required to be protected include:

- water dependents ecosystems and species;
- agriculture and irrigation (stock watering);
- industrial and commercial;
- water based recreation (primary contact recreation);
- traditional owner cultural values;
- buildings and structures; and
- geothermal values.

Table 2-3 Groundwater Environmental Values based on Groundwater Segment (Table 5.3 from ERS 2021)

BENEFICIAL Groundwater Use	Segments (mg/L TDS)						
	A1	A2	B	C	D	E	F
	(0 – 600)	(601 – 1,200)	(1,201 – 3,100)	(3,101 – 5,400)	(5,401 – 7,100)	(7,101 – 10,000)	>10,001
Water dependent ecosystems and species	✓	✓	✓	✓	✓	✓	✓
Potable water supply - desirable	✓						
Potable water supply – acceptable		✓					
Potable mineral water supply	✓	✓	✓	✓			
Agriculture and irrigation (irrigation)	✓	✓	✓				
Agriculture and irrigation (stock watering)	✓	✓	✓	✓	✓	✓	
Industrial and commercial	✓	✓	✓	✓	✓		
Water-based recreation (primary contact recreation)	✓	✓	✓	✓	✓	✓	✓
Traditional Owner cultural values	✓	✓	✓	✓	✓	✓	✓
Buildings and structures	✓	✓	✓	✓	✓		
Geothermal properties	✓	✓	✓	✓	✓	✓	✓

2.4.3 Groundwater Extraction

There was one recorded groundwater extraction bore located within the PSP at 51 Browns Lane. The bore is 167m deep and is registered for domestic and stock use.

Groundwater bores within 2km of the boundary of the PSP were investigated to understand the degree of regional groundwater utilisation. There are multiple bores within and around the PSP, predominately located to the north and west indicating a degree of regional groundwater utilisation for irrigation, investigation, dewatering, industrial, commercial, stock and domestic. Groundwater bores information is presented in Appendix C.

2.5 Surface Water

The northern areas of the PSP are bound by Parwan Creek, Werribee River and Melton Reservoir. The western edge of the PSP is located approximately 200 - 300m from Parwan Creek.

There are no permanent waterways or wetlands within the PSP. The 10m elevation contours indicate that the majority of the PSP area is generally flat, at an elevation of approximately 140mAHD. Areas at the north and east of the PSP slope towards the Werribee River, with the minimum surface elevation of 100mAHD. The surface water flow direction for the remainder of the PSP is unclear due to the site's flat topography. Mapping showing the site topography is presented in Figure 3 of Appendix A.

Amendment C91 of the Moorabool Shire Scheme was gazetted on 18th March 2022. At the time of writing this report the Moorabool Shire Council was undertaking a Planning Scheme Amendment (Amendment C91). Parwan Amendment C91 applies the Land Subject to Inundation Overlay (LSIO) and the Special Building Overlay (SBO) to land affected by a 1% AEP flood event, in the eastern portion of Moorabool Shire which includes areas in and around Parwan PSP.

2.6 Ecological Constraints

2.6.1 Native Vegetation

A search of the DELWP (2015) National Vegetation Database was conducted, which identified the presence of the endangered Ecological Vegetation Communities (EVCs) within the site, as summarised in Table 2-4. The presence of these EVCs may act as a constraint on development, triggering requirement for planning permits. Native vegetation mapping is presented in Appendix F.

Table 2-4 Summary of modelled native vegetation within Parwan PSP

EVC Name	EVC Code	Conservation Status
Plains Grassy Woodland	55	Endangered
Creekline Grassy Woodland	68	Endangered
Plains Grassland	132	Endangered

2.6.2 Groundwater and Inflow Dependent Ecosystems

Searches of the Bureau of Meteorology (BoM; 2017) Groundwater Dependent Ecosystems (GDE) Atlas and Inflow Dependent Ecosystems (IDE) Likelihood Database were conducted to assess for the potential presence of ecosystems within the PSP dependent on groundwater (which may be extracted or impacted as a result of proposed redevelopment) or inflow (which may be amended by drainage modifications due to development). A summary of the findings is presented in Table 2-5 (GDE) and Table 2-6 (IDE). The GDE and IDE potential is a measure of the likelihood of the ecosystem dependency.

Table 2-5 Groundwater Dependent Ecosystems within PSP

Groundwater Dependent Ecosystems (GDE) Potential	GDE Type	Ecosystem Type	Aquifer Geology	Distance to site
High	Aquatic	River (Parwan Creek)	Unconsolidated sedimentary	Onsite
Moderate	Terrestrial	Vegetation	Fractured rock	Onsite
Moderate	Terrestrial	Vegetation	Unconsolidated sedimentary	Onsite
Low	Terrestrial	Vegetation	Fractured rock	Onsite

Table 2-6 Inflow Dependent Ecosystems

Inflow Dependent Ecosystems (IDE) Potential (out of 10)	GDE Type	Ecosystem Type	Aquifer Geology	Distance to site
Low	Aquatic	River (Parwan Creek)	Unconsolidated sedimentary	Onsite
Moderate to High	Terrestrial	Vegetation	Fractured rock	Onsite
Moderate to High	Terrestrial	Vegetation	Unconsolidated sedimentary	Onsite
High	Aquatic	River (Werribee River)	Unconsolidated sedimentary	18m north
High	Terrestrial	Vegetation	Unconsolidated sedimentary	18m north

Please note: the GDE and IDE are related to the presence of rivers, wetlands and EVCs as identified in other sections of this report. As wetlands are potentially sensitive environmental receptors, these are listed if within the PSP or within 350 m of the PSP boundaries.

The full database search results are presented in Appendix F.

A review of Ramsar-listed wetlands was conducted and is presented in Appendix F. There are no Ramsar-listed wetlands within the site investigation area.

3 Precinct Current and Historical Land Use Context

3.1 Historical Aerial Photographs

Historical aerial imagery of the precinct has been reviewed to identify former land use which may present a potential contaminated land risk, summarised as follows:

- 1951 – The precinct consists of farmland, with several small farm dams throughout and a series of roads/tracks. There are approximately three properties (presumed mixed residential and agricultural) located central to the precinct, in the north-eastern corner and in the north-western corner. Harvesting of pasture is evident at the north of the precinct. Some horticulture/cropping is evident, to the north of the precinct;
- 1970 – No notable changes except the additional of several buildings (presumed residential properties with sheds of unknown use);
- 1979 – Additional buildings are present; presumed for residential and agricultural use;
- 1985 – Cropping/horticulture to the north of the PSP has increased significantly;
- 2006 – Large sheds are present at 51 Browns Lane and 4300 Geelong Bacchus Marsh Road (currently 'Uptime Truck and Trailer Services'). They were constructed between 1990 and 2006.
- Between 1951 and 2019, a gradual intensification of agricultural operations and an increase in farm/residential buildings was noted. Notable changes include the large agricultural/industrial facilities constructed at 4300 Geelong Bacchus Marsh Road and 51 Browns Lane between 1990 and 2006. Historical aerial photographs are presented in Appendix G.

3.2 Historical Business Directories

The Universal Business Directory and Sands and McDougall Directory records were searched to identify businesses located within the site area and 1km investigation buffer between 1905 and 1991. The search identified the following businesses within the Parwan PSP:

- Hardi Spraying Systems located at Geelong-Bacchus Marsh Road was listed in 1991 to undertake 'agricultural spraying services'.

3.3 EPA Records

The Priority Sites Register (PSR) records locations where the EPA has issued a Clean-Up Notice (CUN) or Pollution Abatement Notice (PAN) for a site typically known to contain polluted soil and/or groundwater that may pose a risk to human health or to the environment.

The PSR does not list all sites known to be contaminated in Victoria and as such a site should not be presumed to be free of contamination if it does not appear on the PSR. Note that under the Environment Protection Act 1970, PANs are no longer issued, and remedial notice issued by the EPA may include CUNs, Environment Action Notices, Site Management Orders, Improvement Notices and Prohibition Notices.

A review of Environment Protection Authority Victoria (EPA) records was conducted on 14th August 2020 and is presented in Appendix H.

No sites were listed on the PSR within the precinct investigation area.

No Groundwater Quality Restricted Use Zones (GQRUZ) were identified within the precinct area. One GQRUZ was identified within 1km of the precinct area as follows:

- Former Bacchus Marsh Sewage Treatment Plant located at the Avenue of Honour, 660m north of the precinct. This treatment plant ceased operation and was decommissioned in 1996. This is well downgradient of the PSP so it does not present any development constraints for the PSP.

No currently EPA licensed activities were identified within the precinct area. Licensed activities within the 1km investigation buffer are summarised below:

- The Maddingley Brown Coal pit, composting and Landfill is currently subject to an EPA licence which enables the site to deposit to land solid inert waste, tyres shredded into pieces, paper pulp, waste acid sulphate soils, metal recycling residue, prescribed industrial waste and solid wastes. The licence also allows composting onsite. The

site has former and current pollution abatement notices. It is understood that some coal extraction is still taking place.

As of 14th August 2020, no current EPA notices (site management orders, environmental action notices, clean-up notices or PANs) were identified within the precinct area.

No Environmental Audit overlays were identified nor have any environmental audits been conducted within the precinct investigation area. Offsite Environmental Audits within the 1km investigation buffer are summarised below:

- Maddingley Brown Coal Landfill directly adjacent to the site to the west is subject to audit recommendations under Section 53V of the previous Environment Protection Act 1970 (now the 2017 Act); and
- Former Bacchus Marsh Sewage Treatment Plant (decommissioned in 1996) located at the Avenue of Honour, 660m north of the precinct is subject to recommendations of an EPA Environmental Audit.

3.4 Current and Historical Titles

Current and historical titles were purchased for individual parcels located entirely or partially within the PSP boundary; this amounted to 52 parcels in total. Title searches were selected for sites where land use activities had occurred. Current and historical ownership of land may indicate land use however this current and historical title information was used as a guide only and assessed in conjunction with supporting information. Current ownership of the parcels is summarised as follows:

- Twelve (12) parcels are in the proprietorship of Victorian Rail Track;
- Thirty-two (32) parcels are wholly or partially owned by individual persons;
- Three (3) parcels are wholly or partially owned by companies at the following addresses:
  - 4256 Geelong-Bacchus Marsh Road;
  - 4348 Geelong-Bacchus Marsh Road;
  - 137 Woolpack Road;
  - 90 Parwan-Exford Road;
- Three (3) parcels are crown land under the tenure of:
  - Country Fire Authority located at 116 Parwan-Exford Road;
  - Department of Environment, Land, Water and Planning at Lot 10A~9 of PP3375; and
  - Moorabool Shire Council at Lot 10A~9 of PP3375;

Historical ownership of the parcels is summarised as follows:

- Two (2) parcels were owned by companies at the following addresses:
  - 135 Woolpack Road
  - 4348 Geelong-Bacchus Marsh Road
- Fourteen (14) parcels were owned by individual persons;
- Ten (10) parcels are crown land previously under the tenure of:
  - Board of Land and Works of Melbourne;
  - The Victorian Railways Commissioners;
  - Secretary to the Department of Infrastructure; and
  - Department of Environment, Land, Water and Planning

A record of certificate of title has been provided separately.

3.5 Review of Previous Reports

The following background reports were made available by VPA for review:

- Centrum Town Planning, Maddingley Planning Study Background Report, March 2019 (Centrum, March 2019)
- Pacific Environment, Draft Bacchus Marsh Urban Growth Framework Parwan Buffer Assessment (AQU-VC-007-21862), 26 August 2017 (Pacific Environment, August 2017)
- Reeds Consulting, High Level Servicing and Infrastructure Assessment Report of Parwan PSP and Parwan Employment Precinct, April 2020 (Reeds Consulting, April 2020)

Summaries of the Centrum and Pacific reports are provided below.

3.5.1 Centrum, March 2019

The purpose of the Maddingley Planning Study was to provide the strategic foundation for potential changes to the Moorabool Planning Scheme that will guide future land use and development within amenity buffers of the Maddingley WRR Hub and other industrial uses.

The report concluded the key challenges for the Maddingley Planning Study are considered to be:

- how to protect and plan for a waste hub of state significance at the local level;
- how to formally recognise existing buffers in the Planning Scheme, particularly the amalgamated MBC coal and composting buffer, including consideration of the BPEM to reduce buffer requirements;
- how to develop policies and provisions for the operation of buffers both within and outside the Planning Scheme;
- how to appropriately apply zones in conjunction with any other buffer tools;
- determining whether it may be possible to use the industrial zones more extensively;
- reviewing the provisions of the Special Use Zone (SUZ1);
- determining the type and level of infrastructure that might be required to attract industry and development activity;
- identifying a suitable framework for identifying and levying infrastructure costs that should be shared;
- gaining community and stakeholder support for the Maddingley Planning Study; and
- how to balance competing objectives in the absence of a full evidence base to measure different social, economic and environmental outcomes.

3.5.2 Pacific Environment, August 2017

The report provided a buffer assessment of a number of sites within and surrounding the Parwan Employment Precinct (PEP) and Parwan PSP. The study area included within the Pacific Environment August 2017 report is shown in Figure 3-1.

Figure 3-1: Pacific Environment August 2017 Study Area

The assessment focused on the following sites:

- Maddingley landfilling and composting operations
- GWW's Parwan wastewater treatment plant (WWTP)
- the mushroom farm on Geelong-Bacchus Marsh Road
- the broiler farm on Browns Lane
- the broiler farm on Geelong-Bacchus Marsh Road.

The assessment also included a review of the buffer distance which should apply to the sand quarries north of Bacchus Marsh.

Separate conclusions were made for each of the sites as summarised below.

3.5.2.1 GWW's Bacchus Marsh Recycled Water Plant (RWP) at Parwan

The guideline separation distance of 1,400 m for the current plant capacity of 20,000 Equivalent Population was found to be an appropriate separation distance that accommodates increased treatment loads of the current plant design in combination with additional odour controls for the inlet works and also future mechanical treatment plant upgrades (including odour control). The report concluded while the separation distance is considered sufficient for normal operations there is the potential for exposure under unfavourable conditions. Suitable planning controls were recommended to ensure the cumulative odour impacts to the proposed residential area to the north are taken into consideration in the future development.

Note that Class C recycled water is also used onsite using pivot irrigators at the Bacchus Marsh RWP. EPA Publication 1518 recommends a separation distance of 200m for "Disposal areas for secondary treated effluent by spray irrigation". However, EPA Publication 1911.2 indicates a buffer of 100m should be provided for Class C quality recycled water from the edge of the wetted area to the nearest sensitive use. It is common for beneficial irrigation reuse activities to apply the 100m buffer, subject to site specific risk assessments and effectiveness of spray drift controls.

3.5.2.2 Maddingley landfilling and composting operations

The guideline separation distance for this site defaults to the 2km buffer recommended in EPA guidance for composting operations of this scale. This separation distance is also considered appropriate for the onsite solid inert waste landfilling operations given that that inert waste landfill odour impacts would sit well within the odour footprint from the composting operations. The dispersion modelling of the composting operations conducted by Pacific Environment showed odour impacts at greater distance to the east of the site compared to the west of the site. In the discussion of the preliminary results from the dispersion modelling the EPA expressed a strong preference for a minimum separation distance of 2km based on uncertainty regarding the composting operations and the lack of licence limits on production. The dispersion modelling confirmed this as a recommended separation distance to the east of the facility and also showed that a separation distance reduced to 1,500 m to the west of the facility can be recommended. Improved composting practices would result in improved odour performance.

Note also that current EPA Publication 1518 recommends a 1km buffer for open cut coal mining (harvesting, crushing, screening, stockpiling and conveying of coal mining/extraction operations). New draft EPA separation distance guidelines (Publication 1949, Dec 2022) has increased this buffer to 2km from open cut coal mining operations. This is discussed further in Section 4.3.

No reduction in the required buffer distance has been agreed to by EPA Victoria.

3.5.2.3 Mushroom farm on Geelong-Bacchus Marsh Road

There is no guideline separation distance specified for mushroom and substrate production, it is to be determined on a case by case specific basis. The dispersion modelling showed small odour footprints for the existing operations and the potential future onsite production of substrate as for an enclosed facility. The largest distances in the odour footprints, from the site boundaries, for the two scenarios were 200 m and 400 m. It was concluded odour from the mushroom farm does not have the potential to impact on Parwan PSP, which is approximately 2.5 km to the northeast.

3.5.2.4 Broiler farms on Browns Lane and Geelong-Bacchus Marsh Road

The calculated guideline separation distances for the 51 Browns Lane and 4050 Geelong-Bacchus Marsh Road broiler farms are 425 m and 686 m respectively. The dispersion modelling, assessing these two sites cumulatively, show odour impacts at higher levels than any other of the sites included in the assessment. As assessed against the

Victorian Odour Environmental Risk Assessment (OERA) guideline a medium level of risk is predicted across the Parwan PSP. However, this level of risk is based on the risk rating relating to the frequency of lower odour concentrations. Modelling showed that lower levels/concentrations of odour are predicted to occur on occasion across the proposed residential area of the PSP.

3.5.2.5 Sand Quarries to the North of Bacchus Marsh

Sand quarries are located north of Bacchus Marsh. It is understood that the EPA recommended separation distance likely to be applied is 500 m for the operations based on blasting. It was not possible to demonstrate that a reduced separation distance is appropriate with dispersion modelling. This was due to lack of data on the quarry operations to determine an accurate emissions estimation. As such, for planning purposes the 500 m separation distance should be applied for the sand quarry operations. Note that EPA Publication 1518 indicates quarry buffer can be reduced to 250m if there is no blasting. EPA Publication 1949 (new draft guidelines) indicates that if the quarry activity is substantially below ground level (> 10m) then the buffer can be reduced to 250m.

3.5.3 Reeds Consulting, April 2020

The report was a high level servicing report to provide an infrastructure assessment for the Parwan Employment Precinct (PEP) and Parwan PSP.

The report concluded Parwan is currently serviced by scattered infrastructure that is generally already at capacity and significant extensions will be required to service the future development of the precincts.

The report is of limited value and relevance to the objectives of this current LCA investigation.

3.6 Western Irrigation Network

Greater Western Water's The Western Irrigation Network (WIN) is a major new recycled water irrigation scheme in the Parwan-Balliang agricultural district ~7 km south of Bacchus Marsh, providing Class C recycled water suitable for irrigation farming. The Class C quality recycled water is to be sourced from both Bacchus Marsh Recycled Water Plant (located within Parwan PEP) and Melton RWP.

Stage 1 of the project involves new infrastructure to connect the Melton and Bacchus Marsh RWPs to distribute recycled water to several foundation irrigation customers in the Parwan-Balliang area. Sunbury RWP may be connected to the WIN in the future subject to irrigation demand and business case assessment.

Upon completion of the WIN establishment, 2.4 billion litres of recycled water per year could be supplied to up to 1,500 hectares of irrigation land across multiple properties in the (to be proclaimed) Parwan – Balliang Irrigation District (PBID). The recycled water scheme could expand to up to 18 billion litres by 2050 with the interconnection of recycled water from Sunbury RWP (Greater Western Water, 2023).

The Parwan PSP is within the WIN project area, as show in Figure 3-2. Stage 1 of the WIN project will be to the PBID in Parwan South and Balliang area indicatively as shown in Figure 3-2. The PBID is immediately south of the Parwan PSP. Supply to the PBID is expected to commence in summer 2023-24.

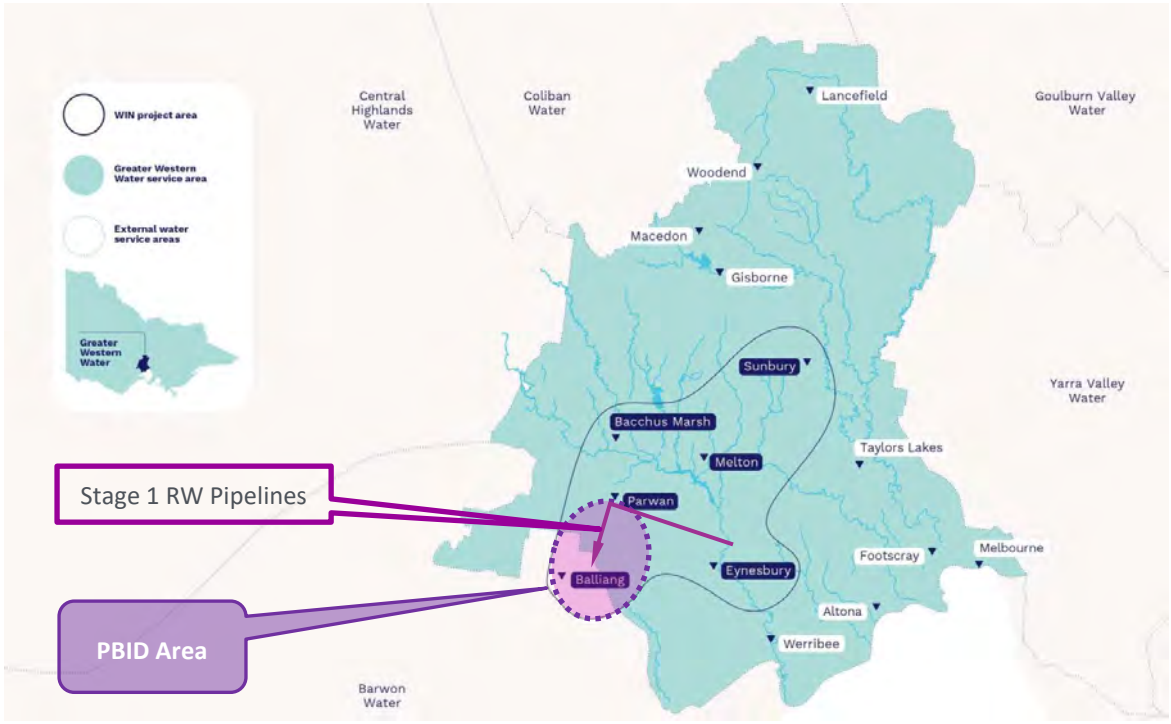


Figure 3-2 Western Irrigation Network Project map (Greater Western Water, 2023)

GWW lodged an EES referral for the WIN project to the Planning Minister for decision on the need for assessment under the Environmental Effects Act 1978. In August 2021 the Minister confirmed that the WIN project did not require an EES, subject to conditions and recognising that potential effects could be addressed through the requirements of the Environment Protection Act 2017 including EPA Permissions for the recycled water scheme.

Guidance for the supply and use of recycled water in Victoria is provided in EPA Publication 1910.2 – *Victorian guideline for water recycling* (EPA, 2021), EPA Publication 1911.2 – *Technical information for the Victorian guideline for water recycling* (EPA, 2021) and EPA Publication 168.3 – *Victorian guideline for irrigation with recycled water* (EPA, 2022).

EPA's "Victorian guideline for water recycling" (Publication 1910, 2021) and associated EPA permissions requires the supply and use of recycled water to be managed and monitored in accordance with a documented "Health and Environmental Management Plan" (HEMP).

The WIN requires a Health and Environment Management Plan (HEMP) to be prepared and approved by the EPA which assesses and manages risks to human health and the environment, details performance objectives of the network and provide a framework for assessing the sustainability of the network. Irrigation would typically be supported by a site-specific assessment of land capability for irrigation with recycled water, which considers proximity to sensitive uses. Indicative buffer distances to sensitive receptors are provided, which varies according to water quality and irrigation method.

GWW is currently preparing the WIN HEMP for submission to EPA Victoria. The WIN HEMP details how GWW will safely and sustainably manage recycled water supply and use in the PBID in accordance with EPA guidelines and the conditions of the EPA Permission for the WIN.

Indicative buffer distances for Class C irrigation are:

- Non-spray methods (ie. flood): 0 metres
- Pivot spray irrigation (relevant to the WID) and other sprinkler methods: >100 metres

Buffer distances provided are indicative and risk assessment is recommended to be undertaken by irrigators, assessing irrigation method and site-specific controls. Buffer distances may also apply to surface waters. The WIN is likely to result in an increase in use of Class C recycled water for irrigation with each irrigation site requiring buffer distances between sensitive uses to be adhered to.

3.7 Council Records

The Moorabool Shire Council provided a record of sites where environmental complaints or enforceable actions have occurred. These sites are listed in Table 3-1.

Table 3-1: Council Records of Environmental Complaints or Enforceable Complaints

Site	Address	Complaints	Location
Maddingley Bown Coal	11 Tilleys Road Maddingley	Dust, loose rubbish, Smell and other EPA issues	Outside of precincts
Parwan Mushroom Farm	12 Aerodrome road Parwan	Smell	Within PEP
Poultry Farm	51 Browns Lane Parwan	Smell and noise	Within Parwan PSP
Bacchus Marsh Aerodrome	145 Aerodrome Road Parwan	Smell, noise (had an ongoing septic issue that has now been resolved)	Within PEP

Council records have been used to support the identification of potentially contaminated sites.

3.8 Sodic and Dispersive Soils

3.8.1 Assessing the presence of sodic and dispersive soils

As requested by VPA, SMEC conducted a high-level review of the sodic and dispersive soils within the study area to determine the extent of these site features and the potential constraints to the future development of the precinct.

Soil sodicity is reported as Exchangeable Sodium Percentage (ESP) and is a measure of the exchangeable sodium in relation to other exchangeable cations in soil. A soil with an ESP greater than 6 % is generally considered sodic.

To assess the soil sodicity within the study area a review of soil mapping from Victorian Resources online (VRO) was conducted. The extent of sodic soils within the Parwan PSP is shown in Figure 3, Appendix A.

From VRO mapping, the soils within the Parwan PSP are expected to be sodic to strongly sodic sodosols (texture contrast soils with dense sodic subsoils) and/or vertisols (cracking clays with dense sodic subsoils).

Surface soils in the north-western portion of the Parwan PSP are typically Sodic with an ESP of 6-15%.

Surface soils in the southern and eastern portion of the Parwan PSP are typically Strongly Sodic with an ESP of 15-25%.

Figure 3-3, Figure 3-4 and Figure 3-5, whilst not available at a high resolution, are also presented to demonstrate that sodic and dispersive soil profiles are widely distributed all across Victoria and the greater Melbourne urban growth area, but are more prevalent in the northern and western suburbs, in the vicinity of the Parwan PSP.

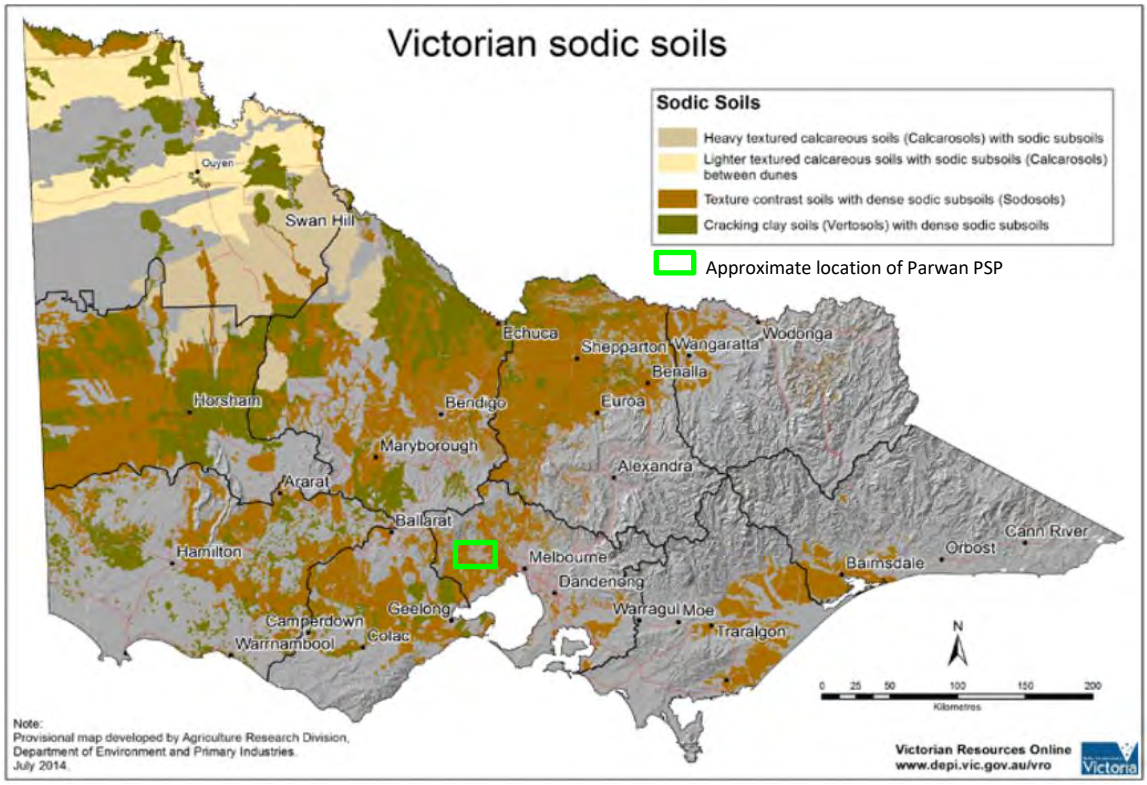


Figure 3-3 Victorian sodic soils (VRO, 2014)

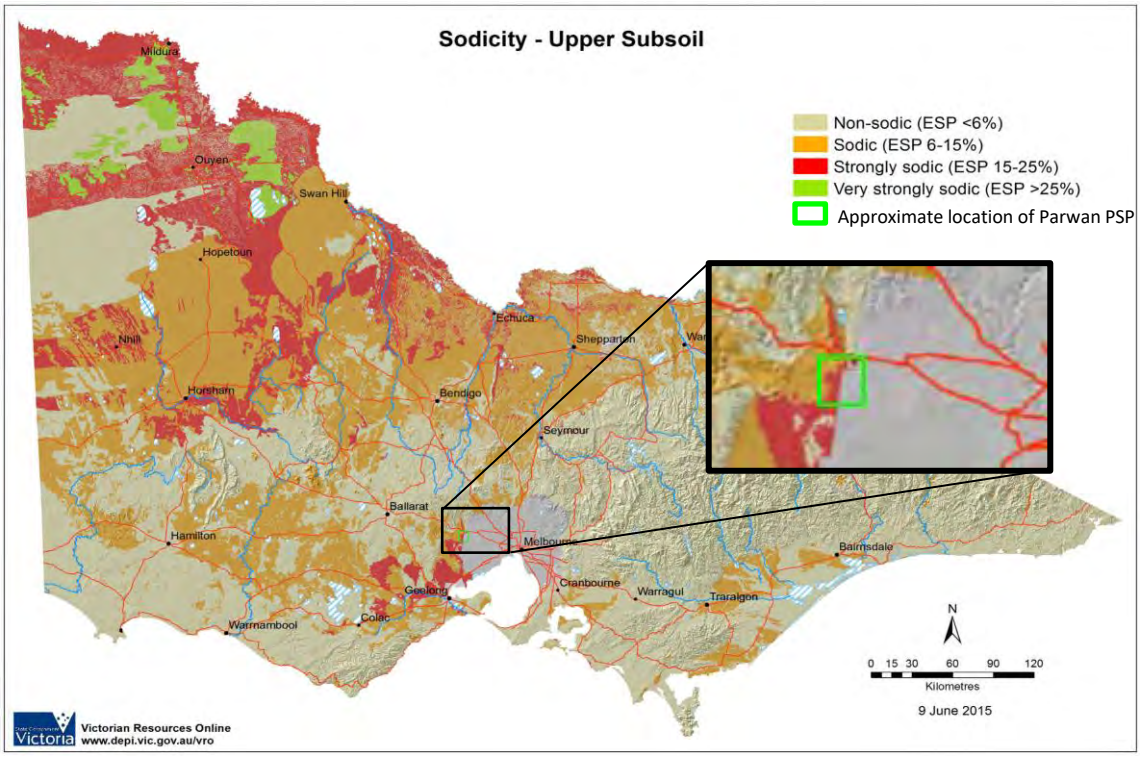


Figure 3-4 Victorian sodic soils – upper subsoil (VRO, 2015)

Note: mapping excludes Melbourne metropolitan areas, as indicated by grey shading

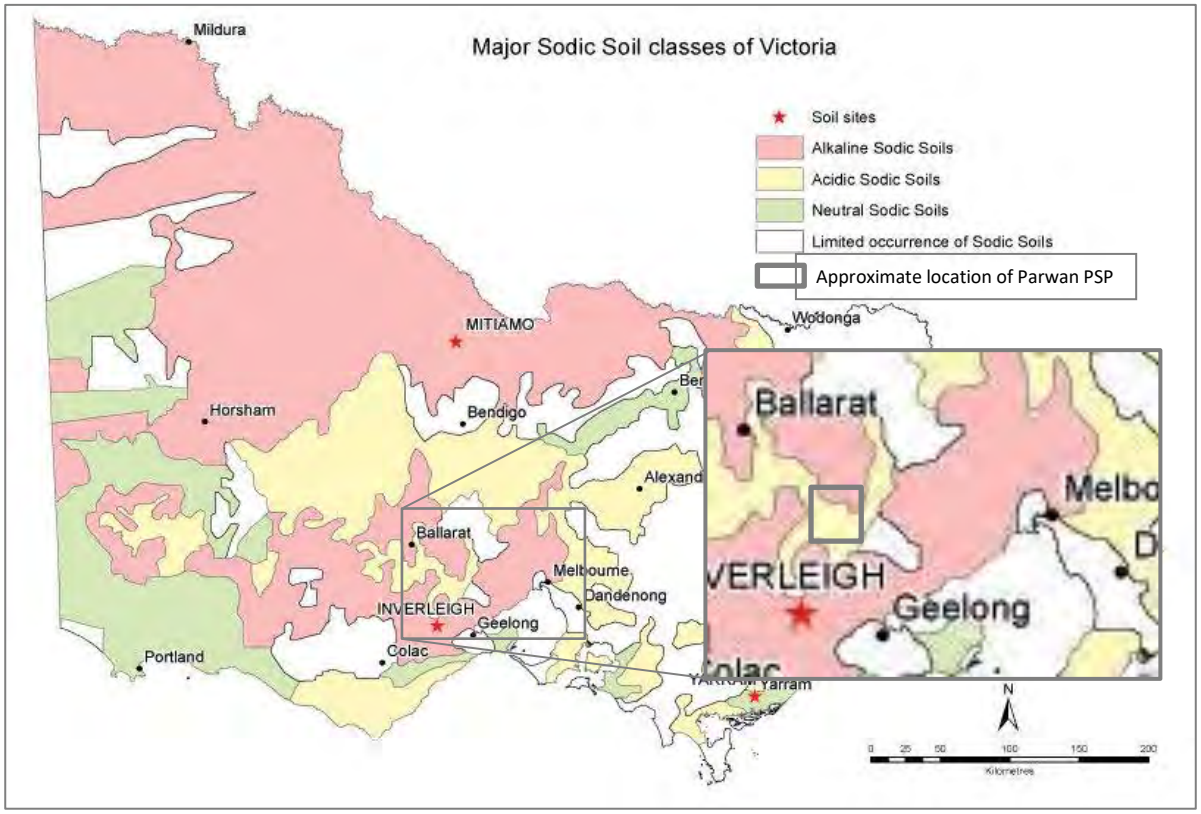


Figure 3-5 Major Sodic Soil classes of Victoria (VRO)

3.8.2 Potential impact of sodic soils

The presence of sodic soils at or near the surface may pose the following potential risks to the current and future land use:

- Once being exposed to water, sodic soils are easily eroded and transported downstream and are very difficult to contain;
- Excessive erosion presents issues relating to safety, loss of amenity, rectification of infrastructure and natural environments, and preventing movement of erosion across property boundaries;
- Sediment (turbidity) is likely to have significant adverse effects on downstream waterway environments, potentially resulting in loss of flora and fauna;
- Sedimentation and erosion caused by sodic soils exceeds the usual capacity of stormwater drainage systems and urban waterways provided in greenfield developments;
- Turbidity caused by sodic soils is very difficult to clear up and is beyond the capacity of the usual stormwater drainage quality infrastructure provided in greenfield developments (i.e. wetlands and sedimentation beds);
- Highly turbid runoff from active development flows into creeks and water courses;
- Construction activities in dispersive soils causes significant water turbidity;
- Can cause unstoppable tunnel and gully erosion;
- Where subsoil is saline, grass growth is inhibited particularly on lower slope towards drains;
- Turbid water in water features/retarding basins will lead to further increases in salinity;
- Hard surfaces and high impervious surface area in new developments leads to decreased runoff and drainage, stopping the sodic soil issue from being resolved naturally;
- Poor infiltration and increased volumes of stormwater runoff;
- Increased tunnel, sheet, rill and gully erosion;
- Increased turbidity and erosion in waterways in response to increased runoff from development areas leading to a deterioration in water quality and degradation of aquatic flora and fauna habitat;
- Failure of/or reducing functioning of interim and ultimate water sensitive urban design asset;

- Soil movement leading to failure of newly constructed and established civil and private assets;
- Poor ability to establish vegetative growth due to adverse soil chemical conditions leading to a failure to thrive for open spaces, gardens and street trees; and
- Dispersion of topsoil and subsoil.

Urban development and site construction cause significant ground disturbance, removal of vegetative ground cover and expose sodic and dispersive soils to erosion. Erosion risks are directly influenced by sodic and dispersive soil exposure and changes in landscape hydrology. Changes to hydrology, including the concentration of flow in culverts, runoff from impervious areas and ponding of rainfall contribute to increased erosion risk.

In addition to the ESP reported for the different areas of the precinct, slope is a critical factor when assessing the impact of sodic soils on a land development site. Areas of steep sloping sodic soils represent a greater risk of erosion. Figure 3 of Appendix A shows the topography of the precinct area. Steeper areas will require greater care when managing the risk of erosion.

Implications of the presence of sodic soils across the PSP are as follows:

- There is potential risk of soil erosion and sediment pollution if sodic soils (where present) are exposed, stockpiled and where water from sodic soil runoff, excavations or ponding on surface is allowed to drain offsite in an uncontrolled manner.
- Urban development and construction involving ground disturbance, and vegetation removal, can expose sodic/dispersive soils to water and wind erosion.
- If underlying clays are exposed during works, these soils will requirement careful management to prevent sediment pollution loads in runoff and drainage to local drainage lines.
- Erosion and sediment pollution risks are able to be routinely managed by the construction industry, and the best practice measures are well documented in industry and EPA guidance.
- Any soil profiles identified in the study area having clay in topsoil or subsoil should be assumed as having some sodic / dispersion risk that should be appropriately managed by the developer at time of making planning and development applications to Council.
- The developer should demonstrate management of construction sites in accordance with Industry Sediment and Pollution control codes (eg. IECA Best Practice Erosion and Sediment Control Guidance, and VPA's Engineering Design and Construction Manual for subdivision in Growth Areas - Addendum 19-01 Sodic and Dispersive Soils (currently in Draft)), and EPA Victoria Guidance including EPA Publication 275 *Construction techniques for sediment pollution control* including development of Erosion and Sediment Control (ESC) Plans as part of Construction Environmental Management Plan (CEMPs).

Our review indicates that sodic soils are present in surface soils across the Parwan PSP. Erosion risks associated with sodic and dispersive soils can be managed by appropriate planning and standard construction erosion control techniques however it is recommended soil disturbance be avoided in steeper areas (greater than 5% slope). Further investigation of sodic soils is recommended.

3.8.3 Management of sodic soils

The following management steps are recommended to minimise soil erosion associated with dispersive sodic soils during the land development:

- During construction works the dispersive sodic soil risk should be documented within a CEMP which lists the required controls to manage sodic soils;
- Avoiding and preventing the use of natural creeks and waterway as urban flow conveyance structures, particularly when these waterways support rare and threatened species and ecological communities;
- Alternative designs to capture, treat and reuse stormwater;
- Lining and armouring conveyance structures;
- Mechanisms to slow surface water flows, and reduce dispersive forces;
- Mechanisms to flocculate sediment from the system;
- Avoiding disturbance in the catchment to the greatest extent possible, particularly in winter and during times of summer storms;
- Early installation of ultimate permanent drainage system; and
- Provision of grassed/mulched contour banks, grassed buffer filter strips to filter potential high sediments in runoff;

- Temporary drainage control systems, including mechanically and/or chemically treated sediment ponds; and Diversion of 'clean' upstream water around the development site;
- Diversion of 'clean' upstream water around the development site.

In areas where soil disturbance can't be avoided during the construction phase, erosion protection measures may be required to reduce the risk of erosion of sodic soils across the PSP. Controls to be considered are listed in **Table 3-2**.

Table 3-2: Sodic and Dispersive Soil Controls[1]

Management options	
Preservation and treatment of topsoil	▪ Preservation of A-horizon topsoil should be used to shroud sodic and dispersive subsoil in all areas across the precinct. ▪ Topsoils with clay-loam textures have a greater resilience to erosion by comparison with finer textured clay-dominant subsoils. Topsoils are also easier to stabilise from dispersion and erosion. ▪ Gypsum treatment of all topsoils to minimise dispersion of any clay within topsoil or subsoil. Gypsum treatment of topsoil is a simple, fast and cost-effective solution that can be applied without use of specialised equipment.
Undisturbed sites	▪ Maintenance of topsoil across undisturbed land, preferably with grasses to provide surface soil stability and root anchorage. ▪ Maintenance of tree cover where trees exist. ▪ Groundcover including a mix of perennial grasses and larger shrubs and overstory vegetation is critical for slowing down overland flow and providing root anchorage of soil.
Disturbed sites – large scale surface disturbance	▪ Minimise the amount of time land is exposed (e.g. by staging development). ▪ Apply gypsum to all topsoils for improved stability. ▪ Avoiding removal or disturbance to topsoil or vegetation until absolutely necessary. ▪ Covering dispersive subsoils with a shroud of stabilised topsoil (100-150mm) or organic matter/mulch, should works cease for any period of time or if prolonged rainfall is forecast. ▪ Consider using appropriately specified geotextile barriers and other engineering measures to protect disturbed areas particularly where there is minimal topsoil, or where steep slopes occur. ▪ Provide grassed/mulched contour banks, grassed buffer filter strips to filter potential high sediments in runoff; ▪ Re-vegetate exposed areas immediately after completion of earthworks, with specific emphasis on steep slopes. ▪ Avoid construction techniques that result in exposure of dispersive subsoils. ▪ Use alternatives to 'cut and fill' construction such as pier and pile foundations. ▪ Use of interception trenches stabilised with topsoil to catch runoff in a controlled fashion and divert flow to sedimentation ponds to capture sediments. ▪ Use of organic materials on finished surfaces to soften the impact of rainfall, filter runoff and aid the generation of seed or turf. ▪ May need to treat hard pan areas (caused by compaction by earthworks equipment) with gypsum, lime, dolomite and/or organic matter, and possibly in conjunction with deep ripping. ▪ Use of agricultural fertilisers at sound agronomic rates to expedite the process of vegetation establishment.
Disturbed sites – Trenching, culverts and drains	▪ Where possible avoid the use of trenches for the construction of services i.e. water & power. ▪ If trenches must be used, ensure that repacked spoil is properly compacted. Treat with hydrated lime (subsurface treatment) and gypsum (topsoils) to limit dispersion and erosion. ▪ Consider alternative trenching techniques that do not expose dispersive subsoils. i.e. use of trenchless technology installations of utilities/services such as horizontal directional drilling ▪ Ensure runoff from hardstand areas is not discharged into areas with dispersive soils. ▪ If necessary create safe areas for discharge of runoff. ▪ Provide grassed/mulched contour banks, grassed buffer filter strips to filter potential high sediments in runoff;

	▪ If possible do not excavate culverts and drains in dispersive soils. ▪ Following engineered design, consider placement of non-sodic soil to create appropriate road surfaces and drains without the need for excavation. ▪ Ensure that culverts and drains excavated into dispersive subsoils are capped with non-dispersive topsoil, gypsum stabilised (if required) and vegetated.

[1]Source - *Jacobs, Sodic Soils Assessment, Beveridge North Precinct Area, 2020*

All land developers should be required to further investigate and identify potential existence of sodic and dispersive soils to assess vulnerability for erosion if exposed or disturbed.

Any soil profiles with clay in topsoil or subsoil identified in the study area should be assumed as having some sodic / dispersion risk that should be managed by the developer at time of making development applications to council.

The developer should demonstrate appropriate management of construction sites in accord with Industry Sediment and Pollution control codes (eg. IECA Best Practice Erosion and Sediment Control Guidance, and VPA's Engineering Design and Construction Manual for subdivision in Growth Areas - Addendum 19-01 Sodic and Dispersive Soils (currently in Draft)), and EPA Victoria Guidance including EPA *Construction techniques for sediment pollution control* (Publication 275) including development of ESC Plans as part of CEMPs.

ESC plans should identify effective procedures to stabilise the soils, including options such as chemical treatment of soils, careful staging of works to minimise sodic soil exposure to rainfall and overland flows, and installation of sediment collection works (silt fences, mulch berms, sediment ponds, filter dams, grass filter strips etc) as recommended in industry and EPA guidance.

3.9 Lava Caves

As requested by VPA, SMEC conducted a high-level review of presence of lava caves within the study area to determine the extent of these site features and the potential constraints to the future development of the precinct.

A review of publicly available information regarding the Lava Caves indicated the Lava Caves are located at the rear of the property located at 65 Parwan South Road, Parwan which is located directly to the south of the precinct.

The land on which the known lava caves exist are privately owned and not publicly accessible. Therefore, no site visit was undertaken to these caves.

Limited information was available regarding the extent and condition of the lava caves and any other potential cave locations in the precinct.

A suitable separation distance could be readily applied to the known location of the lava caves at 65 Parwan South Road for any future development through various planning instruments and land agreements. The extent of the required separation distance is beyond the scope of this LCA and should be the subject of specialist geotechnical studies associated with development plans and planning applications.

4 EPA Separation Distance Guidelines

4.1 EPA Separation Distance Guidelines

Current EPA Publication 1518 *Recommended separation distances for industrial residual air* emissions (EPA, 2013) provides advice on recommended separation distances between industrial land uses that emit odour or dust, and sensitive land uses. Separation distances are also specified in a suite of other publications, with the key guidance relevant to the Parwan PSP including:

- Siting, design, operation and rehabilitation of landfills (Pub. 788.3, Aug 2015)
- Designing, constructing and operating composting facilities (Pub. 1588.1, June 2017)
- Victorian Guidelines for Water Recycling (Pub. 1910 and 1911, March 2021)
- Victorian guideline for irrigation with recycled water (Publication 168.3, Oct 2022).

4.2 Victorian Planning Provisions – Clause 53.10 Threshold Distances

Victoria's Planning Schemes also contain Clause 53.10 (Uses and activities with potential adverse impacts)., which sets out distances that apply to land uses with potential off-site impacts. These distances are based on the potential adverse impacts of each land use or activity. They represent a threshold distance within which further detailed assessment is needed. This is to determine whether the proposed use or activity is appropriate [Source: Planning Victoria website link: Buffers and land use compatibility].

Clause 53.10 Threshold distances are mostly the same or largely consistent with EPA separation distance guidelines.

4.3 EPA's new Draft Separation Distance and Landfill Buffer Guidelines

In December 2022, The Victorian Environmental Protection Authority (EPA) released two new draft Guidelines for industry consultation:

- Draft Publication 1950 - Landfill Buffer Guideline; and
- Draft Publication 1949 - Separation Distance Guideline.

A summary of aspects of the draft guidelines in provided below.

Key aspects of both the draft Landfill Buffer Guideline and draft Separation Distance Guideline are:

- The guideline objectives are twofold:
  - protect human health and amenity from the effects of pollution and waste associated with industry and landfills; and
  - protect industry and landfills from inappropriate land use and development nearby that may constrain operations.
- Separation distances are applied to reduce the occurrence of incompatible land uses which are likely to cause adverse human health or amenity impacts;
- Distance calculation method varies between rural and urban settings;
- The guidelines will adopt the agent of change principle, meaning that the onus is on the person or entity proposing a new, expanded or modified land use that may lead to land use conflict, meaning that the draft guidelines do not apply retrospectively for existing land uses.

4.3.1 Key changes proposed by EPA in the 2022 draft Separation Distance Guidelines

A summary of key changes is provided below:

- This guideline will be organised into two environmental categories – odour and dust;
- Separation distance applies between industrial and sensitive land uses;
- Recommended separation distances are designed to account for potential unintended offsite emissions expected as part of day-to-day operation of industrial land use (ie. including minor accidents, minor failures and slight changes in weather conditions), but major incidents could still results in offsite impacts;
- Additional information about human health and amenity risks is provided, as well as methods and guidance for assessment of separation distance suitability;

- Variations to recommended separation distances may be permissible based on dust and/or odour risk assessment in accordance with existing EPA Publications 1883 and 1943;
- Some examples of changes to the draft recommended separation distances compared with the current EPA Publication 1518 – *Recommended Separation Distances for Industrial Residual Air Emissions – Guideline* are:
  - Where a specified distance is provided in the current guidelines, the draft guidelines require a 'case by case' determination of separation distance;
  - Separation distances provided for industries previously not specified in Publication 1518;
  - Increase in separation distances for some industries (ie. up to a 400% increase on existing distances in some cases); and
  - Reduction in separation distances for some industries (typically based on industry-wide improvement in processes).

4.3.2 Key changes to Landfill Buffer Distance Guidelines

A summary of key changes is provided as follows:

- The draft guideline will replace the existing EPA Publication 1642 - *Assessing planning proposals within the buffer of a landfill* and relevant sections of EPA Publication 788.3 - *Siting, design, operation and rehabilitation of landfills*;
- Human health and amenity risks addressed are landfill gas, odour, noise, litter and dust;
- The definition of sensitive land use varies for each human health and amenity risk ie. any building or structure is considered sensitive land use in the context of landfill gas due to the explosion risk;
- Examples of sensitive use zones which correspond to the VPP are:
  - Activity Centre Zone
  - Capital City Zone
  - Commercial 1 Zone
  - Docklands Zone
  - residential zones
  - Rural Living Zone.
- Increase health and amenity buffer, including those for a landfill accepting municipal (putrescible) waste (Type 2) with a tip face greater than 500m^2 increases from 500m to 1,500m under the draft guideline;
- The buffer distance for a landfill accepting solid inert waste (Type 3) increases from 200m to 500m (for odour) under the draft guideline – relevant to MBC operations;
- The guideline provides planning advice and details on environmental risks associated with landfill buffers;
- Buffer distances provided in the draft guideline will apply to new or expanded landfills;
- The draft guideline discusses appropriate land uses within buffer zones; and
- Provides guidance for planning authorities assessing planning permit applications and planning scheme amendments that would allow use or development within a landfill buffer.

4.4 Implications of new EPA Separation Distance Guidelines for the Parwan PSP

New EPA Publications 1949 (Dec 2022) and 1950 (Dec 2022) are proposing new separation distances that are typically 2-3 times larger than that recommended in EPA publications 1518 and 788.3 for most industrial odour/dust source activities including coal mines and landfills.

If the draft Landfill Buffer Guideline and draft Separation Distance Guideline are issued unchanged, then the implications for key landuses (and therefore development constraints)in the Parwan PSP could include:

- 51 Browns Lane Broiler Farm
  - No recommended separation distance provided in draft Separation Distance Guideline. Reference is made to the existing *Planning and environment guideline for establishing meat chicken farms (Guide 1 – Assessment guide)* (2021).
- Maddingley Brown Coal (MBC) open cut coal mine (11 Tilleys Road)

  - Open cut coal mining currently occurs at MBC, with coal mined at the site being used as a soil conditioner, and some soil based products mixed and sold from the site (MBC, 2023).
  - MBC is located within 1km of the Parwan PSP and a buffer distance of 1km is currently recommended by EPA Publication 1518 from sensitive land uses. The proposed 2km buffer for open cut coal mining in EPA publication 1949 is consistent with the 2km buffer identified for the Maddingley landfilling and composting operations (Pacific Environment, 2017).
  - Under the draft Separation Distance Guideline, a separation distance of 500m is recommended for 'Soil blending, conditioning and mixing' however this typically applies to farms and market gardens.
  - The recommended separation distance as per the draft Separation Distance Guideline is **2,000 metres, as a minimum**. Reference is made to EPA Publication 1961 *Guideline for Assessing and Minimising Air Pollution in Victoria.*
- MBC landfill and composting operations (11 Tilleys Rd)
  - MBC landfill accepts the following wastes: paper pulp, solid inert waste, tyres shredded into pieces <250mm, metal recycling shredder residue (floc), waste acid sulphate soils, contaminated soil (Category C), solid wastes contaminated with Prescribed Industrial Waste (PIW), NOS. The licence allows one tipping face (ie. Cell 6), although the audit identified a second tipping face (Nolan Consulting, 2021).
  - The MBC landfill is likely to be classified as Type 1 or Type 2 landfill under the draft Landfill Buffer Guidelines.
  - The draft Landfill Buffer Guidelines provide default buffer distances for Type 2 landfills based on the tip face area. The MBC landfill tip face area is unknown. Default buffers are not provided for Type 1 landfills, consequently EPA is to be contacted for guidance.
  - Type 2 landfills with a tip face of less than 500m^2 require the following default buffer distances:
    - **500 metres from sensitive land uses** to protect human health and amenity impacts. There is no provision to reduce this default buffer.
    - **500 metres from buildings or structures** (including buildings or structures not used for sensitive uses) for landfill gas impacts
  - Type 2 landfills with a tip face of greater than 500m^2 require the following default buffer distances:
    - **1,500 metres from sensitive land uses** to protect human health and amenity impacts. There is no provision to reduce this default buffer. An odour risk assessment demonstrating an alternative buffer may be used to reduce the buffer to a minimum of 1,000 meters.
    - **500 metres from buildings or structures** (including buildings or structures not used for sensitive uses) for landfill gas impacts
  - Buffer distances for composting operations are provided in the draft Separation Distance Guideline (Appendix C). The distances vary according to the feedstock type, technology used and throughput of the composting plant. The MBC landfill licence allows for composting in Area B (Nolan Consulting, 2021) however the throughput and technology could not be determined from publicly available records. The recommended separation distances provided in the draft Separation Distance Guideline vary from **400 metres to 2,200 metres** and plants with a throughput of >50,000 tonnes/year are assessed on a case by case basis. Reference is made to EPA Publication 1588.1 *Designing, construction and operating composting facilities* (EPA, 2017) which also provides guidance for determining appropriate separation distances.
- Other existing operations requiring a separation distance which have not been identified in this report may be present.

Based on current land use patterns, separation distances should be calculated using the rural method. However, the urban method should be used where the nearest sensitive land use includes residential zones allowing subdivision to less than $4{,}000\text{m}^2$.

5 Geotechnical Desktop Assessment

5.1 Documents, Drawings, Standards and Guidelines

The following documents are referred to within the geotechnical desktop study.

