ENVIRONMENTAL INVESTIGATION SERVICES

REPORT

TO

TSA MANAGEMENT

ON

STAGE 2 ENVIRONMENTAL SITE ASSESSMENT

FOR

PROPOSED NEW SCHOOL DEVELOPMENT

AT

CORNER BARRY O'KEEFE ROAD AND BANFIELD DRIVE, CATHERINE FIELD, NSW

21 DECMEBER 2018

REF: E31912KDrpt

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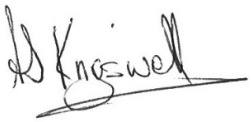

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EXECUTIVE SUMMARY

This report presents the findings of a Stage 2 Environmental Site Assessment (ESA) for the proposed new school development at the corner of Barry O'Keefe Road and Banfield Drive, Catherine Field, NSW. The site location is shown on Figure 1 and the assessment was confined to the site boundaries as shown on Figure 2.

This report has been prepared to address Point 1 to 5 of Key Issue and Desired Performance Outcome 15, as specified in the Soils section of the NSW Department of Planning and Environment, Standard SEARs for Critical State Significant Infrastructure Projects, dated December 2015 provided by the client.

The aim of the assessment was to: identify potential contamination sources and contaminants of concern; assess the soil and groundwater contamination conditions; provide a preliminary waste classification for off-site disposal of in-situ soil; assess the potential for Acid Sulfate Soils (ASS); assess the potential for dryland salinity; and comment on site suitability for the proposed development.

The scope of works included: review of site information; site history information; detailed inspection of accessible areas of the site; preparation of a Conceptual Site Model (CSM); design and implementation of a Sampling Analysis Quality Plan (SAQP) including soil and groundwater sampling from selected locations (see Figure 2); interpretation of the analytical results against the Site Assessment Criteria (SAC); Data Quality Assessment; review of CSM and Tier 1 Risk Assessment; and preparation of this report summarising the results of the ESA.

The CSM identified potential sources of contamination/ Areas of Environmental Concern (AEC) at the site associated with: fill material; historical agricultural use; and dryland salinity. The ESA included the following works:

- Soil sampling from thirty-one (31) locations (boreholes/test pits);
- Groundwater sampling from three monitoring wells;
- Laboratory analysis of selected soil and groundwater samples for contaminants of potential concern (CoPC) identified in the CSM; and
- Interpretation and discussion of the results.

A CSM has been developed to address potential contaminant sources, transport mechanisms/ pathways and sensitive receptors. The CSM has identified potential on-site contamination sources and associated CoPC which have the potential to pose a risk to site receptors.

All of the soil results were below the SAC adopted for this ESA. The groundwater samples encountered marginally elevated concentrations of cadmium, copper, nickel and zinc above the SAC. The source of these elevated concentration is most likely regional and could be associated with leaking water infra structure, surface water run-off or significant earth works to the west. Based on these impacts the groundwater system is considered to be disturbed rather than pristine. EIS understand that groundwater will not be used as a resource at the site. Based on the results of the assessment, the AEC are not considered to pose a risk to site receptors.

The ESA identified saline conditions at the site which warrant management. Landscaped areas and built structures exposed to soil and groundwater should be designed to withstand the conditions described in the report.

Based on the findings of the assessment, EIS are of the opinion that the site is suitable for the proposed development. A salinity management plan should be prepared and implemented when development plans have been finalised.

The conclusions and recommendations should be read in conjunction with the limitations presented in the body of the report.

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ABBREVIATIONS

Asbestos Fines/Fibrous Asbestos	**AF/FA**
Ambient Background Concentrations	**ABC**
Added Contaminant Limits	**ACL**
Asbestos Containing Material	**ACM**
Australian Drinking Water Guidelines	**ADWG**
Area of Environmental Concern	**AEC**
Australian Height Datum	**AHD**
Acid Sulfate Soil	**ASS**
Above-Ground Storage Tank	**AST**
Below Ground Level	**BGL**
Benzo(a)pyrene Toxicity Equivalent Factor	**BaP TEQ**
Bureau of Meteorology	**BOM**
Benzene, Toluene, Ethylbenzene, Xylene	**BTEX**
Cation Exchange Capacity	**CEC**
Contaminated Land Management	**CLM**
Contaminant(s) of Potential Concern	**CoPC**
Chain of Custody	**COC**
Conceptual Site Model	**CSM**
Development Application	**DA**
Data Quality Indicator	**DQI**
Data Quality Objective	**DQO**
Detailed Site Investigation	**DSI**
Ecological Investigation Level	**EIL**
Environmental Investigation Services	**EIS**
Ecological Screening Level	**ESL**
Environmental Management Plan	**EMP**
Excavated Natural Material	**ENM**
Environment Protection Authority	**EPA**
Environmental Site Assessment	**ESA**
Ecological Screening Level	**ESL**
Fibre Cement Fragment(s)	**FCF**
General Approval of Immobilisation	**GAI**
Health Investigation Level	**HILs**
Hardness Modified Trigger Values	**HMTV**
Health Screening Level	**HSLs**
International Organisation of Standardisation	**ISO**
Lab Control Spike	**LCS**
Light Non-Aqueous Phase Liquid	**LNAPL**
Map Grid of Australia	**MGA**
National Association of Testing Authorities	**NATA**
National Environmental Protection Measure	**NEPM**
Organochlorine Pesticides	**OCP**
Organophosphate Pesticides	**OPP**
Polycyclic Aromatic Hydrocarbons	**PAH**
Potential ASS	**PASS**
Polychlorinated Biphenyls	**PCBs**

ABBREVIATIONS

Photo-ionisation Detector	**PID**
Protection of the Environment Operations	**POEO**
Practical Quantitation Limit	**PQL**
Quality Assurance	**QA**
Quality Control	**QC**
Remediation Action Plan	**RAP**
Relative Percentage Difference	**RPD**
Site Assessment Criteria	**SAC**
Sampling, Analysis and Quality Plan	**SAQP**
Site Audit Statement	**SAS**
Site Audit Report	**SAR**
Site Specific Assessment	**SSA**
Source, Pathway, Receptor	**SPR**
Specific Contamination Concentration	**SCC**
Standard Penetration Test	**SPT**
Standard Sampling Procedure	**SSP**
Standing Water Level	**SWL**
Trip Blank	**TB**
Toxicity Characteristic Leaching Procedure	**TCLP**
Total Recoverable Hydrocarbons	**TRH**
Trip Spike	**TS**
Upper Confidence Limit	**UCL**
United States Environmental Protection Agency	**USEPA**
Underground Storage Tank	**UST**
Virgin Excavated Natural Material	**VENM**
Volatile Organic Compounds	**VOC**
World Health Organisation	**WHO**
Work Health and Safety	**WHS**

Units

Litres	**L**
Metres BGL	**mBGL**
Metres	**m**
Millivolts	**mV**
Millilitres	**ml or mL**
Milliequivalents	**meq**
micro Siemens per Centimetre	**µS/cm**
Micrograms per Litre	**µg/L**
Milligrams per Kilogram	**mg/kg**
Milligrams per Litre	**mg/L**
Parts Per Million	**ppm**
Percentage	**%**

1 INTRODUCTION

TSA Management ('the client') commissioned Environmental Investigation Services (EIS)[1] to undertake a Stage 2 Environmental Site Assessment (ESA) for the proposed new school development at corner of Barry O'Keefe Road and Banfield Drive, Catherine Field, NSW ('the site'). The site location is shown on Figure 1 and the assessment was confined to the site boundaries as shown on Figure 2.

This report has been prepared to address Point 1 to 5 of Key Issue and Desired Performance Outcome 15, as specified in the Soils section of the NSW Department of Planning and Environment, Standard SEARs for Critical State Significant Infrastructure Projects, dated December 2015 provided by the client.

The aim of the assessment was to: identify potential contamination sources and contaminants of concern; assess the soil and groundwater contamination conditions; provide a preliminary waste classification for off-site disposal of in-situ soil; assess the potential for Acid Sulfate Soils (ASS); assess the potential for dryland salinity; and comment on site suitability for the proposed development.

1.1 Proposed Development Details

The proposed development includes the construction of a new Primary School. Selected concept design plans are attached in the appendices. Based on a review of the drawings, we understand that the development will include the construction of various buildings between one to three levels high, on grade carparks, sporting fields and associated amenities. EIS understand that cut and fill earthworks will be required, however specific details were not available at the time of reporting.