Table 5-1 Sources of Information

Information Type	Description	Reference	Prepared by	Date
Geological Memoir	Geological Survey of Victoria Report 76. Department of Minerals and Energy, Victoria	Explanatory notes on Bacchus Marsh and Ballan 1:50 000 geological maps.	Roberts, P.S	1984
Geological Map	Geological Survey of Victoria,	Bacchus Marsh. 1:50 000 geological map.	Roberts, P.S	1985
Online historical satellite photography resource	Historical and current satellite photography	Google Earth	-	Accessed on 22/9/2020
Online mapping resource	GeoVic	https://earthresources.vic.gov.au/geology-exploration/maps-reports-data/geovic	DJPR 2020	Accessed on 22/9/2020
Online mapping resource	Australian Soil Resource Information System (ASRIS)	http://www.asris.csiro.au	CSRIO	Accessed on 22/9/2020
Online mapping resource	Visualising Victoria's Groundwater	https://www.vvg.org.au/	Federation University et al.	Accessed on 22/9/2020
Online mapping resource	Soil Health Knowledge Base	https://www.ccmaknowledgebase.vic.gov.au/soilhealth/	CCMA	Accessed on 22/9/2020
Online Mapping Resource	Geoscience Australia's Online earthquake Resource	Geoscience Australia (http://www.ga.gov.au/earthquakes	Geoscience Australia	Accessed on 22/9/2020
Paper	Coal Mining Heritage Study – Mine Sites Identification	https://www.heritage.vic.gov.au/__data/assets/pdf_file/0019/61462/COAL_pp_158_207.pdf	Heritage Victoria	Accessed on 22/9/2020
Australian Standard	Earthquake Actions in Australia	AS1170.4-2007	Standards Australia	2007
Australian Standard	Residential Slabs and Footings	AS 2870 – 2011	Standards Australia	2011

5.2 General context

5.2.1 Topography and land use

The topography of the precinct is illustrated in Figure 5-1. The approximate extents of the PSP and the Parwan Employment Precinct (PEP) are shown as red lines.

Figure 5-1: Topographic Map within the precinct area (indicated by red dashes line)

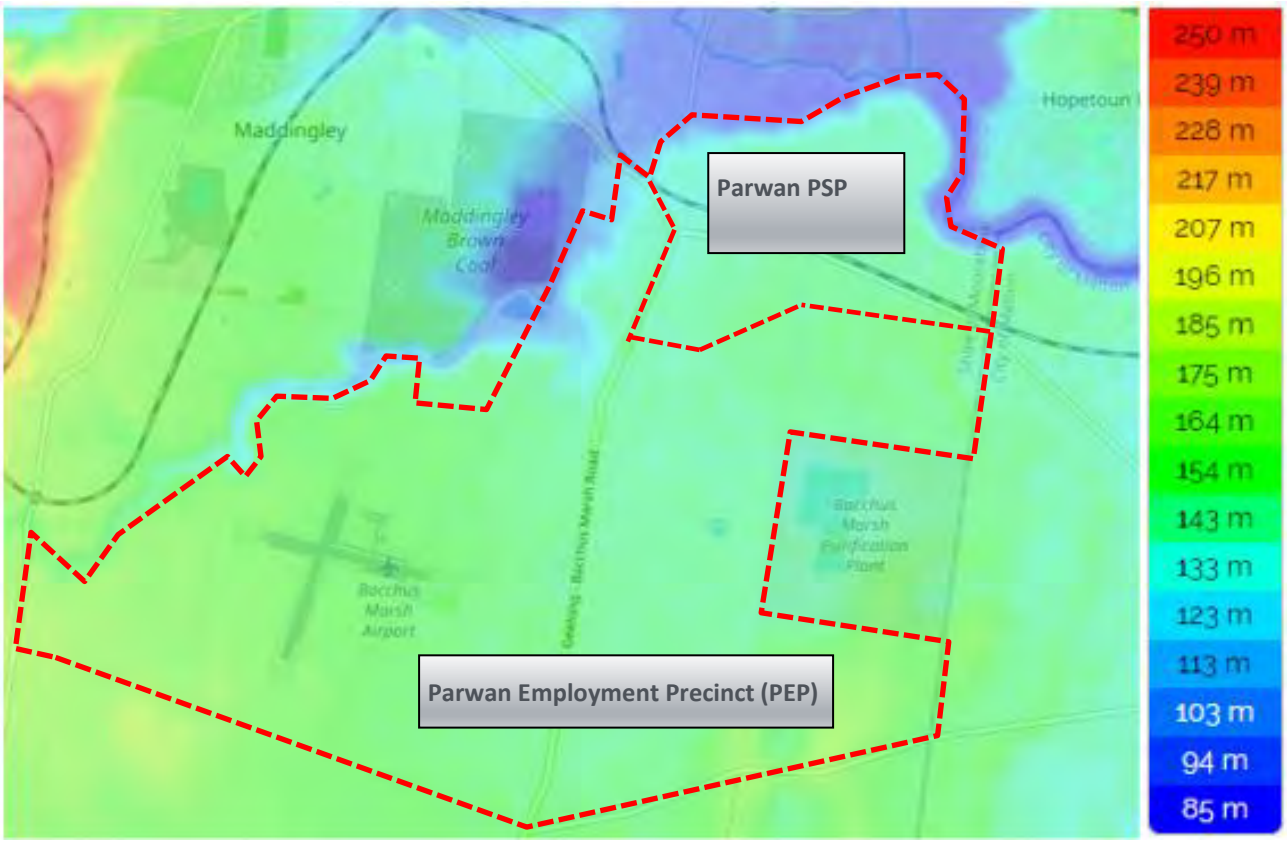
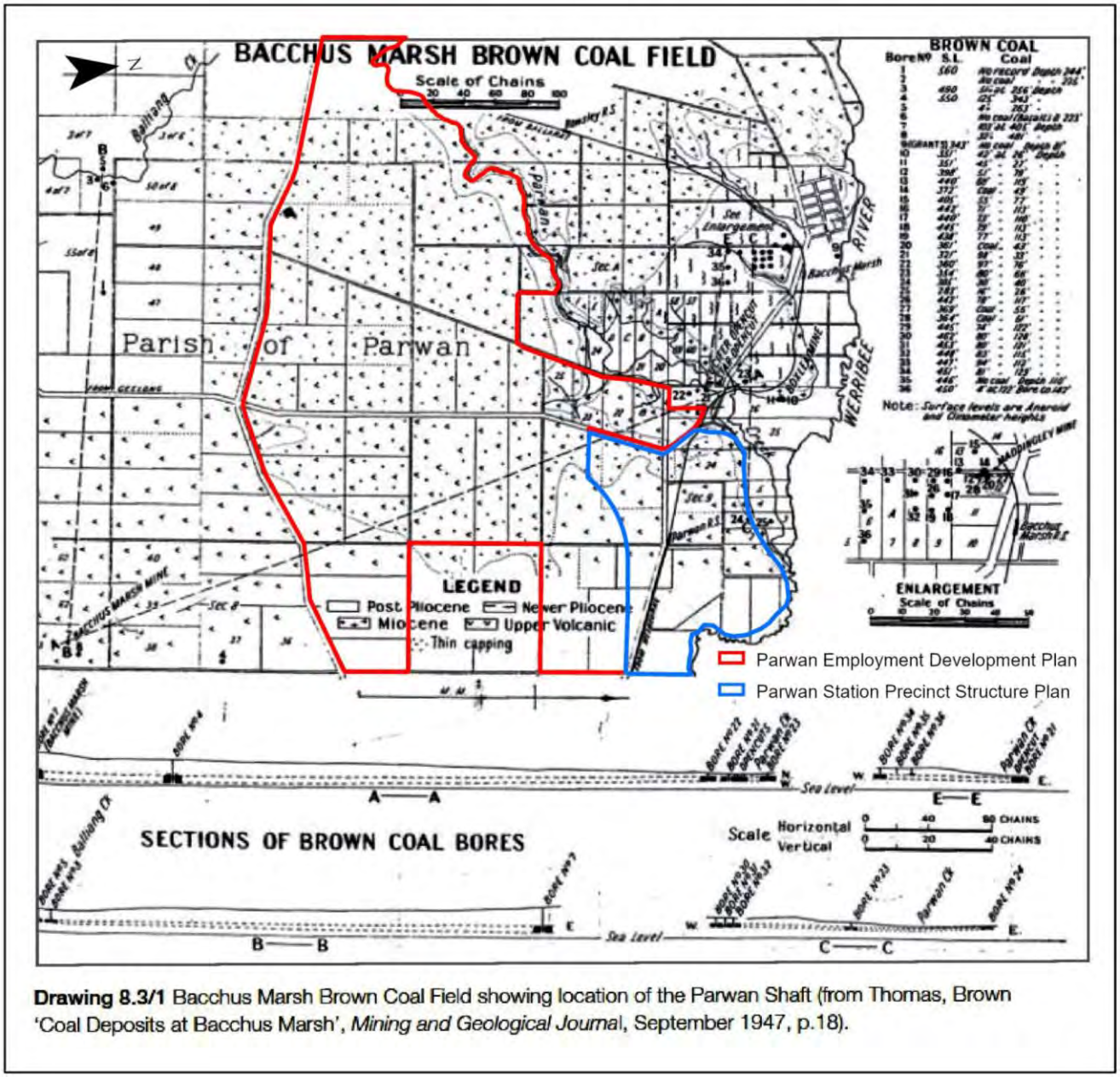


Figure 5-1 shows Maddingley Brown Coal open cut mine is located to the north west of the precinct. Records indicate that private mine known as Parwan Colliery, was operational between 1929 and 1931, and as Bacchus Marsh Coal Mine, between 1941 and 1944.

A map of shaft locations is provided in Figure 5-2 (Heritage Victoria 2020). A diagram indicating direction of drifts from a shaft sunk as part of mining operations is provided in **Figure 5-3.** (Heritage Victoria 2020). Figure 5-2 indicates that shafts sunk as part of mining operations for the Parwan Colliery and Bacchus Marsh Coal Mine, are located within, or very close to, the precinct. **F**igure 5-3 indicates that some drifts were e xcavated from shafts as part of the mining operation. The direction of the drifts in the figure suggests excavation works may have extended into the precinct however have not been confirmed. Further investigation regarding the potential for mining activity having occurred within the precinct extents is required to confirm the extent of mine shafts within the precinct.



Drawing 8.3/1 Bacchus Marsh Brown Coal Field showing location of the Parwan Shaft (from Thomas, Brown 'Coal Deposits at Bacchus Marsh', *Mining and Geological Journal*, September 1947, p.18).

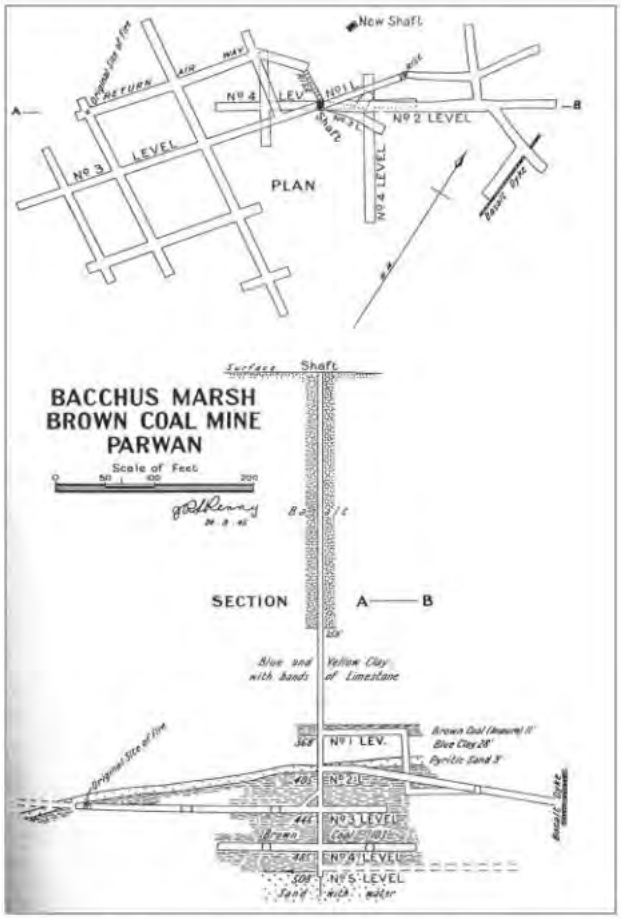
Figure 5-2 Excerpt from Coal Mining Heritage Study – Mine Sites Identification (Heritage Victoria, 2020) illustrating the extents of the Bacchus March Brown Coal Field, and Parwan Shaft.

* Note that:

North is towards the right of the figure

The precinct extents are between the Parwan Creek and the Legend of the figure.

Shafts 21, 22 and 24 are located within the proximity of the precinct extents.



Drawing 8.3/2 Bacchus Marsh Coal Mine, Parwan: Plan and Sections of underground workings at August 1945 (from Kenny, *Mining and Geological Journal*, Vol. 3 No.1, March 1947, p.15).

Figure 5-3 Excerpt from Coal Mining Heritage Study – Mine Sites Identification (Heritage Victoria 2020) illustrating the drifts excavated away from a shaft as part of the Bacchus March Brown Coal Mine.

5.2.2 Geology

The geology of the precinct is illustrated in Figure 5-4 which was sourced from a printed extract of the online Geological Resource, GeoVic. The precinct extent of both the Parwan PSP and PEP are illustrated in the figure.

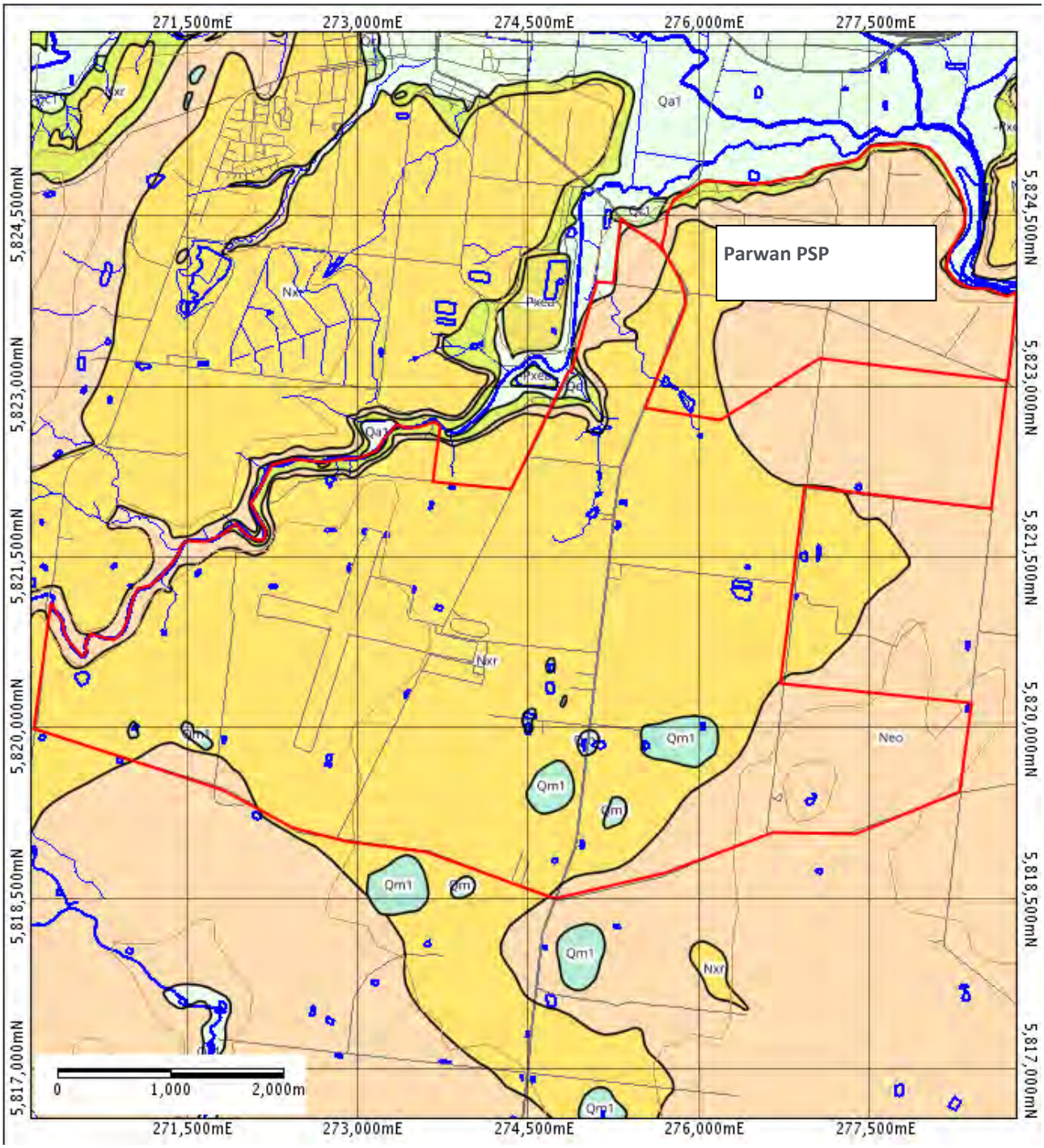


Figure 5-4: Local Surface Geology (GeoVic 2020)

Legend:

Swamp and lake deposits (Qm1): unconsolidated; rare dolomite	Grey to black carbonaceous mud, silt, clay, minor peat: generally
Alluvium (Qa1):	Gravel, sand, silt: variably sorted and rounded; generally unconsolidated; includes deposits of low terraces; alluvial floodplain deposits
Colluvium (Qc1):	Diamictite, gravel, sand, silt, clay, rubble: sorting variable, usually poor; generally poorly rounded; clasts locally sourced; includes channel deposits with better rounding and sorting

Darley Gravel (Nxr):	Gravel, sand, silt: gravel red to pale colours; rounding and sorting moderate to good; moderately consolidated; massive to trough cross-bedded; gravel clasts of vein quartz, sandstone, basalt, ironstone in proportions that reflect the local source
Newer Volcanic Group - basalt flows (Neo):	Olivine tholeiite, quartz tholeiite, basanite, basaltic icelandite, hawaiite, mugearite, minor scoria and ash, fluvial sediments: tholeiitic to alkaline; includes sheet flows and valley flows and intercalated gravel, sand, clay
Werribee Formation (-Pxe):	Sand, silt, clay, gravel in variable proportions: generally white to pale grey; in part carbonaceous, pyritic; ferruginous bands common; contains Cinnamomum flora

It is likely that the Darley Gravels are a superficial, narrow layer of granular material overlying the Newer Volcanics. The Newer Volcanic basaltic rock may be overlain by residual highly plastic clay of varying thickness, which may include basalt boulders, suspended within the clay. The Werribee Formation sediments comprise clays, sands, brown coal and gravel. Within or close to the precinct, the Werribee Formation comprises the Yaloak Formation: which is Clay, Gravel and a thin brown coal seam, outcropping in the Upper Parwan Valley (Roberts P.S. 1984).

The memoir of the area indicates a thick brown coal seam, as seen in the Parwan Mine, within the Yaloak Formation (of the Werribee Formations) which comprises Clay, gravel and thin brown coal outcropping in the Upper Parwan Valley (Roberts P.S. 1984).

Historical borehole records are available on publicly available online data bases. Table 5-2 provides a summary of those bores where summaries of strata encountered is readily accessible. The details of the strata encountered, is presented in Appendix I.

Table 5-2: Summary of records of boreholes with summaries of strata encountered readily accessible, within the study area (GeoVic 2020)

BH ID	Drill date	Drilling method	The location of the borehole	MGA94 Zone 55 Grid Reference (m)	
				Eastings	Northings
326082	12/3/1984	Rotary (diamond/drag bit)	PEP	273842	5821103
942649	29/10/1981	Rotary (diamond/drag bit) and Mud Drilling	PEP	275981	5820926
326003	31/12/1944	-	Parwan PSP	276830	5824592
326001	31/12/1943	-	Parwan PSP	275108	5823998
326000	31/12/1943		Parwan PSP	275077	5824244
326004	31/12/1944	-	Parwan PSP	276876	5824850

5.2.3 The presence of moisture reactive soils within the study area

Australian Standard AS 2870 – 2011 (Residential Slabs and Footings) provides guidance on soil classification. The precinct is located within Climactic Zone 3. Site investigations, leading to soil characterisation over the precinct, is recommended to enable a site-specific soil classification. It is possible that the classification of soils derived from Newer Volcanic Basalt, could be between moderately to highly reactive clay, and may experience seasonal ground movement from moisture variation of between 20 to 60 mm, over a surface material thickness of up to 2.3 m.

5.2.4 Geomorphology

5.2.4.1 Seismicity

Geoscience Australia (http://www.ga.gov.au/earthquakes) lists earthquakes that have occurred within Victoria. It shows no earthquakes with a magnitude greater than 6 have occurred since European settlement in Victoria.

Table 5-3 shows list of earthquakes that are greater than 4 and have occurred in the last 20 years in Victoria. It is noted that the maximum earthquake happened in 2021 with a magnitude of 5.9 at a depth of 10km.

Table 5-3: List of earthquakes with a magnitude greater than 4, since 2000 in Victoria (Geoscience Australia 2020)

SN.	Magnitude	Year	Depth (km)	Location
1	5.9	2021	10	Rawson, VIC.
2	4.8	2015	10	W of King Island, Tasmania.
3	4.3	2012	0	Near Moe, VIC.
4	**5.4**	**2012**	**10**	**SW of Moe, VIC.**
5	4.4	2011	2	Korumburra, VIC.
6	4.6	2009	15	Korumburra, VIC.
7	4.6	2009	15	N of Korumburra, VIC.
8	4.0	2002	3	Fish Creek, VIC.
9	5.0	2000	18	Boolarra South, VIC.

Australian Standard AS1170.4-2007 “Earthquake Actions in Australia” indicates a Hazard Factor (Z) of no greater than 0.09 (10% probability of exceedance in 50 years) for the region surrounding the precinct.

5.2.4.2 Erosion and landslides

The precinct is located within the Port Phillip and Westernport Catchment Management Authority. However, the database maintained by the adjacent Corangamite Catchment Management Authority, includes Erosion and Landslide. The database returns are illustrated in Figure 5-5.

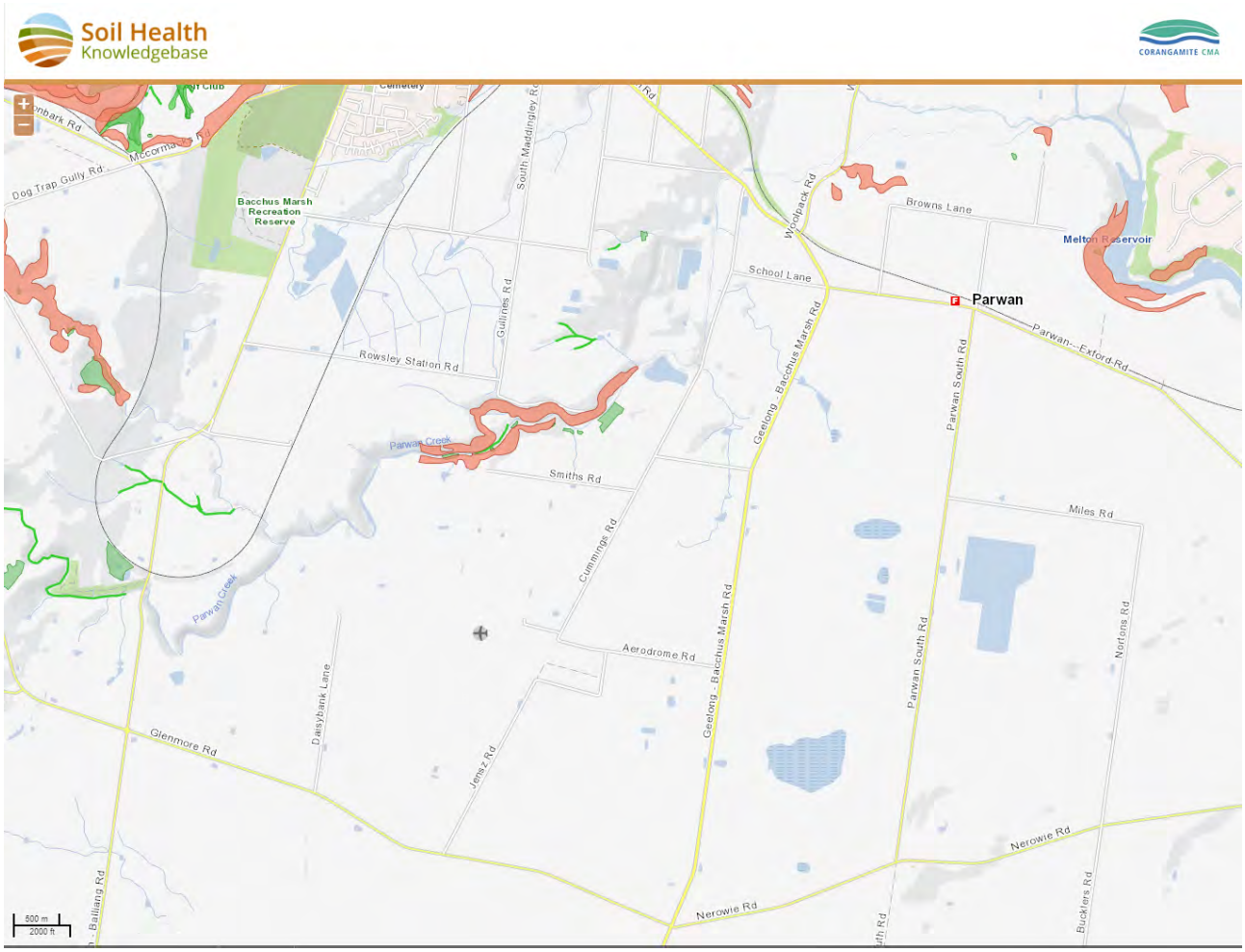


Figure 5-5: Location of areas of erosion susceptibility and known landslides (CCMA 2020)

Legend:
Red coloured areas are areas of known landslides.
Green coloured areas are areas of erosion susceptibility.

Most of the precinct has a low risk of landslip given the mostly flat to gently undulating topography. The map indicates only isolated areas of landslides are located within the bounds of both PEP and PSP proximate to the escarpments of Parwan Ck and Werribee River.

5.3 Topography and Geology - north-east corner of the study area

5.3.1 Topography

As illustrated in Figure 3 of Appendix A, the PSP is generally flat, between 120 mAHD and 150 m AHD elevation. A seasonal stream, dammed at two locations is located within the south-west corner of the precinct.

The Parwan PSP is bisected by the Melbourne to Ballarat railway line, and Parwan – Exford Road.

5.3.2 Geology

Figure 5-4 indicates that the surface geology of the PSP comprises, Darley Gravels to the south west of the precinct. The Newer Volcanics form the surface geology of the majority of the precinct. As the precinct ground level falls towards Parwan Creek and Werribee River, the geology changes to the Werribee Formation.

The logs of historical boreholes located within the PSP are provided in Appendix I.

6 Contaminated Land

At the time of writing Revision 1 of this report, the preliminary investigation of contaminated land applied the principles of the now superseded *Potentially Contaminated Land General Practice Note* (Department of Sustainability and Environment (DSE), June 2005) to assess the potential for contamination as either *High, Medium* or *Low*. The conclusions were based on the findings of the desktop review and restricted site inspection (conducted September 2020).

SMEC note that the outcomes and recommendations of the contaminated land assessment may now be outdated due to the updated *Potentially Contaminated Land Planning Practice Note* (DSE, 2021).

Where a sensitive land use is proposed, the required action to occur under the Planning Practice Note (DSE, 2005), prior to the change in land use for each of the risk categories are:

- **High Risk (A)** – Require an environmental audit as required by Ministerial Direction No. 1 or the Environmental Audit Overlay. Where a planning scheme amendment is proposed to allow a more sensitive land use;
- **Medium (B)** – Requires a site assessment from a suitably qualified environmental professional; or
- **Low (C)** – General duty under Section 12(2)(b) and Section 60(1)(a)(iii) of the Planning and Environment Act (1987) (the P&E Act).

Source – DSE June 2005, Table 2 Assessment Matrix

The risk rating of each land parcel according to the practice note (DSE, 2005) within the PSP is presented in Figure 2 of Appendix A. For those sites identified to have a *high* or *medium* risk of potential contamination the site address and a description of the contamination risk is documented within **Table 6-1**. All remaining sites within the PSP were considered to have risk rating of *Low*.

Table 6-1: Identification of Properties with Potential for Contamination within Parwan PSP (DSE, 2005)

Site ID. and Land Use	Property Address	Identified Land Use and Potential Sources of Contamination	Potential for Contamination	Risk Rating
1. Broiler Farms	51 Browns Lane Maddingley Vic	Large shed structures behind house, poultry/intensive agriculture	Medium	B
2. Parwan CFA	Corner of Whelans Rd and Parwan-Exford Rd Parwan (north side)	Small portable office, shed (assumed to house truck), shipping container, concrete slab and two small stockpiles at back of building (concrete/gravel). No evidence of chemical storage other than small Intermediate Bulk Container (IBC) possibly used for water. Site may have been used for fire training, potential risk of Per- and polyfluoroalkyl substances (PFAS) contamination.	Medium	B

Site ID. and Land Use	Property Address	Identified Land Use and Potential Sources of Contamination	Potential for Contamination	Risk Rating
3. Uptime Truck & Trailer Services/Graeme Spargo Transport	4300 Geelong-Bacchus Marsh Rd	Transport trucking operations, potential for fuel storage and workshop activities.	Medium	B
4. Uncontrolled Waste Disposal	35 Whelans Rd, Parwan Vic	Residential property with scrap metal, disused cars, shipping containers and other unlicensed waste disposal.	Medium	B
5. Uncontrolled Waste Disposal	10 Whelans Rd, Parwan Vic CP105087	Residential property with trucks, shipping containers, concrete blocks/base, multiple IBCs, multiple small stockpiles of soil/gravel.	Medium	B
6. Uncontrolled Waste Disposal	170 Whelans Rd, Parwan Vic	Residential dwelling at front of property. Old portable buildings, scrap metal, metal structures at rear.	Medium	B
7. Uncontrolled Waste Disposal	9 Parwan-Exford Rd Maddingley	Cnr of Geelong-Bacchus March and Parwan-Exford Rd & opposite GST transport. Property has machinery, numerous stockpiles of waste	Medium	B
8. Agricultural Spray Services (Hardi Spraying Systems)	4256 Geelong-Bacchus Marsh Rd	Residential property with minor sheds/structures. No signage/evidence identifying land use/company name	Medium	B

Where a planning scheme amendment is proposed to a more sensitive land use an environmental audit will be required for those sites with High Risk (A) rating and a site assessment will be required for sites with a Medium Risk (B) rating.

It should be noted the site inspection of the precinct was restricted due to limited site access (e.g. private lands) and unexpected finds are likely to be encountered during the development of the precinct. An unexpected finds protocol should be developed to ensure potential contamination identified is correctly investigated and managed in accordance with the requirements of the DSE, *Potentially Contaminated Land General Practice Note* (DSE, 2005).

7 Conclusions

7.1 Contaminated Land

Desktop assessment and fenceline site inspection was conducted in September 2020 to identify sites with current or historical activities with the potential to have caused land contamination. Applying the principles of the now outdated *Potentially Contaminated Land General Practice Note* (DSE, 2005), eight (8) sites with a medium potential for contamination were identified. The 'B' risk rating was applied to these properties which required a site assessment by a suitably qualified professional to assess land suitability for sensitive land uses.

There are now additional land uses classified as having a 'high' potential for contamination in the updated *Potentially Contaminated Land Planning Practice Note* (DSE, 2021), such as firefighting or training (use of foams) and mass animal burial on agricultural sites. The recommended actions for each risk category (ie. A, B or C from Table 3 [DSE, 2021]), have also changed; for example risk category A and B now include Preliminary Risk Screening Assessments (PRSA) to support planning scheme amendments and planning permit applications.

7.2 Odour Risks and Separation Distances

Odour risks and appropriate buffer distances were previously reported by Pacific Environment, August 2017 within the Bacchus Marsh Urban Growth Framework Bacchus Marsh Buffer Assessment. The assessment identified odour risks associated with GWW's Parwan wastewater treatment plant (WWTP), the Maddingley Brown Coal landfill and compost operations and the broiler farm on Browns Lane which impact on the precinct.

Pacific Environment concluded odour risks can be mitigated through appropriate buffer distances, recommending the following buffer distances for existing land uses:

- Maddingley landfill and composting operations (11 Tilleys Rd): 2,000 metres.
- Parwan WWTP (Parwan South Road) 1,400 metres.
- Broiler fam (51 Browns Lane): 425 metres.

Dust is also a potential amenity risk that must be considered in conjunction with odour and other potential air emissions. As part of the Phase 2 studies for Parwan PSP, the VPA will commission a separate buffers assessment to further investigate the current recommended buffer distances.

7.3 Current EPA Separation Distance Guidelines (2013)

SMEC reviewed the current EPA separation distances recommended for industrial residual air emissions to sensitive land uses which are:

- Maddingley Brown Coal open cut coal mine: 1 km (EPA Pub 1518, 2013)
- MBC composting operations: 2km (EPA Pub. 1588.1)
- MBC landfill operations (Type 3 inert waste landfill): 200m (EPA Pub 788.3)
- Broiler farms at 51 Browns Lane and 4050 Geelong-Bacchus Marsh Road: minimum 250m (actual separation distance must be calculated based on the farm capacity) (Victorian Code for Broiler Farms, 2018 and EPA Pub 1518)
- Western Irrigation Network: 0 to 100 metres for each irrigation site (EPA Pub 1910).

7.4 Draft EPA Separation Distances and Landfill Buffer Guidelines (2022)

As discussed in Section 4.3 the draft Landfill Buffer and Separation Distances guidelines should be considered as part of the Phase 2 studies for the Parwan PSP.

The potential changes in buffer distances as a result of the draft guidelines are:

- Maddingley Brown Coal (MBC) open cut coal mine: 2km.
- MBC Composting operations: up to 2,200 metres depending on composting methods and throughput
- MBC Type 3 inert waste landfill: 500m
- GWW's Bacchus Marsh RWP (Parwan South Road): no change
- Broiler farms (51 Browns Lane and 4050 Geelong-Bacchus Marsh Road): no change
- Western Irrigation Network: no change.

7.5 Use of Recycled Water – WIN Recycled Water Scheme

There is potential for Class C recycled water to be available for beneficial use in the Precinct – supplied from the WIN recycled water scheme (Bacchus Marsh and Melton RWP combined flows). Class C recycled water use is subject to EPA Permits and human health and environmental site restrictions that are described in EPA approved Health and Environmental Management Plans (HEMP) and User Site Management Plans (USMPs) .

Potential irrigation of Class recycled water within the Parwan PSP has the potential to impact on land uses and development in the precinct due to the need to maintain buffer distances between irrigation areas and sensitive land uses for many common high throw pivot and travelling spray irrigation methods. Proponents of irrigation of recycled water (supplied by GWW as part of the WIN Recycled Water scheme) would need to ensure adequate irrigation system siting and design, spray drift control and provision of separation distances (typically 10m for spray) to manage potential human health impacts at existing or future nearby sensitive land uses.

7.6 Hydrogeology

The desktop review indicated groundwater depth varied significantly from less than 5m to 50m. The watertable depth is 20m to 50m in the majority (51%) of the precinct. Shallow groundwater (<5m) accounts for only 3% of the precinct. Groundwater depth is greatest in the vicinity of the Parwan Creek, at the northern extent of the precinct. It is understood that groundwater flows north towards the Werribee River.

Groundwater salinity at the precinct ranges from 7,000 to 13,000mg/L of TDS limiting potential beneficial uses of groundwater.

A review of licensed groundwater bores within the precinct reported one groundwater extraction bore located within the precinct at 51 Browns Lane. The bore is 167m deep and is registered for domestic and stock use.

Groundwater bores within 2km of the precinct include dewatering bores which are likely to be associated with Maddingley landfilling operations. Dewatering of the former coal mine site is likely to have altered groundwater conditions including depth and groundwater flow direction.

7.7 Sodic and Dispersive Soils

Sodic soils (sodosols and vertisols) are present in surface and subsoils soils across the Parwan PSP. The north western portion of the Parwan PSP area is classified as Sodic with an ESP of 6-15%. The southern and eastern portion of the Parwan PSP were classified as Strongly Sodic with an ESP of 15-25%.

7.7.1 Sodic and Dispersive Soil Risks

Erosion risks associated with sodic and dispersive soils can be managed by appropriate planning and standard construction erosion control techniques. Identifying where dispersive sodic soils are located in the landscape and, where possible, avoiding or minimising disturbance to these areas is recommended. If exposure of the higher risk soils cannot be avoided there are potentially a range of conventional engineering controls that can be developed to manage sodic and dispersive soil related risks. Management controls for construction are presented in Section 3.8.3.

Steep slopes (greater than 5% slope) were also identified as potentially increasing the risk of erosion of dispersive sodic soils which are present across the precinct.

7.8 Geotechnical

Figure 5-4 indicated that the surface geology of the PSP comprises Darley Gravels to the south west of the precinct. The Newer Volcanics form the surface geology of the majority of the precinct. As the precinct ground level falls towards the Werribee River, the geology changes to the Werribee Formation.

A desktop review indicated historical mine shaft excavations may extend into the precinct.

8 Recommendations

8.1 Contaminated Land

SMEC recommends that the desktop contaminated land assessment be updated to incorporate any land use changes and changes to the updated *Potentially Contaminated Land Planning Practice Note* (DSE, 2021).

8.2 Amenity (Odour and Dust) Risks and Separation Distances

VPA should consider the potential impact of the recently published EPA draft Separation Distance Guideline (Pub. 1949, Dec 2022) and draft Landfill Buffer Guideline (Pub. 1950, Dec 2022) on the existing and potential future land use developments across the Parwan PSP.

8.3 Sodic and Dispersive Soils

8.3.1 Potential Further Investigations

Due to the presence of potentially dispersive sodic and strongly sodic soils within the precinct further investigation of sodic soils is recommended which may include:

- Soil investigation of surface and subsoil conditions including laboratory testing of select parameter focusing on steeper areas where the erosion risk is greatest; and
- Validation of desktop mapping of topography to confirm high risk areas prone to erosion (drainage lines, localised steep sloping areas etc).

This information should be used to update mapping to identify areas where soil disturbance should be avoided or at least minimised as far as reasonably practicable. As part of the Phase 2 studies for Parwan PSP, the VPA will commission a separate sodic soils assessment to assess the presence and extent of the soils and potential implications for development within the precinct.

Subject to further assessment, it is recommended soil disturbance be avoided in steeper areas (> 5% slope).

Further suggested management controls for construction are presented in Section 3.8.3.

8.3.2 Strategic and Statutory Implications

The presence of sodic and/or dispersive soils, may result in significant changes to the design of the subdivision (including greater emphasis on prevention and source control) and the required drainage assets. This may lead to an increase in the land set aside for the delivery of stormwater treatment assets to ensure that they meet Best Practice Environmental Management Guidelines (BPEM) and the management of the dispersive sodic soils through the delivery of development in the catchment.

Future land use change areas, such as expanded growth boundaries, future Precinct Structure Plans and planning scheme amendments, should seek to understand the capability of the soils in the landscape early in the process of preparing for land use change. This will ensure the required land take for drainage assets is understood and planning and design interventions are incorporated earlier, so that the development meets BPEM Guidelines and the Healthy Waterways Strategy Targets.

During the review of all Precinct Structure Plans, a review of the soils and functionality of the drainage strategy should be undertaken. Any amendments required to address identified issues caused by problematic soils should be made.

8.4 Geotechnical

Prior to subdivision, geotechnical site investigations will be required to determine the sub-surface profile and geotechnical properties of the on-site soils with respect to the proposed development. The investigation would be used to determine the soil suitability for any geotechnical works required on the precinct and to provide geotechnical parameters for design. It is recommended that the geotechnical investigations include in-situ testing such as Standard Penetration Testing (SPT) and/or Dynamic Cone Penetration (DCP) testing to assess the soil strength and that soil sampling and laboratory testing is undertaken to assess the relevant engineering properties such as plasticity, shrink-swell potential and CBR strength.

A desktop review indicated historical mine shaft excavations may extend into the precinct. Further investigation is required to confirm the extent of mine shafts within the precinct.

9 Limitations and Assumptions

Site conditions can vary from those encountered and reported herein. The information and findings in this report are based on the site observations and other data obtained by SMEC.

This report has been prepared to general industry standards and tailored to meet the client's needs at the time of writing. For the sections of this report which were based on historic reports prepared by others, SMEC take no responsibility for the accuracy of information within third party reports.

This report was prepared to meet the objectives presented in Section 1.2. This report is not any of the following:

- An assessment of the precinct for the suitability of the land application of treated effluent
- A detailed site investigation
- An environmental site assessment
- An environmental audit
- A hazardous materials assessment
- A soil waste classification for offsite disposal of soil
- A cultural heritage assessment
- A geotechnical assessment
- A flora and fauna assessment.

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Appendix A Site Plans

Figure 1 – Parwan Precinct Title Boundaries

Figure 2 – Parwan Precinct Potential Contaminated Land Risk and Buffer Areas

Figure 3 – Parwan Precinct Sodic Soils and Topography

SMEC

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SMEC AUSTRALIA PTY LTD
ABN 47 065 475 149

0 100 200 300 400
Meters

1:10,000

Legend

- Parwan Precinct Structure Plan
- Title Boundary

Key Map

PROJECT:	VPA Parwan LCA
PROJECT NO:	30042260
FIGURE NAME:	Parwan Precinct Structure Plan Investigation Area
CREATED BY:	JZ15939
DATE:	3/03/2023
VERSION:	Revision 3
PAGE SIZE:	A3

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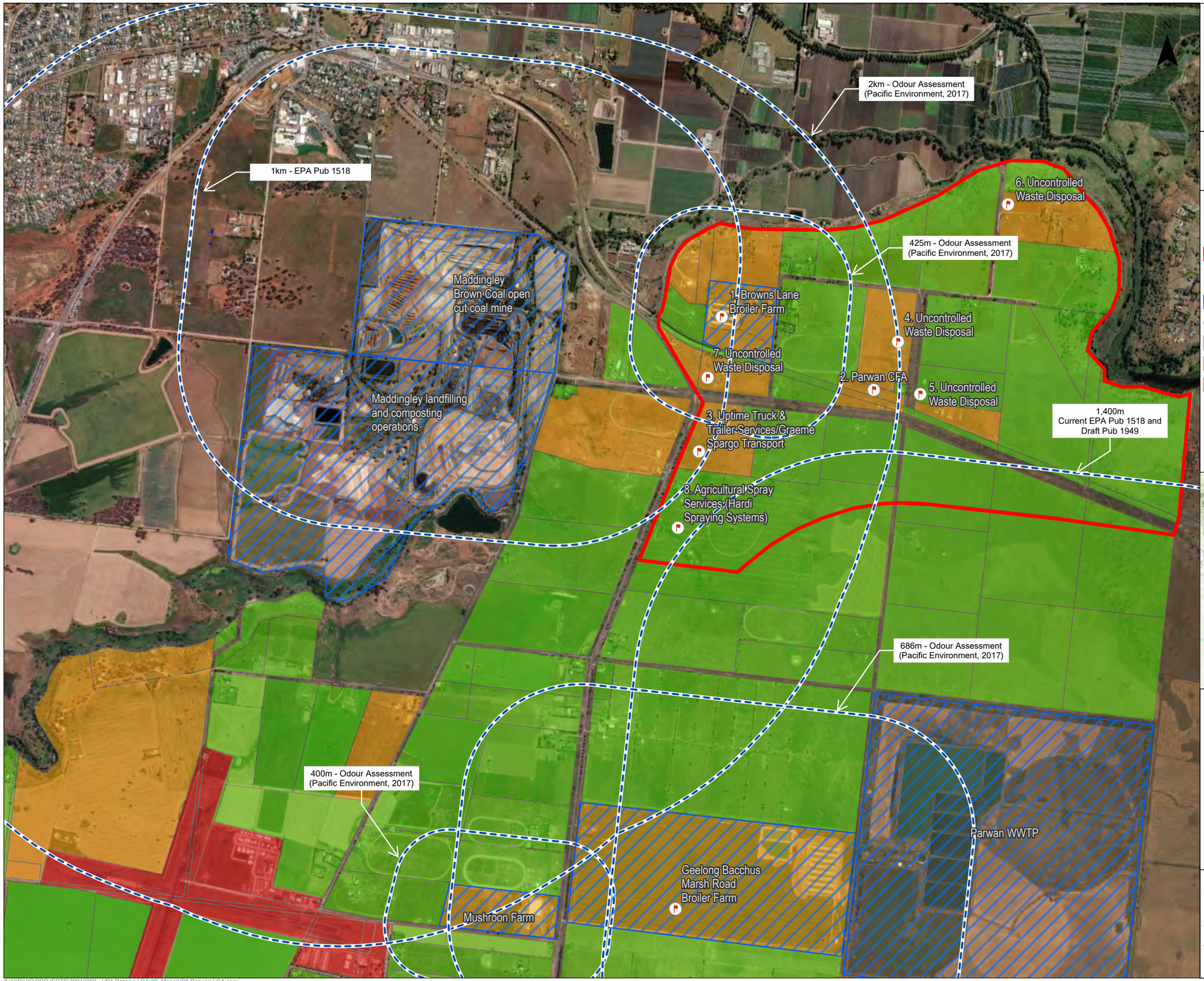

SMEC

Member of the Surbana Jurong Group

SMEC AUSTRALIA PTY LTD
ABN 47 065 475 149

0 200 400 600 800
Meters
1:20,000

Legend

- Sites of Potential Odour Risk
- Parwan Precinct Structure Plan
- Buffer Distance Recommended
- Sites of Potential Odour/Dust Risk

Contamination Potential

- Low
- Medium
- High

SOURCES:
1. Property Boundaries © DELWP 2021
2. Sodic Soils © Agriculture Victoria 2021
3. Basemap © World Topographic Map: Esri, HERE, Garmin, USGS, NGA
World Imagery: Maxar
4. Pacific Environment, *Bacchus Marsh Urban Growth Framework Parwan Buffer Assessment*, June 2017
5. EPA Victoria, *Separation distance guideline DRAFT*, Publication 1949, December 2022
6. EPA Victoria, *Recommended separation distances for industrial residual air emissions*, Publication 1518, March 2013

PROJECT:	VPA Parwan LCA
PROJECT NO:	30042260
FIGURE NAME:	Parwan Precinct Structure Plan Odour, Dust and Contamination Risk
CREATED BY:	JZ15939
DATE:	3/03/2023
VERSION:	Revision 3
PAGE SIZE:	A3

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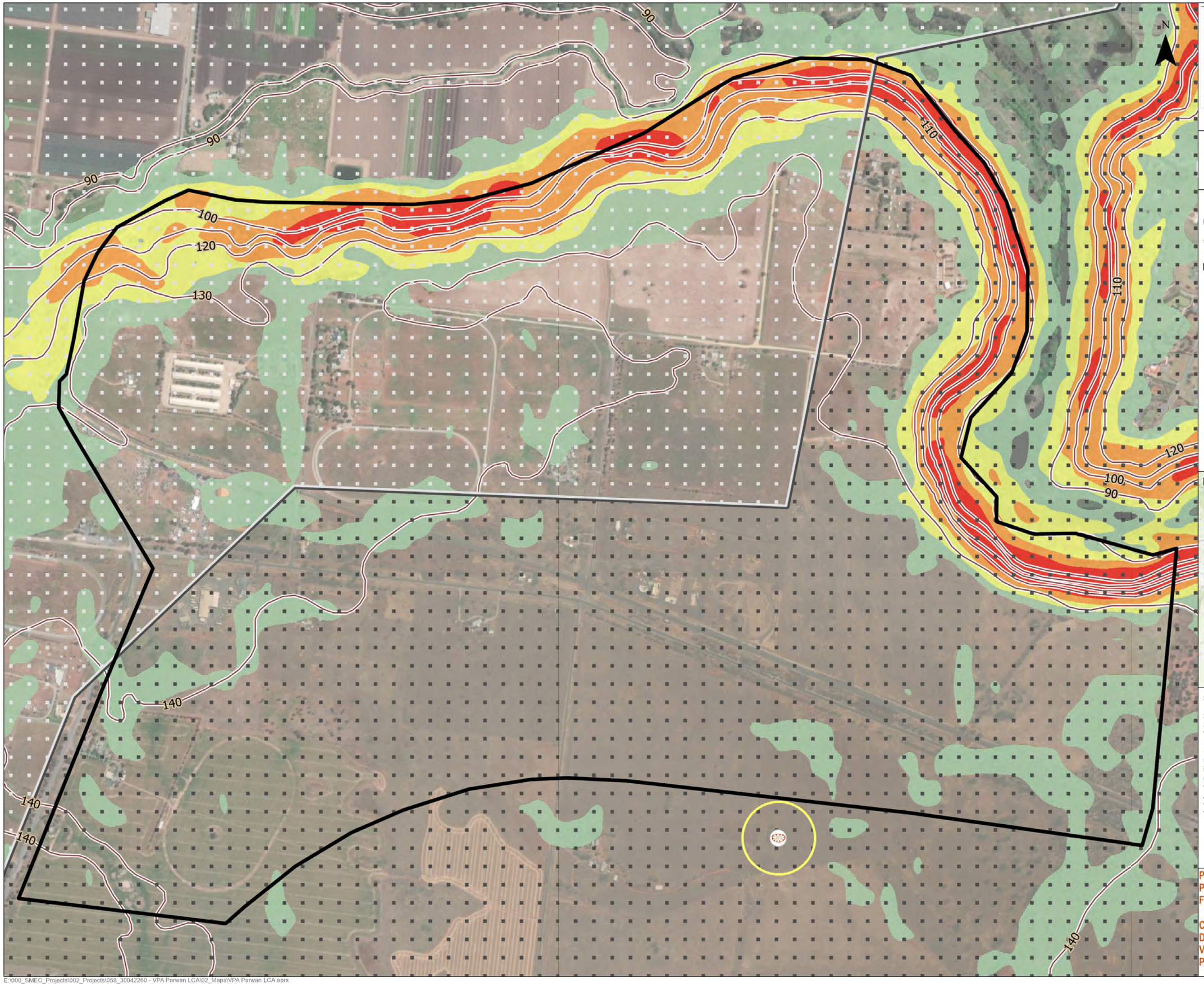

SMEC

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SMEC AUSTRALIA PTY LTD
ABN 47 065 475 149

0 90 180 270 360
Meters
1:9,500

Legend

- Lava Cave Location
- Topographic Contours
- Parwan Precinct Structure Plan
- Approximate Lava Cave Extent

Approximate Sodic Soil Type Boundary

- Sodic (ESP 6-15%)
- Strongly sodic (ESP 15-25%)

Relative Slope

Low

High

SOURCES:
1. Property Boundaries © DELWP 2021
2. Sodic Soils © Agriculture Victoria 2021
2. Basemap © World Imagery: Maxar
World Topographic Map: Esri, HERE, Garmin, FAO, USGS, NGA

Disclaimer: While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, this map contains data from a number of sources - no warranty is given that the information contained on this is free from error or omission. Any reliance placed on such information shall be at the sole risk of the user. Please verify the accuracy of all information prior to using it. This map is not a design document.

PROJECT:	VPA Parwan LCA
PROJECT NO:	30042260
FIGURE NAME:	Parwan Precinct Structure Plan Sodic Soils and Site Features
CREATED BY:	JZ15939
DATE:	3/03/2023
VERSION:	Revision 3
PAGE SIZE:	A3

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Appendix B Site Photographs and Inspection Records

Site Investigation Photographs

Photograph Log of Site Inspection Completed on 3rd September 2020

Parwan Precinct Structure Plan

	
Photograph 1 107 Parwan-Exford Road Parwan CFA	Photograph 2 107 Parwan-Exford Road Parwan CFA

	
Photograph 3 35 Whelans Road	Photograph 4 35 Whelans Road

	
Photograph 5 10 Whelans Road	Photograph 6 10 Whelans Road

	
Photograph 7 170 Whelans Road	Photograph 8 170 Whelans Road

	
Photograph 9 71 Whelans Road	Photograph 10 26 Whelans Lane

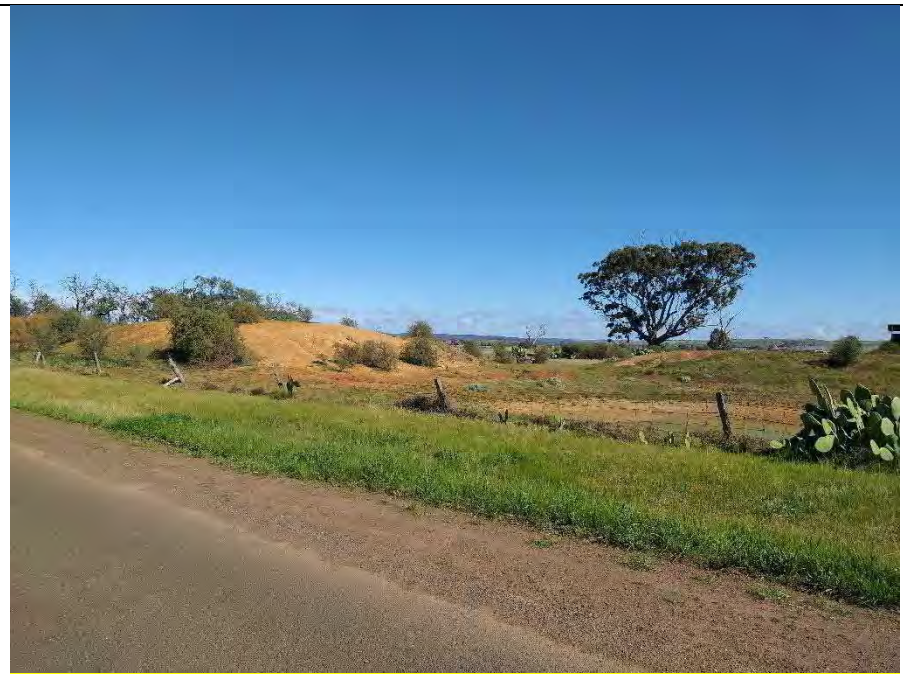
	
Photograph 11 51 Browns Lane	Photograph 12 81 Browns Lane

	
Photograph 13 81 Browns Lane	Photograph 14 9 Parwan-Exford Road

Photograph 16
9 Parwan-Exford Road

Parwan Employment Precinct

	
Photograph 17 4050 Geelong-Bacchus Marsh Road	Photograph 18 4050 Geelong-Bacchus Marsh Road

	
Photograph 17 4099 Geelong-Bacchus Marsh Road	Photograph 18 135 Smiths Road

	
Photograph 17 4099 Geelong-Bacchus Marsh Road	Photograph 18 135 Smiths Road

	
Photograph 17 4099 Geelong-Bacchus Marsh Road	Photograph 18 4104 Geelong-Bacchus Marsh Road

	
Photograph 17 4104 Geelong-Bacchus Marsh Road	Photograph 18 4104 Geelong-Bacchus Marsh Road

	
Photograph 17 4104 Geelong-Bacchus Marsh Road	Photograph 18 4256 Geelong-Bacchus Marsh Road

Photograph 17
4256 Geelong-Bacchus Marsh Road

Parwan Precinct Structure Plan

Land Use	Address	Location (onsite/ offsite)	Comments from site inspection on 3 Sept 2020 (Nicole Krasic)	Photo order	Site Inspection required (Y/N)
Parwan Precinct Structure Plan, 472ha					
Parwan CFA	Exford Road	Onsite	Small portable office, shed (assume truck), shipping container, concrete slab and 2 small stockpiles at back of building (concrete/gravel)	51, 52	Y
Uptime Truck & Trailer Services/Graeme Spargo Transport	4300 Geelong-Bacchus Marsh Rd	Onsite	Unable to find safe stop to have a better look & confirm. Possibly GTS transport	No photos	Y
	Crn school lane & Geelong-Bacchus Marsh Rd (ADDED this in on day of inspection)		Appears to have temp construction project office (possibility related to sewer/water upgrade works along school lane)	No photos	
Bacchus Marsh Motocross	55 Cummings Rd	Onsite			
Agricultural Spray Services (Hardi Spraying Systems)	4256 Geelong-Bacchus Marsh Rd	Onsite	Residential property with minor sheds/structures. No signage/evidence to say Hardi Spraying	28 -32	Y

Appendix B – Site Inspection Notes 3rd September 2020 - Parwan Precinct Structure Plan

Land Use	Address	Location (onsite/ offsite)	Comments from site inspection on 3 Sept 2020 (Nicole Krasic)	Photo order	Site Inspection required (Y/N)
Properties along Whelans Rd/Lane	35 Whelans Rd (Collector)	Onsite	Gate locked so unable to enter. Residential property with scrap metal, disused cars, shipping containers	44, 45	Y
	10 Whelans Road (unknown – storage of waste/garden supplies) CP105087		Residential property with trucks, shipping containers, concrete blocks/base (?). Could only view from Parwan-Exford Rd to see back of property	49, 50	
	15 Whelans Road (dumped spoil at back of property, rear-left of house – may be difficult to see from road)		Could only view from Parwan-Exford Rd to see back of property. Residential property with house and sheds (unable to confirm if any dumped spoil at back)	No photo	
	170 Whelans Road (significant dumping of cars and machinery)		Residential property down driveway, front of property had old portables, scrap metal, metal structures, timber power poles	40-43	
	71 Whelans Road (dumping of cars and machinery) 3~9\PP3375		Unable to confirm location – believe it was at bend in road with long driveway access, however couldn't see property number. House, buildings, sheds & shipping containers appeared in distance. Horses present on property	46	
	26 (gate 28) Whelans Lane (ADDED THIS IN)- end of Whelens lane		Residential property – nothing notable. Part of Landcare group	47, 48	

Appendix B – Site Inspection Notes 3rd September 2020 - Parwan Precinct Structure Plan

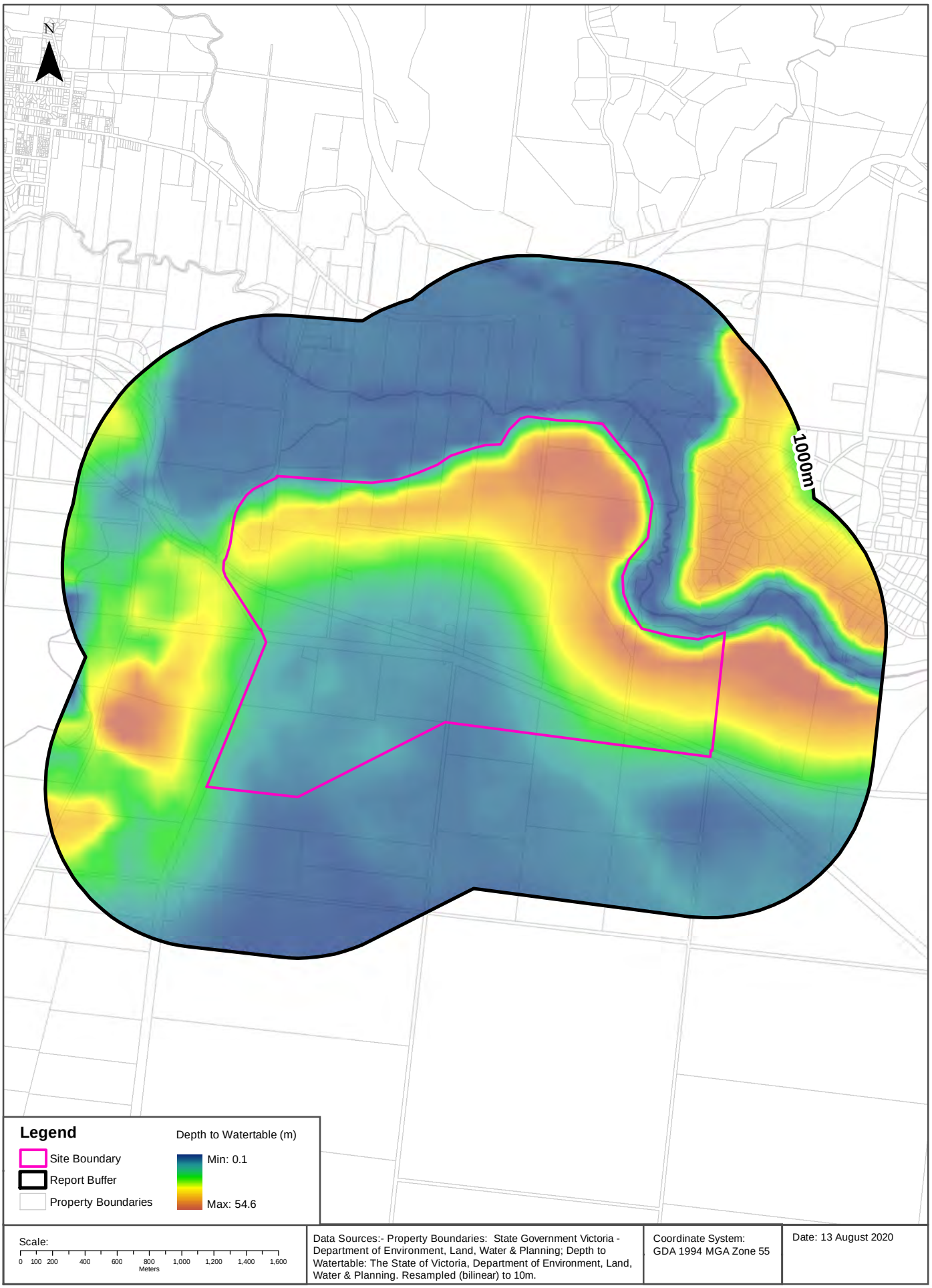
Land Use	Address	Location (onsite/ offsite)	Comments from site inspection on 3 Sept 2020 (Nicole Krasic)	Photo order	Site Inspection required (Y/N)
Broiler Farm	51 Browns Lane (potential poultry/intensive agriculture facility) 81 Browns Lane (cropping at rear of property)	Onsite	Difficult to see from fenceline, however definitely large shed structures behind house Unable to see beyond house (drop in land level). Property has signage to say part of Parwan Landcare group and Land for Wildlife	38, 39 36, 37	Y Y
Dumping	9 Parwan-Exford Road Maddingley (significant dumping of machinery, spoil, vehicles)	Onsite	Cnr of Geelong-Bacchus March and Parwan-Exford Rd & opposite GST transport. Property has machinery, rubbish and numerous stockpiles	27, 28, 33 -35	Y
Lava Caves	65 Parwan South Road, Parwan (rear)	Onsite	Only can view from road and can see house and lots of paddocks (unable to confirm if Lave caves present). Area is large, mostly flat, but difficult as unable to confirm from road. Attempt to drive around boundary in attempt to see rear of property but large boundary so unable to confirm anything else about land	No photos	Y

Offsite/Neighbouring		
Site Name	**Address**	**Direction from site**
Parwan WWTP	Parwan S Rd	East
Open Cut Coal Mine / Maddingley Landfill and Composting Operations	Cummings Rd	North west
Genetics Australia Co-operative Bacchus Marsh	144 Woolpack Rd	
Bacchus Marsh Motocross Club	55 Cummins Road Maddingley	
Wastewater Treatment Plant	144 Miles Road/249 Parwan South Road	East
Interstate Energy Group (fertilisers)	25 Rowsley Station Road	West (900m)
Abattoir	Corner Woolpack Rd & Bacchus Marsh Rd	Further north

Appendix C Geology and Hydrogeology Plans

Depth to Watertable

Parwan Precinct Structure Plan, Parwan, VIC 3340



Hydrogeology & Groundwater

Parwan Precinct Structure Plan, Parwan, VIC 3340

Hydrogeology

Description of aquifers within the dataset buffer:

Description	Distance	Direction
Fractured or fissured, extensive aquifers of low to moderate productivity	0m	Onsite

Groundwater Salinity

On-site Groundwater Salinity:

Groundwater Salinity	Percent Of Site Area
7,000 - 13,000 mg/l	100

Depth to Watertable

On-site Depth to Watertable:

Depth to Watertable	Percent Of Site Area
20 to 50 metres	51
5 to 10 metres	25
10 to 20 metres	15
Less than 5 metres	3

Surface Elevation

Approximate on-site Surface Elevation:

Surface Elevation
81 AHDm to 148 AHDm

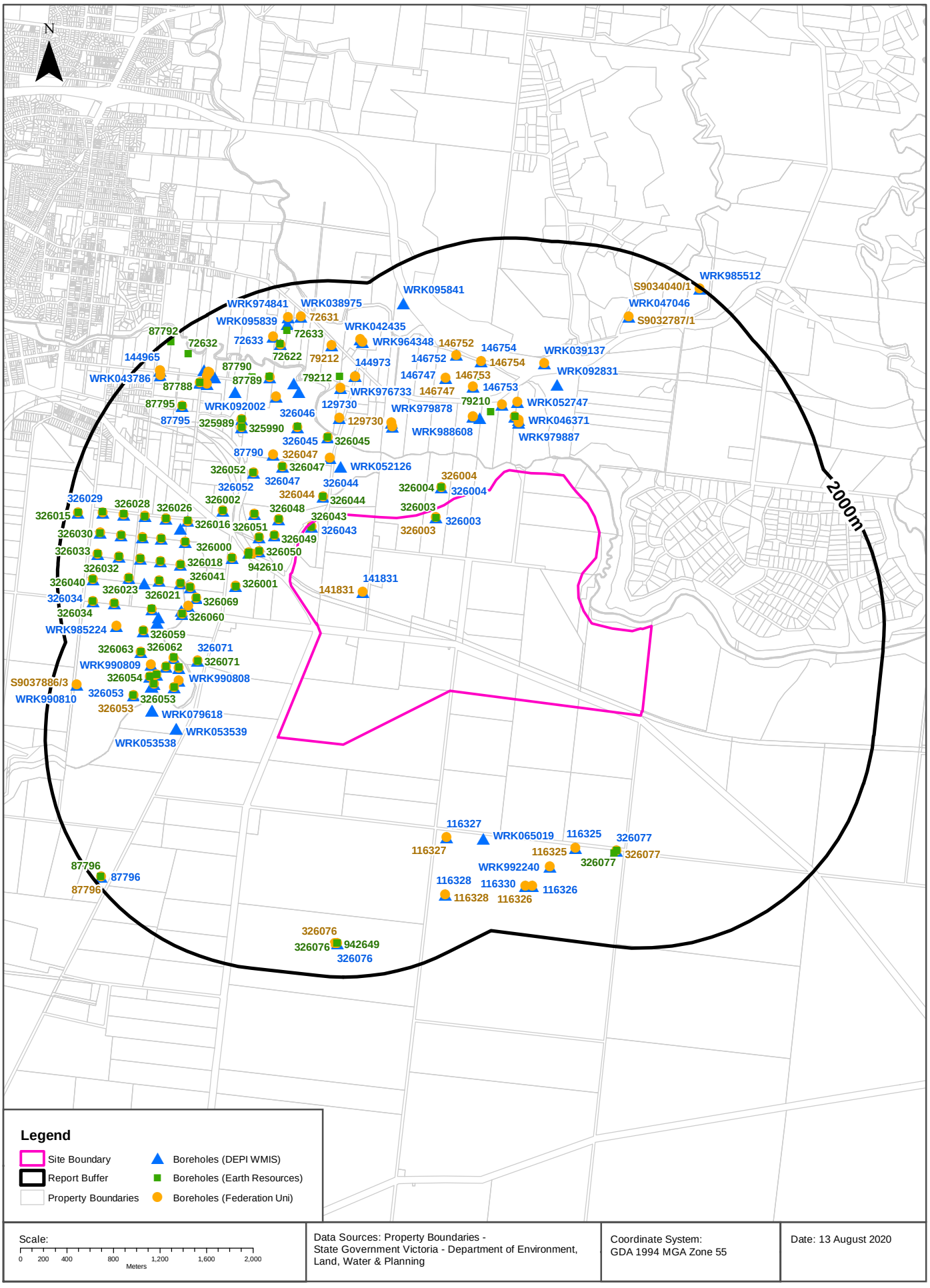
Basement Elevation

Approximate on-site Basement Elevation:

Basement Elevation - Basement Rocks comprise Lower Palaeozoic basement rocks that form the highlands and the crystalline basement; and Mesozoic rocks of the Otway and Gippsland basins both outcropping and subsurface
14 AHDm to 60 AHDm

Groundwater Boreholes

Parwan Precinct Structure Plan, Parwan, VIC 3340



Groundwater Boreholes

Parwan Precinct Structure Plan, Parwan, VIC 3340

Boreholes (DELWP WMIS)

Boreholes from the Department of Environment, Land, Water & Planning's Water Measurement Information System, within the dataset buffer:

Bore Id	Use Type	Drillers Log	Construction	Latest Water Levels	Geology	Completed Date	Dist (m)	Dir
326003	Non Groundwater					1944-12-31	0	Onsite
326043	Non Groundwater					1947-05-31	0	Onsite
141831	Domestic, Stock	0.00m-36.00m HARD FRACTURED BASALT 36.00m-62.00m HARD PRACTURED BASALT 62.00m-99.00m ORANGE/BROWN CLAY 99.00m-144.00m BROWN LIGNEOUS CLAY/SAND, SALTY FINE SAND 144.00m-167.00m HARD BLUE SANDSTONE	0.00m-36.00m INNER LINING - CASING = Steel 40.00m-144.00m INNER LINING - CASING = Steel 142.00m-144.00m INNER LINING - SCREEN = Steel 130.00m-144.00m OUTER LINING - GRAVEL = Gravel			1999-12-05	0	Onsite
326004	Non Groundwater					1944-12-31	139	North
326044	Non Groundwater					1947-05-31	149	North West
326049	Non Groundwater					1947-05-31	212	North West
326048	Non Groundwater					1947-05-31	231	North West
326050	Non Groundwater					1947-05-31	316	West
326051	Non Groundwater					1947-05-31	335	West
326079	Non Groundwater					1984-02-11	399	West
WRK052126	Irrigation	0.00m-4.00m TOP SOIL 4.00m-10.00m GRAVEL COBBLES 10.00m-19.00m COAL 19.00m-20.00m CLAY 20.00m-29.00m GRAVEL 29.00m-30.00m COAL	0.00m-20.00m INNER LINING - CASING = Pvc 20.00m-29.00m INNER LINING - SCREEN = Stainless Steel 29.00m-30.00m INNER LINING - CASING = Pvc 0.00m-16.00m OUTER LINING - GRAVEL = Bentonite		20.00m-29.00m Gravel 29.00m-30.00m Coal	2009-10-01	410	North West
WRK979887							420	North
326042	Non Groundwater					1947-05-31	436	North West

Bore Id	Use Type	Drillers Log	Construction	Latest Water Levels	Geology	Completed Date	Dist (m)	Dir
WRK046371	Irrigation	0.00m-2.00m DRY LIGHT BROWN SEDS 2.00m-4.00m MOIST LIGHT BROWN CLAYS SAND SEDIMENTS 4.00m-6.00m GRE CLAYS AND SEDS (HIGH CLAY) 6.00m-8.00m GREY SEDS LOW CLAY CONTENT .23 METRES LOW/SPH ROUND AND ANG 8.00m-10.00m UP TO .05 METRE LOW/SPH ROUND AND ANG PEBBLES, SEDS AND CLAY 10.00m-14.00m COAL AND ANGULAR QUARTZ .08 METRE STONE 14.00m-16.00m COAL (DENSE) AND ANG QUARTZ 16.00m-18.00m COAL (DENSE) VERY LITTLE STONE 18.00m-20.00m COAL, PEBBLES AND SEDS 20.00m-22.00m CARB. COARSE GRAIN SEDS 22.00m-24.00m COAL AND SEDS. A FEW .08 METRE PEBBLES 24.00m-26.00m COAL AND SEDS 26.00m-28.00m COAL AND LITTLE SEDIMENTATION 28.00m-32.00m COAL AND SEDS 1 MM ANG PEBS 32.00m-38.00m CARB. SEDS EVENLY SORTED MEDIUM GRAIN 38.00m-40.00m DARK CARB SEDAMENTS MED GRAIN POOR/SORTED 40.00m-42.00m LIGHT BROWN CARB. SEDS, FINE GRAIN WELL SORTED 42.00m-56.00m QUARTZ PEBBLES RANGING FROM 2 MM TO 4 MM AND CARB SILTS	0.00m-50.00m INNER LINING - CASING = Pvc 50.00m-56.00m INNER LINING - SCREEN = Pvc 0.00m-56.00m OUTER LINING - GRAVEL = Gravel		50.00m-56.00m Chert	1982-11-20	439	North
319777	Sec Bores (Use Unidentified)					1946-07-02	465	North
326001	Non Groundwater					1943-12-31	469	West
129731	Groundwater Investigation	0.00m-0.50m TOP SOIL 0.50m-4.30m STIFF GREY BROWN SILTY CLAY 4.30m-8.50m FIRM BROWN CLAY SILTY WITH SAND & GRAVEL	0.00m-6.50m INNER LINING - CASING = Pvc 6.50m-7.50m INNER LINING - SCREEN = Pvc 7.50m-8.50m INNER LINING - CASING = Pvc 0.00m-5.50m OUTER LINING - GRAVEL = Cement 5.50m-6.00m OUTER LINING - GRAVEL = Bentonite 6.00m-8.50m OUTER LINING - GRAVEL = Gravel		0.00m-3.80m Clay 3.80m-6.20m Clay 6.20m-7.40m Clay	1996-11-21	472	North West
WRK052127	Irrigation	0.00m-2.00m TOP SOIL 2.00m-4.00m CLAY 4.00m-8.00m COBBLES 8.00m-13.00m COAL 13.00m-17.00m SAND 17.00m-23.00m COAL 23.00m-30.00m SAND & GRAVEL	0.00m-23.00m INNER LINING - CASING = Pvc 23.00m-30.00m INNER LINING - SCREEN = Stainless Steel 8.00m-10.00m OUTER LINING - GRAVEL = Cement			2009-06-16	508	North
326000	Non Groundwater					1943-12-31	519	West
WRK988608							541	North
WRK989794		0.00m-2.00m TOP SOIL 2.00m-4.00m CLAY 4.00m-8.00m COBBLES 8.00m-13.00m COAL 13.00m-17.00m SAND 17.00m-23.00m COAL 23.00m-30.00m SAND & GRAVEL	0.00m-23.00m INNER LINING - CASING = Pvc 23.00m-30.00m INNER LINING - SCREEN = Stainless Steel 8.00m-10.00m OUTER LINING - GRAVEL = Cement 10.00m-30.00m OUTER LINING - GRAVEL = Gravel			2009-06-16	541	North
326047	Non Groundwater					1947-05-31	544	North West
WRK979212						2008-07-01	568	North
WRK052747	Irrigation	0.00m-2.00m TOP SOIL 2.00m-7.00m GRAVEL 7.00m-25.00m GREY CLAY 25.00m-26.00m COAL 26.00m-30.00m GRAVEL	0.00m-25.00m INNER LINING - CASING = Pvc 25.00m-30.00m INNER LINING - SCREEN = Stainless Steel 9.00m-21.00m OUTER LINING - GRAVEL = Cement			2009-07-29	592	North
326045	Non Groundwater					1947-05-31	651	North West
326052	Non Groundwater					1947-05-31	655	North West

Bore Id	Use Type	Drillers Log	Construction	Latest Water Levels	Geology	Completed Date	Dist (m)	Dir
87790	Irrigation	0.00m-2.00m BROWN SEDS AND CLAYS 2.00m-6.00m WATER BEARING BROWN SEDS AND CLAYS, CLAYS CONT. DECREASING 6.00m-8.00m BROWN CLAYS, LOW SPH. SUB ROUNDED QUARTER INCH PEBBLES 8.00m-10.00m QUARTZ SANDS 1 INCH VERY ANGULAR ROCKS 10.00m-16.00m GRAVELS AND SANDS DECREASING IN GRAVEL 16.00m-20.00m COAL AND SEDIMENTS 20.00m-26.00m COAL AND SEDIMENTS 26.00m-28.00m COAL 28.00m-34.00m COAL AND SEDIMENTS 34.00m-40.00m COAL AND SEDIMENTS 40.00m-46.00m CARBONATIOUS MED GRAIN SEDS	0.00m-3.00m INNER LINING - CASING = Pvc 3.00m-6.00m INNER LINING - SCREEN = Pvc 6.00m-13.00m INNER LINING - CASING = Pvc 13.00m-16.00m INNER LINING - SCREEN = Pvc 16.00m-20.00m INNER LINING - CASING = Pvc 20.00m-23.00m INNER LINING - SCREEN = Pvc 23.00m-37.00m INNER LINING - CASING = Pvc 37.00m-45.00m INNER LINING - SCREEN = Pvc 45.00m-46.00m INNER LINING - CASING = Pvc		3.00m-6.00m Sedimentary 13.00m-16.00m Sand 20.00m-23.00m Coal 37.00m-45.00m Sedimentary	1982-11-09	671	North West
326002	Non Groundwater					1944-12-31	697	North West
WRK092831	Irrigation	0.00m-7.00m Top soil & gravel 7.00m-12.00m LARGE GRAVEL & CLAY 12.00m-22.00m SILTY CLAYS 22.00m-27.00m COAL& GRAVEL 27.00m-58.00m SAND& CLAY SEAMS	0.50m-49.00m INNER LINING - CASING = Pvc 49.00m-55.00m INNER LINING - SCREEN = Stainless Steel 55.00m-58.00m INNER LINING - CASING = Stainless Steel 0.00m-32.00m OUTER LINING - GRAVEL = Cement 32.00m-58.00m OUTER LINING - GRAVEL = Gravel		49.00m-55.00m Sand	2016-04-06	772	North East
146753	Groundwater Investigation	0.00m-5.50m CLAY, SILT ORANGE RED BROWN 5.50m-6.50m GRAVEL AND RIVER ROCKS	-0.50m-1.50m INNER LINING - CASING = Pvc Class 18 1.50m-6.50m INNER LINING - SCREEN = Pvc Class 18 0.00m-0.50m OUTER LINING - GRAVEL = Cement 0.50m-1.50m OUTER LINING - GRAVEL = Bentonite 1.50m-0.00m OUTER LINING - GRAVEL = Seal		1.50m-6.50m Gravel	2001-03-26	777	North
WRK046376	Irrigation					2006-10-31	782	North
326046	Non Groundwater					1947-05-31	788	North West
326069	Non Groundwater					1948-07-31	817	West
WRK979878							820	North
129730	Groundwater Investigation	0.00m-0.50m TOP SOIL 0.50m-3.50m STIFF GREY BROWN SILT CLAY 3.50m-8.00m FIRM BROWN CLAYEY SILT WITH SANDY GRAVEL 8.00m-8.50m BROWN COAL	0.00m-6.50m INNER LINING - CASING = Pvc 6.50m-7.50m INNER LINING - SCREEN = Pvc 7.50m-8.50m INNER LINING - CASING = Pvc 0.00m-5.50m OUTER LINING - GRAVEL = Cement 5.50m-6.00m OUTER LINING - GRAVEL = Bentonite 6.00m-8.50m OUTER LINING - GRAVEL = Gravel		0.00m-2.50m Clay 2.50m-3.30m Clay 3.30m-5.20m Gravel 5.20m-6.80m Gravel	1996-11-22	826	North West
326041	Sec Bores (Use Unidentified)					1979-09-20	859	West
WRK053539	Observation	0.00m-4.00m fill 4.00m-28.00m clay 28.00m-62.00m coal 62.00m-69.00m sand	0.50m-30.00m INNER LINING - CASING = Steel 30.00m-66.00m INNER LINING - CASING = Pvc 66.00m-69.00m INNER LINING - SCREEN = Pvc 0.00m-62.00m OUTER LINING - GRAVEL = Cement 62.00m-65.50m OUTER LINING - GRAVEL = Bentonite 65.50m-69.00m OUTER LINING - GRAVEL = Gravel		0.50m-30.00m Clay 30.00m-66.00m Coal 66.00m-69.00m Sand	2010-06-03	876	South West

Bore Id	Use Type	Drillers Log	Construction	Latest Water Levels	Geology	Completed Date	Dist (m)	Dir
WRK053538	Observation	0.00m-1.00m fill 1.00m-16.00m yellow clay 16.00m-67.00m coal 67.00m-74.00m sand	0.50m-19.00m INNER LINING - CASING = Steel 19.00m-71.00m INNER LINING - CASING = Pvc 71.00m-74.00m INNER LINING - SLOT = Pvc 0.00m-69.50m OUTER LINING - GRAVEL = Cement 69.50m-71.50m OUTER LINING - GRAVEL = Bentonite 71.50m-74.00m OUTER LINING - GRAVEL = Gravel		0.50m-19.00m Clay 19.00m-71.00m Coal 71.00m-74.00m Sand	2010-05-28	876	South West
326071	Non Groundwater					1949-07-19	887	West
WRK043014	Dewatering, Industrial, Irrigation, Stock					1800-01-01	900	West
326021	Non Groundwater					1953-12-31	940	West
326017	Non Groundwater					1952-12-31	943	West
WRK039137	Irrigation	0.00m-4.27m LOAM 4.27m-8.53m GRAVEL (OLD BED) 8.53m-9.75m COAL 9.75m-17.06m SAND (SOUP) 17.06m-18.89m COAL 18.89m-24.38m COURSE SAND AND COAL 24.38m-36.57m MEDIUM SAND	0.00m-30.40m INNER LINING - CASING = Pvc 30.40m-36.50m INNER LINING - SCREEN = Pvc		30.40m-36.50m Sand	1984-05-17	945	North
146747	Groundwater Investigation	0.00m-5.50m C;AY, SILT ORANGE RED BROWN 5.50m-6.50m GRAVEL AND RIVER ROCKS	-0.05m-1.50m INNER LINING - CASING = Pvc Class 18 1.50m-6.50m INNER LINING - SCREEN = Pvc Class 18 0.00m-0.50m OUTER LINING - GRAVEL = Cement 0.50m-1.50m OUTER LINING - GRAVEL = Bentonite 1.50m-0.00m OUTER LINING - GRAVEL = Seal		1.50m-6.50m Gravel	2001-03-26	948	North
326018	Non Groundwater					1953-12-31	948	West
326016	Non Groundwater					1952-12-31	965	West
146754	Groundwater Investigation	0.00m-5.50m CLAY, SILT ORANGE RED BROWN 5.50m-6.50m GRAVEL AND RIVER ROCKS	-0.50m-1.50m INNER LINING - CASING = Pvc Class 18 1.50m-6.50m INNER LINING - SCREEN = Pvc Class 18 0.00m-0.50m OUTER LINING - GRAVEL = Cement 0.50m-1.50m OUTER LINING - GRAVEL = Bentonite 1.50m-0.00m OUTER LINING - GRAVEL = Seal		1.50m-6.50m Gravel	2001-03-26	966	North
WRK110063	Industrial or Commercial		0.00m-0.00m OUTER LINING - GRAVEL = Not Known			2018-11-01	968	West
326060	Non Groundwater					1947-08-07	968	West
WRK990808							971	West
326057	Non Groundwater					1960-07-15	986	West
326056	Non Groundwater					1960-07-12	1014	West
325990	Non Groundwater					1942-12-31	1015	North West
WRK053537	Observation	0.00m-1.00m sandy top soil 1.00m-39.00m clay 39.00m-42.00m hard band quartz 42.00m-50.00m yellow clay 50.00m-100.00m coal 100.00m-108.00m sand	0.50m-50.50m INNER LINING - CASING = Steel 50.50m-105.50m INNER LINING - CASING = Pvc 105.50m-108.20m INNER LINING - SLOT = Pvc 0.00m-94.20m OUTER LINING - GRAVEL = Cement 94.20m-104.60m OUTER LINING - GRAVEL = Bentonite 105.20m-108.20m OUTER LINING - GRAVEL = Gravel		0.50m-50.50m Clay 50.50m-105.50m Coal 105.50m-108.20m Sand	2010-05-24	1015	West
325989	Non Groundwater					1942-12-31	1072	North West

Bore Id	Use Type	Drillers Log	Construction	Latest Water Levels	Geology	Completed Date	Dist (m)	Dir
WRK094131	Irrigation	0.00m-1.00m Top Soil 1.00m-5.00m CLAY 5.00m-7.00m CLAYey Gravel 7.00m-8.00m GRAVEL 8.00m-10.00m CLAY 10.00m-17.50m COAL 17.50m-19.00m MEd Sand 19.00m-25.00m LIGNITEClas & coal 25.00m-36.00m MEd Sands 36.00m-38.00m FIne sands 38.00m-41.00m MEd Sands 41.00m-46.00m CLAYey Sands 46.00m-50.00m CLAY	0.00m-9.00m INNER LINING - CASING = Steel 9.00m-26.00m INNER LINING - CASING = UPVC class 12 26.00m-36.00m INNER LINING - SCREEN = Wire W S/Steel 0.00m-15.00m OUTER LINING - GRAVEL = Cement 15.00m-43.00m OUTER LINING - GRAVEL = Gravel		26.00m-36.00m Sand	2017-08-30	1072	North West
WRK976733	Domestic & Stock		0.30m-6.00m INNER LINING - CASING = Steel 6.00m-9.00m INNER LINING - SLOT = Steel 0.00m-0.50m OUTER LINING - GRAVEL = Cement			2006-12-18	1082	North West
146752	Groundwater Investigation	0.00m-5.50m CLAY, SILT ORANGE RED BROWN 5.50m-6.50m GRAVEL AND RIVER ROCKS	-0.05m-1.50m INNER LINING - CASING = Pvc Class 18 1.50m-6.50m INNER LINING - SCREEN = Pvc Class 18 0.00m-0.50m OUTER LINING - GRAVEL = Cement 0.50m-1.50m OUTER LINING - GRAVEL = Bentonite 1.50m-0.00m OUTER LINING - GRAVEL = Seal		1.50m-6.50m Gravel	2001-03-26	1085	North
326062	Non Groundwater					1947-08-12	1087	West
WRK042478	Irrigation	0.00m-0.40m RICH BLACK EARTH 0.40m-1.80m BLACK CLAY 1.80m-4.70m SILTY YELLOW CLAY 4.70m-8.60m LARGE CEMENTED GRAVELS 8.60m-21.00m BROWN COAL 21.00m-28.60m SILTY BROWN CLAY	0.00m-2.00m INNER LINING - CASING = Pvc 2.00m-5.00m INNER LINING - SCREEN = Pvc 5.00m-12.00m INNER LINING - CASING = Pvc		2.00m-5.00m Clay	1982-10-22	1095	North West
WRK079618	Observation	0.00m-11.00m CLAY	0.00m-8.00m INNER LINING - CASING = Pvc 8.00m-11.00m INNER LINING - SCREEN = Pvc 0.00m-6.00m OUTER LINING - GRAVEL = Cement 6.00m-7.00m OUTER LINING - GRAVEL = Bentonite 7.00m-11.00m OUTER LINING - GRAVEL = Gravel		8.00m-11.00m Clay	2014-05-13	1106	West
WRK079617	Observation	0.00m-9.50m CLAY	0.00m-6.50m INNER LINING - CASING = Pvc 6.50m-9.50m INNER LINING - SCREEN = Pvc 0.00m-5.00m OUTER LINING - GRAVEL = Cement 5.00m-6.00m OUTER LINING - GRAVEL = Bentonite 6.00m-9.50m OUTER LINING - GRAVEL = Gravel		6.50m-9.50m Clay	2014-05-13	1106	West
WRK079620	Observation	0.00m-10.00m CLAY	0.00m-7.00m INNER LINING - CASING = Pvc 7.00m-10.00m INNER LINING - SCREEN = Pvc 0.00m-5.00m OUTER LINING - GRAVEL = Cement 5.00m-6.00m OUTER LINING - GRAVEL = Bentonite 6.00m-10.00m OUTER LINING - GRAVEL = Gravel		7.00m-10.00m Clay	2014-05-13	1106	West
WRK079619	Observation	0.00m-10.00m CLAY	0.00m-7.00m INNER LINING - CASING = Pvc 7.00m-10.00m INNER LINING - SCREEN = Pvc 0.00m-5.00m OUTER LINING - GRAVEL = Cement 5.00m-6.00m OUTER LINING - GRAVEL = Bentonite 6.00m-10.00m OUTER LINING - GRAVEL = Gravel		7.00m-10.00m Clay	2014-05-13	1106	West
116327	Groundwater Investigation	0.00m-1.00m SILTY CLAY RED 1.00m-3.00m SILTY CLAY BROWN/GREY 3.00m-3.80m SANDY CLAY BROWN 3.80m-6.00m BASALT GREY	-0.50m-5.00m INNER LINING - CASING = Pvc 5.00m-6.00m INNER LINING - SCREEN = Pvc 2.00m-3.00m OUTER LINING - GRAVEL = Bentonite 3.00m-6.00m OUTER LINING - GRAVEL = Gravel			1993-07-06	1110	South
326055	Non Groundwater					1960-07-05	1119	West
326019	Non Groundwater					1953-12-31	1121	West

Bore Id	Use Type	Drillers Log	Construction	Latest Water Levels	Geology	Completed Date	Dist (m)	Dir
326022	Non Groundwater					1953-12-31	1122	West
326020	Non Groundwater					1953-12-31	1149	West
326026	Non Groundwater					1953-12-31	1151	West
WRK058469	Irrigation	0.00m-3.00m top soil 3.00m-8.00m clay 8.00m-10.00m gravel 10.00m-20.00m coal 20.00m-34.00m clay 34.00m-44.00m sand 44.00m-45.00m clay	0.00m-35.00m INNER LINING - CASING = Pvc 35.00m-44.00m INNER LINING - SCREEN = Stainless Steel 44.00m-45.00m INNER LINING - CASING = Pvc 8.00m-29.00m OUTER LINING - GRAVEL = Cement		0.00m-35.00m Gravel	2010-10-23	1158	North West
326058	Non Groundwater					1960-07-22	1159	West
326072	Non Groundwater					1949-07-15	1167	West
WRK069602	Observation					2012-08-03	1167	West
WRK069603	Observation	0.00m-9.50m CLAY 9.50m-22.50m SILT 22.50m-29.50m SAND 29.50m-35.00m CLAY 35.00m-36.00m SAND 36.00m-47.00m GRAVEL 47.00m-49.50m COAL	0.00m-38.00m INNER LINING - CASING = Pvc 38.00m-47.00m INNER LINING - SLOT = Pvc 0.00m-34.00m OUTER LINING - GRAVEL = Cement 34.00m-37.00m OUTER LINING - GRAVEL = Bentonite 37.00m-47.00m OUTER LINING - GRAVEL = Bentonite 47.00m-49.50m OUTER LINING - GRAVEL = Bentonite		38.00m-47.00m Gravel	2012-10-12	1167	West
WRK069600	Observation	0.00m-60.80m FILL	0.00m-52.70m INNER LINING - CASING = Steel 52.70m-60.70m INNER LINING - SCREEN = Stainless Steel 0.00m-48.20m OUTER LINING - GRAVEL = Bentonite 48.20m-50.70m OUTER LINING - GRAVEL = Bentonite 50.70m-60.70m OUTER LINING - GRAVEL = Gravel		52.70m-60.70m Fill	2012-07-19	1167	West
WRK069601	Observation	0.00m-40.50m FILL	0.00m-34.00m INNER LINING - CASING = Steel 34.00m-40.50m INNER LINING - SCREEN = Stainless Steel 0.00m-31.50m OUTER LINING - GRAVEL = Bentonite 31.50m-40.50m OUTER LINING - GRAVEL = Gravel		34.00m-40.50m Fill	2012-07-02	1167	West
WRK057605	Observation		0.00m-0.00m OUTER LINING - GRAVEL = Not Known			2012-01-01	1173	West
326077	Non Groundwater					1983-11-12	1180	South East
144973	Observation, State Observation Network		0.00m-21.00m INNER LINING - CASING = Pvc Class 12 21.00m-24.00m INNER LINING - SCREEN = Pvc Class 12 24.00m-25.00m INNER LINING - CASING = Pvc Class 12 19.00m-19.70m OUTER LINING - GRAVEL = Bentonite 19.70m-25.00m OUTER LINING - GRAVEL = Gravel	Date/time: 2020-05-29 1024 Quality: 43 WLMP: 10.66m DBNS: RWL:		2001-05-22	1192	North West
144972	Observation, State Observation Network	0.00m-2.80m TOP SOIL & CLAY 2.80m-12.50m SILTY SAND & GRAVEL	0.00m-8.50m INNER LINING - CASING = Pvc Class 12 8.50m-11.50m INNER LINING - SCREEN = Pvc Class 12 11.50m-12.50m INNER LINING - CASING = Pvc Class 12 7.50m-8.00m OUTER LINING - GRAVEL = Bentonite 8.00m-12.50m OUTER LINING - GRAVEL = Gravel	Date/time: 2020-05-29 1017 Quality: 43 WLMP: 5.98m DBNS: RWL:		2001-05-21	1193	North West
WRK057606	Observation		0.00m-0.00m OUTER LINING - GRAVEL = Not Known			2012-01-01	1196	West
116325	Groundwater Investigation	0.00m-0.80m SILTY CLAY RED/YELLOW 0.80m-6.00m BASALT MOSTLY GREY	-0.50m-5.00m INNER LINING - CASING = Pvc 5.00m-6.00m INNER LINING - SCREEN = Pvc 2.00m-3.00m OUTER LINING - GRAVEL = Bentonite 3.00m-6.00m OUTER LINING - GRAVEL = Gravel			1993-07-06	1198	South East
326061	Non Groundwater					1947-08-11	1211	West

Bore Id	Use Type	Drillers Log	Construction	Latest Water Levels	Geology	Completed Date	Dist (m)	Dir
326054	Non Groundwater					1960-06-29	1215	West
WRK065019	Observation	0.00m-1.80m SOIL 1.80m-22.00m SCORIA 22.00m-34.00m BASALT	0.00m-29.00m INNER LINING - CASING = Pvc 29.00m-32.00m INNER LINING - SCREEN = Pvc 0.00m-26.50m OUTER LINING - GRAVEL = Cement 26.50m-28.50m OUTER LINING - GRAVEL = Bentonite 28.50m-32.00m OUTER LINING - GRAVEL = Gravel		0.00m-29.00m Basalt 29.00m-32.00m Basalt	2011-07-20	1220	South
WRK990809							1246	West
WRK084902	Dewatering	0.00m-15.00m GRAVELLY SAND 15.00m-23.00m SILTY CLAY 23.00m-61.00m COALBROWN 61.00m-62.50m CLAYLIGHT GREY 62.50m-67.00m COALBROWN 67.00m-71.50m SANDMED-COARSE 71.50m-77.50m BROWN COAL 77.50m-91.00m CLAYLIGHT GREY 91.00m-100.50m SANDY CLAY 100.50m-101.00m ROCK REFUSAL (SICURIAN BEDROCK)	0.00m-18.00m INNER LINING - CASING = Steel 18.00m-66.50m INNER LINING - CASING = Pvc 66.50m-72.50m INNER LINING - SCREEN = Stainless Steel 0.00m-52.00m OUTER LINING - GRAVEL = Cement 52.00m-56.00m OUTER LINING - GRAVEL = Bentonite 56.00m-73.00m OUTER LINING - GRAVEL = Gravel			2015-06-23	1252	West
87789	Not Known	0.00m-2.00m KHAKI SEDS 2.00m-6.00m KHAKI SEDS AND GREY CLAYS 6.00m-8.00m WATER BEARING KHAKI SEDS AND CLAYS (GREY) 8.00m-10.00m COAL SEAM 10.00m-16.00m CARB. SEDS AND CLAYS 16.00m-24.00m GREY SANDS DECREASING IN CLAY CONTENT 24.00m-39.00m GREY CLAYS AND SEDIMENTS AND CARBONATIOUS MATERIAL	0.00m-10.00m INNER LINING - CASING = Pvc 10.00m-14.25m INNER LINING - SCREEN = Pvc 24.56m-30.81m INNER LINING - SCREEN = Bronze Mesh 32.81m-39.00m INNER LINING - SCREEN = Bronze Mesh 0.00m-10.00m OUTER LINING - GRAVEL = Cement		10.00m-14.25m Sedimentary 24.56m-30.81m Sand 32.81m-39.00m Clay	1982-10-30	1276	North West
326053	Non Groundwater					1960-07-22	1291	West
326024	Non Groundwater					1953-12-31	1295	West
WRK092002	Domestic & Stock	0.00m-1.80m BLACK 1.80m-2.20m TAN SANDY CLAY 2.20m-5.50m BROWN CLAY 5.50m-8.00m DIRTY SILTY RIVER GREAVEL 8.00m-9.00m BLACK CLAY WITH GRAVEL 9.00m-15.00m COAL 15.00m-18.00m WHITE BROWN CLAY 18.00m-25.00m BROWN CLAYS 25.00m-27.00m FINE SAND 27.00m-31.00m FINE GRAVEL & SANDS 31.00m-37.50m BROWN CLAY & WOOD FIBRES 37.50m-38.50m WHITE GRAVELLY CLAY	0.00m-28.00m INNER LINING - CASING = Pvc Class 12 28.00m-32.00m INNER LINING - SCREEN = Stainless Steel 32.00m-35.80m INNER LINING - CASING = Pvc Class 12 0.00m-15.60m OUTER LINING - GRAVEL = Cement 15.60m-17.00m OUTER LINING - GRAVEL = Bentonite 17.00m-37.50m OUTER LINING - GRAVEL = Gravel			2016-12-07	1301	North West
326025	Non Groundwater					1953-12-31	1309	West
326059	Non Groundwater					1947-07-31	1330	West
326027	Non Groundwater					1953-12-31	1333	West
326063	Non Groundwater					1947-08-14	1368	West
326023	Non Groundwater					1953-12-31	1383	West
WRK992240							1389	South
WRK046372	Irrigation	0.00m-7.60m CLAYS 7.60m-11.50m RIVER GRAVELLS 11.50m-16.50m COAL 16.50m-37.50m COARSE SAND 37.50m-58.40m WHITE CLAYS 58.40m-0.00m SHALE	0.00m-21.00m INNER LINING - CASING = Not Known 21.00m-23.00m INNER LINING - SCREEN = Not Known 23.00m-39.00m INNER LINING - CASING = Pvc Class 12 25.00m-32.00m INNER LINING - SCREEN = Pvc Class 12 34.50m-36.00m INNER LINING - SCREEN = Wire W S/Steel		21.00m-23.00m Sand 25.00m-32.00m Sand 34.50m-36.00m Sand	1983-01-13	1441	North West

Bore Id	Use Type	Drillers Log	Construction	Latest Water Levels	Geology	Completed Date	Dist (m)	Dir
WRK047046		0.00m-1.00m SILTY TOP SOIL 1.00m-11.00m SILTY CLAY 11.00m-18.00m SAND, MEDIUM 18.00m-24.00m GRAVEL 24.00m-30.00m GREY CLAY	0.00m-12.00m INNER LINING - CASING = Pvc 12.00m-24.00m INNER LINING - SCREEN = Pvc 9.00m-10.00m OUTER LINING - GRAVEL = Bentonite 10.00m-30.00m OUTER LINING - GRAVEL = Gravel			2008-02-09	1477	North East
326032	Non Groundwater					1953-12-31	1478	West
87795	Domestic, Miscellaneous		0.00m-2.00m INNER LINING - CASING = Not Known 2.00m-4.22m INNER LINING - SCREEN = Not Known			1986-07-31	1489	North West
326031	Non Groundwater					1953-12-31	1490	West
WRK964348	Commercial						1494	North
87803	Domestic, Stock	0.00m-1.50m BLACK TOP SOIL 1.50m-4.00m GREY CLAY 4.00m-8.00m BROWN COAL 8.00m-12.00m RIVER GRAVELS TO 50MM 12.00m-21.50m GREY CLAY 21.50m-26.00m RIVER GRAVELS TO 100MM	0.00m-23.00m INNER LINING - CASING = Mild Steel 23.00m-26.00m INNER LINING - SCREEN = Mild Steel		23.00m-26.00m Gravel	1990-08-24	1494	North West
WRK089104	Domestic & Stock	0.00m-9.00m CLAY/BROWN/SANDY 9.00m-14.00m LIGNITE/CLAY/BROWN-BLACK 14.00m-19.00m SAND/FIND 19.00m-22.00m LIGNITE 22.00m-29.00m SAND/COARSE 29.00m-33.00m LIGNES/SAND 33.00m-39.00m LIGNITES/SAND 39.00m-40.40m CLAY/WEATHERED	0.00m-23.70m INNER LINING - CASING = Pvc 23.70m-29.70m INNER LINING - SLOT = Pvc 0.00m-3.00m OUTER LINING - GRAVEL = Cement 3.00m-40.40m OUTER LINING - GRAVEL = Gravel			2016-06-20	1501	North West
WRK042435	Irrigation					1800-01-01	1508	North
72622	Not Known					1967-10-14	1512	North West
326028	Non Groundwater					1953-12-31	1515	West
326035	Non Groundwater					1953-12-31	1520	West
87788	Not Known	0.00m-0.50m RICH BLACK EARTH 0.50m-1.50m BLACK CLAY 1.50m-7.20m SANDY YELLOW CLAY 7.20m-9.00m LAYER CEMENTED GRAVEL 9.00m-22.00m BROWN COAL 22.00m-24.30m FINE GRAVEL AQUIFER	0.00m-22.50m INNER LINING - CASING = Galvanised Iron 22.50m-24.30m INNER LINING - SCREEN = Galvanised Iron		22.50m-24.30m Gravel	1982-10-20	1539	North West
WRK985224							1540	West
116328	Groundwater Investigation	0.00m-0.80m SILTY CLAY YELLOW/BROWN 0.80m-1.40m CLAY GREY/BROWN 1.40m-6.00m BASALT BROWN/GREY	-0.50m-5.00m INNER LINING - CASING = Pvc 5.00m-6.00m INNER LINING - SCREEN = Pvc 1.50m-2.50m OUTER LINING - GRAVEL = Bentonite 2.50m-6.00m OUTER LINING - GRAVEL = Gravel			1993-07-06	1542	South
87793	Irrigation	0.00m-2.00m DARK BROWN CLAY 2.00m-7.00m LIGHT BROWN CLAY 7.00m-9.10m GRAVELS 9.10m-21.50m COAL 21.50m-23.90m SAND 23.90m-27.50m COAL-SMALL BANDS SAND 27.50m-28.10m SAND 28.10m-33.50m COAL 33.50m-36.50m FINE SAND 36.50m-42.50m BLUE CLAYS 42.50m-44.90m COARSE SANDS 44.90m-52.50m BROWN CLAY 52.50m-53.00m SAND 53.00m-53.50m WHITE CLAY 53.50m-55.90m FINE SAND 55.90m-59.50m CLAY	0.00m-43.00m INNER LINING - CASING = Steel 43.00m-45.00m INNER LINING - SCREEN = Steel 45.00m-53.00m INNER LINING - CASING = Steel 53.00m-55.50m INNER LINING - SCREEN = Steel		43.00m-45.00m Sand 53.00m-55.50m Sand	1982-12-24	1550	North West
WRK978683							1556	North West
87791	Not Known	0.00m-0.60m BLACK EARTH 0.60m-1.80m BLACK CLAY 1.80m-6.90m SANDY BROWN CLAY 6.90m-9.00m CEMENTED GRAVELS 9.00m-22.20m BROWN COAL 22.20m-24.30m FINE GRAVEL AQUIFER	0.00m-22.50m INNER LINING - CASING = Galvanised Iron 22.50m-24.30m INNER LINING - SCREEN = Galvanised Iron		22.50m-24.30m Gravel	1982-10-18	1572	North West

Bore Id	Use Type	Drillers Log	Construction	Latest Water Levels	Geology	Completed Date	Dist (m)	Dir
116326	Groundwater Investigation	0.00m-0.15m TOP SOIL 0.15m-1.50m SILTY CLAY RED/BROWN 1.50m-2.00m SANDY CLAY YELLOW 2.00m-3.00m SILTY CLAY BROWN/GREY 3.00m-6.00m BASALT BROWN/GREY CLAY SEAMS	-0.50m-4.90m INNER LINING - CASING = Pvc 4.90m-6.00m INNER LINING - SCREEN = Pvc 1.90m-2.90m OUTER LINING - GRAVEL = Bentonite 2.90m-5.90m OUTER LINING - GRAVEL = Gravel			1993-07-06	1573	South
116330	Groundwater Investigation	0.00m-2.90m SILTY CLAY BROWN 2.90m-9.00m BASALT 9.00m-13.00m FINE SAND SOME GRAVEL 13.00m-15.00m SILTY CLAY 15.00m-17.50m SILTY SAND 17.50m-19.00m SILTY CLAY 19.00m-27.00m BASALT 27.00m-30.00m SILTY CLAY 30.00m-42.50m BASALT 42.50m-56.00m SAND SOME CLAYEY 56.00m-63.00m SAND CLAY/CLAYEY SAND 63.00m-68.00m CLAY SILTY/DARK GREY 68.00m-77.50m COAL CLAYEY	-0.50m-55.00m INNER LINING - CASING = Pvc 55.00m-58.00m INNER LINING - SCREEN = Pvc 58.00m-73.00m INNER LINING - CASING = Pvc 73.00m-76.00m INNER LINING - SCREEN = Pvc 0.00m-36.00m OUTER LINING - GRAVEL = Cement 36.00m-39.00m OUTER LINING - GRAVEL = Bentonite 39.00m-76.00m OUTER LINING - GRAVEL = Gravel			1993-07-12	1581	South
72633	Irrigation		0.00m-4.00m INNER LINING - CASESCRN = Asbestos Cement 3.05m-5.49m INNER LINING - SCREEN = Not Known			1982-12-02	1590	North West
WRK052558	Irrigation	0.00m-7.00m CLAY / TOP SOIL 7.00m-9.00m SAND 9.00m-19.00m COAL 19.00m-21.00m GRAVEL 21.00m-22.50m COAL 22.50m-25.50m CLAY 25.50m-27.50m GRAVEL 27.50m-30.00m CLAY	0.00m-7.00m INNER LINING - CASING = Pvc 7.00m-9.00m INNER LINING - SCREEN = Stainless Steel 9.00m-19.00m INNER LINING - CASING = Pvc 19.00m-23.00m INNER LINING - SCREEN = Stainless Steel 23.00m-24.50m INNER LINING - CASING = Pvc 24.50m-27.00m INNER LINING - SCREEN = Stainless Steel 27.00m-30.00m INNER LINING - CASING = Pvc 0.00m-30.00m OUTER LINING - GRAVEL = Gravel		7.00m-9.00m Sand 24.50m-27.00m Gravel	2009-12-23	1606	North West
326033	Non Groundwater					1953-12-31	1663	West
WRK095839	Irrigation	0.00m-5.00m BROWN CLAY 5.00m-8.00m CLAYAND GRAVEL 8.00m-18.00m BLACK CLAY AND FINE SAND 18.00m-30.00m FINE TO COARSE GRAVEL	0.00m-24.00m INNER LINING - CASING = Pvc 24.00m-30.00m INNER LINING - SLOT = Pvc 0.00m-2.00m OUTER LINING - GRAVEL = Cement 2.00m-30.00m OUTER LINING - GRAVEL = Gravel		24.00m-30.00m Sand	2016-09-06	1667	North West
326030	Non Groundwater					1953-12-31	1672	West
WRK095841	Irrigation	0.00m-2.00m SILTY CLAY 2.00m-6.00m GRAVELSAND CLAY 6.00m-25.00m LIGNITECLAY AND GRAVELS 25.00m-38.00m COARSE GRAVELS	0.00m-28.00m INNER LINING - CASING = Pvc 28.00m-38.00m INNER LINING - SLOT = Pvc 0.00m-2.00m OUTER LINING - GRAVEL = Cement 2.00m-38.00m OUTER LINING - GRAVEL = Gravel		28.00m-38.00m Gravel	2016-09-04	1689	North
326040	Non Groundwater					1953-12-31	1694	West
326029	Non Groundwater					1953-12-31	1698	West
326034	Non Groundwater					1953-12-31	1703	West
WRK038975	Irrigation	0.00m-0.40m SILTY BROWN TOPSOIL 0.40m-1.50m SILTY BROWN SUBSOIL 1.50m-8.10m BROWN SEDIMENTARY CLAY 8.10m-10.00m YELLOW GRAVEL AND CLAY 10.00m-12.00m LARGE GRAVEL WASH 12.00m-0.00m BROWN COAL	0.00m-10.30m INNER LINING - CASING = Galvanised Iron 10.30m-12.00m INNER LINING - SCREEN = Galvanised Iron		10.30m-12.00m Gravel	1982-10-23	1707	North West
326076	Non Groundwater					1981-10-29	1711	South
WRK974841	Irrigation	0.00m-0.80m BROWN TOP SOIL 0.80m-2.00m GRAY CLAY 2.00m-4.50m DAMP BROWN SANDY CLAY 4.50m-6.00m SILT 6.00m-8.50m SAND 8.50m-9.00m COARSE GRAVEL & PEBBLES	0.00m-0.90m INNER LINING - CASING = Steel 0.00m-0.50m OUTER LINING - GRAVEL = Cement			2006-09-27	1718	North West

Bore Id	Use Type	Drillers Log	Construction	Latest Water Levels	Geology	Completed Date	Dist (m)	Dir
WRK990810							1786	West
WRK043786	Domestic & Stock, Irrigation	0.00m-1.20m TOP SOIL 1.20m-4.00m STIFF BROWN CLAY 4.00m-7.00m SANDY CLAY 7.00m-34.00m BROWN COAL 34.00m-67.00m GREY SILTY CLAYEY SANDS	0.00m-22.00m INNER LINING - CASING = Pvc 22.00m-66.00m INNER LINING - SLOT = Pvc Class 12		22.00m-66.00m Sand	2003-07-17	1810	North West
144965	Observation, State Observation Network	0.00m-3.80m TOP SOIL & CLAYS 3.80m-12.00m SILTY SANDS & GRAVEL	0.00m-5.00m INNER LINING - CASING = Pvc Class 12 5.00m-8.00m INNER LINING - SCREEN = Pvc Class 12 8.00m-9.00m INNER LINING - CASING = Pvc Class 12 3.00m-4.10m OUTER LINING - GRAVEL = Bentonite 4.10m-12.00m OUTER LINING - GRAVEL = Gravel	Date/time: 2020-05-29 0934 Quality: 43 WLMP: 3.52m DBNS: RWL:		2001-05-18	1842	North West
144963	Observation, State Observation Network	0.00m-3.00m TOP SOIL & CLAY 3.00m-26.32m SILTY SANDS & GRAVEL	0.00m-20.00m INNER LINING - CASING = Pvc Class 12 20.00m-23.00m INNER LINING - SCREEN = Pvc Class 12 23.00m-24.00m INNER LINING - CASING = Pvc Class 12 18.50m-19.60m OUTER LINING - GRAVEL = Bentonite 19.60m-26.32m OUTER LINING - GRAVEL = Gravel	Date/time: 2020-05-29 0926 Quality: 43 WLMP: 9.64m DBNS: RWL:		2001-05-20	1843	North West
326015	Non Groundwater					1944-12-31	1899	West
87796	Not Known					1987-06-01	1937	South West
WRK985512	Domestic & Stock	1.00m-2.00m SANDY TOPSOIL 2.00m-5.00m SILTY CLAY 6.00m-10.00m HEAVY GRAVELS 10.00m-11.00m SILTY CLAY 11.00m-15.00m SANDS & GRAVELS	3.00m-15.00m INNER LINING - CASING = Pvc 0.00m-1.00m OUTER LINING - GRAVEL = Bentonite 1.00m-15.00m OUTER LINING - GRAVEL = Gravel			1950-01-01	1987	North East

Groundwater Boreholes

Parwan Precinct Structure Plan, Parwan, VIC 3340

Boreholes (Earth Resources Database)

Boreholes from the Earth Resources dataset, within the dataset buffer:

Bore Id	Bore Type	Company	Usage	Method	Status	Drill Date	Depth	Elevation	Accuracy (m)	Dist (m)	Direct
326003		Department of Manufacturing & Industry Development				31/12/1944	22.86	120.00	10	0	Onsite
326043		Private Individual/Corporation				31/05/1947	28.05	101.90	10	0	Onsite
326004		Department of Manufacturing & Industry Development				31/12/1944	14.33	86.26	10	140	North
326044		Private Individual/Corporation				31/05/1947	20.77	91.10	10	150	North West
326049		Private Individual/Corporation				31/05/1947	13.11	96.60	10	214	North West
326048		Private Individual/Corporation				31/05/1947	31.10	94.20	10	233	North West
326050		Private Individual/Corporation				31/05/1947	24.70	98.50	10	318	West
326051		Private Individual/Corporation				31/05/1947	35.98	95.40	10	337	West
942610		CRA Exploration Pty Ltd		Rotary mud drilling	Completed	11/02/1984	74.70	120.08	110	397	West
326079		Private Individual/Corporation		Rotary (diamond/drag bit)		11/02/1984	74.70	100.00	300	401	West
326042		Private Individual/Corporation				31/05/1947	35.37	94.50	10	437	North West
319777		State Electricity Commission of Victoria				02/07/1946	40.80	95.00	10	465	North
326001		Department of Manufacturing & Industry Development				31/12/1943	53.95	109.73	10	471	West
326000		Department of Manufacturing & Industry Development				31/12/1943	40.54	97.84	10	521	West
79210		Private Individual/Corporation	Irrigation	Rotary (diamond/drag bit)		20/11/1982	56.00		100	527	North
326047		Private Individual/Corporation				31/05/1947	19.82	91.40	10	546	North West
326045		Private Individual/Corporation				31/05/1947	20.73	89.90	10	652	North West
326052		Private Individual/Corporation				31/05/1947	72.20	92.70	10	657	North West

Bore Id	Bore Type	Company	Usage	Method	Status	Drill Date	Depth	Elevation	Accuracy (m)	Dist (m)	Direct
326002		Department of Manufacturing & Industry Development				31/12/1944	45.41	107.90	10	698	North West
326046		Private Individual/Corporation				31/05/1947	19.82	91.70	10	789	North West
326069		Private Individual/Corporation				31/07/1948	123.70	100.00	10	819	West
79214		Private Individual/Corporation	Irrigation	Percussion (cable)		17/05/1984	36.57		100	843	North
326041		State Electricity Commission of Victoria				20/09/1979	45.50	96.40	10	861	West
326071		Private Individual/Corporation				19/07/1949	57.90	100.00	10	888	West
326021		Department of Manufacturing & Industry Development				31/12/1953	59.44	107.60	10	942	West
326017		Department of Manufacturing & Industry Development				31/12/1952	61.88	110.60	10	945	West
326018		Department of Manufacturing & Industry Development				31/12/1953	61.88	107.60	10	948	West
326016		Department of Manufacturing & Industry Development				31/12/1952	61.88	114.30	10	966	West
326060		Private Individual/Corporation				07/08/1947	47.50	110.00	10	968	West
326057		Private Individual/Corporation				15/07/1960	54.90	100.70	10	988	West
326056		Private Individual/Corporation				12/07/1960	51.80	99.40	10	1015	West
325990		Department of Manufacturing & Industry Development				31/12/1942	21.95	121.92	10	1016	North West
325989		Department of Manufacturing & Industry Development				31/12/1942	22.86	121.92	10	1073	North West
326062		Private Individual/Corporation				12/08/1947	12.20	100.00	10	1089	West
326055		Private Individual/Corporation				05/07/1960	51.80	100.20	10	1121	West
326019		Department of Manufacturing & Industry Development				31/12/1953	66.14	116.40	10	1122	West
326022		Department of Manufacturing & Industry Development				31/12/1953	63.70	113.40	10	1123	West
326020		Department of Manufacturing & Industry Development				31/12/1953	68.58	121.30	10	1152	West
326026		Department of Manufacturing & Industry Development				31/12/1953	74.37	134.40	10	1153	West

Bore Id	Bore Type	Company	Usage	Method	Status	Drill Date	Depth	Elevation	Accuracy (m)	Dist (m)	Direct
326058		Private Individual/Corporation				22/07/1960	56.10	102.50	10	1161	West
326072		Private Individual/Corporation				15/07/1949	64.60	105.00	10	1169	West
79212		Private Individual/Corporation	Irrigation	Rotary (diamond/drag bit)		13/01/1983	58.40		100	1176	North West
326077		Private Individual/Corporation		Rotary (diamond/drag bit)		12/11/1983	122.80	140.00	300	1179	South East
942608		CRA Exploration Pty Ltd		Rotary mud drilling	Completed	12/11/1983	122.80	144.08	110	1205	South East
326061		Private Individual/Corporation				11/08/1947	9.80	120.00	10	1213	West
326054		Private Individual/Corporation				29/06/1960	53.90	100.90	10	1216	West
87789		Private Individual/Corporation	Irrigation	Rotary (diamond/drag bit)		30/10/1982	39.00		100	1277	North West
326053		Private Individual/Corporation				22/07/1960	55.80	103.00	10	1293	West
326024		Department of Manufacturing & Industry Development				31/12/1953	75.59	128.90	10	1296	West
326025		Department of Manufacturing & Industry Development				31/12/1953	75.59	129.50	10	1310	West
326059		Private Individual/Corporation				31/07/1947	50.00	110.00	10	1331	West
326027		Department of Manufacturing & Industry Development				31/12/1953	74.68	132.60	10	1335	West
87790		Private Individual/Corporation	Irrigation	Rotary (diamond/drag bit)		09/11/1982	46.00		100	1343	North West
326063		Private Individual/Corporation				14/08/1947	12.20	100.00	10	1369	West
326023		Department of Manufacturing & Industry Development				31/12/1953	72.24	125.00	10	1385	West
326032		Department of Manufacturing & Industry Development				31/12/1953	82.30	137.70	10	1479	West
326031		Department of Manufacturing & Industry Development				31/12/1953	82.60	137.70	10	1491	West
87795		Private Individual/Corporation	Domestic water supply	Dragline/back hoe/Caldwell bkt		31/07/1986	4.22		100	1491	North West
87795		Private Individual/Corporation	Fire fighting/Sports/general	Dragline/back hoe/Caldwell bkt		31/07/1986	4.22		100	1491	North West
72622		Private Individual/Corporation				14/10/1967	45.11	95.00	300	1513	North West
326028		Department of Manufacturing & Industry Development				31/12/1953	75.59	134.40	10	1517	West

Bore Id	Bore Type	Company	Usage	Method	Status	Drill Date	Depth	Elevation	Accuracy (m)	Dist (m)	Direct
326035		Department of Manufacturing & Industry Development				31/12/1953	85.34	132.90	10	1521	West
87788		Private Individual/Corporation	Irrigation	Percussion (cable)		20/10/1982	24.30		100	1540	North West
72633		Private Individual/Corporation	Irrigation	Shaft/Well		02/12/1982	5.49		100	1612	North West
326033		Department of Manufacturing & Industry Development				31/12/1953	82.30	137.70	10	1664	West
326030		Department of Manufacturing & Industry Development				31/12/1953	78.64	137.70	10	1673	West
326040		Department of Manufacturing & Industry Development				31/12/1953	77.72	132.90	10	1696	West
326029		Department of Manufacturing & Industry Development				31/12/1953	21.95	135.60	10	1699	West
326034		Department of Manufacturing & Industry Development				31/12/1953	90.83	136.20	10	1705	West
326076		Private Individual/Corporation		Rotary (diamond/drag bit)		29/10/1981	134.00	140.00	300	1710	South
942649		CRA Exploration Pty Ltd		Rotary mud drilling	Completed	29/10/1981	134.00	141.14	25	1711	South
72632		Private Individual/Corporation	Domestic water supply	Rotary (diamond/drag bit)		27/10/1982	7.93		100	1800	North West
326015		Department of Manufacturing & Industry Development				31/12/1944	43.28	137.16	10	1901	West
87796		Private Individual/Corporation		Air Percussion/Air Rotary	Abandoned	01/06/1987	42.00		100	1939	South West
87792		Private Individual/Corporation	Irrigation	Percussion (cable)		22/10/1982	28.60		100	1971	North West

Boreholes (Federation University)

Boreholes from the Federation University Australia dataset, within the dataset buffer:

Bore Id	Authority	Type	Uses	Initial TD	Log	Dist (m)	Direct
141831		Groundwater	Domestic Stock		D: 0.000m-36.000m Hard Fractured Basalt D: 36.000m-62.000m Hard Practured Basalt D: 62.000m-99.000m Orange/Brown Clay D: 99.000m-144.000m Brown Ligneous Clay/Sand D: 144.000m-167.000m Hard Blue Sandstone	0	Onsite

Bore Id	Authority	Type	Uses	Initial TD	Log	Dist (m)	Direct
326003	Victorian Mines Department (1909 - 1977)		Non Groundwater		D: 0.000m-0.300m Loam D: 0.300m-0.600m Red Clay D: 0.600m-1.500m Basalt D: 1.500m-6.400m Clay, Gravel, And Basalt D: 6.400m-11.900m Yellow Clay D: 11.900m-12.200m Ligneous Clay D: 12.200m-21.300m Brown Coal D: 21.300m-21.900m Ligneous Clay D: 21.900m-22.900m Sandy Clay	0	Onsite
326043	Victorian Mines Department (1909 - 1977)		Non Groundwater		D: 0.000m-21.600m No Details Available D: 21.600m-21.600m Brown Coal D: 21.600m-28.100m No Details Available	0	Onsite
326004	Victorian Mines Department (1909 - 1977)		Non Groundwater		D: 0.000m-0.300m Loam D: 0.300m-1.800m Grey Clay D: 1.800m-4.900m Grey And Yellow Clay D: 4.900m-5.200m Sand And Gravel D: 5.200m-7.900m Drift Sand And Gravel D: 7.900m-12.800m Brown Coal D: 12.800m-13.100m Ligneous Clay D: 13.100m-14.300m Yellow Clay	139	North
326044	Victorian Mines Department (1909 - 1977)		Non Groundwater		D: 0.000m-8.500m No Details Available D: 8.500m-18.700m Brown Coal D: 18.700m-20.800m No Details Available	149	North West
326049	Victorian Mines Department (1909 - 1977)		Non Groundwater		D: 0.000m-13.100m No Details Available - No Coal Found	212	North West
326048	Victorian Mines Department (1909 - 1977)		Non Groundwater		D: 0.000m-9.400m No Details Available D: 9.400m-11.500m Brown Coal D: 11.500m-31.100m No Details Available	231	North West
326050	Victorian Mines Department (1909 - 1977)		Non Groundwater		D: 0.000m-11.800m No Details Available D: 11.800m-22.400m Brown Coal D: 22.400m-24.700m No Details Available	316	West
326051	Victorian Mines Department (1909 - 1977)		Non Groundwater		D: 0.000m-9.400m No Details Available D: 9.400m-17.400m Brown Coal D: 17.400m-36.000m No Details Available	335	West
942610	Exploration Company - Minerals and Petroleum	Coal	Non Groundwater			368	West
326079	Department of Minerals and Energy (1977 - 1985)		Non Groundwater			399	West
S9030095/1		Groundwater				419	North
326042	Victorian Mines Department (1909 - 1977)		Non Groundwater		D: 0.000m-9.100m No Details Available D: 9.100m-33.200m Brown Coal D: 33.200m-35.400m No Details Available	436	North West
79210		Groundwater	Irrigation		D: 0.000m-2.000m Dry Light Brown Seds D: 2.000m-4.000m Moist Light Brown Clays Sand Sediments D: 4.000m-6.000m Gre Clays And Seds (High Clay) D: 6.000m-8.000m Grey Seds Low Clay Content .23 Metres Low/Sph Round And Ang D: 8.000m-10.000m Up To .05 Metre Low/Sph Round And Ang Pebbles D: 10.000m-14.000m Coal And Angular Quartz .08 Metre Stone D: 14.000m-16.000m Coal (Dense) And Ang Quartz D: 16.000m-18.000m Coal (Dense) Very Little Stone D: 18.000m-20.000m Coal D: 20.000m-22.000m Carb. Coarse Grain Seds D: 22.000m-24.000m Coal And Seds. A Few .08 Metre Pebbles D: 24.000m-26.000m Coal And Seds D: 26.000m-28.000m Coal And Little Sedimentation D: 28.000m-32.000m Coal And Seds 1 Mm Ang Pebs D: 32.000m-38.000m Carb. Seds Evenly Sorted Medium Grain D: 38.000m-40.000m Dark Carb Sedaments Med Grain Poor/Sorted D: 40.000m-42.000m Light Brown Carb. Seds D: 42.000m-56.000m Quartz Pebbles Ranging From 2 Mm To 4 Mm And Carb Silts	439	North

Bore Id	Authority	Type	Uses	Initial TD	Log	Dist (m)	Direct
319777	State Electricity Commission (1919 - 1993)		SEC Bores (Use unidentified)		G: 0.000m-6.400m Silt G: 6.400m-7.900m Gravel G: 7.900m-9.100m C = , Gdse = , H = , N = , Volatiles = 47.3 G: 7.900m-10.700m Inferior Coal G: 9.100m-10.700m C = , Gdse = , H = , N = , Volatiles = 45.5 G: 10.700m-12.200m Coal Brown G: 10.700m-12.200m C = , Gdse = , H = , N = , Volatiles = 45.9 G: 12.200m-16.500m Inferior Coal G: 12.200m-13.700m C = , Gdse = , H = , N = , Volatiles = 44.8 G: 16.500m-18.000m Coarse Sand G: 18.000m-21.900m Inferior Coal G: 18.000m-21.900m C = , Gdse = , H = , N = , Volatiles = 43.9 G: 21.900m-25.000m Brown Clay G: 25.000m-40.800m Sand & Gravel	465	North
326001	Victorian Mines Department (1909 - 1977)		Non Groundwater		D: 0.000m-0.600m Red Sandy Loam D: 0.600m-1.200m Red Sand D: 1.200m-1.800m Red Sandy Clay D: 1.800m-8.500m Red Clay D: 8.500m-9.800m Clay And Gravel D: 9.800m-13.100m Grey And Yellow Clay D: 13.100m-14.000m Yellow Sand D: 14.000m-17.100m Grey Clay D: 17.100m-20.100m Dark Green Pug D: 20.100m-23.200m Yellow Sand D: 23.200m-52.700m Brown Coal D: 52.700m-53.000m Ligneous Clay D: 53.000m-54.000m Yellow Clay Water Struck At 20.12 Metres	469	West
129731		Groundwater	Groundwater Investigation		D: 0.000m-0.500m Top Soil D: 0.500m-4.300m Stiff Grey Brown Silty Clay D: 4.300m-8.500m Firm Brown Clay Silty With Sand & Gravel	472	North West
326000	Victorian Mines Department (1909 - 1977)		Non Groundwater		D: 0.000m-0.300m Red Loam D: 0.300m-1.800m Red Sand D: 1.800m-4.300m Clay, Sand, And Gravel D: 4.300m-4.900m Sand D: 4.900m-8.200m Grey And Yellow Clay D: 8.200m-9.800m Sand And Gravel D: 9.800m-10.100m Yellow Clay D: 10.100m-39.900m Brown Coal D: 39.900m-40.200m Ligneous Clay D: 40.200m-40.500m Brown Clay Water Struck At 4.57 Metres Standing At 4.57 Metres	519	West
S9036227/1		Groundwater				541	North
S9037104/1		Groundwater			D: 0.000m-2.000m Top Soil D: 2.000m-4.000m Clay D: 4.000m-8.000m Cobbles D: 8.000m-13.000m Coal D: 13.000m-17.000m Sand D: 17.000m-23.000m Coal D: 23.000m-30.000m Sand & Gravel	541	North
326047	Victorian Mines Department (1909 - 1977)		Non Groundwater		D: 0.000m-7.600m No Details Available D: 7.600m-18.200m Brown Coal D: 18.200m-19.800m No Details Available	544	North West
S9029439/1		Groundwater				568	North
WRK052747		Groundwater	Irrigation		D: 0.000m-2.000m Top Soil D: 2.000m-7.000m Gravel D: 7.000m-25.000m Grey Clay D: 25.000m-26.000m Coal D: 26.000m-30.000m Gravel	592	North
326045	Victorian Mines Department (1909 - 1977)		Non Groundwater		D: 0.000m-6.700m No Details Available D: 6.700m-15.200m Brown Coal D: 15.200m-20.700m No Details Available	651	North West
326052	Victorian Mines Department (1909 - 1977)		Non Groundwater		D: 0.000m-9.400m No Details Available D: 9.400m-27.400m Brown Coal D: 27.400m-42.100m No Details Available D: 42.100m-55.100m Brown Coal D: 55.100m-72.200m No Details Available	655	North West

Bore Id	Authority	Type	Uses	Initial TD	Log	Dist (m)	Direct
87790		Groundwater	Irrigation		D: 0.000m-2.000m Brown Seds And Clays D: 2.000m-6.000m Water Bearing Brown Seds And Clays D: 6.000m-8.000m Brown Clays D: 8.000m-10.000m Quartz Sands 1 Inch Very Angular Rocks D: 10.000m-16.000m Gravels And Sands Decreasing In Gravel D: 16.000m-20.000m Coal And Sediments D: 20.000m-26.000m Coal And Sediments D: 26.000m-28.000m Coal D: 28.000m-34.000m Coal And Sediments D: 34.000m-40.000m Coal And Sediments D: 40.000m-46.000m Carbonatious Med Grain Seds	671	North West
326002	Victorian Mines Department (1909 - 1977)		Non Groundwater		D: 0.000m-0.600m Sand And Gravel D: 0.600m-0.900m Clay And Gravel D: 0.900m-1.200m Basalt D: 1.200m-1.800m Clay And Gravel D: 1.800m-2.700m Basalt D: 2.700m-3.700m Gravel D: 3.700m-4.900m Yellow Sand D: 4.900m-7.300m Grey Clay D: 7.300m-8.500m Yellow Clay D: 8.500m-10.400m Grey Sandy Clay D: 10.400m-12.200m Grey Clay D: 12.200m-16.800m Grey Sandy Clay D: 16.800m-18.300m Grey Yellow Sandy Clay D: 18.300m-19.500m Yellow Sand D: 19.500m-20.100m Ligneous Clay D: 20.100m-44.500m Brown Coal D: 44.500m-45.400m Ligneous Clay	697	North West
146753		Groundwater	Groundwater Investigation		D: 0.000m-5.500m Clay D: 5.500m-6.500m Gravel And River Rocks	777	North
S62209/1		Groundwater	Irrigation			782	North
326046	Victorian Mines Department (1909 - 1977)		Non Groundwater		D: 0.000m-9.400m No Details Available D: 9.400m-19.700m Brown Coal D: 19.700m-19.800m No Details Available	788	North West
326069	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.900m Soil G: 0.900m-3.400m Black Sandy Clay G: 3.400m-4.900m Clay & Gravel G: 4.900m-6.100m Black Sandy Clay G: 6.100m-7.900m Grey Sandy Clay G: 7.900m-11.600m Gravel Wet G: 11.600m-12.200m Fine Sand Wet G: 12.200m-13.700m Ligneous Silt G: 13.700m-42.700m Coal Brown G: 15.200m-30.500m C = 60.8, Gdse = 25.77, H = 4.3, N = 0.61, Volatiles = 50.5 G: 30.500m-42.700m C = 62, Gdse = 26.47, H = 4.4, N = 0.58, Volatiles = 52.6 G: 42.700m-45.700m Ligneous Silt G: 45.700m-50.300m Coarse Sand Wet G: 50.300m-51.800m Ligneous Silt G: 51.800m-52.700m Coal Brown G: 52.700m-56.700m Ligneous Silt G: 56.700m-58.200m Fine Sand Wet G: 58.200m-59.700m Ligneous Silt Cont Quartz G: 59.700m-60.000m Fine Sand & Quartz G: 60.000m-61.300m Fine Sand Wet G: 61.300m-101.500m Grey Clay G: 101.500m-101.800m Sandstone G: 101.800m-114.300m Grey Clay G: 114.300m-117.300m Ligneous Clay G: 117.300m-123.400m Grey Clay G: 123.400m-123.700m Sandstone [End Of Hole :- Unconsolidated : Coarse Sand Wet]	817	West
S9030088/1		Groundwater				819	North
129730		Groundwater	Groundwater Investigation		D: 0.000m-0.500m Top Soil D: 0.500m-3.500m Stiff Grey Brown Silt Clay D: 3.500m-8.000m Firm Brown Clayey Silt With Sandy Gravel D: 8.000m-8.500m Brown Coal	826	North West

Bore Id	Authority	Type	Uses	Initial TD	Log	Dist (m)	Direct
326041	State Electricity Commission (1919 - 1993)		SEC Bores (Use unidentified)		G: 0.000m-0.500m Mottled Clay G: 0.500m-9.200m Sand & Gravel G: 9.200m-9.400m Inferior Coal G: 9.400m-10.800m Sand & Gravel G: 10.800m-42.000m Coal Brown G: 14.000m-14.600m C = 62.2, Gdse = 24.17, H = 4.4, N = 0.56, Volatiles = 47.4 G: 18.000m-18.600m C = 63.5, Gdse = 24.74, H = 4.6, N = 0.58, Volatiles = 48.8 G: 21.000m-21.700m C = 65.3, Gdse = 25.06, H = 4.6, N = 0.59, Volatiles = 49 G: 26.400m-26.800m C = 65.6, Gdse = 26.01, H = 4.9, N = 0.59, Volatiles = 50.5 G: 27.000m-27.300m C = 65.3, Gdse = 25.95, H = 4.9, N = 0.57, Volatiles = 51.2 G: 29.500m-30.000m C = 66.2, Gdse = 26.38, H = 5, N = 0.43, Volatiles = 50 G: 31.400m-31.700m C = 66.1, Gdse = 25.72, H = 4.6, N = 0.62, Volatiles = 48.5 G: 33.000m-33.300m C = 66.9, Gdse = 26.7, H = 5.2, N = 0.57, Volatiles = 53.4 G: 37.000m-37.600m C = 66.5, Gdse = 26.63, H = 5.2, N = 0.56, Volatiles = 53.1 G: 40.000m-40.600m C = 66.4, Gdse = 26.3, H = 4.9, N = 0.57, Volatiles = 50.5 G: 42.000m-43.800m Inferior Coal G: 43.800m-44.600m Brown Sandy Clay G: 44.600m-45.500m Sand & Pyrites	859	West
326071	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-11.000m Sand & Clay G: 11.000m-53.300m Coal Brown G: 53.300m-56.100m Clay G: 56.100m-57.900m Sand	887	West
140688		Groundwater	Stock Irrigation Dewatering			900	West
326021	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.600m Surface Soil G: 0.600m-2.700m Brown Sandy Clay G: 2.700m-6.400m Grey Sandy Clay G: 6.400m-11.000m Hard Quartz G: 11.000m-12.800m Yellow Sand G: 12.800m-14.000m White Sandy Clay G: 14.000m-15.200m Grey Sandy Clay G: 15.200m-15.900m Ligneous Clay G: 15.900m-56.100m Brown Coal G: 21.900m-37.200m C = 64.3, Gdse = 24.75, H = 4.6, N = 0.6, Volatiles = 48.5 G: 37.200m-49.400m C = 64.8, Gdse = 25.62, H = 4.9, N = 0.6, Volatiles = 49.6 G: 56.100m-57.900m Ligneous Clay G: 57.900m-59.400m Grey Sand	940	West
326017	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.600m Surface Soil G: 0.600m-2.700m Brown Sandy Clay G: 2.700m-12.500m Light Brown Sandy Clay G: 12.500m-13.400m Hard Sandstone G: 13.400m-16.800m White Clay G: 16.800m-19.500m White And Yellow Sandy Clay G: 19.500m-21.300m Brown Sandy Clay G: 21.300m-39.600m C = 61.4, Gdse = 24.55, H = 4.3, N = 0.64, Volatiles = 46.7 G: 21.300m-53.300m Brown Coal G: 39.600m-51.800m C = 63.1, Gdse = 25.47, H = 4.8, N = 0.63, Volatiles = 49.5 G: 53.300m-54.900m Ligneous Clay G: 54.900m-61.900m Fine Sand	943	West
79214		Groundwater	Irrigation		D: 0.000m-4.300m Loam D: 4.300m-8.500m Gravel Old Bed D: 8.500m-9.800m Coal D: 9.800m-17.100m Sand Soupy D: 17.100m-17.700m Coal D: 17.700m-18.900m Coal D: 18.900m-24.400m Coarse Sand & Coal D: 24.400m-36.600m Medium Sand	945	North
326018	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.600m Surface Soil G: 0.600m-8.800m Brown Sandy Clay G: 8.800m-14.000m Hard Sandstone With Quartz Boulders G: 14.000m-21.000m Ligneous Clay G: 21.000m-36.300m C = 61.9, Gdse = 24.45, H = 4.4, N = 0.58, Volatiles = 48.7 G: 21.000m-52.400m Brown Coal G: 36.300m-48.500m C = 64.3, Gdse = 25.63, H = 4.8, N = 0.58, Volatiles = 50 G: 52.400m-61.900m Brown Sand	948	West

Bore Id	Authority	Type	Uses	Initial TD	Log	Dist (m)	Direct
146747		Groundwater	Groundwater Investigation		D: 0.000m-5.500m C;Ay D: 5.500m-6.500m Gravel And River Rocks	948	North
326016	Victorian Mines Department (1909 - 1977)		Non Groundwater		D: 0.000m-2.100m Coarse Gravel D: 2.100m-5.800m Fine Brown Cemented Sand D: 5.800m-7.300m Hard Sandstone With Thin Bands Of Clay D: 7.300m-8.800m Quartz Boulder Conglomerate D: 8.800m-9.100m Hard Sandstone D: 9.100m-16.500m White Clay D: 16.500m-25.300m Brown Clay D: 25.300m-55.800m Brown Coal G: 29.000m-45.700m C = 62.2, Gdse = 24.86, H = 4.6, N = 0.58, Volatiles = 47.5 D: 55.800m-61.900m Brown Sand	965	West
146754		Groundwater	Groundwater Investigation		D: 0.000m-5.500m Clay D: 5.500m-6.500m Gravel And River Rocks	966	North
326060	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.300m Soil G: 0.300m-5.500m Clay G: 5.500m-6.100m Sand G: 6.100m-7.000m Sand & Gravel G: 7.000m-7.600m Clay & Gravel G: 7.600m-9.800m Gravel Wet G: 9.800m-44.800m Coal Brown G: 12.200m-17.700m C = , Gdse = 25.24, H = , N = , Volatiles = 30.5 G: 17.700m-24.300m C = , Gdse = 25.35, H = , N = , Volatiles = 28.9 G: 24.300m-31.100m C = , Gdse = 25.4, H = , N = , Volatiles = 30.4 G: 31.100m-37.700m C = , Gdse = 25.28, H = , N = , Volatiles = 31.5 G: 44.800m-45.700m Coal & Sand G: 45.700m-47.500m Clay G: 47.500m-47.500m Sand Wet	968	West
S9037886/1		Groundwater				971	West
326057	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.600m Soil G: 0.600m-5.800m Silt G: 5.800m-7.900m Gravel G: 7.900m-9.400m Clayey Silt G: 9.400m-26.200m Inferior Coal G: 26.200m-29.300m Coal Brown G: 29.300m-30.800m Inferior Coal G: 30.800m-35.400m Coal Brown G: 35.400m-36.900m Inferior Coal G: 36.900m-49.000m Coal Brown G: 49.000m-50.600m Inferior Coal G: 50.600m-52.100m Coal Brown G: 52.100m-53.600m Inferior Coal G: 53.600m-54.900m Ligneous Silty Clay	986	West
326056	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-2.700m Silty Soil G: 2.700m-3.700m Yellow Silty Clay G: 3.700m-4.300m Yellow Clayey Sand G: 4.300m-4.900m Sandy Clay G: 4.900m-8.800m Gravel Wet G: 8.800m-9.400m Mottled Clay & Gravel G: 9.400m-17.000m Inferior Coal G: 17.000m-49.000m Coal Brown G: 49.000m-50.600m Inferior Coal G: 50.600m-51.800m Ligneous Silty Clay	1014	West
325990	Victorian Mines Department (1909 - 1977)		Non Groundwater		D: 0.000m-1.500m Black Soil D: 1.500m-7.600m Yellow Clay D: 7.600m-8.200m Sand D: 8.200m-11.900m Brown Coal D: 11.900m-21.900m Brown Coal Water Struck At 4.57 Metres	1015	North West
325989	Victorian Mines Department (1909 - 1977)		Non Groundwater		D: 0.000m-1.500m Black Soil D: 1.500m-3.000m Grey Pug D: 3.000m-5.200m Yellow Clay D: 5.200m-6.700m Yellow Sand D: 6.700m-7.900m Blue Clay D: 7.900m-20.900m Brown Coal D: 20.900m-22.900m Brown Pug Water Struck At 3.66 Metres	1072	North West
S9027653/1		Groundwater	Domestic and Stock			1082	North West

Bore Id	Authority	Type	Uses	Initial TD	Log	Dist (m)	Direct
146752		Groundwater	Groundwater Investigation		D: 0.000m-5.500m Clay D: 5.500m-6.500m Gravel And River Rocks	1085	North
326062	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-1.200m Soil G: 1.200m-4.600m Clay G: 4.600m-8.800m Gravel Wet G: 8.800m-12.200m Coal Brown	1087	West
87792		Groundwater	Irrigation		D: 0.000m-0.400m Rich Black Earth D: 0.400m-1.800m Black Clay D: 1.800m-4.700m Silty Yellow Clay D: 4.700m-8.600m Large Cemented Gravels D: 8.600m-21.000m Brown Coal D: 21.000m-28.600m Silty Brown Clay	1095	North West
116327		Groundwater	Groundwater Investigation		D: 0.000m-1.000m Silty Clay Red D: 1.000m-3.000m Silty Clay Brown/Grey D: 3.000m-3.800m Sandy Clay Brown D: 3.800m-6.000m Basalt Grey	1109	South
326055	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.600m Soil G: 0.600m-0.900m Silty Soil G: 0.900m-2.100m Silt G: 2.100m-2.700m Silty Clay G: 2.700m-5.200m Mottled Clay G: 5.200m-7.000m Gravel G: 7.000m-8.500m Clayey Silt G: 8.500m-9.400m Gravel Wet G: 9.400m-15.500m Inferior Coal G: 15.500m-17.000m Coal Brown G: 17.000m-20.100m Inferior Coal G: 20.100m-24.700m Coal Brown G: 24.700m-27.700m Inferior Coal G: 27.700m-29.300m Coal Brown G: 29.300m-32.300m Inferior Coal G: 32.300m-33.800m Coal Brown G: 33.800m-35.400m Inferior Coal G: 35.400m-38.400m Coal Brown G: 38.400m-41.500m Inferior Coal G: 41.500m-43.000m Coal Brown G: 43.000m-50.600m Inferior Coal G: 50.600m-51.800m Ligneous Silty Clay	1119	West
326019	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.300m Surface Soil G: 0.300m-2.100m Coarse Clayey Gravel G: 2.100m-8.200m Brown Clay G: 8.200m-15.500m Hardstone (Quartz) G: 15.500m-21.300m Yellow Sandy Clay G: 21.300m-22.900m Ligneous Clay G: 22.900m-60.000m Brown Coal G: 22.900m-41.100m C = 63.9, Gdse = 25.24, H = 4.8, N = 0.6, Volatiles = 50.3 G: 41.100m-56.400m C = 64.5, Gdse = 25.52, H = 4.9, N = 0.6, Volatiles = 50.6 G: 60.000m-66.100m Brown Sand	1121	West
326022	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.600m Surface Soil G: 0.600m-24.700m Sandy Clay G: 24.700m-30.800m Ligneous Clay G: 30.800m-59.700m Brown Coal G: 30.800m-46.000m C = 63.6, Gdse = 25.07, H = 4.8, N = 0.6, Volatiles = 51.1 G: 46.000m-59.700m C = 63.2, Gdse = 24.91, H = 4.7, N = 0.5, Volatiles = 50.4 G: 59.700m-61.000m Ligneous Clay G: 61.000m-62.500m Grey Clay G: 62.500m-63.700m Grey Sand	1122	West
326020	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.300m Surface Soil G: 0.300m-4.300m Quartz Gravel G: 4.300m-32.300m Yellow Sandy Clay G: 32.300m-34.100m Ligneous Clay G: 34.100m-46.300m C = 61, Gdse = 23.89, H = 4.5, N = 0.6, Volatiles = 46.1 G: 34.100m-62.800m Brown Coal G: 46.300m-61.600m C = 63.9, Gdse = 25.21, H = 4.8, N = 0.6, Volatiles = 50 G: 62.800m-65.200m White Clay G: 65.200m-68.600m Grey Sand	1149	West

Bore Id	Authority	Type	Uses	Initial TD	Log	Dist (m)	Direct
326026	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.600m Surface Soil G: 0.600m-4.600m Brown Clay G: 4.600m-7.000m Grey Clayey Sand G: 7.000m-10.400m Coarse Sand And Gravel G: 10.400m-38.400m Sandy Clay G: 38.400m-39.600m Grey Sand G: 39.600m-49.100m Brown Sandy Clay G: 49.100m-71.600m Brown Coal G: 49.100m-67.300m C = 64.1, Gdse = 25.33, H = 4.8, N = 0.6, Volatiles = 49.8 G: 71.600m-72.500m Ligneous Clay G: 72.500m-73.500m Grey Sand G: 73.500m-74.400m Grey Clay	1151	West
326058	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.300m Soil G: 0.300m-3.400m Silt G: 3.400m-6.400m Brown Silty Clay G: 6.400m-9.900m Gravel Wet G: 9.900m-26.500m Inferior Coal G: 26.500m-29.600m Coal Brown G: 29.600m-32.600m Inferior Coal G: 32.600m-46.300m Coal Brown G: 46.300m-47.900m Inferior Coal G: 47.900m-52.400m Coal Brown G: 52.400m-53.900m Inferior Coal G: 53.900m-55.500m Ligneous Silty Clay G: 55.500m-56.100m Inferior Coal Silty	1159	West
326072	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-9.100m Clay & Gravel G: 9.100m-9.800m Ligneous Sand G: 9.800m-57.900m Coal Brown G: 57.900m-58.500m Fine Sand G: 58.500m-64.600m Clay	1167	West
326077	Department of Minerals and Energy (1977 - 1985)		Non Groundwater			1180	South East
144973	Department of Sustainability and Environment (2003 -)	Groundwater	State Observation Network Observation			1191	North West
144972	Department of Sustainability and Environment (2003 -)	Groundwater	State Observation Network Observation		D: 0.000m-2.800m Top Soil & Clay D: 2.800m-12.500m Silty Sand & Gravel	1192	North West
116325		Groundwater	Groundwater Investigation		D: 0.000m-0.800m Silty Clay Red/Yellow D: 0.800m-6.000m Basalt Mostly Grey	1198	South East
326061	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-2.100m Soil G: 2.100m-3.000m Sandy Clay G: 3.000m-6.100m Clay & Gravel G: 6.100m-8.200m Clay G: 8.200m-9.100m Clay & Gravel G: 9.100m-9.800m Clay & Sand G: 9.800m-9.800m Coal Brown	1211	West
326054	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.600m Soil G: 0.600m-1.200m Silty Soil G: 1.200m-3.400m Silt G: 3.400m-4.900m Mottled Clay G: 4.900m-5.800m Mottled Silty Clay G: 5.800m-6.400m Clay & Large Stones G: 6.400m-7.000m Gravel Wet G: 7.000m-7.900m Clayey Silt G: 7.900m-9.400m Inferior Coal G: 9.400m-11.000m Coal Brown G: 11.000m-12.500m Inferior Coal G: 12.500m-14.000m Coal Brown G: 14.000m-17.000m Inferior Coal G: 17.000m-23.200m Coal Brown G: 23.200m-24.700m Inferior Coal G: 24.700m-26.200m Coal Brown G: 26.200m-35.400m Inferior Coal G: 35.400m-38.400m Coal Brown G: 38.400m-39.900m Inferior Coal G: 39.900m-41.500m Coal Brown G: 41.500m-44.500m Inferior Coal G: 44.500m-50.600m Coal Brown G: 50.600m-52.100m Inferior Coal Silty G: 52.100m-53.900m Ligneous Silty Clay G: 53.900m-53.900m Sand	1214	West

Bore Id	Authority	Type	Uses	Initial TD	Log	Dist (m)	Direct
S9037886/2		Groundwater				1246	West
87789					D: 0.000m-2.000m Khaki Seds D: 2.000m-6.000m Khaki Seds And Grey Clays D: 6.000m-8.000m Water Bearing Khaki Seds And Clays (Grey) D: 8.000m-10.000m Coal Seam D: 10.000m-16.000m Carb. Seds And Clays D: 16.000m-24.000m Grey Sands Decreasing In Clay Content D: 24.000m-39.000m Grey Clays And Sediments And Carbonatious Material	1276	North West
326053	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.600m Silty Soil G: 0.600m-3.700m Brown Silty Clay G: 3.700m-5.800m Mottled Silty Clay G: 5.800m-6.400m Yellow Sandy Clay G: 6.400m-7.300m Gravel Wet G: 7.300m-8.700m Clayey Gravel Wet G: 8.700m-9.700m Ligneous Clay G: 9.700m-12.800m Inferior Coal G: 12.800m-14.300m Coal Brown G: 14.300m-15.800m Inferior Coal G: 15.800m-17.400m Coal Brown G: 17.400m-25.000m Inferior Coal G: 25.000m-26.500m Coal Brown G: 26.500m-28.000m Inferior Coal G: 28.000m-31.100m Coal Brown G: 31.100m-32.600m Inferior Coal G: 32.600m-52.400m Coal Brown G: 52.400m-53.900m Inferior Coal G: 53.900m-55.800m Ligneous Sandy Clay G: 55.800m-55.800m Sand	1291	West
326024	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.600m Surface Soil G: 0.600m-2.100m Brown Clay G: 2.100m-3.400m Grey Sand G: 3.400m-4.300m Grey Sandy Clay G: 4.300m-6.400m Grey Clay G: 6.400m-9.400m Hard Stone G: 9.400m-10.400m Yellow Clay G: 10.400m-11.300m Hard Stone G: 11.300m-17.100m Grey Clay G: 17.100m-28.700m Yellow Gravelly Clay G: 28.700m-31.100m Grey Sand G: 31.100m-34.400m Grey Clay G: 34.400m-35.100m Band Pyrites G: 35.100m-39.000m Grey Clay G: 39.000m-49.400m Ligneous Clay G: 49.400m-74.100m Brown Coal G: 49.400m-70.700m C = 63.9, Gdse = 25.25, H = 4.8, N = 0.6, Volatiles = 48.9 G: 74.100m-75.600m Grey Clay	1295	West
326025	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.300m Surface Soil G: 0.300m-0.900m Brown Clay G: 0.900m-6.100m Yellow Clay G: 6.100m-9.100m Coarse Sandy Quartz G: 9.100m-30.200m Yellow Sandy Clay G: 30.200m-43.900m Grey Clay G: 43.900m-44.500m Ligneous Clay G: 44.500m-59.700m C = 59.8, Gdse = 23.32, H = 4.3, N = 0.6, Volatiles = 45.9 G: 44.500m-72.200m Brown Coal G: 59.700m-71.900m C = 61.9, Gdse = 24.32, H = 4.6, N = 0.6, Volatiles = 47.3 G: 72.200m-72.800m Ligneous Clay G: 72.800m-75.600m Grey Clay	1309	West
326059	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.300m Soil G: 0.300m-6.400m Clay G: 6.400m-7.600m Gravel G: 7.600m-9.800m Coal Brown G: 9.800m-10.400m Clay G: 10.400m-47.200m Coal Brown G: 12.800m-18.900m C = , Gdse = 25.19, H = , N = , Volatiles = 30.7 G: 18.900m-25.000m C = , Gdse = 25.4, H = , N = , Volatiles = 30.2 G: 25.000m-31.100m C = , Gdse = 25.33, H = , N = , Volatiles = 30.9 G: 31.100m-37.200m C = , Gdse = 25.4, H = , N = , Volatiles = 29.5 G: 37.200m-43.300m C = , Gdse = 25.4, H = , N = , Volatiles = 31.5 G: 47.200m-48.800m Clay & Coal G: 48.800m-50.000m Brown Clay	1330	West

Bore Id	Authority	Type	Uses	Initial TD	Log	Dist (m)	Direct
326027	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.600m Surface Soil G: 0.600m-9.800m Brown Clay With Quartz Rocks G: 9.800m-10.400m Brown Sandy Clay G: 10.400m-13.400m Coarse Grey Sand And Gravel G: 13.400m-29.900m Yellow Sandy Clay G: 29.900m-42.700m Grey Sandy Clay G: 42.700m-47.200m Dark Grey Clay G: 47.200m-53.300m Ligneous Clay With Thin Bands Of Brown Coal G: 53.300m-71.900m C = 65.2, Gdse = 25.82, H = 5, N = 0.6, Volatiles = 49.8 G: 53.300m-71.900m Brown Coal G: 71.900m-74.700m Grey Clay	1333	West
326063	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-1.200m Soil G: 1.200m-6.100m Clay G: 6.100m-6.700m Sand G: 6.700m-8.800m Gravel Wet G: 8.800m-12.200m Coal Brown	1368	West
326023	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.300m Surface Soil G: 0.300m-0.900m Brown Clay G: 0.900m-4.300m Quartz Gravel And Clay G: 4.300m-4.900m Hard Stone G: 4.900m-17.100m Yellow Clayey Gravel G: 17.100m-18.000m Hard Stone G: 18.000m-24.400m Yellow Gravelly Clay G: 24.400m-26.200m Cementy Sandstone G: 26.200m-34.100m Grey Clay G: 34.100m-34.400m Iron Pyrites G: 34.400m-40.200m Ligneous Clay G: 40.200m-68.600m Brown Coal G: 68.600m-69.800m Ligneous Clay G: 69.800m-71.600m Grey Clay G: 71.600m-72.200m Grey Sand	1383	West
S9038729/1		Groundwater				1389	South
79212		Groundwater	Irrigation		D: 0.000m-7.600m Clays D: 7.600m-11.500m River Gravells D: 11.500m-16.500m Coal D: 16.500m-37.500m Coarse Sand D: 37.500m-58.400m White Clays D: 58.400m-0.000m Shale	1441	North West
S9032787/1		Groundwater			D: 0.000m-1.000m Silty Top Soil D: 1.000m-11.000m Silty Clay D: 11.000m-18.000m Sand D: 18.000m-24.000m Gravel D: 24.000m-30.000m Grey Clay	1477	North East
326032	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.300m Surface Soil G: 0.300m-2.100m Brown Clay G: 2.100m-8.200m Yellow Sandy Clay G: 8.200m-14.300m Gravel And Quartz G: 14.300m-35.700m Yellow Sandy Clay G: 35.700m-50.000m Grey Clay G: 50.000m-56.100m Ligneous Clay G: 56.100m-78.600m Brown Coal G: 56.100m-78.600m C = 63.1, Gdse = 24.88, H = 4.7, N = 0.6, Volatiles = 47.9 G: 78.600m-81.100m Ligneous Clay G: 81.100m-82.300m Brown Clay	1478	West
87795		Groundwater	Domestic Miscellaneous		D: 0.000m-2.000m Topsoil & Clay D: 2.000m-4.200m Sand & Gravel	1489	North West
326031	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.300m Surface Soil G: 0.300m-3.700m Brown Clay G: 3.700m-12.800m Yellow Sandy Clay G: 12.800m-15.200m Coarse Gravel And Quartz G: 15.200m-21.900m Yellow Sandy Clay G: 21.900m-23.200m Grey Sandy Gravel G: 23.200m-35.700m Sandy Clay G: 35.700m-45.100m Ligneous Clay G: 45.100m-45.700m Brown Coal G: 45.700m-50.900m Ligneous Clay G: 50.900m-66.100m C = 63.6, Gdse = 25.11, H = 4.8, N = 0.7, Volatiles = 49.7 G: 50.900m-81.100m Brown Coal G: 66.100m-78.300m C = 59.7, Gdse = 23.27, H = 4.3, N = 0.5, Volatiles = 50.2 G: 81.100m-82.300m Ligneous Clay G: 82.300m-82.600m Grey Clay	1490	West
S9019187/2		Groundwater	Commercial			1494	North

Bore Id	Authority	Type	Uses	Initial TD	Log	Dist (m)	Direct
87803	Rural Water Commission / Corporation (1984 - 1995)	Groundwater	Domestic Stock		D: 0.000m-1.500m Black Top Soil D: 1.500m-4.000m Grey Clay D: 4.000m-8.000m Brown Coal D: 8.000m-12.000m River Gravels To 50Mm D: 12.000m-21.500m Grey Clay D: 21.500m-26.000m River Gravels To 100Mm	1494	North West
140687		Groundwater	Irrigation			1508	North
72622					D: 0.000m-13.100m Silty Sand: Very Poorly Sorted Carbonaceous D: 13.100m-18.900m Sand Silty: Silt To Medium Grained Angular Carbonaceous Dirty Unconsolidated Dark Grey Water: Static Level 22' (6.71 Metres) D: 18.900m-20.100m Coal: Brown Soft Inferior D: 20.100m-21.900m Sand: Granule To Fine Grained Very Poorly Sorted Clean, Grey Translucent Quartz Consolidated D: 21.900m-22.900m Coal: Brown Soft Inferior D: 22.900m-32.900m Sand: Fine Grained Poorly Sorted Interbedded With Coarse Grained D: 32.900m-37.800m Sand: Poorly Sorted And Pebble Size D: 37.800m-42.700m Sand: Poorly Sorted And Pebble Size D: 42.700m-43.900m Silt: Carbonaceous D: 43.900m-45.100m Sand: Very Fine Grained	1512	North West
326028	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.600m Surface Soil G: 0.600m-12.800m Brown Clay G: 12.800m-15.500m Hard Quartz Rock And Gravel G: 15.500m-22.600m Yellow And White Sandy Clay G: 22.600m-23.500m Hard Quartz Rocks G: 23.500m-39.600m Grey Clay G: 39.600m-42.700m Dark Grey Clay G: 42.700m-57.300m Ligneous Clay G: 57.300m-72.800m C = 67.9, Gdse = 27.09, H = 5.2, N = 0.5, Volatiles = 53.6 G: 57.300m-72.800m Brown Coal G: 72.800m-74.700m Ligneous Clay G: 74.700m-75.600m Grey Clay	1515	West
326035	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.300m Surface Soil G: 0.300m-2.400m Brown Clay G: 2.400m-7.000m Yellow Sandy Clay G: 7.000m-11.600m Gravel And Quartz G: 11.600m-14.600m Yellow Clay G: 14.600m-21.300m Yellow Sandy Clay G: 21.300m-22.300m Brown Sandy Clay G: 22.300m-27.400m Yellow And White Sandy Clay G: 27.400m-29.900m Hard Gravel And Quartz G: 29.900m-44.500m Brown Sandy Clay G: 44.500m-47.500m Ligneous Clay G: 47.500m-62.800m C = 63.5, Gdse = 25.05, H = 4.7, N = 0.7, Volatiles = 49.1 G: 47.500m-82.600m Brown Coal G: 62.800m-78.000m C = 66.8, Gdse = 26.56, H = 5.1, N = 0.6, Volatiles = 51.3 G: 82.600m-85.300m Brown Clay	1521	West
87788					D: 0.000m-0.500m Rich Black Earth D: 0.500m-1.500m Black Clay D: 1.500m-7.200m Sandy Yellow Clay D: 7.200m-9.000m Layer Cemented Gravel D: 9.000m-22.000m Brown Coal D: 22.000m-24.300m Fine Gravel Aquifer	1539	North West
S9033880/1		Groundwater				1540	West
116328		Groundwater	Groundwater Investigation		D: 0.000m-0.800m Silty Clay Yellow/Brown D: 0.800m-1.400m Clay Grey/Brown D: 1.400m-6.000m Basalt Brown/Grey	1542	South
87793	Department of Minerals and Energy (1977 - 1985)	Groundwater	Irrigation		D: 0.000m-2.000m Dark Brown Clay D: 2.000m-7.000m Light Brown Clay D: 7.000m-9.100m Gravels D: 9.100m-21.500m Coal D: 21.500m-23.900m Sand D: 23.900m-27.500m Coal-Small Bands Sand D: 27.500m-28.100m Sand D: 28.100m-33.500m Coal D: 33.500m-36.500m Fine Sand D: 36.500m-42.500m Blue Clays D: 42.500m-44.900m Coarse Sands D: 44.900m-52.500m Brown Clay D: 52.500m-53.000m Sand D: 53.000m-53.500m White Clay D: 53.500m-55.900m Fine Sand D: 55.900m-59.500m Clay	1550	North West

Bore Id	Authority	Type	Uses	Initial TD	Log	Dist (m)	Direct
S9028898/1		Groundwater				1556	North West
87791					D: 0.000m-0.600m Black Earth D: 0.600m-1.800m Black Clay D: 1.800m-6.900m Sandy Brown Clay D: 6.900m-9.000m Cemented Gravels D: 9.000m-22.200m Brown Coal D: 22.200m-24.300m Fine Gravel Aquifer	1572	North West
116326		Groundwater	Groundwater Investigation		D: 0.000m-0.200m Top Soil D: 0.200m-1.500m Silty Clay Red/Brown D: 1.500m-2.000m Sandy Clay Yellow D: 2.000m-3.000m Silty Clay Brown/Grey D: 3.000m-6.000m Basalt Brown/Grey Clay Seams	1573	South
116330		Groundwater	Groundwater Investigation		D: 0.000m-2.900m Silty Clay Brown D: 2.900m-9.000m Basalt D: 9.000m-13.000m Fine Sand Some Gravel D: 13.000m-15.000m Silty Clay D: 15.000m-17.500m Silty Sand D: 17.500m-19.000m Silty Clay D: 19.000m-27.000m Basalt D: 27.000m-30.000m Silty Clay D: 30.000m-42.500m Basalt D: 42.500m-56.000m Sand Some Clayey D: 56.000m-63.000m Sand Clay/Clayey Sand D: 63.000m-68.000m Clay Silty/Dark Grey D: 68.000m-77.500m Coal Clayey	1581	South
72633		Groundwater	Irrigation		D: 0.000m-1.200m Topsoil D: 1.200m-4.900m Mottled Clay D: 4.900m-5.500m Gravel	1590	North West
326033	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.300m Surface Soil G: 0.300m-2.400m Brown Clay G: 2.400m-10.700m White Clay G: 10.700m-12.800m Gravel And Quartz G: 12.800m-17.100m Grey Sand G: 17.100m-21.300m Grey Clay G: 21.300m-22.900m Hard Quartz G: 22.900m-37.800m Grey Clay G: 37.800m-39.000m Dark-Grey Clay G: 39.000m-56.100m Ligneous Clay G: 56.100m-78.300m Brown Coal G: 56.400m-78.300m C = 62.6, Gdse = 24.6, H = 4.6, N = 0.6, Volatiles = 48.1 G: 78.300m-80.200m Ligneous Clay G: 80.200m-82.300m Brown Clay	1663	West
326030	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.600m Surface Soil G: 0.600m-5.500m Brown Clay G: 5.500m-14.600m Yellow And White Sandy Clay G: 14.600m-18.000m Coarse Gravel And Quartz G: 18.000m-22.600m Yellow And White Sandy Clay With Quartz Rocks G: 22.600m-36.600m Yellow Sandy Clay G: 36.600m-49.100m Grey Clay G: 49.100m-51.800m Ligneous Clay G: 51.800m-76.200m C = 61, Gdse = 23.91, H = 4.5, N = 0.5, Volatiles = 47 G: 51.800m-76.200m Brown Coal G: 76.200m-78.000m Ligneous Clay G: 78.000m-78.600m Grey Clay	1672	West
326040	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.300m Surface Soil G: 0.300m-5.200m Brown And White Mottled Clay G: 5.200m-6.100m Brown Sand G: 6.100m-9.400m Grey Sand And Gravel G: 9.400m-11.000m Yellow And White Mottled Clay G: 11.000m-14.600m Sand And Gravel G: 14.600m-35.400m Yellow And White Mottled Clay G: 35.400m-36.000m Hard Band Stone G: 36.000m-47.200m Ligneous Clay G: 47.200m-62.500m C = 58.7, Gdse = 22.66, H = 4.3, N = 0.6, Volatiles = 46.3 G: 47.200m-77.700m Brown Coal G: 62.500m-74.700m C = 55.8, Gdse = 22.64, H = 4.2, N = 0.6, Volatiles = 46.4	1694	West
326029	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.600m Surface Soil G: 0.600m-6.700m Brown Clay G: 6.700m-13.100m Yellow And White Sandy Clay G: 13.100m-16.200m Coarse Gravel With Quartz G: 16.200m-20.700m Yellow Sandy Clay And Quartz Rocks G: 20.700m-21.900m Hard Rock	1698	West

326034	Victorian Mines Department (1909 - 1977)		Non Groundwater		G: 0.000m-0.300m Surface Soil G: 0.300m-2.100m Brown Clay G: 2.100m-3.000m Yellow Sandy Clay G: 3.000m-3.700m Coarse Sand G: 3.700m-10.400m Yellow Clay G: 10.400m-15.500m Coarse Gravel And Quartz G: 15.500m-25.600m Grey Clay G: 25.600m-29.300m Brown Sandy Clay G: 29.300m-31.700m Hard Quartz G: 31.700m-37.800m Yellow And White Sandy Clay G: 37.800m-43.300m Ligneous Clay G: 43.300m-86.600m Brown Coal G: 43.300m-61.600m C = 59, Gdse = 22.96, H = 4.3, N = 0.5, Volatiles = 46.1 G: 61.600m-76.800m C = 66, Gdse = 26.18, H = 5, N = 0.7, Volatiles = 51.3 G: 86.600m-89.000m Ligneous Clay G: 89.000m-90.800m Grey Sandy Clay	1703	West
72631		Groundwater	Irrigation		D: 0.000m-0.400m Silty Brown Topsoil D: 0.400m-1.500m Silty Brown Subsoil D: 1.500m-8.100m Brown Sedimentary Clay D: 8.100m-10.000m Yellow Gravel And Clay D: 10.000m-12.000m Large Gravel Wash D: 12.000m-0.000m Brown Coal	1707	North West
942649	Exploration Company - Minerals and Petroleum	Coal	Non Groundwater			1709	South
326076	Department of Minerals and Energy (1977 - 1985)		Non Groundwater		D: 0.000m-2.000m Clay - Light Red/Brown To Orange/Brown Stiff, Silty Clay With Occasional Ochre/Brown, Very Weathered Rounded Basalt Fragments D: 2.000m-4.000m Clay - Light Grey To Buff Slightly Silty Stiff Clay D: 4.000m-6.000m Clay - Light Grey To Buff, Slightly Silty Stiff Clay With Some Dark Grey/Brown To Dark Brown Well Weathered Basalt Fragments D: 6.000m-14.000m Basalt - Brown/Grey Weathered Basalt With Occasional Off White Crystalline Small Grains (Chalcedone?) D: 14.000m-22.000m Basalt - Dark Brown To Dark Red/Brown Well Weathered Basalt, With Some Red/Brown To Red Claystone Rock Fragments. Occasional Stiff Light Brown Clay. Some Brown Silty Friable Clay Below 20 Metres D: 22.000m-24.000m Clay - Light Brown, Moderately Soft, Smooth To Silty, With Occasional Rare Weathered Basalt (?) Rock Fragments, Some Approaching Friable. Possibly Paleosal. D: 24.000m-28.000m Clay - All As Above, With Some Brown And Grey Friable, Very Silty Clay D: 28.000m-30.000m Silt - Extremely Fine, Orange/Brown With Some Light Grey To Light Brown Moderately Soft Silty Clay D: 30.000m-32.000m Sand - Very Fine, Ochre Stained Quartz Sand With Some Fine To Coarse Sub-Rounded To Rounded Ochre Stained Quartz Grains. Occasional Light Brown Silty Clay D: 32.000m-34.000m Basalt - Dark Brown To Dark Grey Brown, Very Weathered Basalt Fragments With Some Fine To Pebble Sized, Ochre Stained, Sub-Rounded Quartz Grains. Occasional Dark Brown Sandy Friable To Firm Clay D: 34.000m-36.000m Gravel - Coarse, Orange/Brown To Ochre Stained, Sub-Angular To Rounded Quartz Pebbles, Mainly 2X2X1 Cm Size, With Some Dark Brown Weathered Basalt Rock Fragments. Some Light Grey Firm, Slightly Silty Clay. Occasional Fine To Coarse Ochre Stained Sand D: 36.000m-46.000m Basalt - Dark Grey/Brown, Becoming Dark Grey With Depth, Well Weathered Basalt, With Some Ochre Fragile Slightly Silty Rounded Rock Fragments. Occasional Light Brown And Ochre Soft Clay. Occasional White To Ochre Stained Quartz Grains (Vein Quartz?) - Rou D: 46.000m-48.000m Clay - Very Soft, Silty, Red Clay. Some Dark Browny Grey To Dark Red/Brown Weathered Basalt Rock Fragments. Occasional Ochre Fine Grey Slightly Silty Rock Fragments. Occasional Medium Grained Quartz Sand - Sub-Angular To Sub-Rounded Ochre Stained D: 48.000m-52.000m Clay - Ochre And Red Silty Soft Clay With Some Ochre, Moderately Soft, Sandy Clay, And Some Dark Grey To Dark Brown Weathered Basalt Fragments. Rare, Sub-Rounded, Medium Grained, Ochre Stained Quartz Sand D: 52.000m-54.000m Clay - Ochre, Moderately Soft, Sandy Clay. Abundant Dark Brown Soft Carbonaceous Clay (Some Possibly Ligneous), And Some Dark Grey To Dark Brown Weathered Basalt Fragments. Occasional Ochre Stained, Angular Clean Quartz Grains D: 54.000m-56.000m Carbonaceous Clay - Dark Brown, Moderatley Soft, With Some Ochre Sandy Clay. Some Dark Grey Brown Weathered Basalt Fragments. Occasional Medium Grained, Sub-Rounded, Ochre Stained Quartz Grains	1710	South

					D: 56.000m-58.000m Brown Coal - Slightly Ligneous With Some Dark Brown Carbonaceous Clay - Soft. Some Ochre Stained Sandy Clay. Occasional Medium Grained Ochre Stained Quartz Sand D: 58.000m-60.000m Carbonaceous Clay - Dark Brown, Moderately Soft With Some Ochre Sandy Clay. Some Dark Grey Brown Weathered Basalt Fragments. Occasional Medium Grained, Sub-Rounded, Ochre Stained Quartz Grains D: 60.000m-68.000m Clay - Medium Grained Soft, Smooth Clay, With Some Medium Grained, Sub-Rounded, Ochre Stained Quartz Sand. Occasional Dark Grey Basalt Fragments And Occasional Dark Brown Carbonaceous Clay Increasing Down D: 68.000m-76.000m Brown Coal (?) - Very Soft, With Some Dark Brown Soft Carbonaceous Clay And Occasional Fine To Medium Grained, Sub-Rounded Quartz Sand. Occasional Medium Grey, Moderately Soft, Smooth Clay And Occasional Ligneous Fragments D: 76.000m-84.000m Brown Coal (?) - Some Ligneous Fragments And Some Dark Brown, Soft Carbonaceous Clay. Rare Fine To Medium Quartz Sand D: 84.000m-90.000m Clay - Dark Brown Carbonaceous Clay, Very Soft, With Some Soft Smooth Brown-Grey Clay And Rare Ochre And Red Friable Clay. Occasional Ligneous Fragments D: 90.000m-102.000m Brown Coal - Some Ligneous Dark Brown Fragments Increasing Downwards. Some Dark Brown Soft Carbonaceous Clay D: 102.000m-108.000m Brown Coal (?) - Some Ligneous Fragments And Occasional Light Grey Soft, Smooth Clay D: 108.000m-114.000m Carbonaceous Clay - Soft, Dark Brown Carbonaceous Clay With Some Moderately Firm Brown Coal And Some Ligneous Fragments. From 112M Downwards Some Fine To Medium Clean Quartz Sand, Moderately Sorted And Sub-Angular To Sub-Rounded D: 114.000m-120.000m Carbonaceous Clay - Dark Brown, Very Soft Carbonaceous Clay. Occasional Beige Soft Smooth. Occasional Fine To Medium Clean Quartz Sand. Occasional Ligneous Fragments D: 120.000m-124.000m Sand - Very Fine To Medium Grained Poorly Sorted Clean Quartz Sand - Sub-Angular To Sub-Rounded. Some Very Soft Carbonaceous Clay And Some Very Soft Light Grey And Beige Smooth Clay. Occasional Ligneous Fragments D: 124.000m-128.000m Sand - Fine To Med But Becoming Coarser Downwards. Sub-Angular To Sub-Rounded Moderately Sorted Quartz Sand With Some Grey/Brown And Light Grey Very Soft Smooth Clay. Occasional Brown Coal And Ligneous Fragments D: 128.000m-134.000m Sand - Fine To Medium Grained, Becoming Coarser Downwards, Sub-Angular To Sub-Rounded Sand. Some Light Grey, Very Stiff Clay		
S9026242/1		Groundwater	Irrigation		D: 0.000m-0.800m Brown Top Soil D: 0.800m-2.000m Gray Clay D: 2.000m-4.500m Damp Brown Sandy Clay D: 4.500m-6.000m Silt D: 6.000m-8.500m Sand D: 8.500m-9.000m Coarse Gravel & Pebbles	1718	North West
S9037886/3		Groundwater				1786	West
S62109/1		Groundwater	Domestic and Stock Irrigation		D: 0.000m-1.200m Top Soil D: 1.200m-4.000m Stiff Brown Clay D: 4.000m-7.000m Sandy Clay D: 7.000m-34.000m Brown Coal D: 34.000m-67.000m Grey Silty Clayey Sands	1810	North West
144965	Department of Sustainability and Environment (2003 -)	Groundwater	State Observation Network Observation		D: 0.000m-3.800m Top Soil & Clays D: 3.800m-12.000m Silty Sands & Gravel	1841	North West
144963	Department of Sustainability and Environment (2003 -)	Groundwater	State Observation Network Observation		D: 0.000m-3.000m Top Soil & Clay D: 3.000m-26.300m Silty Sands & Gravel	1843	North West

Bore Id	Authority	Type	Uses	Initial TD	Log	Dist (m)	Direct
326015	Victorian Mines Department (1909 - 1977)		Non Groundwater		D: 0.000m-0.300m Red Loam D: 0.300m-0.600m Red Clay D: 0.600m-0.900m Yellow Clay D: 0.900m-2.100m Clay And Gravel D: 2.100m-4.900m Yellow Clay D: 4.900m-12.200m Grey Clay D: 12.200m-14.900m Yellow Sandy Clay D: 14.900m-16.500m Sand And Gravel D: 16.500m-22.600m Yellow Sand D: 22.600m-25.900m Grey Clay D: 25.900m-30.800m Grey Sand D: 30.800m-33.500m Grey Clay D: 33.500m-35.100m Yellow Sand D: 35.100m-35.400m Grey Clay D: 35.400m-37.200m Ligneous Clay D: 37.200m-38.400m Brown Coal D: 38.400m-40.200m Grey Clay D: 40.200m-43.300m Grey Sand	1899	West
87796					D: 0.000m-0.300m Black Topsoil D: 0.300m-3.000m Basalt Floaters D: 3.000m-6.000m Honeycomb Basalt D: 6.000m-31.000m Basalt D: 31.000m-36.000m Fine Sands To 1Inch River Grave Ls No Water-Abandoned	1937	South West
S9034040/1		Groundwater	Domestic and Stock		D: 1.000m-2.000m Sandy Topsoil D: 2.000m-5.000m Silty Clay D: 6.000m-10.000m Heavy Gravels D: 10.000m-11.000m Silty Clay D: 11.000m-15.000m Sands & Gravels	1987	North East

Historical Mining Activity - Shafts

Parwan Precinct Structure Plan, Parwan, VIC 3340

Historical Mining Activity - Shafts

Mine Shaft Locations were collected by a variety of methods from 1869 in some areas of the state, mainly concentrating in Ballarat and Bendigo. In places a shaft may be recorded multiple times with a different source. In cases where several shaft locations are shown close together (generally with separations less than stated position errors) and they have different sources, it is possible that one shaft has been mapped several times. In cases where several shaft locations are shown close together but they have the same information source, it is possible that each shaft location represents a different shaft on the ground.

Historical Mine Shafts within the dataset buffer:

Map Id	Name	Source	Depth (m)	Collar (ft)	Fill/Cap Method	Location Desc	Location Accuracy	Distance	Direction
N/A	No records in buffer								

Geology 1:50,000

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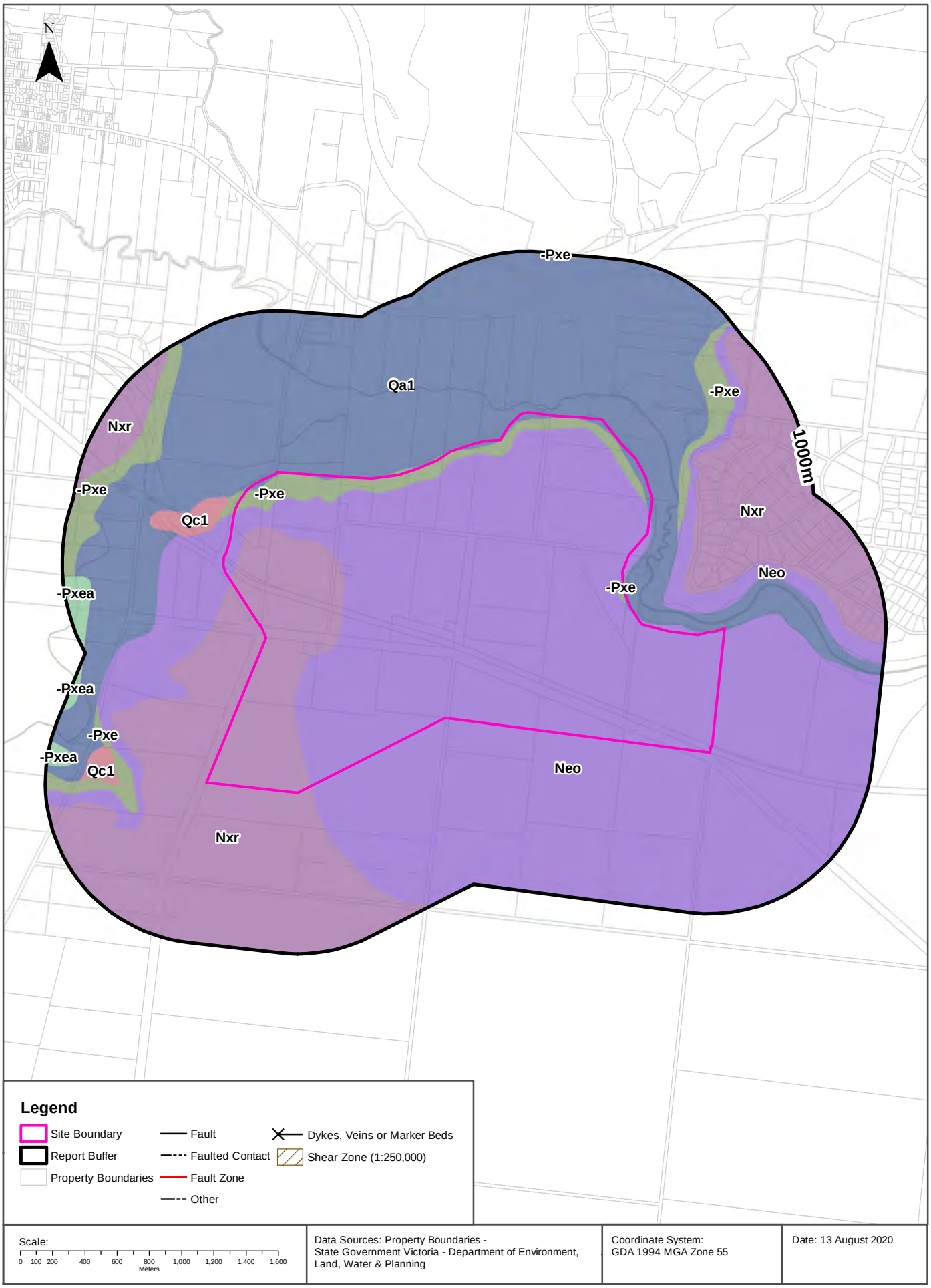


Geology

Parwan Precinct Structure Plan, Parwan, VIC 3340

Geological Units

What are the Geological Units onsite?

Symbol	Name	Description	Geological Age	Lithology	Dataset
Neo	Newer Volcanic Group - basalt flows (Neo): generic	Olivine tholeiite, quartz tholeiite, basanite, basaltic icelandite, hawaiite, mugearite, minor scoria and ash, fluvial sediments: tholeiitic to alkaline; includes sheet flows and valley flows and intercalated gravel, sand, clay	Miocene to Holocene	alkali basalt (major proportion); tholeiitic basalt (major proportion); alluvium (minor proportion); tuff (minor proportion)	1:50,000
Nxr	Darley Gravel (Nxr): generic	Gravel, sand, silt: gravel red to pale colours; rounding and sorting moderate to good; moderately consolidated; massive to trough cross-bedded; gravel clasts of vein quartz, sandstone, basalt, ironstone in proportions that reflect the local source	Neogene to Pleistocene	gravel material (significant); sand (significant); silt material (significant)	1:50,000
-Pxe	Werribee Formation (-Pxe): generic	Sand, silt, clay, gravel in variable proportions: generally white to pale grey; in part carbonaceous, pyritic; ferruginous bands common; contains Cinnamomum flora	Eocene to Miocene	sand (significant); silt material (significant); clay lithology (significant); gravel material (significant)	1:50,000
Qa1	alluvium(Qa1): generic	Gravel, sand, silt: variably sorted and rounded; generally unconsolidated; includes deposits of low terraces; alluvial floodplain deposits	Pleistocene to Holocene	gravel material (significant); sand (significant); silt material (significant)	1:50,000

What are the Geological Units within the dataset buffer?

Symbol	Name	Description	Geological Age	Lithology	Dataset
Neo	Newer Volcanic Group - basalt flows (Neo): generic	Olivine tholeiite, quartz tholeiite, basanite, basaltic icelandite, hawaiite, mugearite, minor scoria and ash, fluvial sediments: tholeiitic to alkaline; includes sheet flows and valley flows and intercalated gravel, sand, clay	Miocene to Holocene	alkali basalt (major proportion); tholeiitic basalt (major proportion); alluvium (minor proportion); tuff (minor proportion)	1:50,000
Nxr	Darley Gravel (Nxr): generic	Gravel, sand, silt: gravel red to pale colours; rounding and sorting moderate to good; moderately consolidated; massive to trough cross-bedded; gravel clasts of vein quartz, sandstone, basalt, ironstone in proportions that reflect the local source	Neogene to Pleistocene	gravel material (significant); sand (significant); silt material (significant)	1:50,000
-Pxe	Werribee Formation (-Pxe): generic	Sand, silt, clay, gravel in variable proportions: generally white to pale grey; in part carbonaceous, pyritic; ferruginous bands common; contains Cinnamomum flora	Eocene to Miocene	sand (significant); silt material (significant); clay lithology (significant); gravel material (significant)	1:50,000

Symbol	Name	Description	Geological Age	Lithology	Dataset
-Pxea	Altona Coal Seam (-Pxea): generic	Lignite, minor clay: dark brown, locally pyritic; plant fossils common	Miocene to Miocene	lignite (major proportion); clay lithology (minor proportion)	1:50,000
Qa1	alluvium(Qa1): generic	Gravel, sand, silt: variably sorted and rounded; generally unconsolidated; includes deposits of low terraces; alluvial floodplain deposits	Pleistocene to Holocene	gravel material (significant); sand (significant); silt material (significant)	1:50,000
Qc1	colluvium(Qc1): generic	Diamictite, gravel, sand, silt, clay, rubble: sorting variable, usually poor; generally poorly rounded; clasts locally sourced; includes channel deposits with better rounding and sorting	Pliocene to Holocene	diamictite (dominant); gravel material (significant); sand (significant); silt material (significant)	1:50,000

Geology

Parwan Precinct Structure Plan, Parwan, VIC 3340

Geological Structures

What are the Geological Faults or Faulted Contacts onsite?

Map Id	Type	Name	Contact	Positional Accuracy	Dataset
No features					1:50,000

What are the Dykes, Marker Beds and Veins onsite?

Map Id	Type	Name	Description	Positional Accuracy	Dataset
No features					1:50,000

What are the Shear Zones onsite (1:250,000 scale)?

Map Id	Type	Name	Description	Positional Accuracy	Dataset
No features					1:250,000

What are the Geological Faults or Faulted Contacts within the dataset buffer?

Map Id	Type	Name	Contact	Positional Accuracy	Dataset
No features					1:50,000

What are the Dykes, Marker Beds and Veins within the dataset buffer?

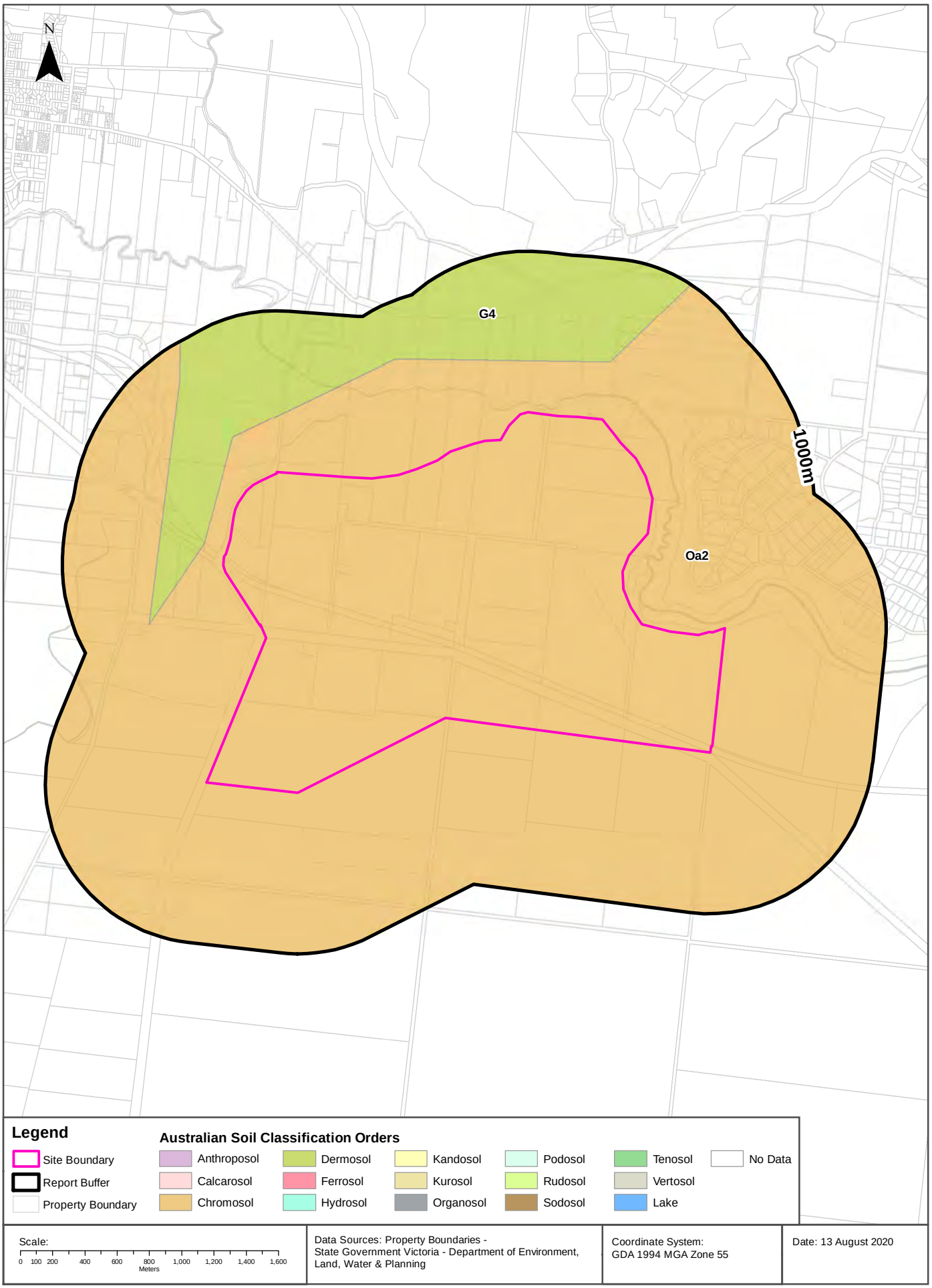
Map Id	Type	Name	Description	Positional Accuracy	Dataset
No features					1:50,000

What are the Shear Zones within the dataset buffer (1:250,000 scale)?

Map Id	Type	Name	Description	Positional Accuracy	Dataset
No features					1:250,000

Atlas of Australian Soils

Parwan Precinct Structure Plan, Parwan, VIC 3340



Soil Landscapes

Parwan Precinct Structure Plan, Parwan, VIC 3340

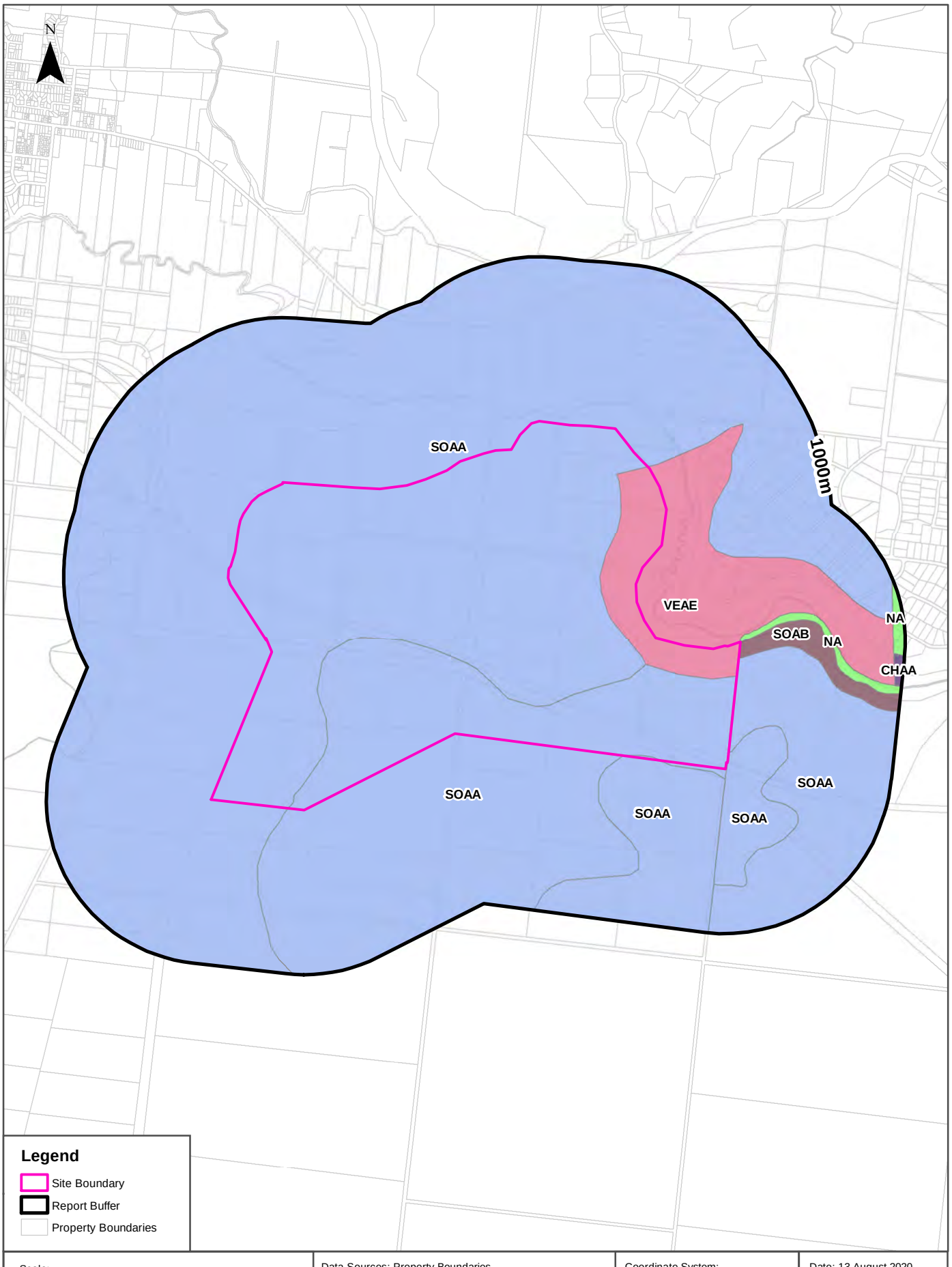
Atlas of Australian Soils

Australian soil types within the dataset buffer:

Symbol	Soil Order	Map Unit Description	Distance
Oa2	Chromosol	Dissected plateaux at low elevation: plains of hard alkaline red soils (Dr2.13) often in gilgai micro- association with dark cracking clays (Ug5.1), and grey and brown cracking clays (Ug5.2 and Ug5.3), small areas of other soils such as (Dr2.33), (Dy3.43), and (Dd1.l); also with (1) low, broad, sprawling stony rises of (Dr2.13), (2) low rounded hills of various (D) soils such as (Db1.23) with boulder strewn slopes, and (3) incised, often gorge-like, stream valleys of undescribed soils.	0m
G4	Dermosol	Plains: floodplains and low terraces of various friable loamy soils (Um6), friable earths (Gn4), and other soils including (Dd) and (Dy); area has a relatively high water-table. Remnants of higher terraces of hard alkaline red soils (Dr2.23) occur also.	133m

Victorian Soil Type Mapping

Parwan Precinct Structure Plan, Parwan, VIC 3340



Soils Landscapes

Parwan Precinct Structure Plan, Parwan, VIC 3340

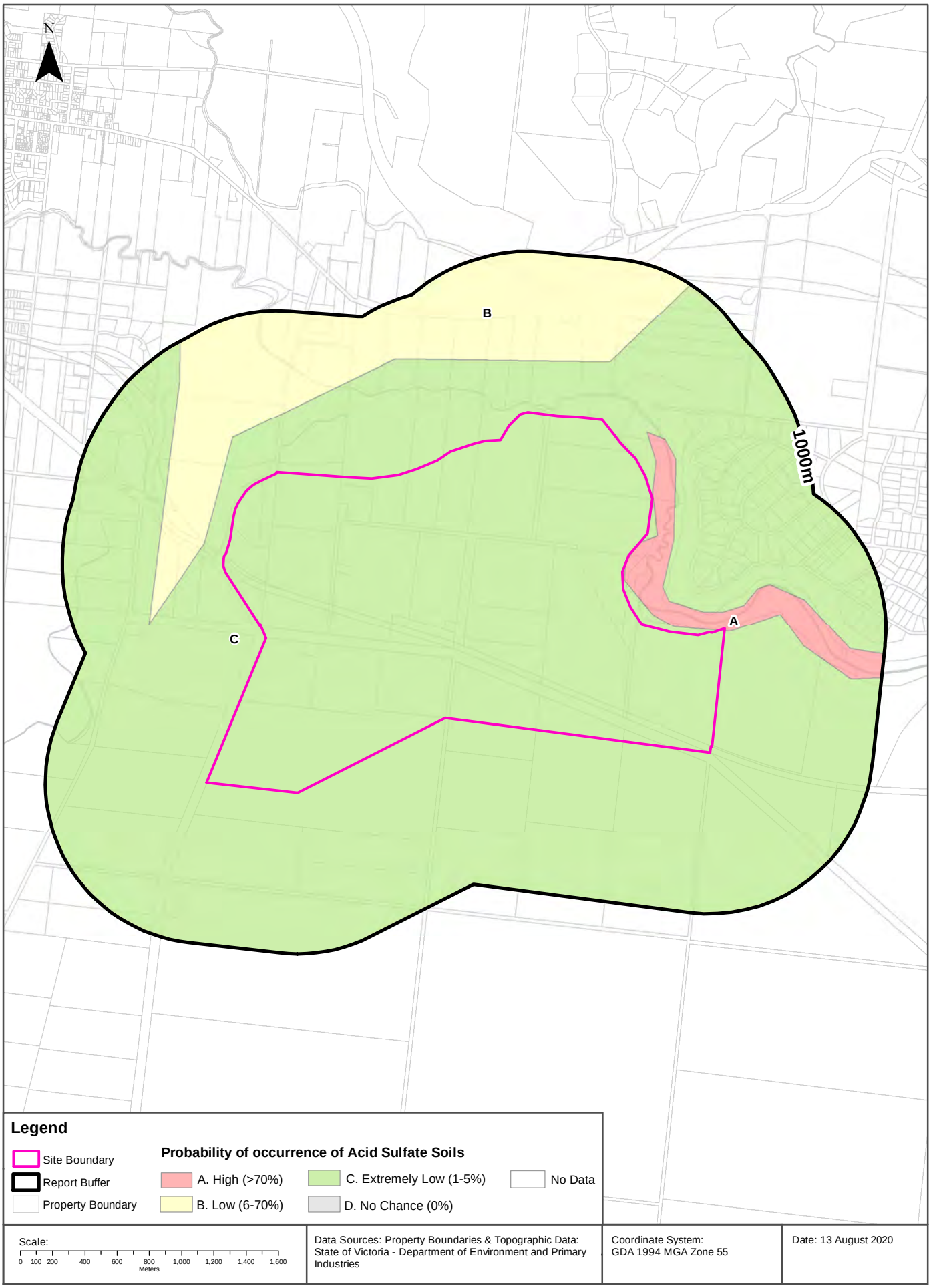
Victorian Soil Type Mapping

Victorian Soil Types within the dataset buffer:

Symbol	Description	Distance
SOAA	Red Sodosols	0m
SOAB	Brown Sodosols	0m
VEAE	Black Vertosols	0m
NA	Unassigned	1m
CHAA	Red Chromosols	929m

Atlas of Australian Acid Sulfate Soils

Parwan Precinct Structure Plan, Parwan, VIC 3340



Acid Sulfate Soils

Parwan Precinct Structure Plan, Parwan, VIC 3340

Atlas of Australian Acid Sulfate Soils

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

PROBCLASS	Description	Distance
A	High Probability of occurrence. >70% chance of occurrence.	0m
C	Extremely low probability of occurrence. 1-5% chance of occurrence with occurrences in small localised areas.	0m
B	Low Probability of occurrence. 6-70% chance of occurrence.	133m

Acid Sulfate Soils

Parwan Precinct Structure Plan, Parwan, VIC 3340

Coastal Acid Sulfate Soils

What are the on-site Coastal Acid Sulfate Soil types?

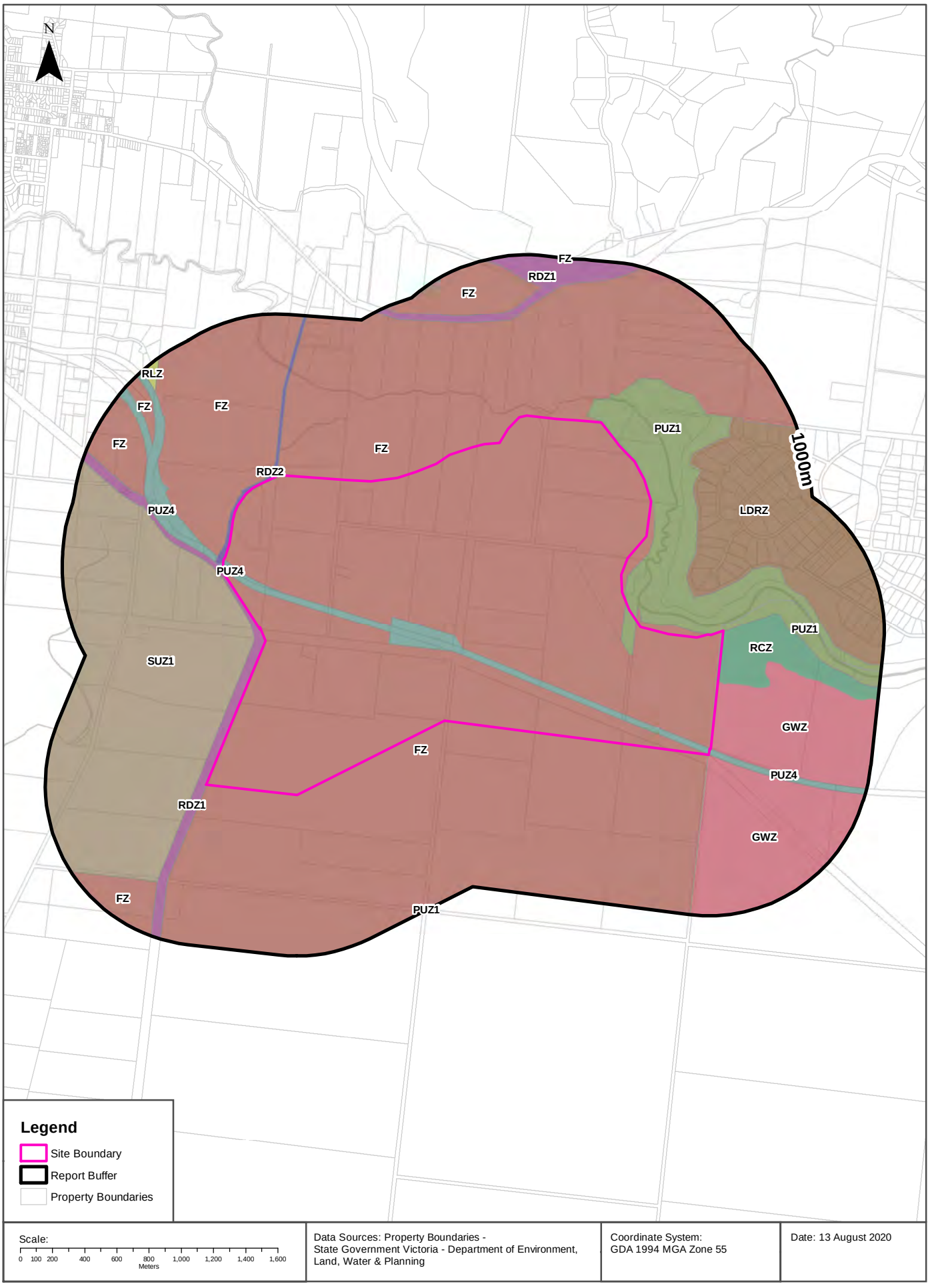
Coastal Acid Sulfate Soil Types
There are no Acid Sulfate areas onsite

What are the Coastal Acid Sulfate Soil types within the dataset buffer?

Coastal Acid Sulfate Soil Types	Distance	Direction
There are no Acid Sulfate areas within the report buffer		

Planning Zones

Parwan Precinct Structure Plan, Parwan, VIC 3340



Planning

Parwan Precinct Structure Plan, Parwan, VIC 3340

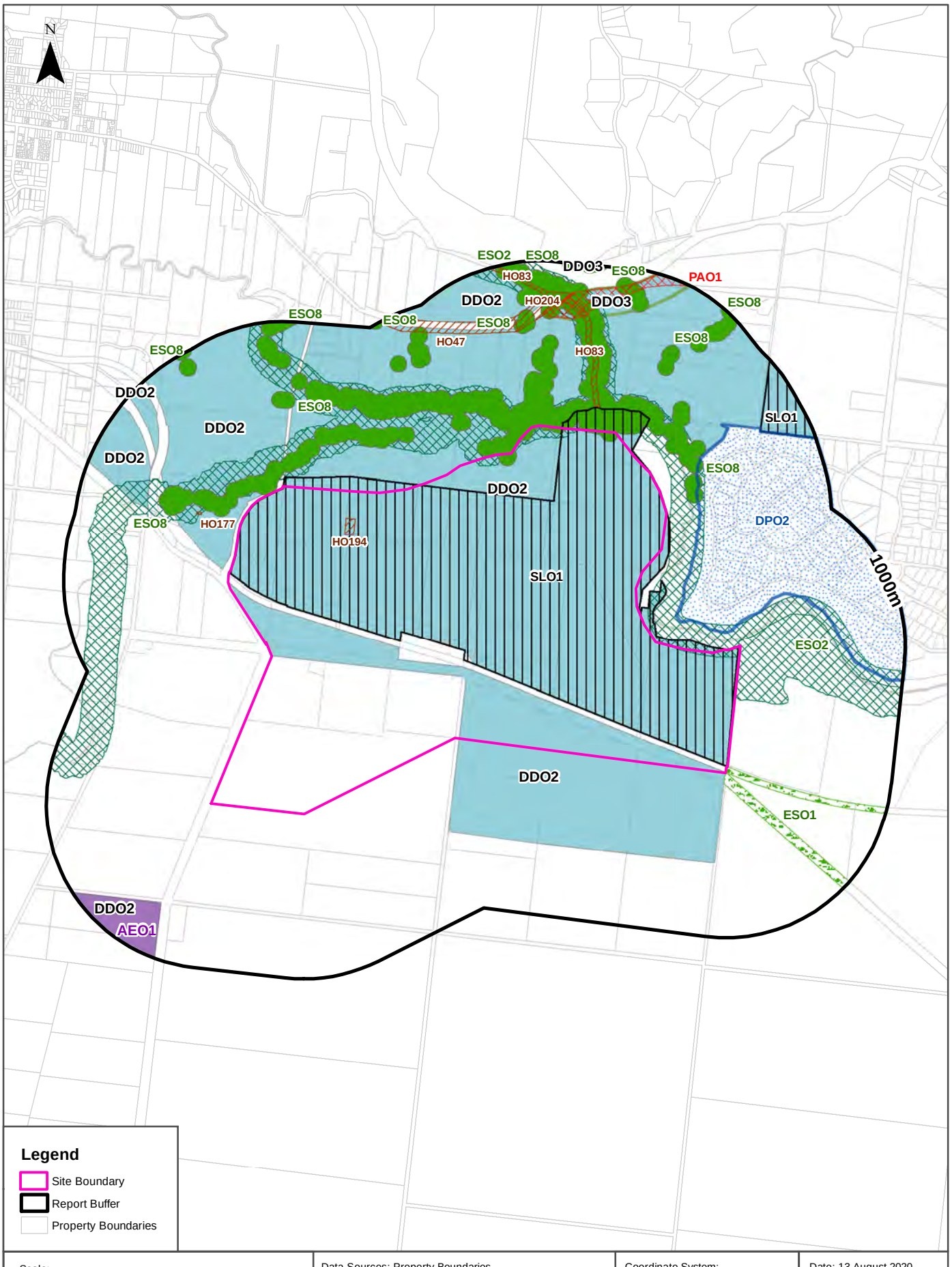
Planning Zones

Planning zones within the dataset buffer:

Zone Code	Description	Distance	Direction
FZ	FARMING ZONE	0m	Onsite
PUZ4	PUBLIC USE ZONE - TRANSPORT	0m	Onsite
PUZ1	PUBLIC USE ZONE - SERVICE AND UTILITY	0m	East
GWZ	GREEN WEDGE ZONE	0m	East
RCZ	RURAL CONSERVATION ZONE	0m	East
RDZ1	ROAD ZONE - CATEGORY 1	0m	North West
RDZ2	ROAD ZONE - CATEGORY 2	0m	North West
FZ	FARMING ZONE	20m	North West
SUZ1	SPECIAL USE ZONE - SCHEDULE 1	22m	West
PUZ4	PUBLIC USE ZONE - TRANSPORT	43m	North West
LDRZ	LOW DENSITY RESIDENTIAL ZONE	249m	East
FZ	FARMING ZONE	566m	North West
FZ	FARMING ZONE	649m	North West
FZ	FARMING ZONE	659m	North
FZ	FARMING ZONE	674m	South West
RLZ	RURAL LIVING ZONE	853m	North West
FZ	FARMING ZONE	994m	North East
PUZ1	PUBLIC USE ZONE - SERVICE AND UTILITY	994m	South

Planning Overlays

Parwan Precinct Structure Plan, Parwan, VIC 3340



Planning

Parwan Precinct Structure Plan, Parwan, VIC 3340

Planning Overlays

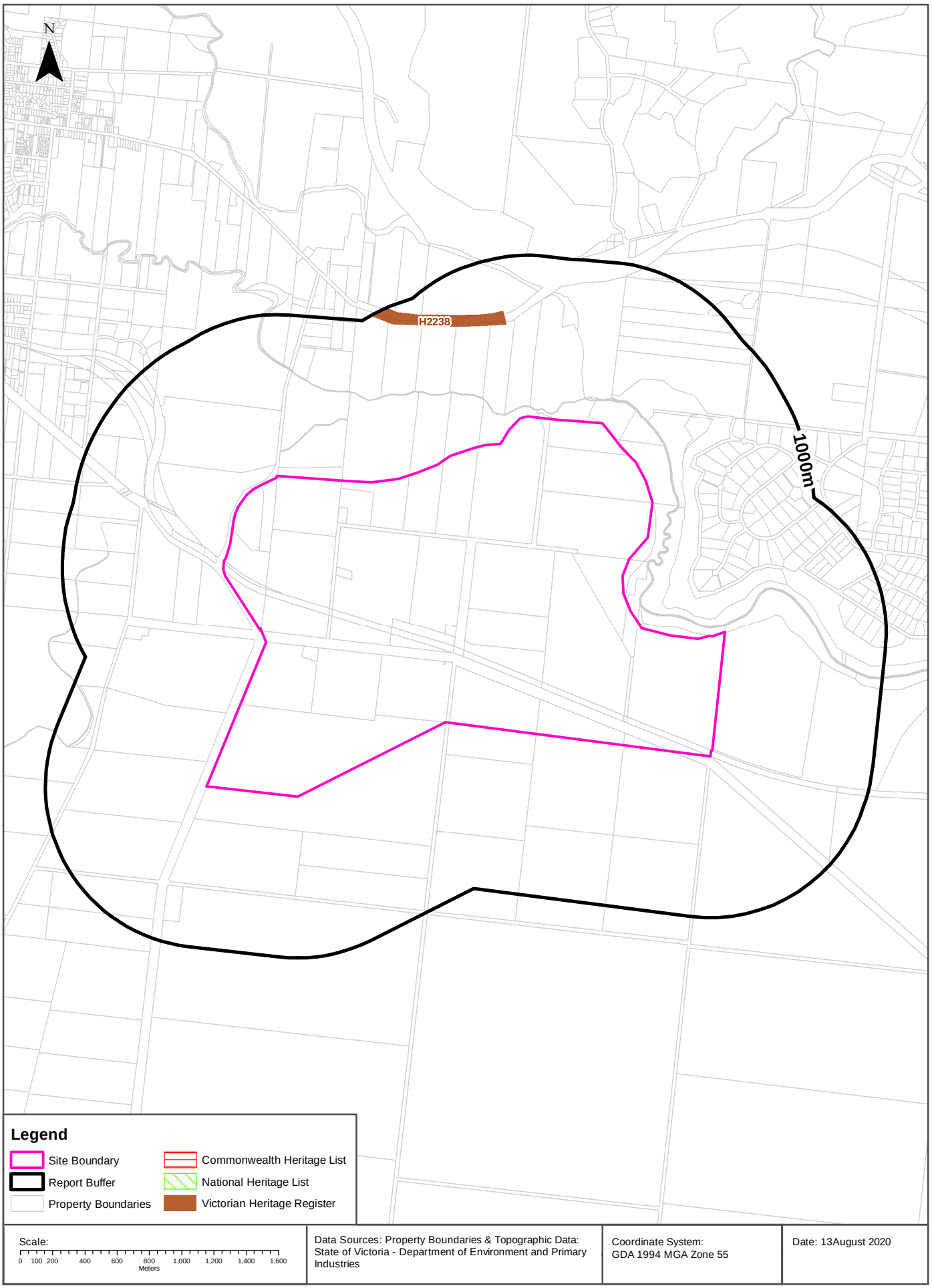
Planning overlays within the dataset buffer:

Zone Code	Description	Distance	Direction
DDO2	DESIGN AND DEVELOPMENT OVERLAY - SCHEDULE 2	0m	Onsite
SLO1	SIGNIFICANT LANDSCAPE OVERLAY - SCHEDULE 1	0m	Onsite
DDO2	DESIGN AND DEVELOPMENT OVERLAY - SCHEDULE 2	0m	Onsite
ESO2	ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 2	0m	Onsite
ESO8	ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 8	0m	Onsite
ESO2	ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 2	0m	East
HO194	HERITAGE OVERLAY (HO194)	0m	North West
ESO8	ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 8	0m	North West
ESO1	ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 1	0m	South East
ESO1	ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 1	0m	East
DDO2	DESIGN AND DEVELOPMENT OVERLAY - SCHEDULE 2	20m	North West
DPO2	DEVELOPMENT PLAN OVERLAY - SCHEDULE 2	107m	East
HO83	HERITAGE OVERLAY (HO83)	143m	North East
ESO8	ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 8	145m	North East
HO177	HERITAGE OVERLAY (HO177)	247m	North West
ESO8	ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 8	449m	North East
ESO8	ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 8	474m	North West
ESO8	ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 8	563m	North
DDO2	DESIGN AND DEVELOPMENT OVERLAY - SCHEDULE 2	566m	North West
HO204	HERITAGE OVERLAY (HO204)	584m	North
HO47	HERITAGE OVERLAY (HO47)	584m	North
DDO2	DESIGN AND DEVELOPMENT OVERLAY - SCHEDULE 2	629m	North West
ESO8	ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 8	637m	North
DDO2	DESIGN AND DEVELOPMENT OVERLAY - SCHEDULE 2	659m	North
DDO3	DESIGN AND DEVELOPMENT OVERLAY - SCHEDULE 3	662m	North East
PAO1	PUBLIC ACQUISITION OVERLAY 1	665m	North East
ESO8	ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 8	672m	North
AEO1	AIRPORT ENVIRONS OVERLAY (AEO1)	674m	South West
DDO2	DESIGN AND DEVELOPMENT OVERLAY - SCHEDULE 2	674m	South West
ESO8	ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 8	684m	North East

Zone Code	Description	Distance	Direction
SLO1	SIGNIFICANT LANDSCAPE OVERLAY - SCHEDULE 1	705m	North East
ESO8	ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 8	710m	North West
ESO8	ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 8	745m	North East
HO83	HERITAGE OVERLAY (HO83)	795m	North
ESO8	ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 8	858m	North West
ESO8	ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 8	951m	North
ESO8	ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 8	952m	North
ESO8	ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 8	966m	North
DDO3	DESIGN AND DEVELOPMENT OVERLAY - SCHEDULE 3	994m	North

Heritage

Parwan Precinct Structure Plan, Parwan, VIC 3340



Heritage

Parwan Precinct Structure Plan, Parwan, VIC 3340

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							

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							

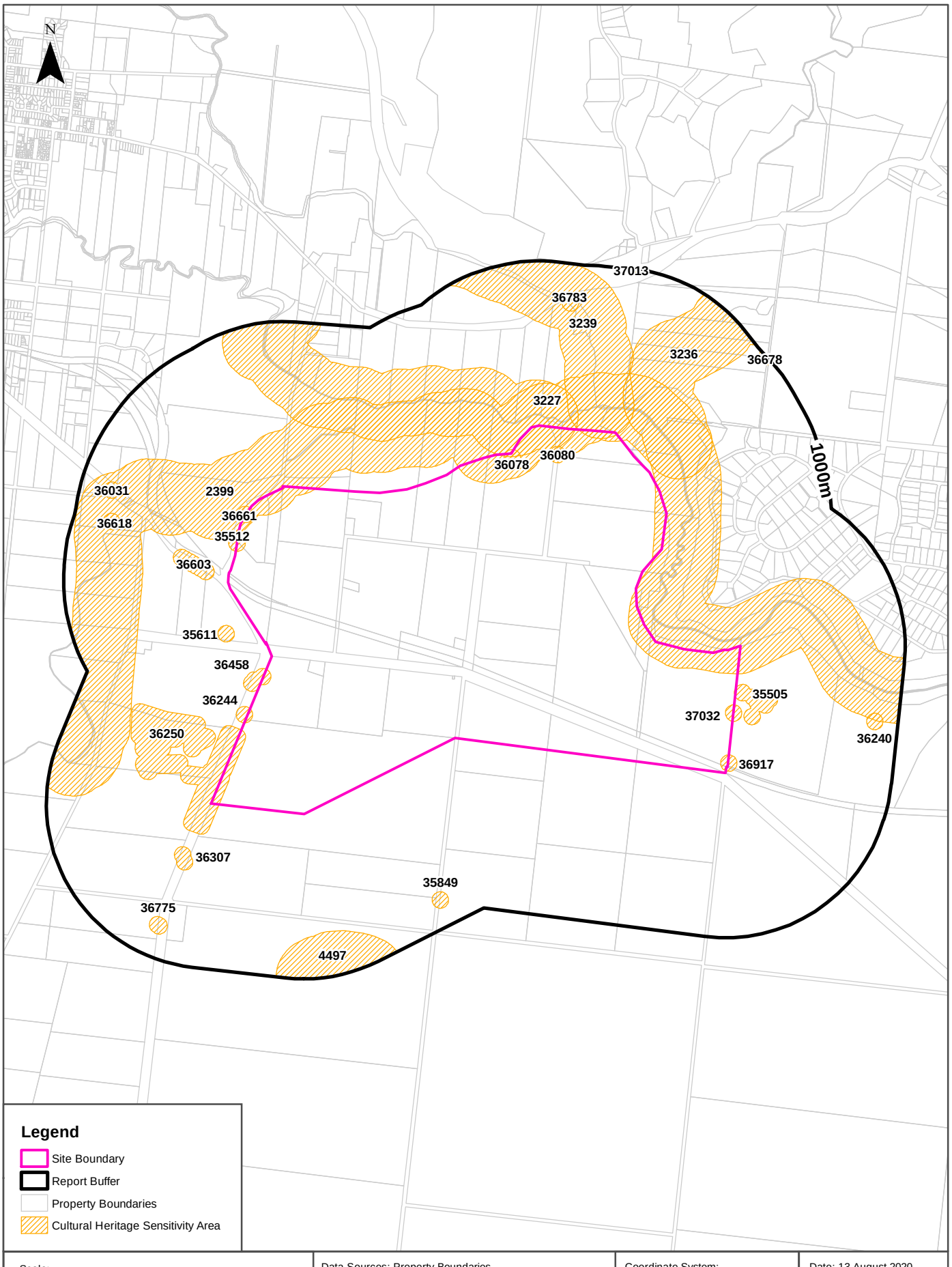
Victorian Heritage Register

What are the Victorian Heritage Register items located within the dataset buffer?:

VHR Number	Description	Distance	Direction
H2238	AVENUE OF HONOUR	583m	North

Cultural Heritage Sensitivity

Parwan Precinct Structure Plan, Parwan, VIC 3340



Scale:	Data Sources: Property Boundaries - State Government Victoria - Department of Environment, Land, Water & Planning	Coordinate System: GDA 1994 MGA Zone 55	Date: 13 August 2020

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

Heritage

Parwan Precinct Structure Plan, Parwan, VIC 3340

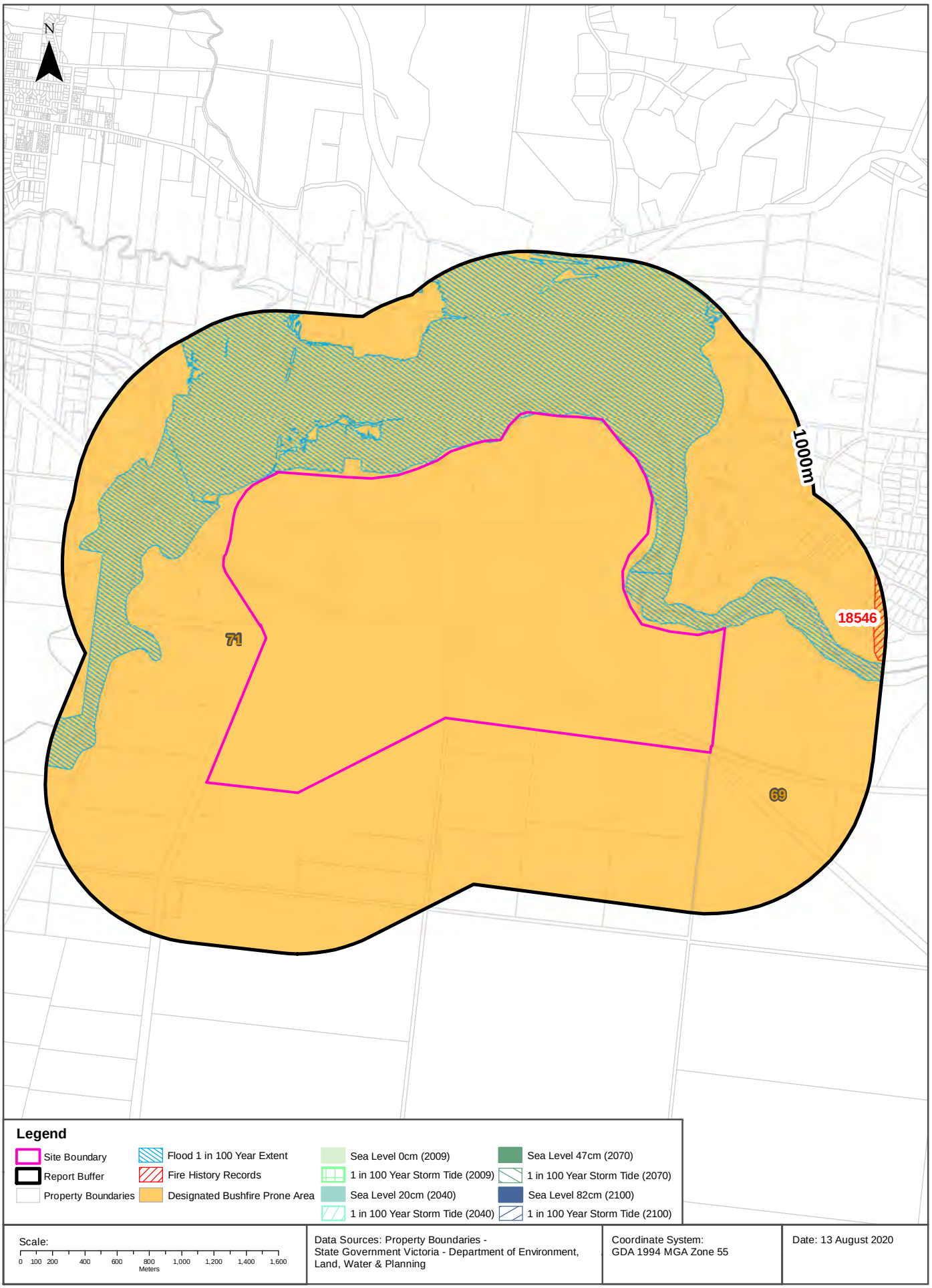
Cultural Heritage Sensitivity

Areas of Cultural Heritage Sensitivity as specified in Division 3 of Part 2 in the Victorian Aboriginal Heritage Regulations 2018, within the dataset buffer:

Map Id	Distance	Direction
3227	0m	Onsite
2399	0m	Onsite
36250	0m	Onsite
36080	0m	Onsite
36078	0m	Onsite
36458	0m	Onsite
35512	0m	Onsite
3239	0m	Onsite
36661	0m	Onsite
36917	0m	Onsite
37032	0m	Onsite
35505	0m	East
36244	0m	West
3236	39m	North
36603	88m	West
35611	118m	West
36307	306m	South West
36783	711m	North
36618	723m	West
4497	727m	South
36775	754m	South West
36031	758m	West
35849	789m	South
36240	810m	East
36678	952m	North East
37013	977m	North East

Natural Hazards

Parwan Precinct Structure Plan, Parwan, VIC 3340



Natural Hazards

Parwan Precinct Structure Plan, Parwan, VIC 3340

Bushfire Prone Areas

What are the designated bushfire prone areas within the dataset buffer?

Map ID	Feature	Plan No	LGA	Gazetted Date	Distance	Direction
69	Designated Bushfire Prone Area	LEGL./20-110	MELTON	24/03/2020	0m	Onsite
71	Designated Bushfire Prone Area	LEGL./20-111	MOORABOOL	24/03/2020	0m	Onsite

Fire History

What are the fire history records of fires primarily on public land, within the dataset buffer?

Map Id	Fire Type	Fire Key	Season	Fire No	Fire Name	Treatment	Fire Cover	Start Date	Dist (m)	Direction
18546	BUSHFIRE	W198599999	1985	999	Melton	FIRE			917m	East

Flood - 1 in 100 year modelled flood extent

What 1 in 100 year flood extent features exist within the dataset buffer?

Feature	Source	Method	Scale	Modified Date	Distance	Direction
100 Year Flood Outline	Melbourne Water	Modelled		03/10/2013	0m	Onsite
100 Year Flood Outline	Unknown	No contours & some flood info		01/01/2000	98m	West

Natural Hazards

Parwan Precinct Structure Plan, Parwan, VIC 3340

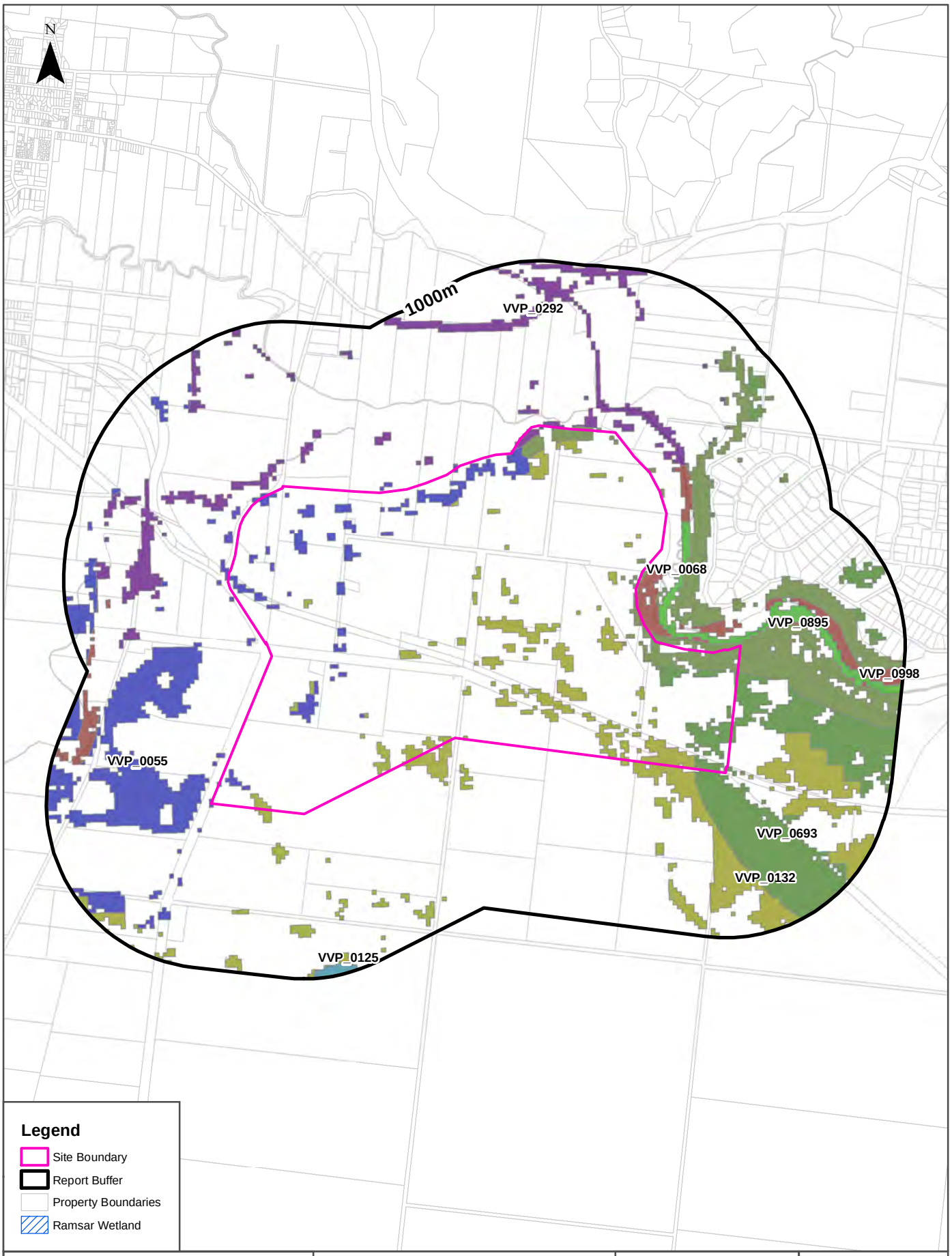
Victorian Coastal Inundation Sea Level Rise

What coastal inundation sea level rise features exist within the dataset buffer?

Description	Distance	Direction
No records within buffer		

Ecological Constraints - Native Vegetation 2005 & Ramsar Wetlands

Parwan Precinct Structure Plan, Parwan, VIC 3340



Ecological Constraints

Parwan Precinct Structure Plan, Parwan, VIC 3340

Native Vegetation (Modelled 2005 Ecological Vegetation Classes)

What native vegetation exists within the dataset buffer?

Veg Code	EVC Name	EVCCode	Group	Subgroup	Bioregion	Conservation Status	Geographic Occurance	Distance
VVP_0055	Plains Grassy Woodland	0055	Plains Woodlands or Forests	Freely-draining	Victorian Volcanic Plain	Endangered	Common	0m
VVP_0068	Creekline Grassy Woodland	0068	Riverine Grassy Woodlands or Forests	Creekline and/or swampy	Victorian Volcanic Plain	Endangered	Common	0m
VVP_0132	Plains Grassland	0132	Plains Grasslands and Chenopod Shrublands	Clay soils	Victorian Volcanic Plain	Endangered	Common	0m
VVP_0292	Red Gum Swamp	0292	Wetlands	Freshwater	Victorian Volcanic Plain	Endangered	Naturally Restricted	0m
VVP_0693	Plains Woodland/Plains Grassland Mosaic	0693	Plains Woodlands or Forests	Poorly-draining	Victorian Volcanic Plain	Endangered	not applicable	0m
VVP_0895	Escarpment Shrubland	0895	Plains Woodlands or Forests	Freely-draining	Victorian Volcanic Plain	Endangered	Naturally Restricted	0m
VVP_0998	Water Body - man-made	0998	No native vegetation recorded		Victorian Volcanic Plain	Not Applicable	not applicable	12m
VVP_0125	Plains Grassy Wetland	0125	Wetlands	Freshwater	Victorian Volcanic Plain	Endangered	Common	671m

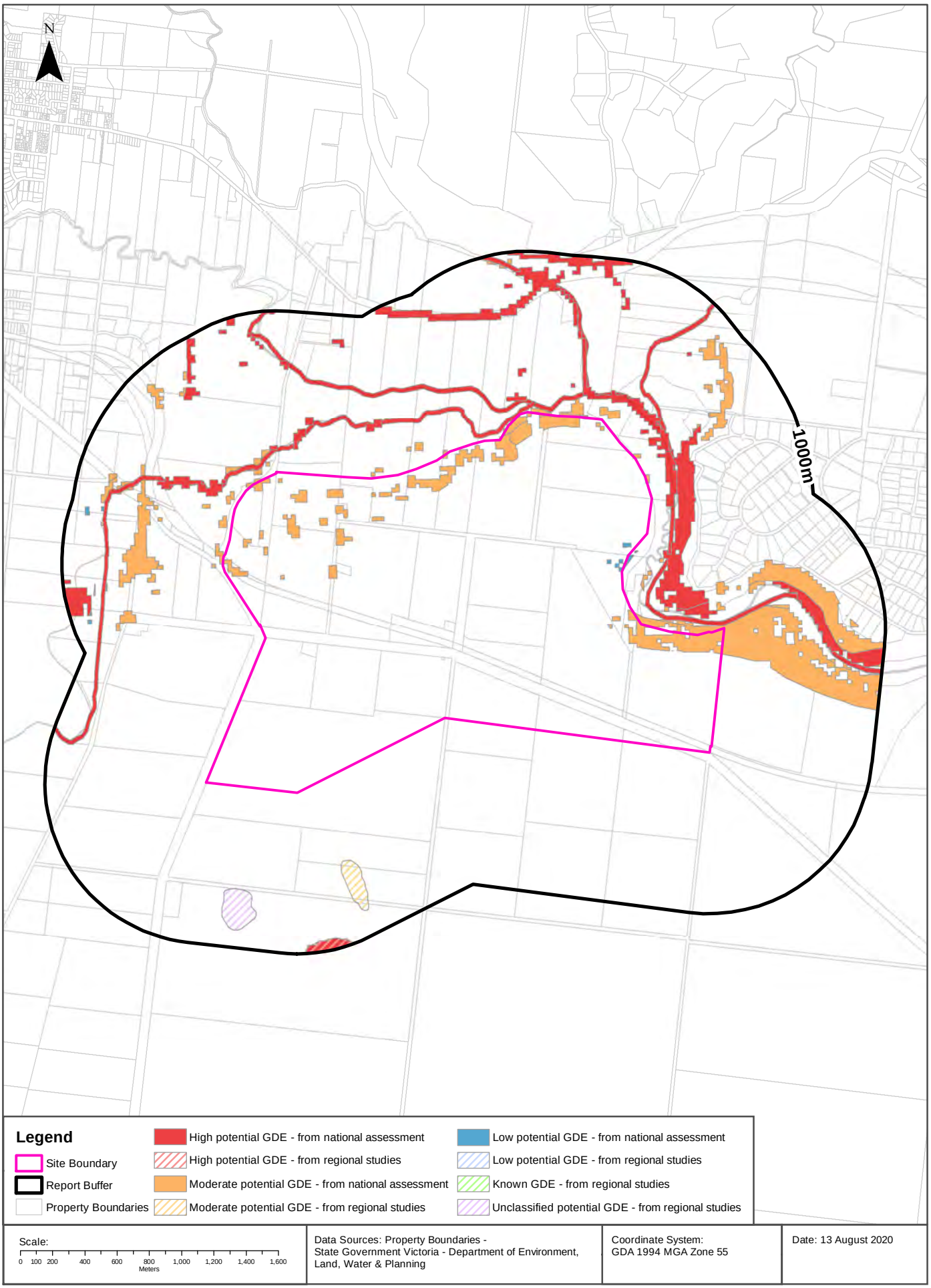
Ramsar Wetlands

What Ramsar wetland areas exist within the dataset buffer?

Map ID	Site Name	Lake Name	Distance	Direction
N/A	No records within buffer			

Ecological Constraints - Groundwater Dependent Ecosystems Atlas

Parwan Precinct Structure Plan, Parwan, VIC 3340



Ecological Constraints

Parwan Precinct Structure Plan, Parwan, VIC 3340

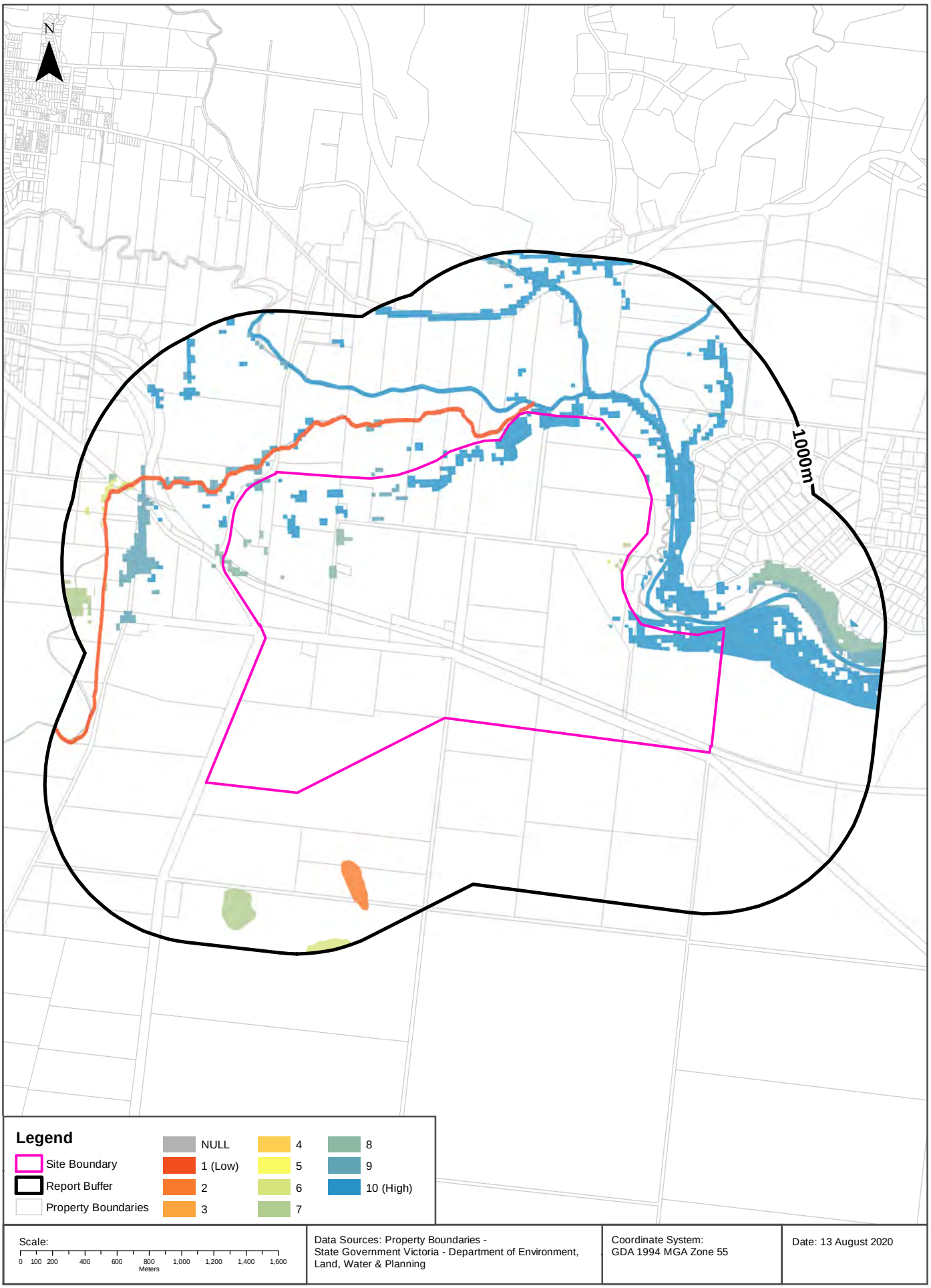
Groundwater Dependent Ecosystems Atlas

What GDEs exist within the dataset buffer?

GDE Type	Name	GDE Potential	Geomorphology	Ecosystem Type	Aquifer Geology	Distance
Aquatic	PARWAN CREEK	High potential GDE - from national assessment	Moderately high plateaus and strike ridges.	River	Unconsolidated sedimentary	0m
Terrestrial		Low potential GDE - from national assessment	Moderately high plateaus and strike ridges.	Vegetation	Fractured rock	0m
Terrestrial		Low potential GDE - from national assessment	Plains mainly on basalt lavas with many volcanic forms and lakes, partly on weak sedimentary rocks.	Vegetation	Fractured rock	0m
Terrestrial		Moderate potential GDE - from national assessment	Moderately high plateaus and strike ridges.	Vegetation	Fractured rock	0m
Terrestrial		Moderate potential GDE - from national assessment	Moderately high plateaus and strike ridges.	Vegetation	Unconsolidated sedimentary	0m
Terrestrial		Moderate potential GDE - from national assessment	Plains mainly on basalt lavas with many volcanic forms and lakes, partly on weak sedimentary rocks.	Vegetation	Fractured rock	0m
Terrestrial		High potential GDE - from national assessment	Moderately high plateaus and strike ridges.	Vegetation	Unconsolidated sedimentary	73m
Aquatic		Moderate potential GDE - from regional studies	Plains mainly on basalt lavas with many volcanic forms and lakes, partly on weak sedimentary rocks.	Wetland		507m
Aquatic		Unclassified potential GDE - from regional studies	Plains mainly on basalt lavas with many volcanic forms and lakes, partly on weak sedimentary rocks.	Wetland		631m
Aquatic		High potential GDE - from regional studies	Plains mainly on basalt lavas with many volcanic forms and lakes, partly on weak sedimentary rocks.	Wetland		929m

Inflow Dependent Ecosystems Likelihood

Parwan Precinct Structure Plan, Parwan, VIC 3340



Ecological Constraints

Parwan Precinct Structure Plan, Parwan, VIC 3340

Inflow Dependent Ecosystems Likelihood

What IDEs exist within the dataset buffer?

GDE Type	Name	IDE Likelihood	Geomorphology	Ecosystem Type	Aquifer Geology	Distance
Aquatic	PARWAN CREEK	1	Moderately high plateaus and strike ridges.	River	Unconsolidated sedimentary	0m
Terrestrial		6	Plains mainly on basalt lavas with many volcanic forms and lakes, partly on weak sedimentary rocks.	Vegetation	Fractured rock	0m
Terrestrial		7	Moderately high plateaus and strike ridges.	Vegetation	Fractured rock	0m
Terrestrial		7	Plains mainly on basalt lavas with many volcanic forms and lakes, partly on weak sedimentary rocks.	Vegetation	Fractured rock	0m
Terrestrial		8	Moderately high plateaus and strike ridges.	Vegetation	Fractured rock	0m
Terrestrial		8	Moderately high plateaus and strike ridges.	Vegetation	Unconsolidated sedimentary	0m
Terrestrial		9	Moderately high plateaus and strike ridges.	Vegetation	Fractured rock	0m
Terrestrial		9	Moderately high plateaus and strike ridges.	Vegetation	Unconsolidated sedimentary	0m
Terrestrial		10	Moderately high plateaus and strike ridges.	Vegetation	Fractured rock	0m
Terrestrial		10	Moderately high plateaus and strike ridges.	Vegetation	Unconsolidated sedimentary	0m
Terrestrial		10	Plains mainly on basalt lavas with many volcanic forms and lakes, partly on weak sedimentary rocks.	Vegetation	Fractured rock	0m
Aquatic	WERRIBEE RIVER	10	Plains mainly on basalt lavas with many volcanic forms and lakes, partly on weak sedimentary rocks.	River	Unconsolidated sedimentary	18m
Terrestrial		10	Moderately high plateaus and strike ridges.	Vegetation	Unconsolidated sedimentary	18m
Aquatic		2	Plains mainly on basalt lavas with many volcanic forms and lakes, partly on weak sedimentary rocks.	Wetland		507m
Aquatic		7	Plains mainly on basalt lavas with many volcanic forms and lakes, partly on weak sedimentary rocks.	Wetland		631m
Terrestrial		5	Moderately high plateaus and strike ridges.	Vegetation	Unconsolidated sedimentary	811m
Aquatic		6	Plains mainly on basalt lavas with many volcanic forms and lakes, partly on weak sedimentary rocks.	Wetland		929m

Inflow Dependent Ecosystems Likelihood Data Source: The Bureau of Meteorology

Site Diagram

Parwan Precinct Structure Plan, Parwan, VIC 3340

Legend

- Site Boundary
- Internal Parcel Boundaries

Total Area: 5m²

Total Perimeter: 10.37km

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

Data Sources: Aerial Imagery © Aerometrex Pty Ltd

Disclaimers:

Measurements are approximate only and may have been simplified or smaller lengths removed for readability.

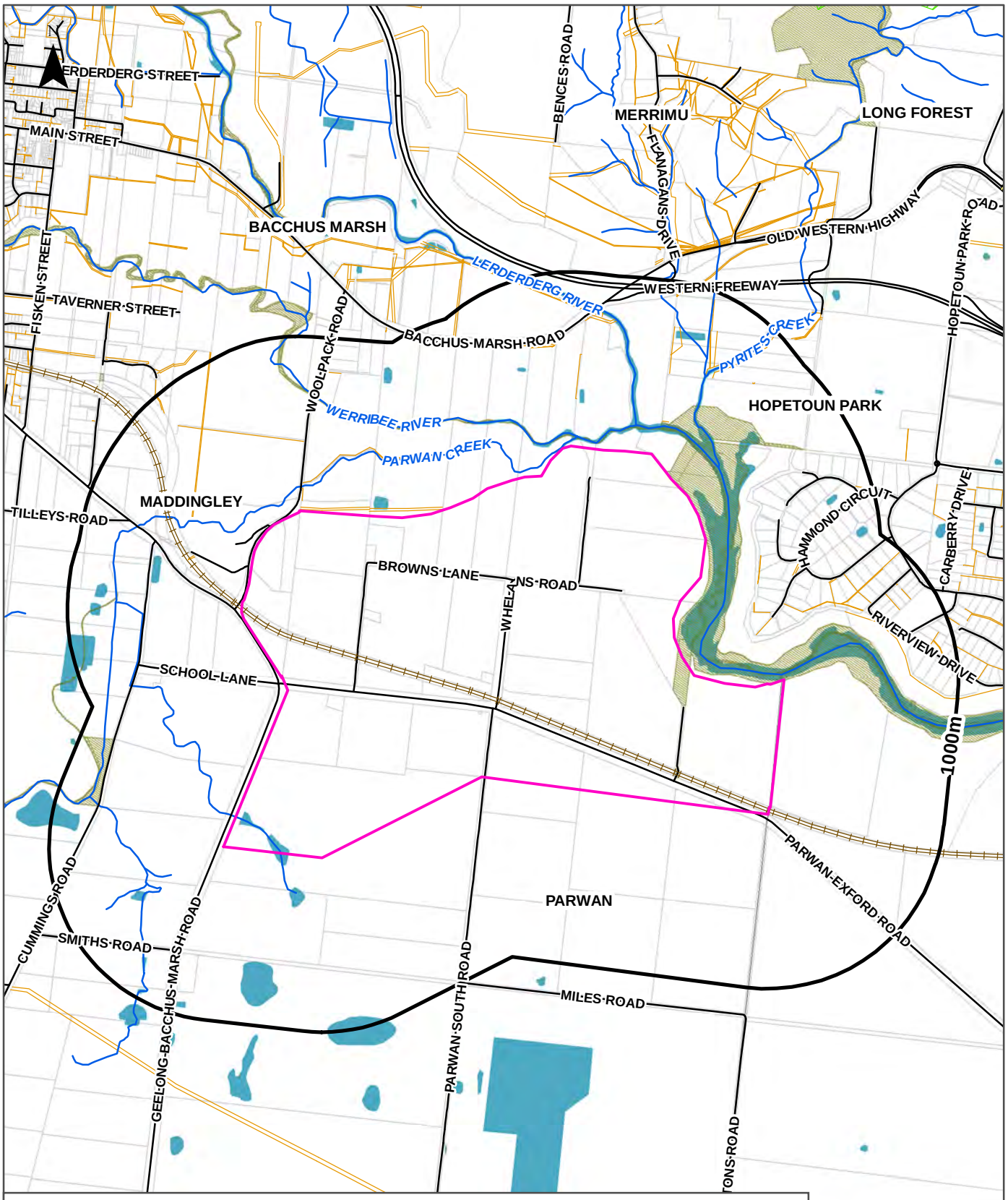
Parcels that make up a small percentage of the total site area have not been labelled for increased legibility.

Coordinate System: GDA 1994 MGA Zone 55

Date: 13 August 2020

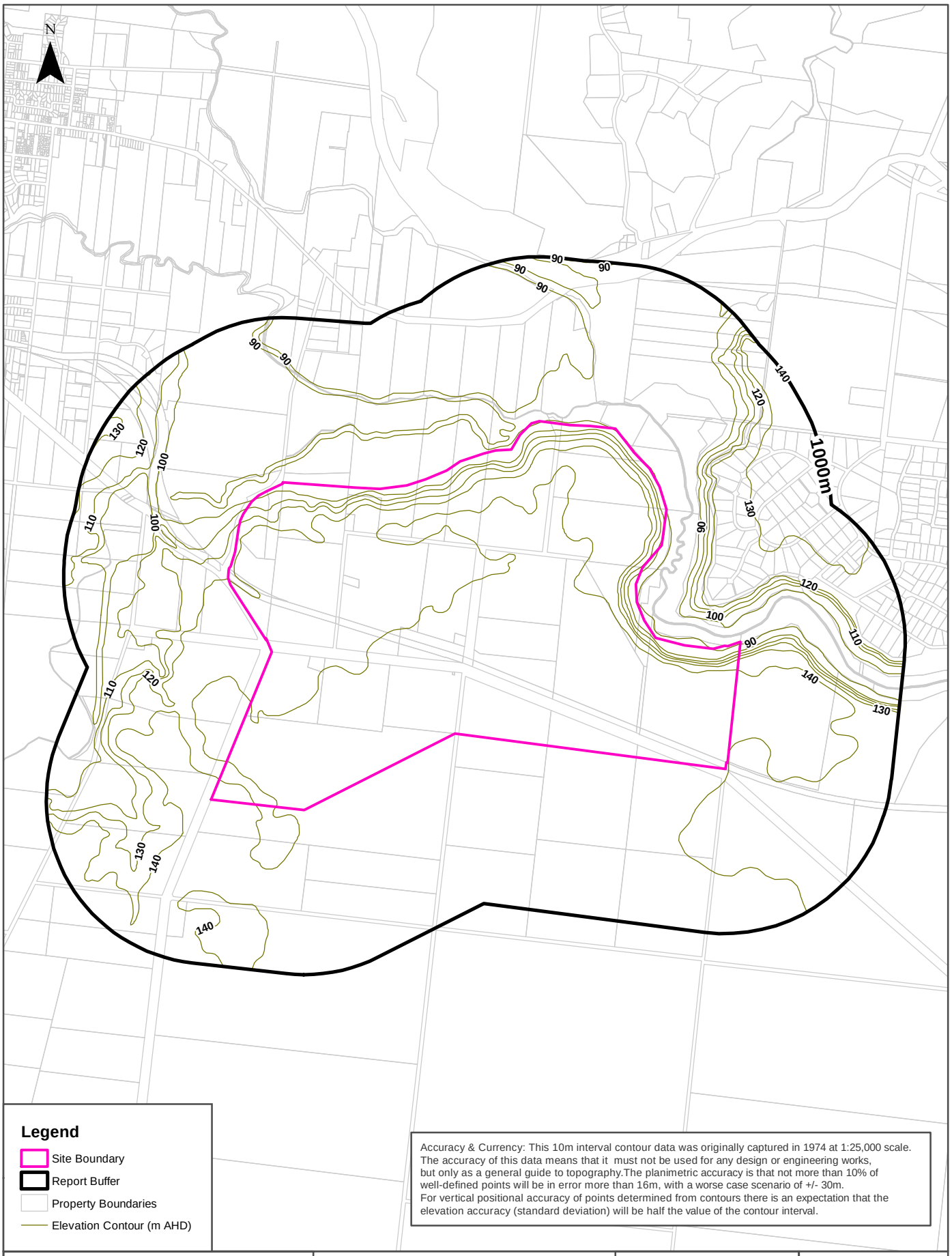
Topographic Data

Parwan Precinct Structure Plan, Parwan, VIC 3340



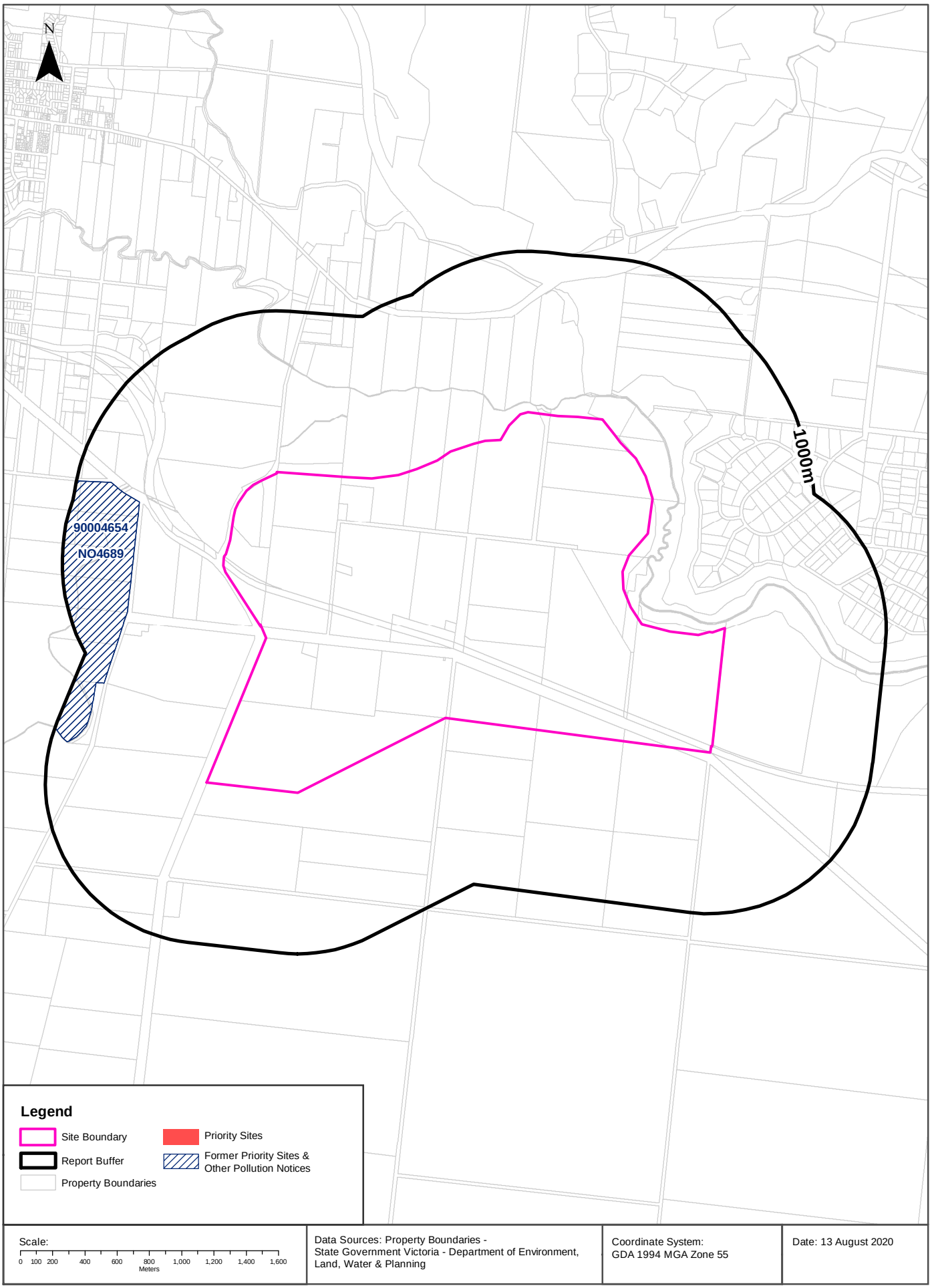
Elevation Contours (m AHD) 10m Interval at 1:25,000

Parwan Precinct Structure Plan, Parwan, VIC 3340



EPA Records - Priority Sites & Pollution Notices

Parwan Precinct Structure Plan, Parwan, VIC 3340



EPA Priority Sites & Pollution Notices

Parwan Precinct Structure Plan, Parwan, VIC 3340

Current EPA Priority Sites Register

Sites on the current EPA priority sites register that exist within the dataset buffer:

Notice No	Address	Suburb	Issue	Loc Conf	Dist (m)	Direction
N/A	No records in buffer					

Priority Sites Data Custodian: State Government Victoria - Environment Protection Authority (EPA)

Former EPA Priority Sites & Other Pollution Notices

Sites within the dataset buffer that have been issued a Pollution Notice:
Note. Due to pollution notices being revoked and removed from published lists this is not an exhaustive list of all past pollution notices.

Notice No	Notice Type	Company	Address	Suburb	Status	Issue	Date Issued	Loc Conf	Dist	Dir
NO4689	31B(1)	MADDINGLEY BROWN COAL P/L	EAST MADDINGLEY RD	BACCHUS MARSH	Legacy EPA Database Pollution Notice	Current Landfill, Requires ongoing management.	16/03/2005	Premise Match	557m	West
90004654	Pollution Abatement Notice	MADDINGLEY BROWN COAL PTY LTD	Maddingley Road	BACCHUS MARSH	Previous Pollution Notice			Premise Match	557m	West

Pollution Notice Data Custodian: State Government Victoria - Environment Protection Authority (EPA)

PFAS Investigation & Management Programs

Parwan Precinct Structure Plan, Parwan, VIC 3340

EPA PFAS Site Investigations

Sites being investigated by the EPA for PFAS contamination within the dataset buffer:

Map ID	Site Name	Address	Location Confidence	Distance	Direction
N/A	No records in buffer				

EPA PFAS Site Investigations Data Custodian: State Government Victoria - Environment Protection Authority (EPA)

Defence PFAS Investigation & Management Program Investigation Sites

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

Map ID	Base Name	Address	Location Confidence	Distance	Direction
N/A	No records in buffer				

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

Defence PFAS Investigation & Management Program Management Sites

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

Map ID	Base Name	Address	Location Confidence	Distance	Direction
N/A	No records in buffer				

Defence PFAS Investigation & 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	Location Confidence	Distance	Direction
N/A	No records in buffer				

Airservices Australia National PFAS Management Program Data Custodian: Airservices Australia

Defence Sites

Parwan Precinct Structure Plan, Parwan, VIC 3340

Defence 3 Year Regional Contamination Investigation Program

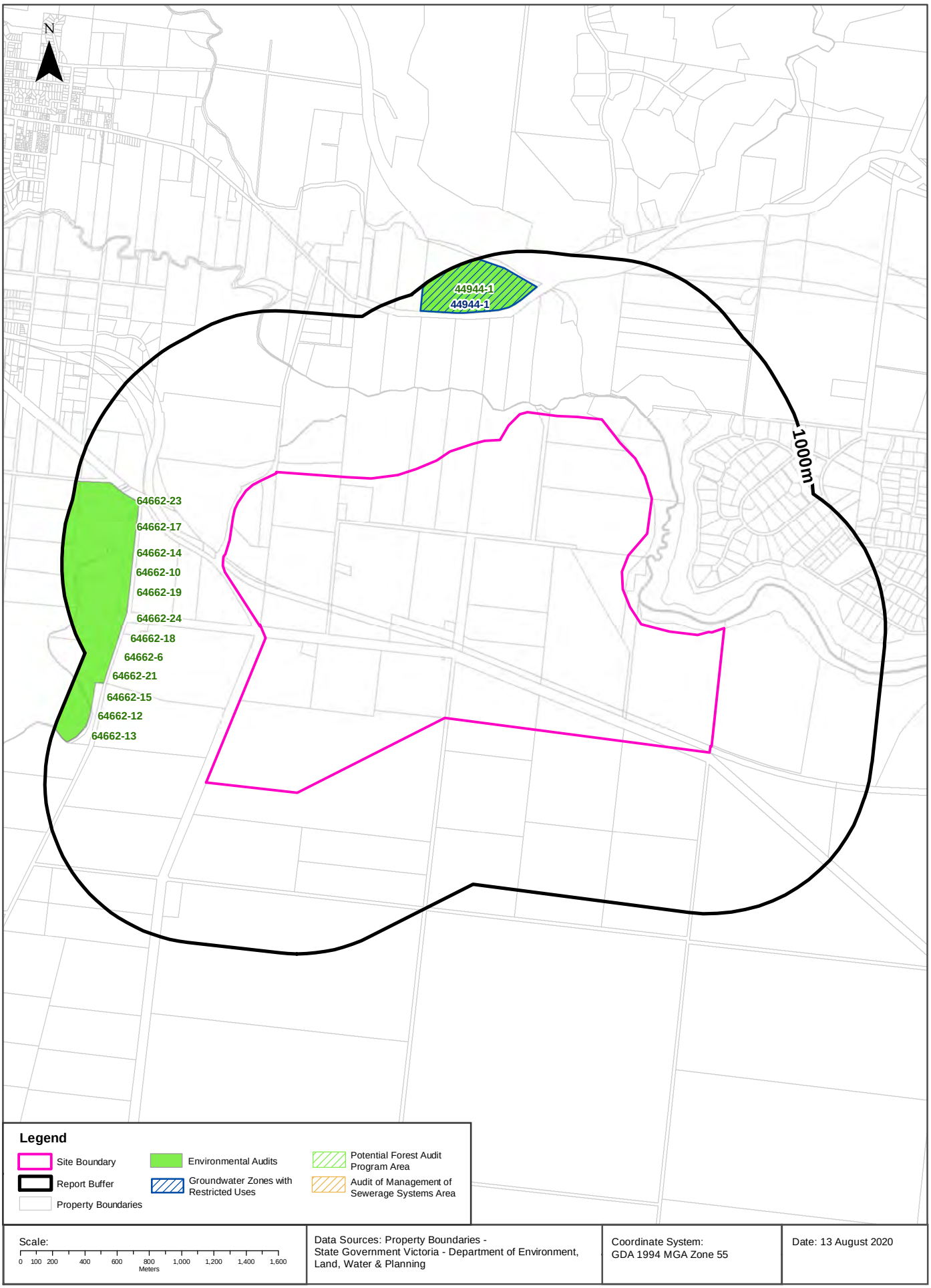
Sites which have been assessed as part of the Defence 3 Year Regional Contamination Investigation Program within the dataset buffer:

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 Records - Audit Reports & GQRUZ

Parwan Precinct Structure Plan, Parwan, VIC 3340



EPA Records

Parwan Precinct Structure Plan, Parwan, VIC 3340

EPA Environmental Audits

EPA environmental audit records that exist within the dataset buffer:
Note. Please click on CARMS No. to activate a hyperlink to online documentation. If link does not work, documentation may still be accessible via the EPA Interaction Portal.

CARMS No	Transaction No	Site	Address	Suburb	Date Complete	Audit Category	Loc Conf	Distance	Direction
64662-10	8004134	EAST MADDINGLEY ROAD MADDINGLEY BROWN COAL (MBC) LANDFILL	EAST MADDINGLEY ROAD	Bacchus Marsh	16/01/2014	53V Audit recommendations	Premise Match	557m	West
64662-14	8004738	EAST MADDINGLEY RD, MADDINGLEY VIC 3340 EAST MADDINGLEY RD	EAST MADDINGLEY RD, MADDINGLEY VIC 3340 EAST MADDINGLEY RD	MADDINGLEY	10/12/2015	53V Audit recommendations	Premise Match	557m	West
64662-17	8005136	MADDINGLEY BROWN COAL LANDFILL 11 TILLEYS RD	MADDINGLEY BROWN COAL LANDFILL 11 TILLEYS RD, MADDINGLEY	MADDINGLEY	13/01/2017	53V Audit recommendations	Premise Match	557m	West
64662-19	8005528	11 TILLEYS RD, MADDINGLEY VIC 3340 11 TILLEYS RD	MADDINGLEY BROWN COAL LANDFILL 11 TILLEYS RD	MADDINGLEY	30/01/2018	53V Audit recommendations	Premise Match	557m	West
64662-23	8005942	11 TILLEYS RD, MADDINGLEY VIC 3340 11 TILLEYS RD	11 TILLEYS RD, MADDINGLEY VIC 3340 11 TILLEYS RD	MADDINGLEY	25/01/2019	53V Audit recommendations	Premise Match	557m	West
64662-24	8006370	11 TILLEYS RD, MADDINGLEY VIC 3340 11 TILLEYS RD	11 TILLEYS RD, MADDINGLEY VIC 3340 11 TILLEYS RD	MADDINGLEY	27/03/2020	53V Audit recommendations	Premise Match	557m	West
44944-1	8001314	BACCHUS MARSH SEWERAGE TREATMENT PLANT THE AVENUE OF HONOUR RD	HONOUR RD	BACCHUS MARSH	24/07/2003	53X Statement	Premise Match	659m	North
64662-13	8004437	11 TILLEYS RD, MADDINGLEY VIC 3340 11 TILLEYS RD	11 TILLEYS RD, MADDINGLEY VIC 3340 11 TILLEYS RD	MADDINGLEY	23/12/2014	53V Audit recommendations	Premise Match	722m	West
64662-15	8004805	11 TILLEYS RD, MADDINGLEY VIC 3340 11 TILLEYS RD	11 TILLEYS RD, MADDINGLEY VIC 3340 11?, MADDINGLEY	MADDINGLEY	25/08/2016	53V Audit recommendations	Premise Match	877m	West
64662-6	8002697	MADDINGLEY BROWN COAL LANDFILL EAST MADDINGLEY RD	MADDINGLEY BROWN COAL LANDFILL EAST MADDINGLEY RD	MADDINGLEY	15/07/2015	53V No audit recommendations	Premise Match	939m	West
64662-21	8005893	11 TILLEYS RD, MADDINGLEY VIC 3340 11 TILLEYS RD	CELL SWLE E5 11 TILLEYS RD	MADDINGLEY	21/09/2018	53V Audit recommendations	Premise Match	939m	West
64662-18	8005362	11 TILLEYS RD, MADDINGLEY VIC 3340 (CELL 11 TILLEYS RD	11 TILLEYS RD, MADDINGLEY VIC 3340 (CELL 11 TILLEYS RD	MADDINGLEY	19/09/2019	53V Audit recommendations	Premise Match	942m	West

CARMS No	Transaction No	Site	Address	Suburb	Date Complete	Audit Category	Loc Conf	Distance	Direction
64662-12	8004417	MADDINGLEY BROWN COAL LANDFILL 11 TILLEYS RD	MADDINGLEY BROWN COAL LANDFILL 11 TILLEYS RD	MADDINGLEY	11/12/2014	53V Audit recommendations	Premise Match	975m	West

Environmental Audit Data Custodian: State Government Victoria - Environment Protection Authority (EPA)

EPA Records

Parwan Precinct Structure Plan, Parwan, VIC 3340

EPA Groundwater Zones with Restricted Uses

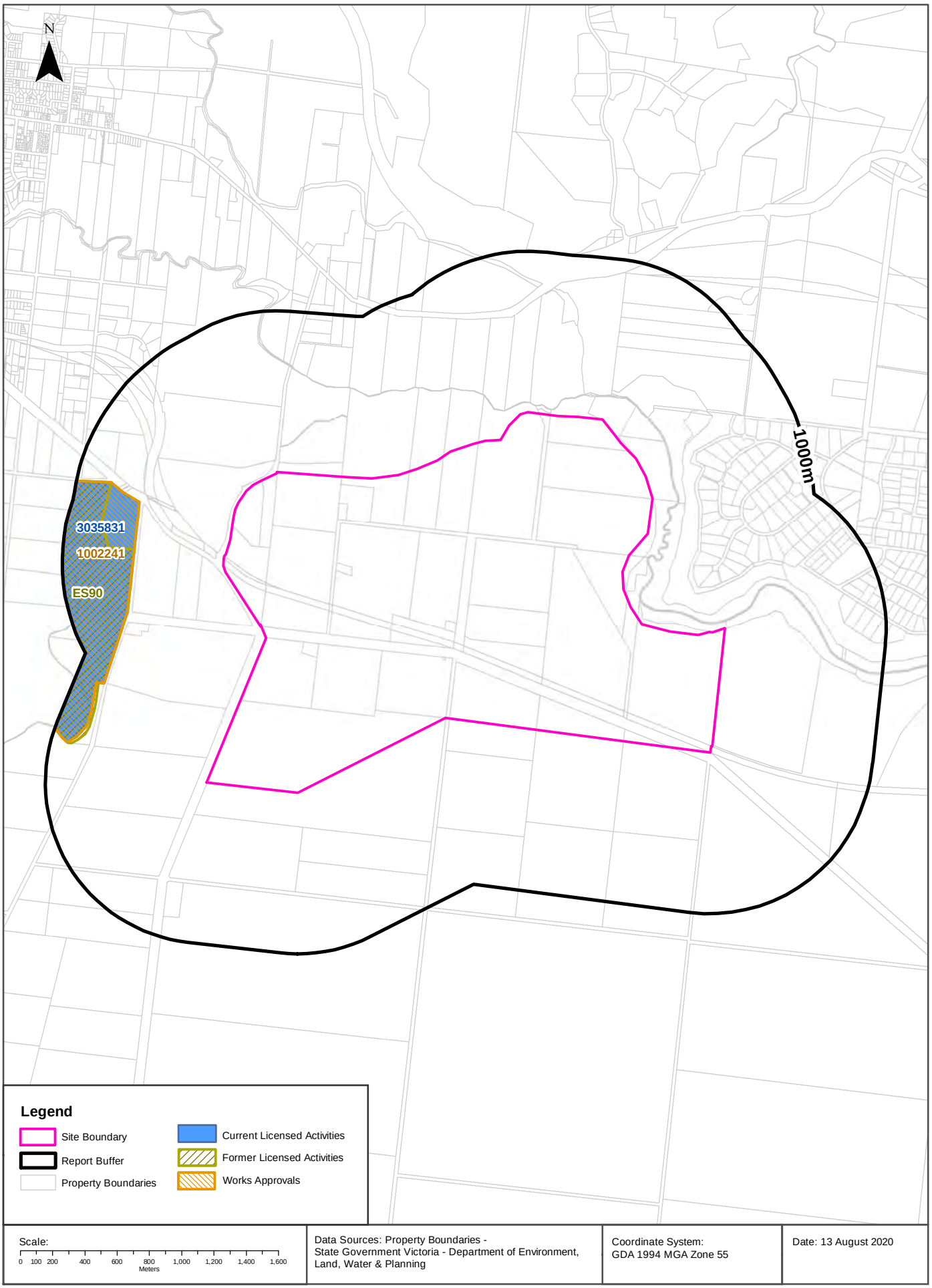
EPA GQRUZ records that exist within the dataset buffer:
Note. Please click on CARMS No. to activate a hyperlink to online documentation.

CARMS No	EPA Id	Site History	Site Address	Restricted Uses	Status	Loc Conf	Distance	Direction
44944-1	7000059	Water treatment plant	BACCHUS MARSH SEWERAGE TREATMENT PLANT THE AVENUE OF HONOURRD BACCHUS MARSH VIC 3340	Drinking water Irrigation of crops (including domestic gardens) and parks Water used for recreational purposes (e.g. swimming)	Current EPA list	Premise Match	659m	North

Environmental GQRUZ Data Custodian: State Government Victoria - Environment Protection Authority (EPA)

EPA Records - Licensed Activities & Works Approvals

Parwan Precinct Structure Plan, Parwan, VIC 3340



EPA Activities

Parwan Precinct Structure Plan, Parwan, VIC 3340

EPA Licensed Activities

EPA licensed activities that exist within the dataset buffer:

Trans No	Licence No	Licence Type	Organisation	Premise Ref	Premise Address 1	Premise Address 2	Activities	Loc Conf	Dist (m)	Direction
3035831	45288	Licence	MADDINGLEY BROWN COAL PTY LTD [MADDINGLEY]		11 TILLEYS RD	MADDINGLEY VIC 3340	A05 Landfills; A01 Prescribed Industrial Waste Management; A07 Composting	Premise Match	557m	West

Licensed Activity Data Custodian: State Government Victoria - Environment Protection Authority (EPA)

Former EPA Licensed Activities

Former EPA licensed activities that exist within the dataset buffer:

Licence No	Organisation	Premise Address	Suburb	Activities	Loc Conf	Dist (m)	Direction
ES90	MADDINGLEY BROWN COAL PTY LTD [MADDINGLEY]	EAST MADDINGLEY RD, BACCHUS MARSH VIC 3340	MADDINGLEY	Landfilling, Composting	Premise Match	557m	West

Former Licensed Activity Data Custodian: State Government Victoria - Environmental Protection Authority (EPA)

EPA Works Approvals

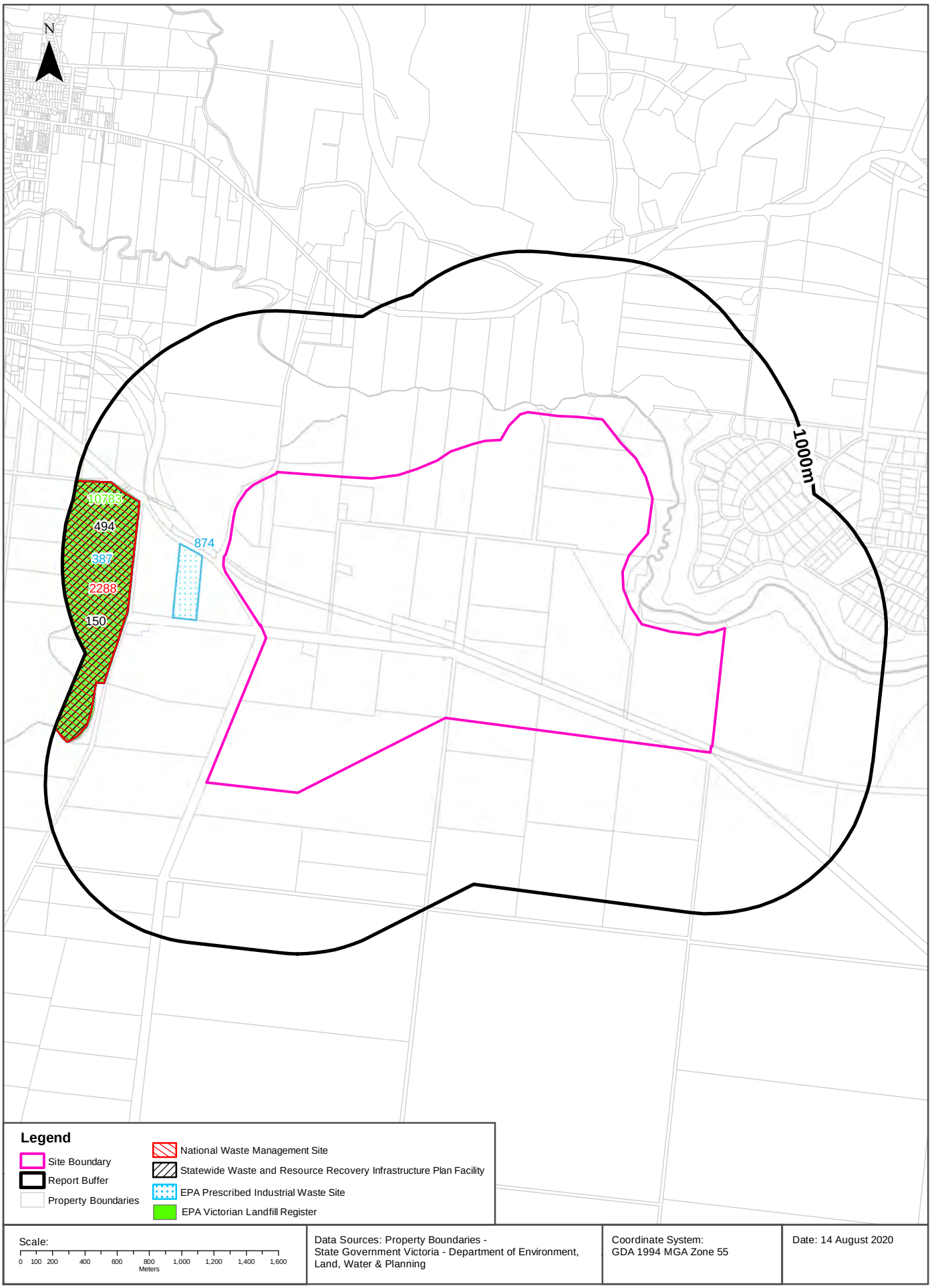
EPA works approvals that exist within the dataset buffer:

Transaction No	Status	Approval No	Organisation	Premise Address	Suburb	Scheduled Categories	Loc Conf	Dist (m)	Direction
1002241	Approved/ Issued		MADDINGLEY BROWN COAL PTY LTD [MADDINGLEY]		MADDINGLEY	Design and construct landfill cells	Premise Match	557m	West

Works Approvals Data Custodian: State Government Victoria - Environment Protection Authority (EPA)

Waste Management Facilities & Landfills

Parwan Precinct Structure Plan, Parwan, VIC 3340



Waste Management Facilities & Landfills

Parwan Precinct Structure Plan, Parwan, VIC 3340

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 (m)	Direction
2288	Maddingley Brown Coal Pty Ltd	Maddingley Brown Coal Pty Ltd	Tilleys Road	Maddingley	Landfill	Operational		Operational	Commercial waste only	Premise Match	557m	West

Waste Management Facilities Data Source: Australian Government Geoscience Australia

Statewide Waste and Resource Recovery Infrastructure Plan Facilities

Statewide Waste and Resource Recovery Infrastructure Plan Facilities within the dataset buffer:

Map Id	Owner	Site Name	Address	Suburb	Category	Sub Category	Loc Conf	Distance	Direction
150	Maddingley Brown Coal P/L	Maddingley Brown Coal - ES90	East Maddingley Rd	Bacchus Marsh	Landfill	Inert Landfill	Premise Match	557m	West
494		Calleja Transport	East Maddingley Rd	Bacchus Marsh	Organics	Garden Waste	Premise Match	557m	West

SWRRIPF Data Source: State Government Victoria - Department of Sustainability

EPA Prescribed Industrial Waste

EPA Prescribed Industrial Waste treaters, disposers and permitted transporters within the dataset buffer:

Map Id	Company Name	Address	Suburb	Treatment /Disposal	Transport	Accredited Agent	EPA List Status	Loc Conf	Dist' (m)	Direct
874	EASTERN PETS PTY LTD	42 SCHOOL LANE	MADDINGLEY VIC 3340	No	Yes	No	Previous EPA List	Premise Match	136m	West
387	MADDINGLEY BROWN COAL PTY LTD [MADDINGLEY]	11 TILLEYS RD	MADDINGLEY VIC 3340	Yes	No	No	Current EPA List	Premise Match	557m	West

Prescribed Industrial Waste Data Source: State Government Victoria - Environment Protection Authority (EPA)

EPA Victorian Landfill Register

EPA Victorian Landfill Register sites within the dataset buffer:

Landfill Register No.	Site	Address	Operating Status	Est. Year Of Closure	Waste type	Loc Conf	Dist' (m)	Direction
10783	Not available	11 Tilleys Road, Maddingley, VIC 3340	Operating	Not available	Contaminated soil (Cat C), Paper pulp, Shredder floc, Tyres (shredded), Waste acid sulphate soils, Solid inert waste, Foundry sands, Paper pulp, Commercial food waste, Biosolids, Green waste	As Supplied	555m	West

EPA Victorian Landfill Register Data Source: State Government Victoria - Environment Protection Authority (EPA)

Former Gasworks and Liquid Fuel Facilities

Parwan Precinct Structure Plan, Parwan, VIC 3340

Former Gasworks

Former Gasworks identified from various historical sources within the dataset buffer:
Note - As this is a dataset collated from various historical sources, it is not an exhaustive list of all former Gasworks

Map Id	Site Name	Date Opened	Year Closed	Location Confidence	Distance	Direction
N/A	No records in buffer					

Former Gasworks Data Source: Collated from various historical sources

National Liquid Fuel Facilities

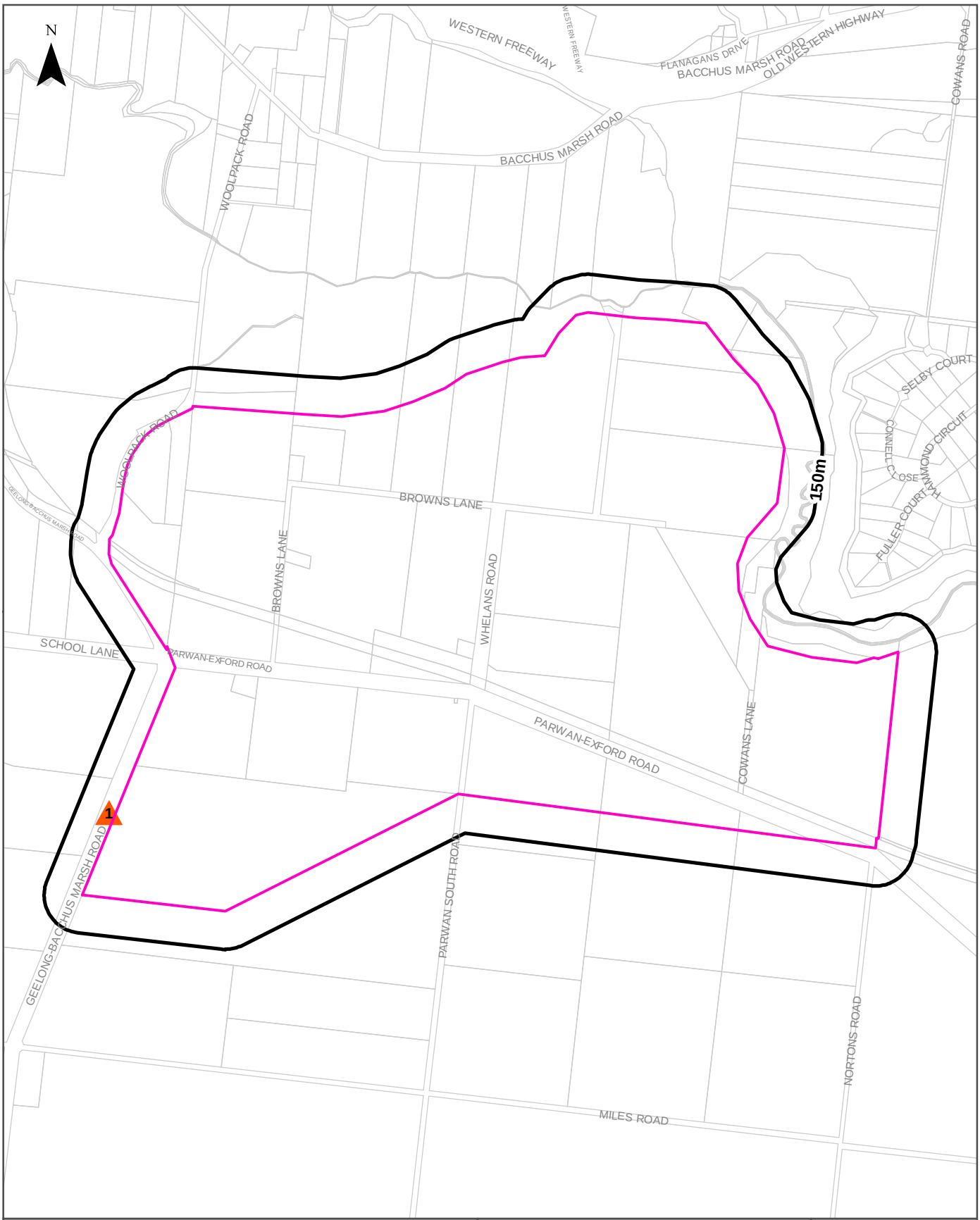
National Liquid Fuel Facilties within the dataset buffer:

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

National Liquid Fuel Facilities Data Source: Geoscience Australia

Historical Business Directories

Parwan Precinct Structure Plan, Parwan, VIC 3340



Legend

- Site Boundary
- Buffer 150m
- Property Boundary
- Business directory records mapped to a specific premise
- Business directory records mapped to a road intersection
- Business directory records mapped to a road corridor
- Business directory records mapped to a general area

Scale: 0 290 580 870 1,160 Meters

Coordinate System: GDA 1994 MGA Zone 55

Date: 13 August 2020

Data Sources: Reproduced with permission of UBD and Hardie Grant Media Pty Ltd DD 01/08/2018
Sands & McDougall's Directory - Digitised by State Library Victoria
Property Boundaries © State Government Victoria - Dept. of Environment, Land, Water & Planning 2020

Historical Business Directories

Parwan Precinct Structure Plan, Parwan, VIC 3340

Business Directory Records 1905-1991
Premise or Road Intersection Matches

Universal Business Directory and Sands & McDougall Directory records, from years 1991, 1980, 1970, 1960, 1950, 1945, 1925 & 1905, mapped to a premise or road intersection within the dataset buffer:

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

Business Directory Records 1905-1991
Road or Area Matches

Universal Business Directory and Sands & McDougall Directory records, from years 1991, 1980, 1970, 1960, 1950, 1945, 1925 & 1905, 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
1	Agricultural Spray Services	Hardi Spraying Systems., Geelong Rd. Bacchus Marsh. 3340	73725	1991	Road Match	0m

Historical Business Directories

Parwan Precinct Structure Plan, Parwan, VIC 3340

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

Dry Cleaners, Motor Garages & Service Stations from Sands & McDougall's Directories and 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
	No records in buffer						

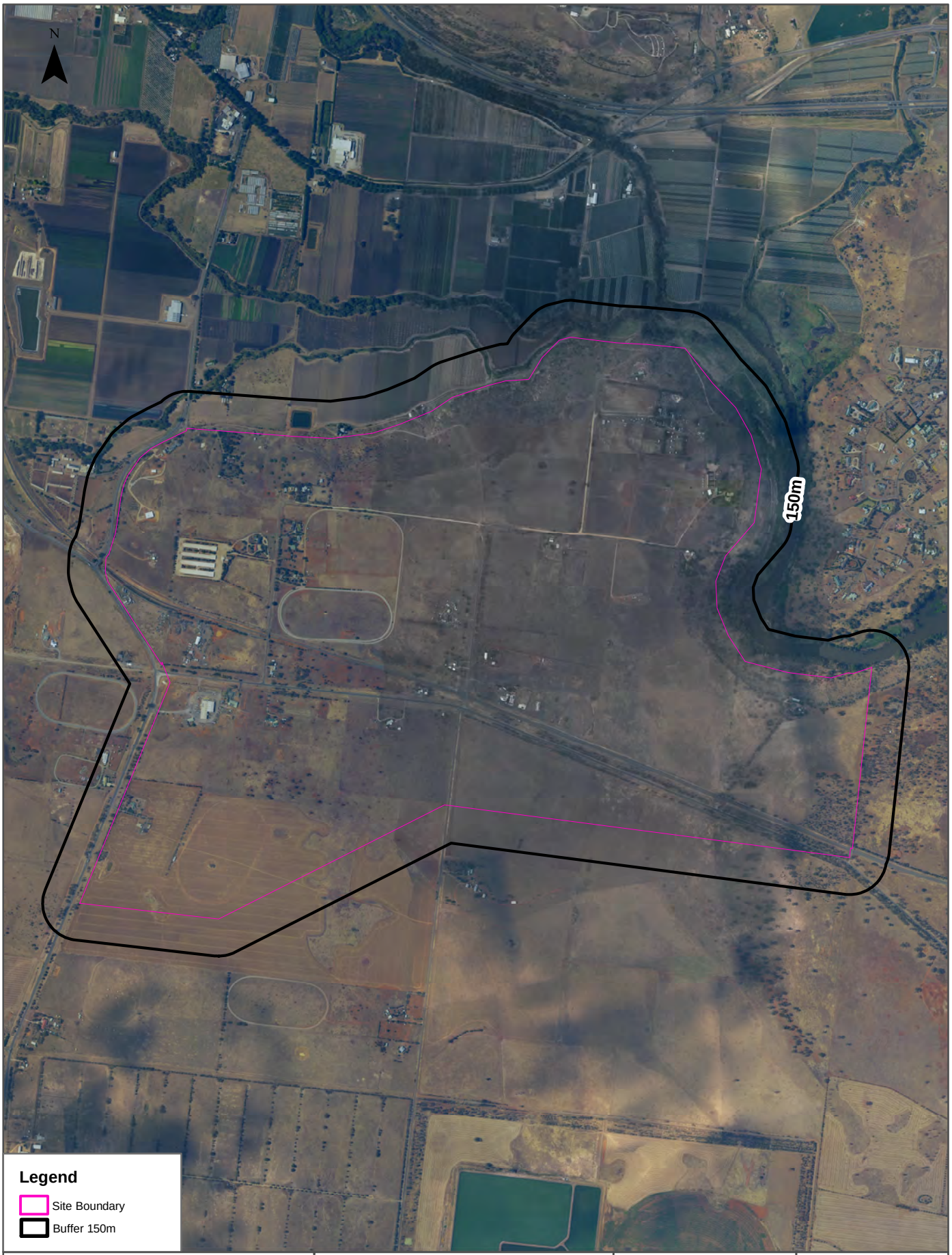
Dry Cleaners, Motor Garages & Service Stations Road or Area Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories and Sands & McDougall's 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
	No records in buffer					

Aerial Imagery 2019

Parwan Precinct Structure Plan, Parwan, VIC 3340



Data Sources: Aerial Imagery © Aerometrex Pty Ltd

Coordinate System: GDA 1994 MGA Zone 55

Date: 13 August 2020

Aerial Imagery 2013

Parwan Precinct Structure Plan, Parwan, VIC 3340

Scale: 0 240 480 720 960 Meters	Data Source Aerial Imagery: © 2020 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.	Coordinate System: GDA 1994 MGA Zone 55	Date: 13 August 2020

Aerial Imagery 2010

Parwan Precinct Structure Plan, Parwan, VIC 3340

Scale: 0 240 480 720 960 Meters

Data Source Aerial Imagery: © 2020 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.

Coordinate System: GDA 1994 MGA Zone 55

Date: 13 August 2020

Aerial Imagery 2006

Parwan Precinct Structure Plan, Parwan, VIC 3340

Scale:	Data Source Aerial Imagery: © 2020 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.	Coordinate System: GDA 1994 MGA Zone 55	Date: 13 August 2020

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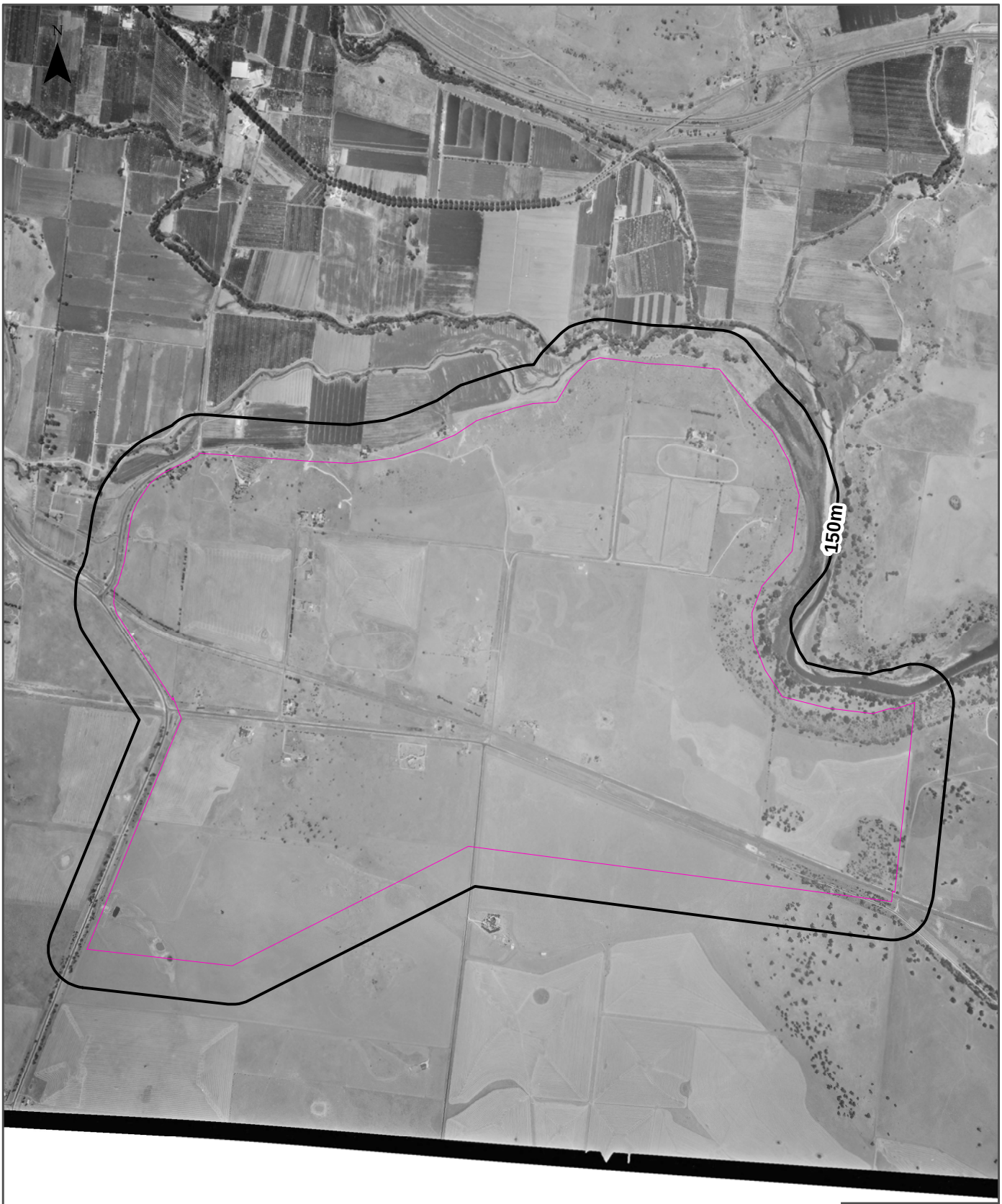
Aerial Imagery 1990

Parwan Precinct Structure Plan, Parwan, VIC 3340

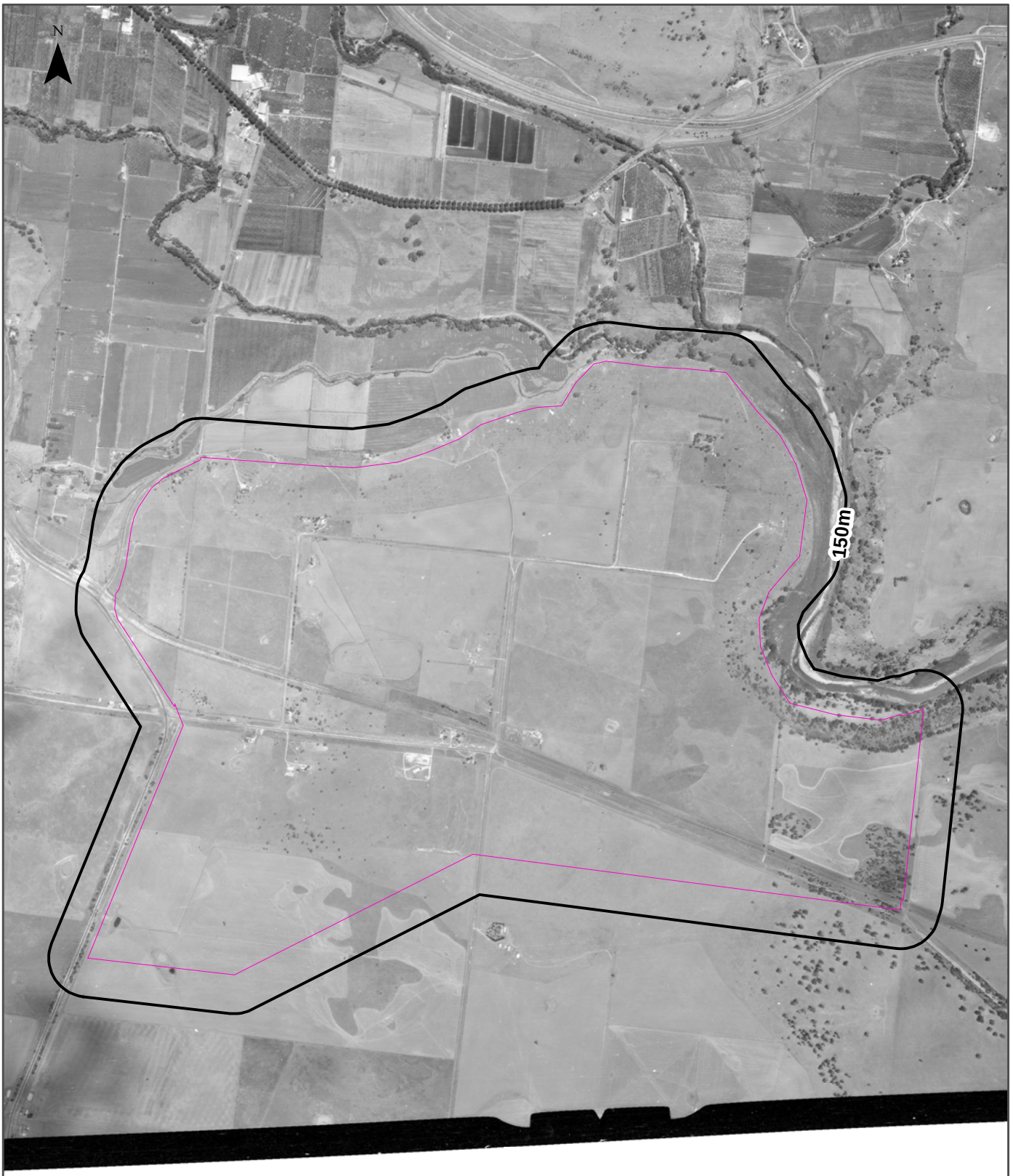
Aerial Imagery 1985

Parwan Precinct Structure Plan, Parwan, VIC 3340



Aerial Imagery 1979

Parwan Precinct Structure Plan, Parwan, VIC 3340



Legend

Site Boundary

Buffer 150m

Scale:
0 240 480 720 960
Meters

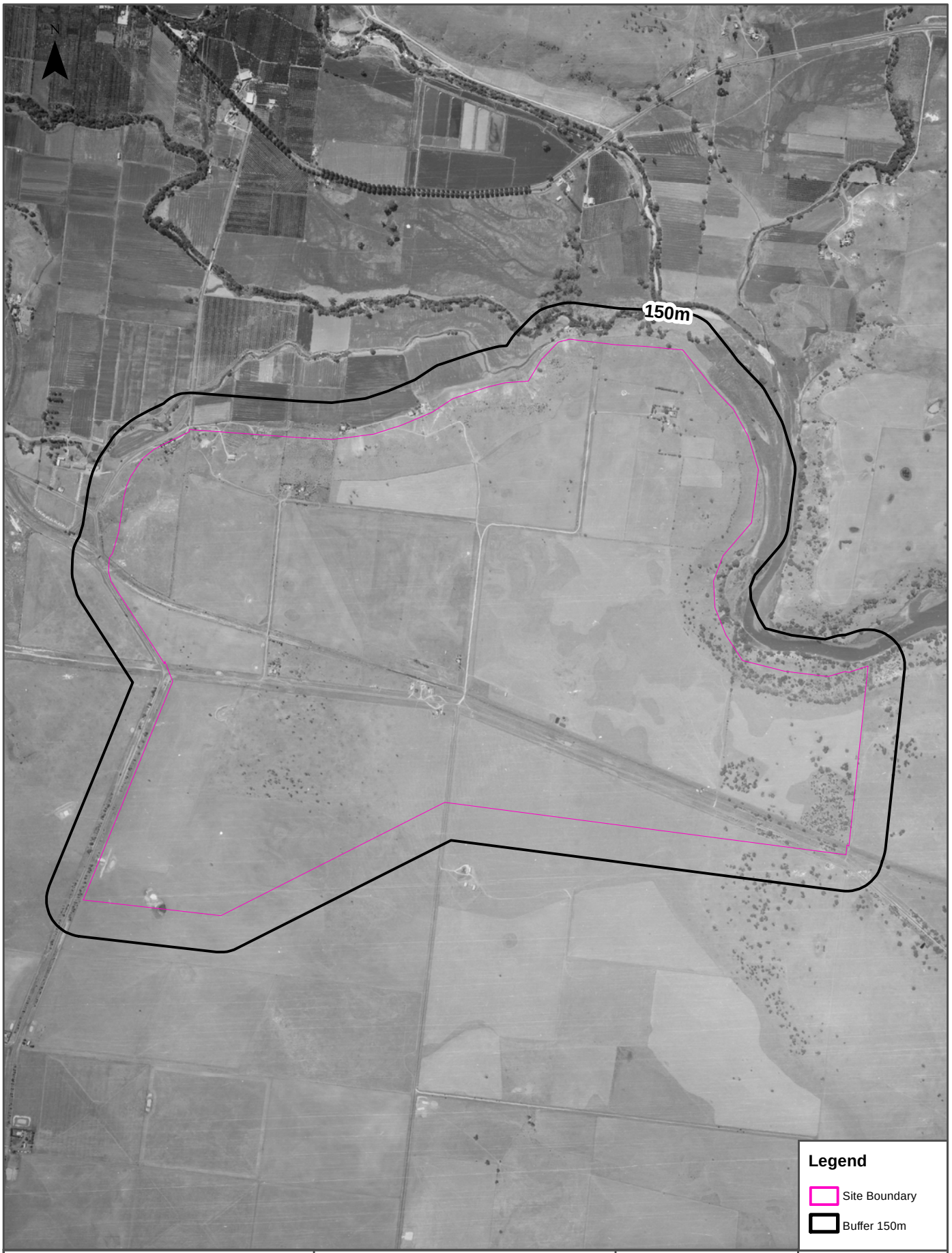
Data Source Aerial Imagery:
© Department of Environment, Land, Water and Planning (Vicmap Topographic Mapping Program)

Coordinate System:
GDA 1994 MGA Zone 55

Date: 13 August 2020

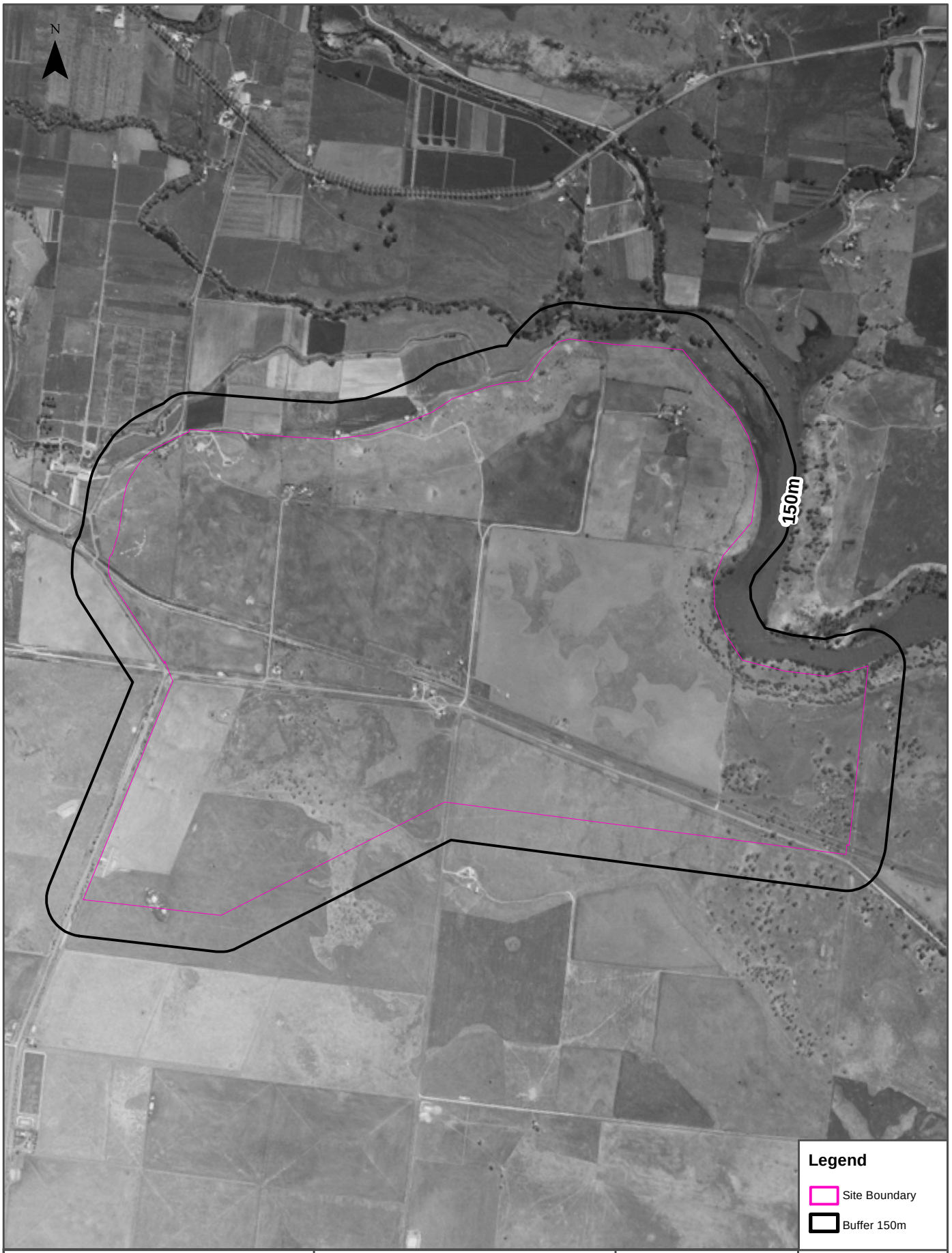
Aerial Imagery 1970

Parwan Precinct Structure Plan, Parwan, VIC 3340



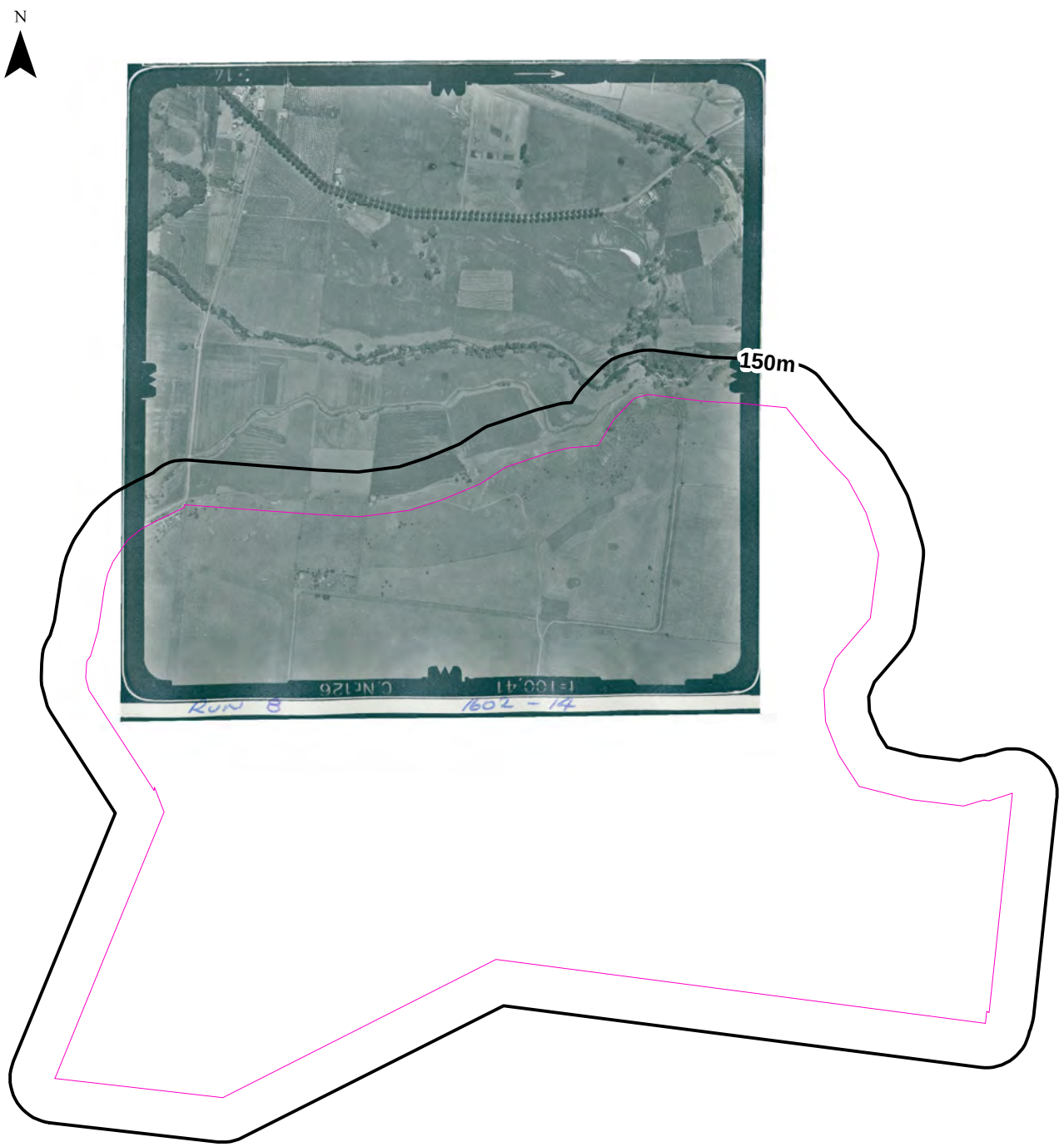
Aerial Imagery 1968

Parwan Precinct Structure Plan, Parwan, VIC 3340



Aerial Imagery 1961

Parwan Precinct Structure Plan, Parwan, VIC 3340



Legend

Site Boundary

Buffer 150m

Scale:
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Meters

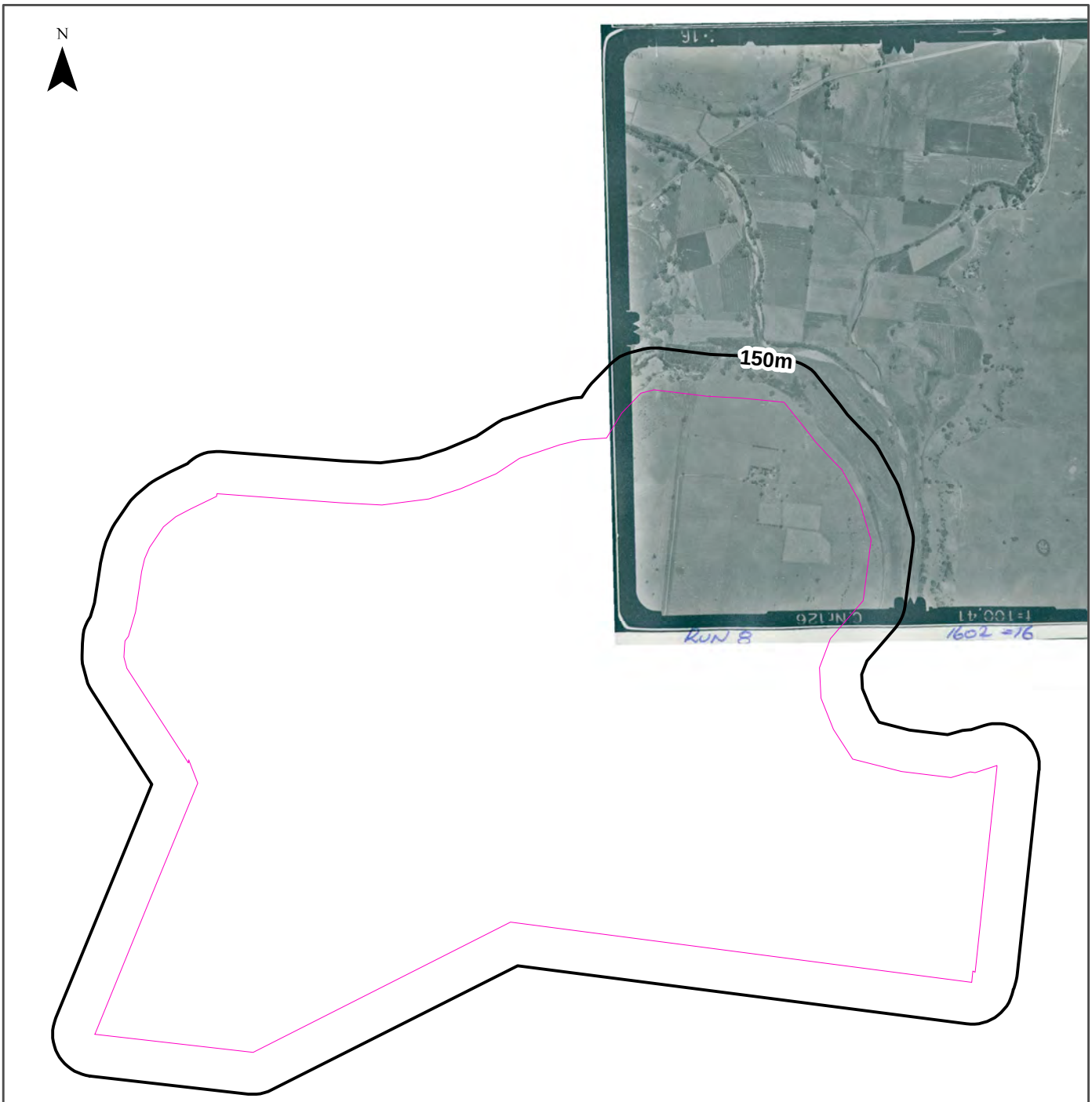
Data Source Aerial Imagery:
© Department of Environment, Land, Water and Planning (Vicmap Topographic Mapping Program)

Coordinate System:
GDA 1994 MGA Zone 55

Date: 14 August, 2020

Aerial Imagery 1961

Parwan Precinct Structure Plan, Parwan, VIC 3340



Legend

Site Boundary

Buffer 150m

Scale:
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Meters

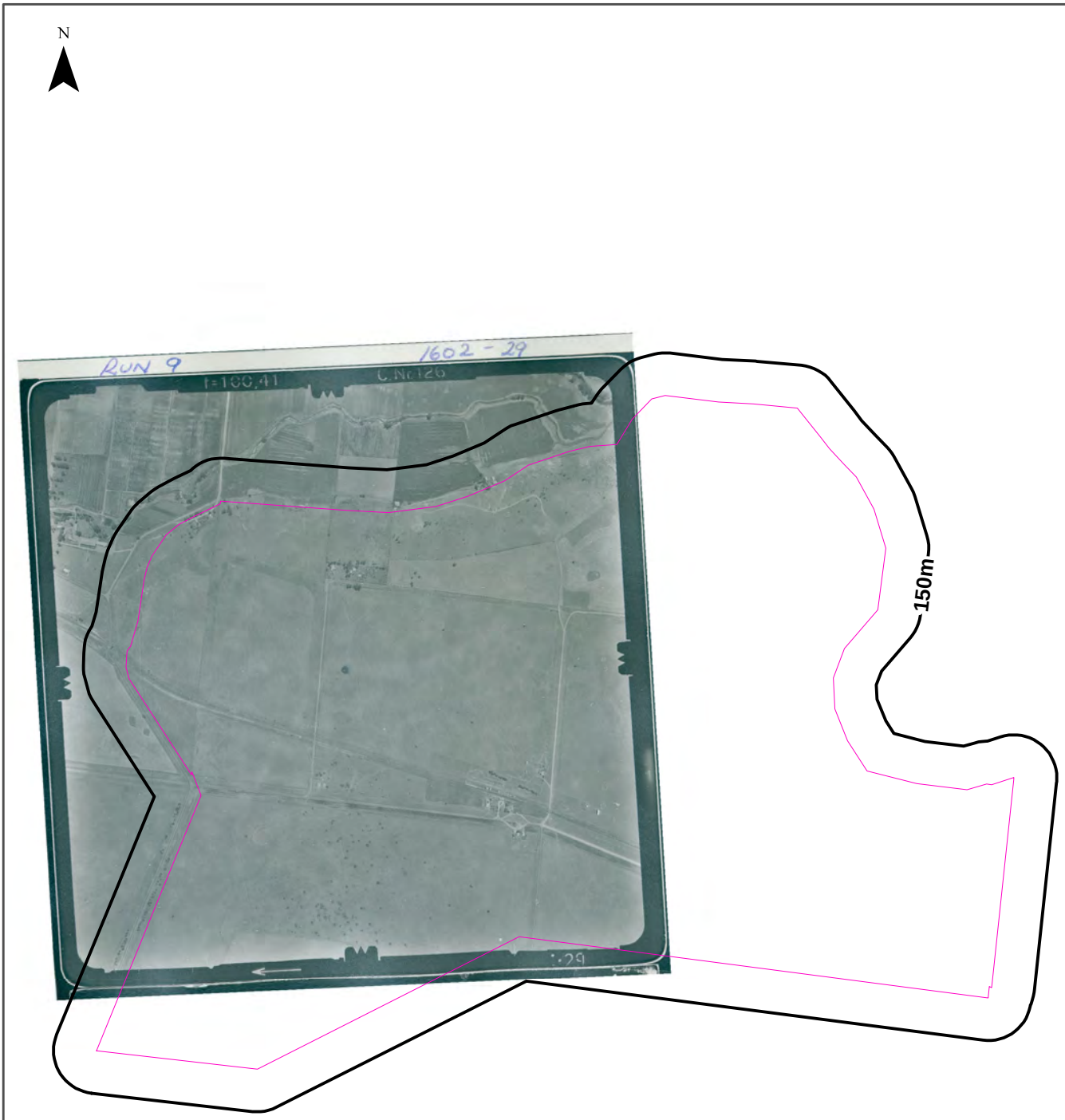
Data Source Aerial Imagery:
© Department of Environment, Land, Water and Planning (Vicmap Topographic Mapping Program)

Coordinate System:
GDA 1994 MGA Zone 55

Date: 14 August, 2020

Aerial Imagery 1961

Parwan Precinct Structure Plan, Parwan, VIC 3340



Legend

Site Boundary

Buffer 150m

Scale:

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Meters

Data Source Aerial Imagery:
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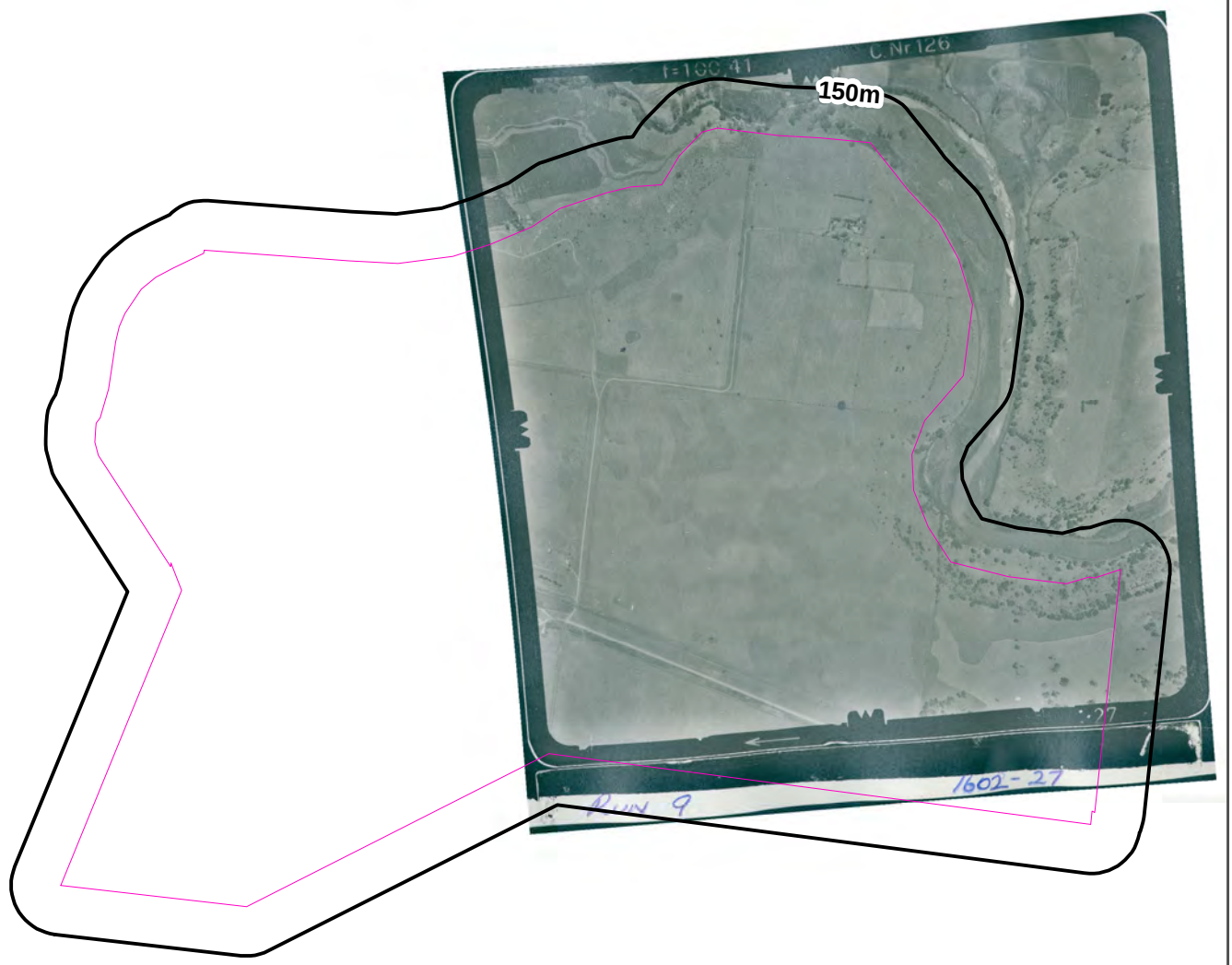
Coordinate System:
GDA 1994 MGA Zone 55

Date: 13 August 2020

Aerial Imagery 1961

Parwan Precinct Structure Plan, Parwan, VIC 3340



Legend

Site Boundary

Buffer 150m

Scale:
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Meters

Data Source Aerial Imagery:
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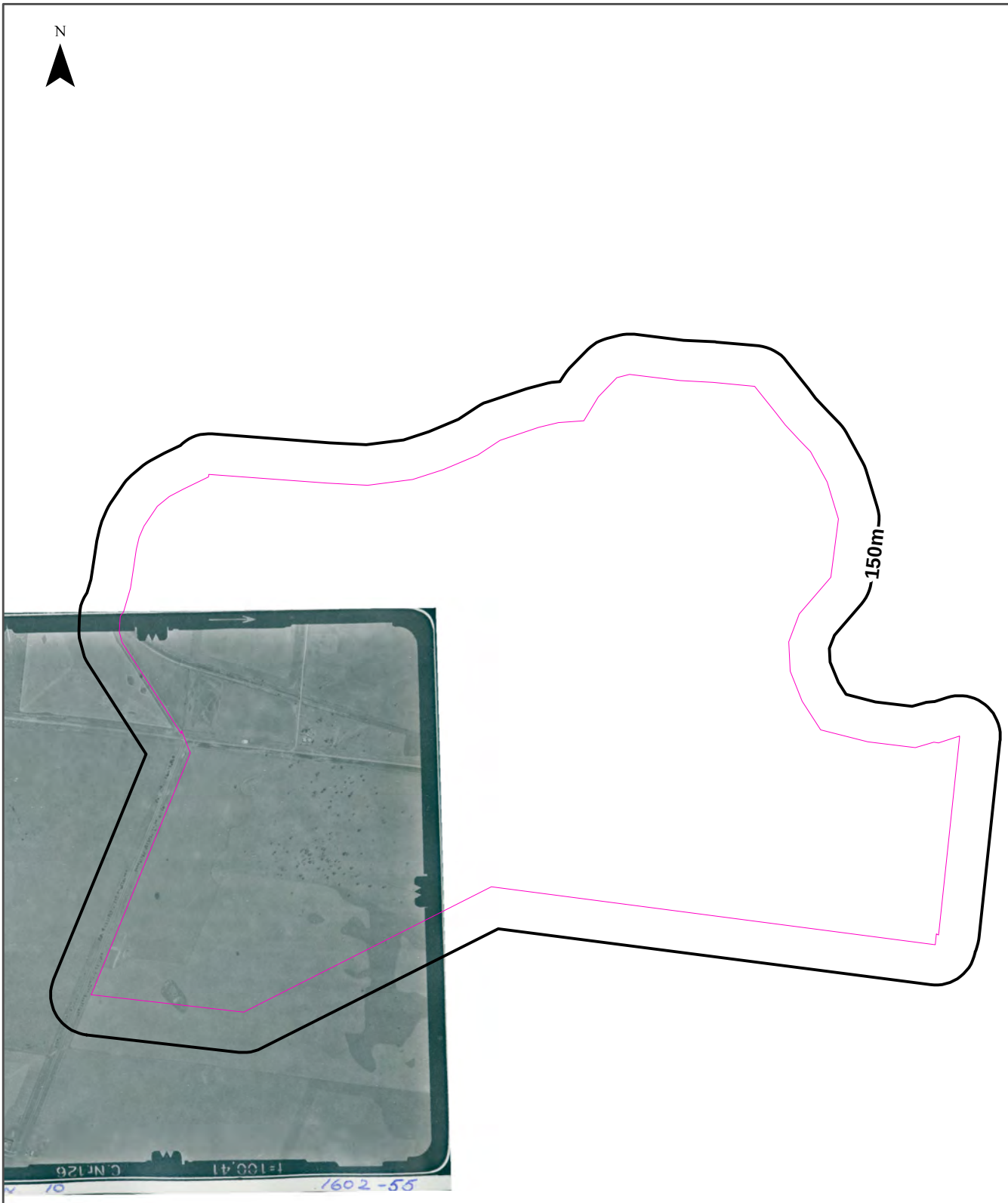
Coordinate System:
GDA 1994 MGA Zone 55

Date: 14 August, 2020

Aerial Imagery 1961

Parwan Precinct Structure Plan, Parwan, VIC 3340



Legend

Site Boundary

Buffer 150m

Scale:
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Meters

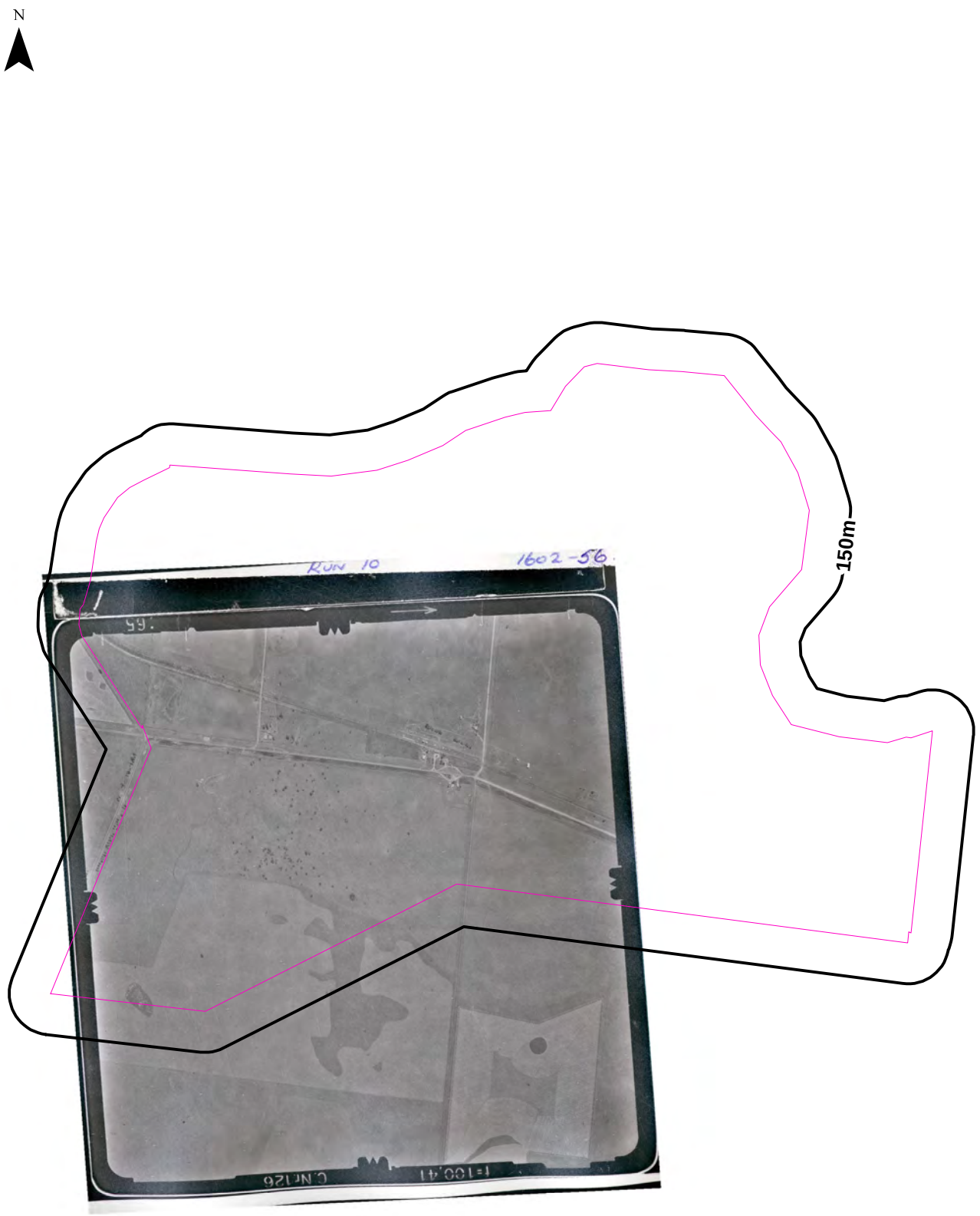
Data Source Aerial Imagery:
© Department of Environment, Land, Water and Planning (Vicmap Topographic Mapping Program)

Coordinate System:
GDA 1994 MGA Zone 55

Date: 13 August 2020

Aerial Imagery 1961

Parwan Precinct Structure Plan, Parwan, VIC 3340



Legend

Site Boundary

Buffer 150m

Scale:
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Meters

Data Source Aerial Imagery:
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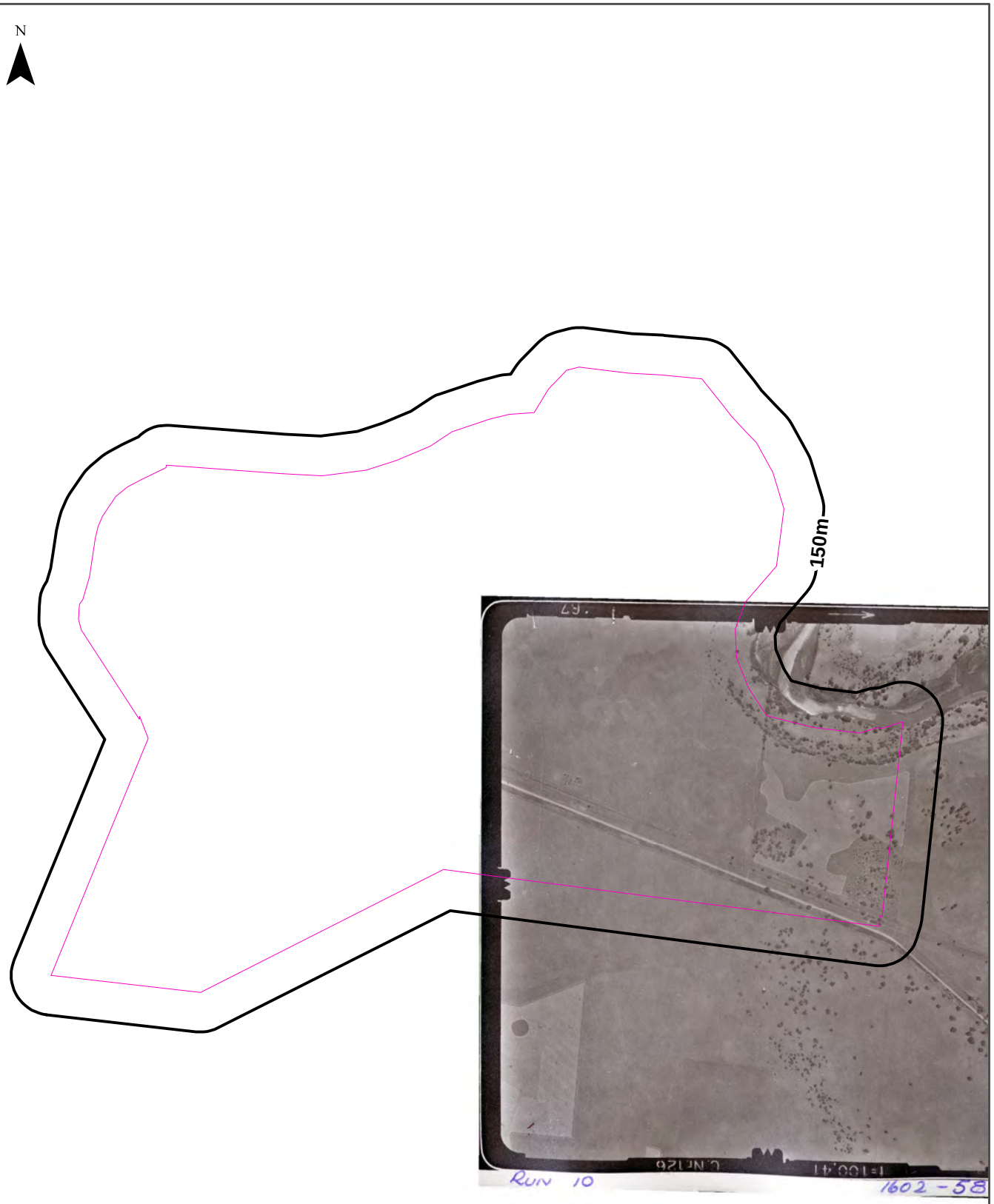
Coordinate System:
GDA 1994 MGA Zone 55

Date: 13 August 2020

Aerial Imagery 1961

Parwan Precinct Structure Plan, Parwan, VIC 3340



Legend

Site Boundary

Buffer 150m

Scale:
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Meters

Data Source Aerial Imagery:
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Coordinate System:
GDA 1994 MGA Zone 55

Date: 13 August 2020

Aerial Imagery 1951

Parwan Precinct Structure Plan, Parwan, VIC 3340

Legend

- Site Boundary
- Buffer 150m

Scale:
0 240 480 720 960
Meters

Data Source Aerial Imagery:
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Coordinate System:
GDA 1994 MGA Zone 55

Date: 13 August 2020

Aerial Imagery 1951

Parwan Precinct Structure Plan, Parwan, VIC 3340

Legend

Site Boundary

Buffer 150m

Scale:
0 240 480 720 960
Meters

Data Source Aerial Imagery:
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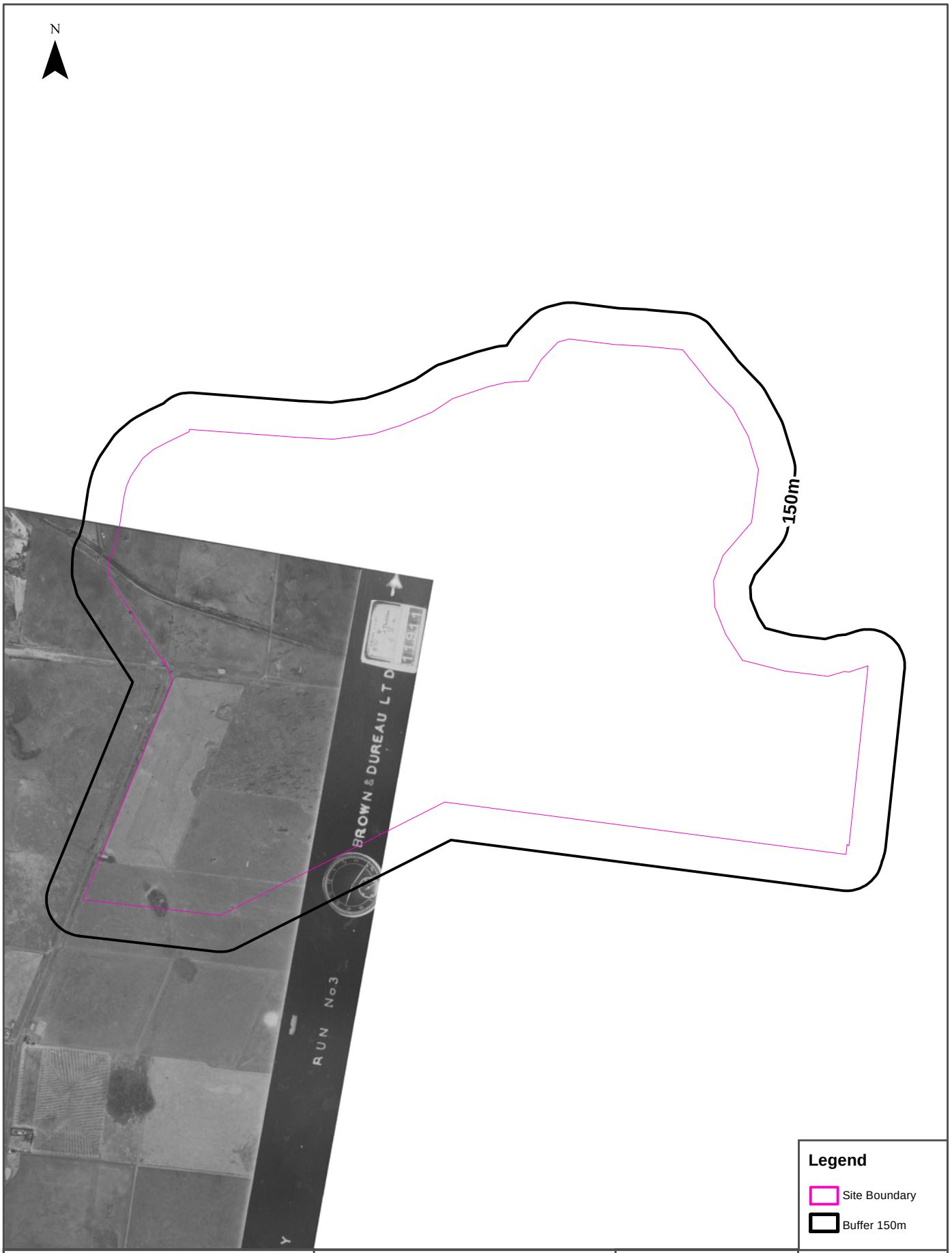
Coordinate System:
GDA 1994 MGA Zone 55

Date: 14 August, 2020

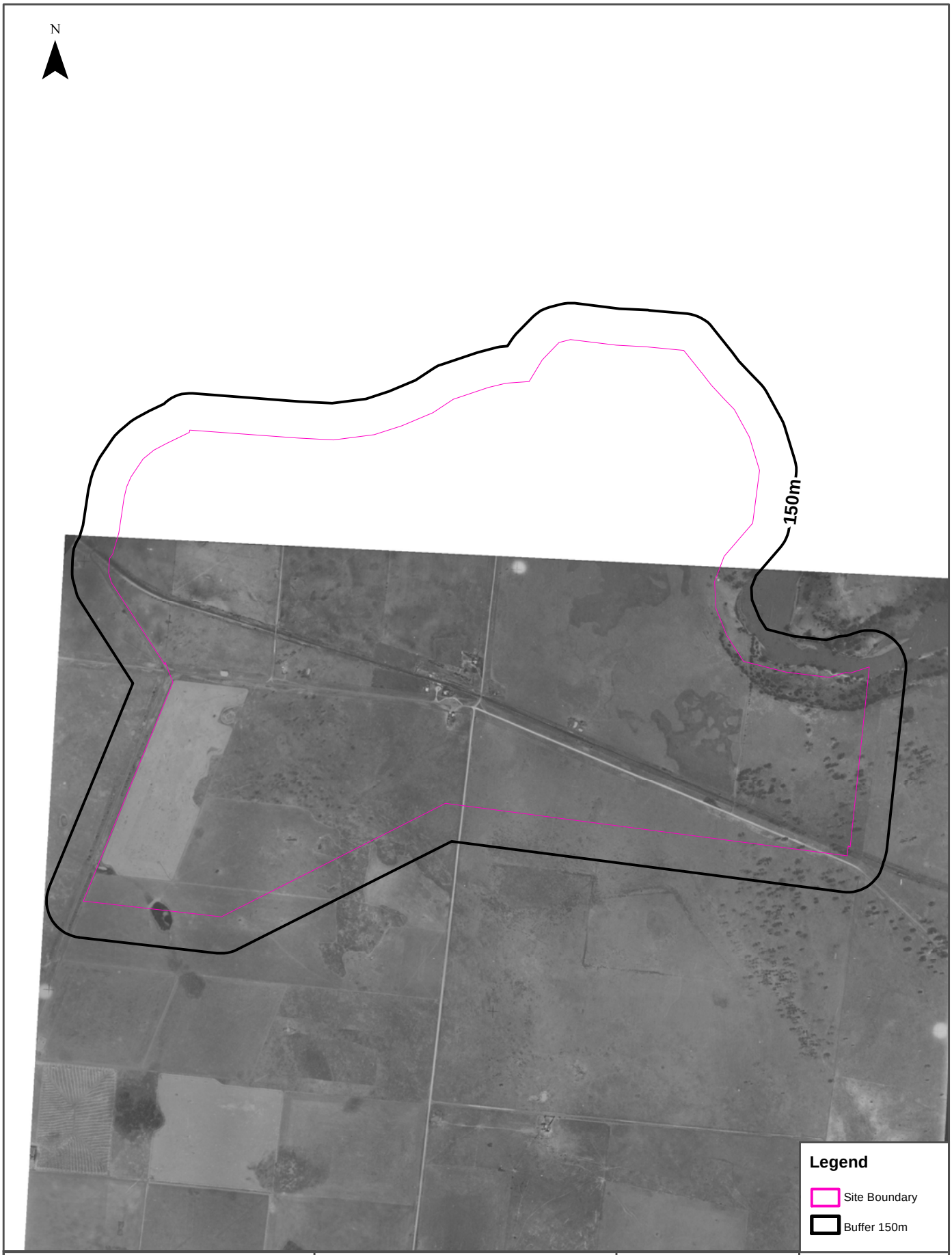
Aerial Imagery 1951

Parwan Precinct Structure Plan, Parwan, VIC 3340



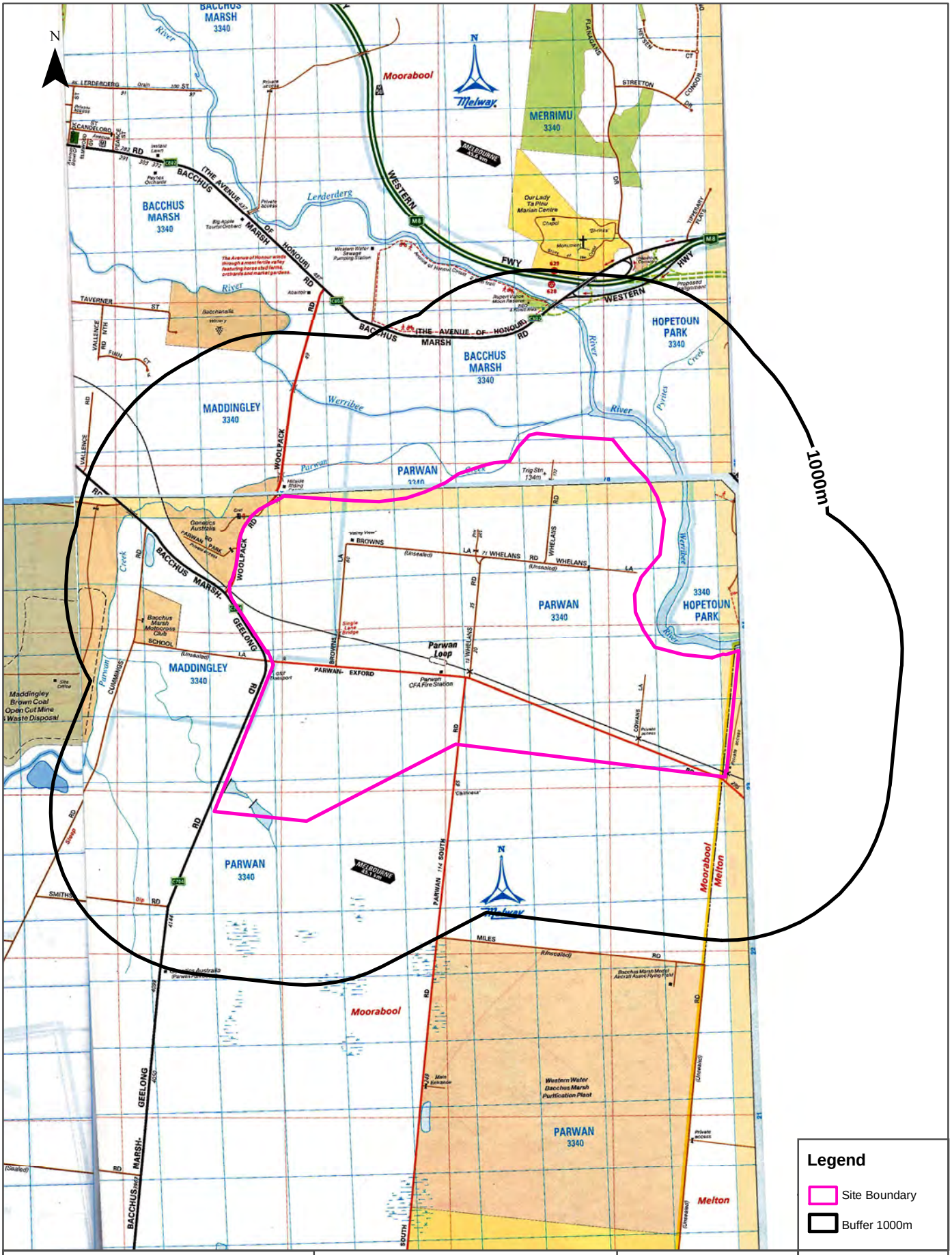
Aerial Imagery 1951

Parwan Precinct Structure Plan, Parwan, VIC 3340



Historical Map 2009

Parwan Precinct Structure Plan, Parwan, VIC 3340



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Meters

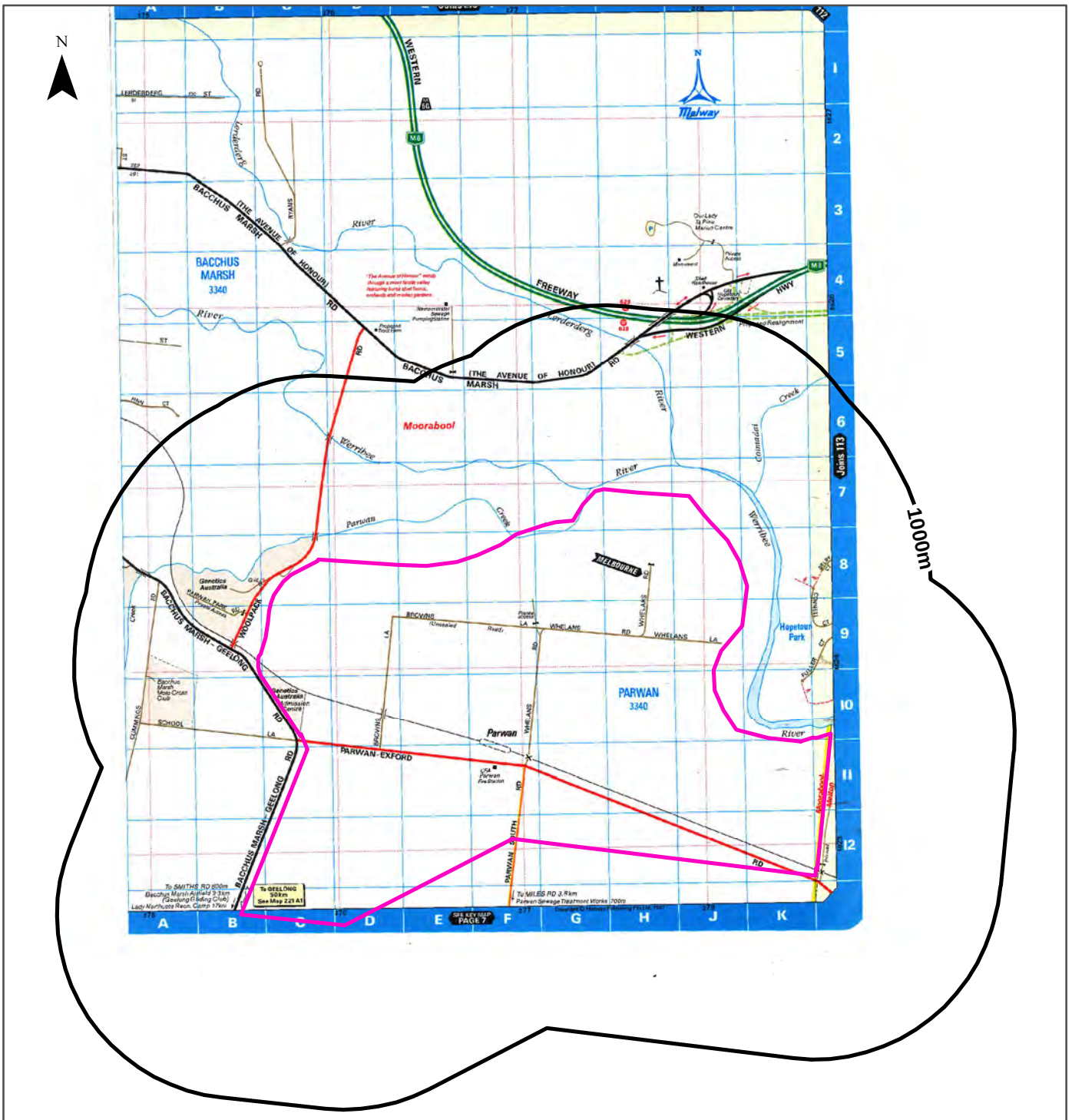
Data Sources: Maps reproduced from 2009, Edition 36 of the Melway Street Directory

Coordinate System: GDA 1994 MGA Zone 55

Date: 14 August 2020

Historical Map 1998

Parwan Precinct Structure Plan, Parwan, VIC 3340



Legend

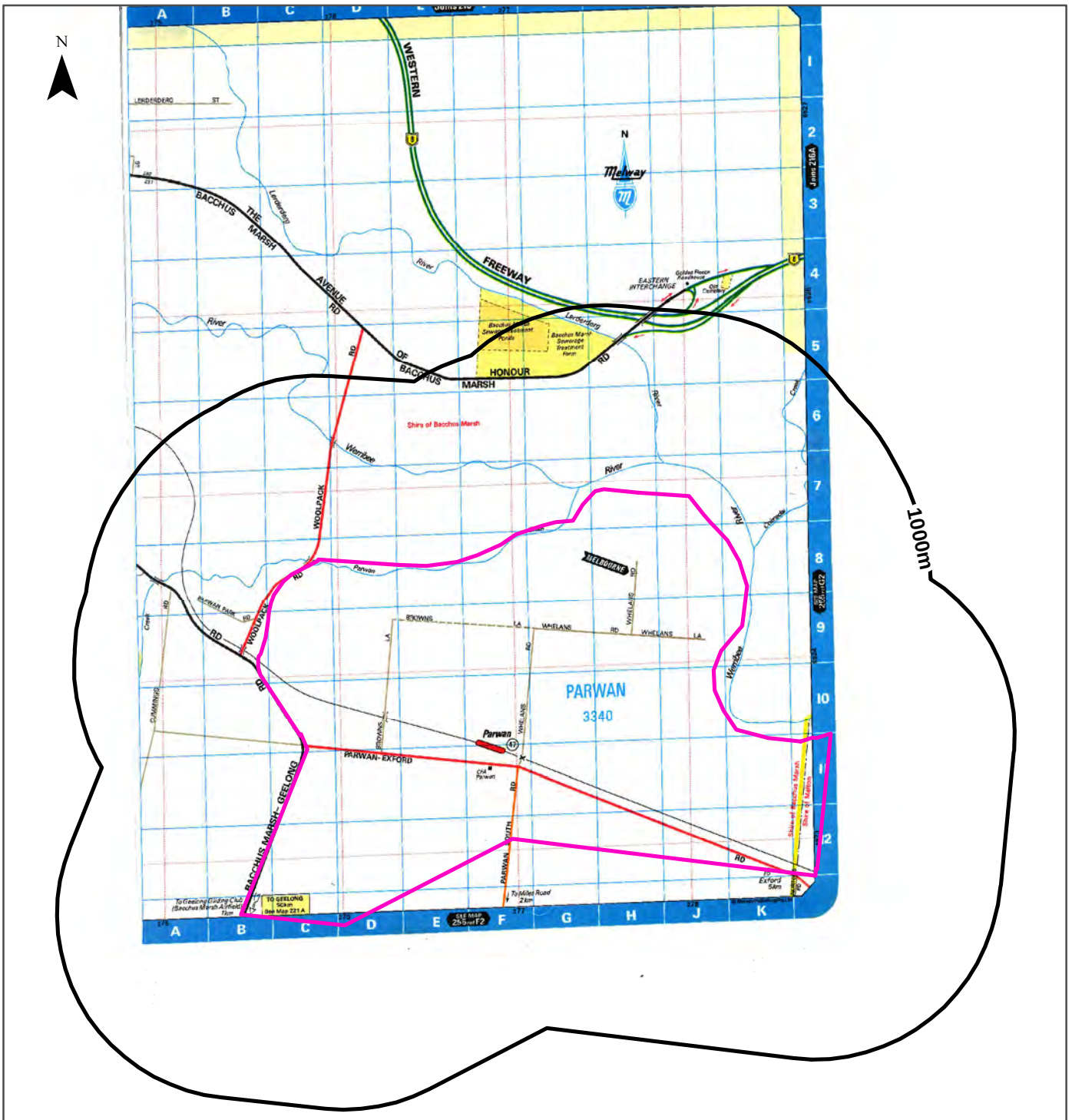
- Site Boundary
- Buffer 1000m

Scale:	Data Sources: Maps reproduced from 1998, Edition 26 of the Melway Street Directory	Coordinate System: GDA 1994 MGA Zone 55	Date: 11 August 2020

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

Historical Map 1986

Parwan Precinct Structure Plan, Parwan, VIC 3340



Legend

- Site Boundary
- Buffer 1000m

Scale:	Data Sources: Maps reproduced from 1986, Edition 16 of the Melway Street Directory	Coordinate System: GDA 1994 MGA Zone 55	Date: 11 August 2020

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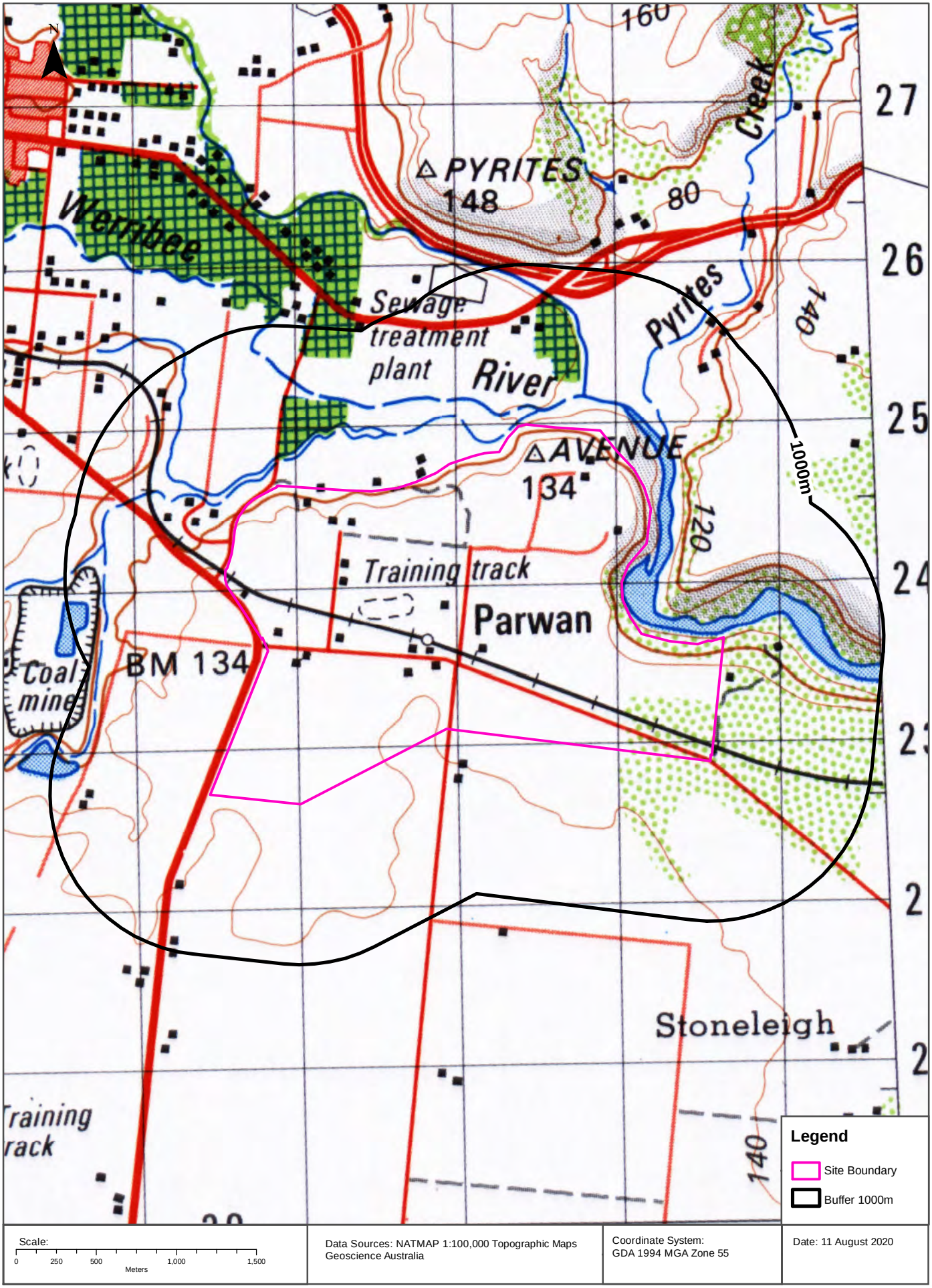
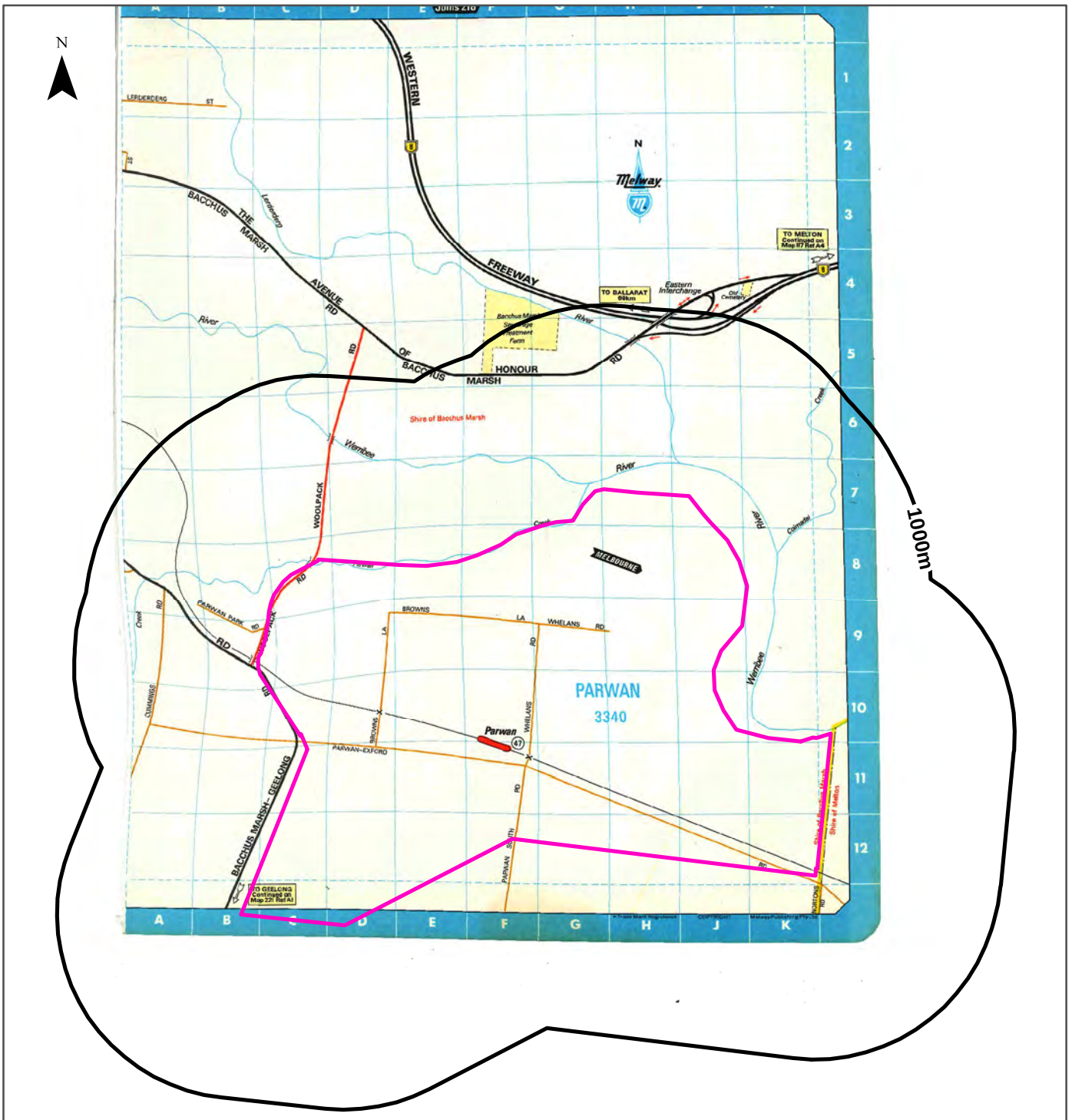
Historical Map 1981

Parwan Precinct Structure Plan, Parwan, VIC 3340



Historical Map 1978

Parwan Precinct Structure Plan, Parwan, VIC 3340



Legend

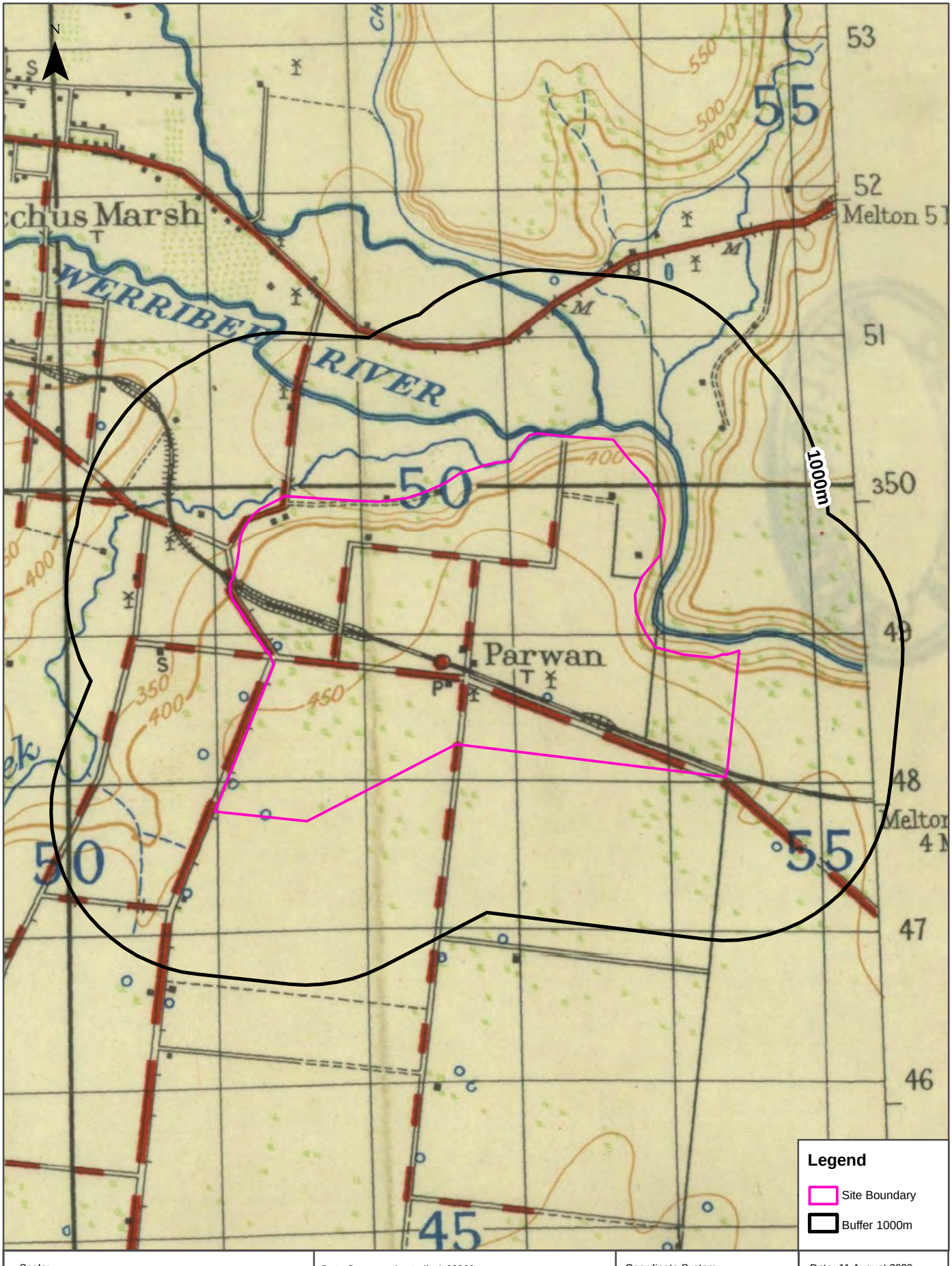
- Site Boundary
- Buffer 1000m

Scale:	Data Sources: Maps reproduced from 1978, Edition 11 of the Melway Street Directory	Coordinate System: GDA 1994 MGA Zone 55	Date: 11 August 2020

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

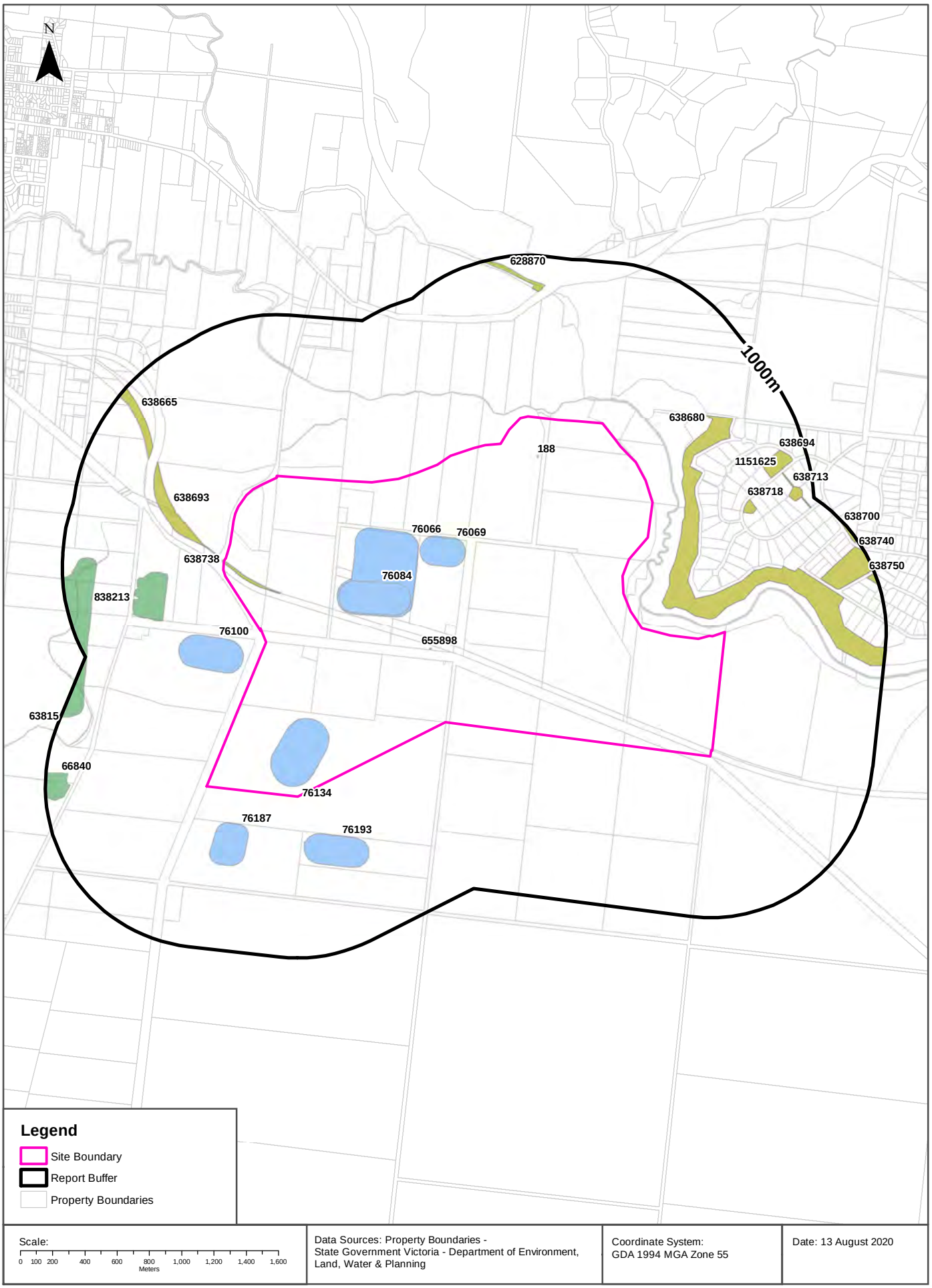
Historical Map c.1936

Railway Avenue, Pakenham, VIC 3810



Features of Interest

Parwan Precinct Structure Plan, Parwan, VIC 3340



Features of Interest

Parwan Precinct Structure Plan, Parwan, VIC 3340

Features of Interest

Features of Interest within the dataset buffer:

Feature Id	Feature Type	Feature Sub Type	Name	Distance	Direction
76066	sport facility	training track		0m	Onsite
76069	sport facility	training track		0m	Onsite
76084	sport facility	training track		0m	Onsite
76134	sport facility	training track		0m	Onsite
188	control point	survey monument	Avenue	0m	Onsite
638738	reserve	park		0m	Onsite
655898	emergency facility	fire station	Parwan Fire Station	0m	Onsite
638693	reserve	park		59m	West
76100	sport facility	training track		88m	West
638680	reserve	park		107m	East
76187	sport facility	training track		207m	South West
76193	sport facility	training track		256m	South West
838213	excavation site	mine		349m	West
638718	reserve	park		562m	East
638665	reserve	park		628m	North West
638740	reserve	park		677m	East
638694	reserve	park		712m	North East
628870	reserve	park	Rupert Vance Moon Reserve	778m	North
63815	excavation site	mine	Open Cut Coal Mine	788m	West
1151625	recreational resource	playground		792m	North East
638713	reserve	park		820m	East
66840	excavation site	quarry		846m	South West
638750	reserve	park		939m	East
638700	reserve	park		972m	East

Parwan PSP Historical Borehole Records

The logs of historical boreholes located within the PSP are provided below.

Descriptions of strata encountered by Borehole Reference 326082 (GeoVic 2020)

From (m)	To (m)	Material	Comments
0	3	clay	clay - red brown clay. little moisture, fair consistency
3	6	soil	soil - red brown earth
6	29	basaltic rock	basalt - the basalt is scoria, weathered, with large vesicles throughout becomes more massive until 26m where a fine red brown clay layer is present. at 27m basalt is vesicular, partly weathered grey colour
29	43	clay	clay - ochre coloured then a lighter orange at 33m, little moisture, slightly silty. at 34.5m clay turns a reddy colour. at 35m clay becomes whiter and more silty. 37.5m clay is very silty and a distinctly ochre colour. at 39m clay is very silty and orange. at 40m becomes redder again. 41.5m clay is whitey yellow. at 42m silty clay is red then at 43m fawny white and at 44m ochre to light tan/oran
43	57	silt [material]	silt/sand - silt as described above with sand ~ 1mm average angular to sub-angular well sorted
57	62.5	clay	clay - good consistency, ochre to orange colour - white and fawn
62.5	63	clay	carbonaceous clay - dark black to brown - good consistency, high moisture content
63	67.2	humic coal series	brown coal - start coring - 63.5m 63.5 - 64.9 no recovery 64.9 - 66.4 2.1m recovery 66.4 - 69.4 3.09m recovery
67.2	73.06	clay	clay - grey clay, good consistency, good moisture - contains bands of pyrite 69.4 - 72.4 2.04m recovery clay also contains fine shell material 72.4 - 75.4 3.1m recovery last 0.6m of clay has abundant pyrite and some rounded quartz grains ~ 3mm to <1mm in size
73.06	121.1	humic coal series	brown coal - black to dark brown slightly clayey for 73.06 - 73.56m abundant lignite material 75.4 - 78.4 3.0m recovery 78.4 - 81.4 3.0m recovery 81.4 - 84.4 3.0m recovery 84.4 - 87.4 3.0m recovery coal is much drier and less clayier 87.4 - 90.4 3.0m recovery 90.4 - 93.4 3.0m recovery 93.4 - 96.4 3.0m recovery 96.4 - 99.2 2.8m recovery 99.2 - 102.2 3.0m recovery 102.2 - 105.2 3.0m recovery 105.2 - 108.2 3.0m recovery 108.4 - 111.4 3.0m recovery 111.4 - 113.4 0.6m recovery 113.4 - 115.9 1.03m recovery 115.9 - 118.0 2.1m recovery 118.0 - 121.1 coal from 110.2 - 114.7 is drier and woodier than previously large pieces of lignite present. 117.2 - 117.7 - coal has quartz sand associated - sub-angular grains - well sorted n/mm size fairly abundant
121.1	129.699	clay	silty clay - fawn coloured clay with silty particles within - good consistency silt becomes more abundant at 120.2m. some parts of the bed are clayier and others siltier 117.7 - 120.7 2.7m recovery 0.8m coal 1.8m non coal 120.7 - 123.7 1.7m recovery 123.7 - 126.7 1.9m recovery 126.7 - 129.7 1.45m recovery

Descriptions of strata encountered by Borehole Reference 942649 (GeoVic 2020)

From (m)	To (m)	Material	Comments
0	2	clay	clay - light red/brown to orange/brown stiff, silty clay with occasional ochre/brown, very weathered rounded basalt fragments
2	4	clay	clay - light grey to buff slightly silty stiff clay
4	6	clay	clay - light grey to buff, slightly silty stiff clay with some dark grey/brown to dark brown well weathered basalt fragments
6	14	basaltic rock	basalt - brown/grey weathered basalt with occasional off white crystalline small grains (chalcedone?)

From (m)	To (m)	Material	Comments
14	22	basaltic rock	basalt - dark brown to dark red/brown well weathered basalt, with some red/brown to red claystone rock fragments. occasional stiff light brown clay. some brown silty friable clay below 20 metres
22	24	clay	clay - light brown, moderately soft, smooth to silty, with occasional rare weathered basalt (?) rock fragments, some approaching friable. possibly paleosal.
24	28	clay	clay - all as above, with some brown and grey friable, very silty clay
28	30	silt [material]	silt - extremely fine, orange/brown with some light grey to light brown moderately soft silty clay
30	32	sand	sand - very fine, ochre stained quartz sand with some fine to coarse sub-rounded to rounded ochre stained quartz grains. occasional light brown silty clay
32	34	basaltic rock	basalt - dark brown to dark grey brown, very weathered basalt fragments with some fine to pebble sized, ochre stained, sub-rounded quartz grains. occasional dark brown sandy friable to firm clay
34	36	gravel [material]	gravel - coarse, orange/brown to ochre stained, sub-angular to rounded quartz pebbles, mainly 2x2x1 cm size, with some dark brown weathered basalt rock fragments. some light grey firm, slightly silty clay. occasional fine to coarse ochre stained sand
36	46	basaltic rock	basalt - dark grey/brown, becoming dark grey with depth, well weathered basalt, with some ochre fragile slightly silty rounded rock fragments. occasional light brown and ochre soft clay. occasional white to ochre stained quartz grains (vein quartz?) - rounded to angular
46	48	clay	clay - very soft, silty, red clay. some dark browny grey to dark red/brown weathered basalt rock fragments. occasional ochre fine grey slightly silty rock fragments. occasional medium grained quartz sand - sub-angular to sub-rounded ochre stained
48	52	clay	clay - ochre and red silty soft clay with some ochre, moderately soft, sandy clay, and some dark grey to dark brown weathered basalt fragments. rare, sub-rounded, medium grained, ochre stained quartz sand
52	54	clay	clay - ochre, moderately soft, sandy clay. abundant dark brown soft carbonaceous clay (some possibly ligneous), and some dark grey to dark brown weathered basalt fragments. occasional ochre stained, angular clean quartz grains
54	56	clay	carbonaceous clay - dark brown, moderatley soft, with some ochre sandy clay. some dark grey brown weathered basalt fragments. occasional medium grained, sub-rounded, ochre stained quartz grains
56	58	humic coal series	brown coal - slightly ligneous with some dark brown carbonaceous clay - soft. some ochre stained sandy clay. occasional medium grained ochre stained quartz sand
58	60	clay	carbonaceous clay - dark brown, moderately soft with some ochre sandy clay. some dark grey brown weathered basalt fragments. occasional medium grained, sub-rounded, ochre stained quartz grains
60	68	clay	clay - medium grained soft, smooth clay, with some medium grained, sub-rounded, ochre stained quartz sand. occasional dark grey basalt fragments and occasional dark brown carbonaceous clay increasing down
68	76	humic coal series	brown coal (?) - very soft, with some dark brown soft carbonaceous clay and occasional fine to medium grained, sub-rounded quartz sand. occasional medium grey, moderately soft, smooth clay and occasional ligneous fragments
76	84	humic coal series	brown coal (?) - some ligneous fragments and some dark brown, soft carbonaceous clay. rare fine to medium quartz sand
84	90	clay	clay - dark brown carbonaceous clay, very soft, with some soft smooth brown-grey clay and rare ochre and red friable clay. occasional ligneous fragments
90	102	humic coal series	brown coal - some ligneous dark brown fragments increasing downwards. some dark brown soft carbonaceous clay

From (m)	To (m)	Material	Comments
102	108	humic coal series	brown coal (?) - some ligneous fragments and occasional light grey soft, smooth clay
108	114	clay	carbonaceous clay - soft, dark brown carbonaceous clay with some moderately firm brown coal and some ligneous fragments. from 112m downwards some fine to medium clean quartz sand, moderately sorted and sub-angular to sub-rounded
114	120	clay	carbonaceous clay - dark brown, very soft carbonaceous clay. occasional beige soft smooth. occasional fine to medium clean quartz sand. occasional ligneous fragments
120	124	sand	sand - very fine to medium grained poorly sorted clean quartz sand - sub-angular to sub-rounded. some very soft carbonaceous clay and some very soft light grey and beige smooth clay. occasional ligneous fragments
124	128	sand	sand - fine to med but becoming coarser downwards. sub-angular to sub-rounded moderately sorted quartz sand with some grey/brown and light grey very soft smooth clay. occasional brown coal and ligneous fragments
128	133.999	sand	sand - fine to medium grained, becoming coarser downwards, sub-angular to sub-rounded sand. some light grey, very stiff clay

Parwan Employment Precinct Historical Borehole Records

The logs of historical boreholes located within the PEP are provided below.

Descriptions of strata encountered by Borehole Reference 326003 (GeoVic 2020)

From (m)	To (m)	Material	Comments
0	0.305	soil	loam
0.305	0.61	clay	red clay
0.61	1.524	basaltic rock	basalt
1.524	6.401	clay	clay, gravel, and basalt
6.401	11.887	clay	Yellow clay
11.887	12.192	clay	ligneous clay
12.192	21.336	humic coal series	brown coal
21.336	21.946	clay	ligneous clay
21.946	22.859	clay	sandy clay

Descriptions of strata encountered by Borehole Reference 326001 (GeoVic 2020)

From (m)	To (m)	Material	Comments
0	0.61	soil	red sandy loam
0.61	1.219	sand	red sand
1.219	1.829	clay	red sandy clay
1.829	8.534	clay	red clay
8.534	9.754	clay	clay and gravel
9.754	13.106	clay	grey and yellow clay
13.106	14.021	sand	Yellow sand
14.021	17.069	clay	grey clay
17.069	20.117	clay	dark green pug

From (m)	To (m)	Material	Comments
20.117	23.165	sand	Yellow sand
23.165	52.73	humic coal series	brown coal
52.73	53.035	clay	ligneous clay
53.035	53.949	clay	Yellow clay water struck at 20.12 metres

Descriptions of strata encountered by Borehole Reference 326000 (GeoVic 2020)

From (m)	To (m)	Material	Comments
0	0.305	soil	red loam
0.305	1.829	sand	red sand
1.829	4.267	clay	clay, sand, and gravel
4.267	4.877	sand	sand
4.877	8.23	clay	grey and yellow clay
8.23	9.754	sand	sand and gravel
9.754	10.058	clay	Yellow clay
10.058	39.929	humic coal series	brown coal
39.929	40.234	clay	ligneous clay
40.234	40.537	clay	brown clay water struck at 4.57 metres standing at 4.57 metres

Descriptions of strata encountered by Borehole Reference 326004 (GeoVic 2020)

From (m)	To (m)	Material	Comments
0	0.305	soil	loam
0.305	1.829	clay	grey clay
1.829	4.877	clay	grey and yellow clay
4.877	5.182	sand	sand and gravel
5.182	7.925	sand	drift sand and gravel
7.925	12.802	humic coal series	brown coal
12.802	13.106	clay	ligneous clay
13.106	14.325	clay	Yellow clay

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