1.2 Background

A geotechnical investigation was undertaken previously to this assessment by JK Geotechnics[2]. The results of the investigation are presented in a separate report (Ref. 31912SQrpt, dated 5 November 2018[3]). Key information relevant to this report is summarised in Section 3.

EIS are not aware of any other investigation reports prepared for the site.

1.3 Objectives

The objectives of the assessment were to:

- Identify areas of environmental concern (AEC)/contamination sources and contaminants of potential concern (CoPC) by review of site information;

[1] Environmental consulting division of Jeffery & Katauskas Pty Ltd (J&K)

[2] Geotechnical consulting division of J&K

[3] Referred to as JK Geotechnics (5 November 2018)

- Assess soil and groundwater contamination, salinity and ASS conditions by implementing a sampling, analysis and quality program (SAQP);
- Prepare a conceptual site model (CSM) to identify source, pathway and receptor (SPR) linkages;
- Assess risk posed by contamination to the receptors (Tier 1 risk assessment); and
- Assess site suitability for the proposed development, or whether remediation is required.

1.4 Scope of Work

The assessment was undertaken generally in accordance with an EIS proposal (Ref: EP46994KD_Rev4) of 4 October 2018 and written acceptance from the client. The scope of work included the following:

- Review of site information, background and site history information;
- Detailed inspection of accessible areas of the site;
- Preparation of a CSM;
- Design and implementation of a SAQP;
- Interpretation of the analytical results against the Site Assessment Criteria (SAC);
- Data Quality Assessment; and
- Preparation of this report.

The scope of work was undertaken with reference to the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)[4], other guidelines made under or with regards to the Contaminated Land Management Act (1997)[5] and State Environmental Planning Policy No.55 – Remediation of Land (1998)[6]. A list of reference documents/guidelines is included in the appendices.

[4] National Environment Protection Council (NEPC), (2013). *National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013).* (referred to as NEPM 2013)

[5] Contaminated Land Management Act 1997 (NSW) (referred to as CLM Act 1997)

[6] *State Environmental Planning Policy No. 55 – Remediation of Land 1998* (NSW) (referred to as SEPP55)

2 SITE INFORMATION

2.1 Site Identification

Table 2-1: Site Identification

Current Site Owner:	Leppington Pastoral Company Pty Ltd
Site Address:	O'Keefe Drive, Catherine Field, NSW
Lot & Deposited Plan:	Lot 1001 DP1234527
Current Land Use:	Vacant
Proposed Land Use:	Primary School
Local Government Authority:	Camden Council
Current Zoning:	R2 – Low Density Residential
Site Area (m^2):	2.08 Ha
RL (AHD in m) (approx.):	84 to 89
Geographical Location (decimal degrees) (approx.):	Latitude: -34.007284 Longitude: 150.749604
Site Location Plan:	Figure 1
Sample Location Plan:	Figure 2

2.2 Site Location and Regional Setting

The site is located in a predominantly residential area of Catherine Field. The site is bounded by O'Keefe Drive to the west. The site is located approximately 300m to the west of South Creek.

2.3 Topography

The regional topography is characterised by gentle undulating hills. The site itself is located on a mild slope of approximately 1 – 2° to the east away from O'Keefe Drive.

2.4 Site Inspection

A walkover inspection of the site was undertaken by EIS on 31 October 2018. The inspection was limited to accessible areas of the site and immediate surrounds. Selected site photographs obtained during the inspection are attached in the appendices.

A summary of the other inspection findings are outlined in the following subsections:

2.4.1 Current Site Use and/or Indicators of Former Site Use

At the time of inspection, the site was vacant and unoccupied. The site was mostly grassed and located within a new subdivision area. It appeared that the site had previously been occupied for grazing purposes.

2.4.2 Buildings, Structures and Roads

Two compacted driveways of exposed soil were located along the western and southern boundaries of the site. A barbed wire fence was located in the west section of the site and generally ran north to south.

2.4.3 Boundary Conditions, Soil Stability and Erosion

The north, south and western boundaries were distinguished by metal or wire fencing. Fencing along the eastern boundary was less visible or non-existent due to vegetation overgrowth. No visible signs of erosion were observed.

2.4.4 Visible or Olfactory Indicators of Contamination

No signs of chemical or waste storage were visible.

2.4.5 Presence of Drums/Chemicals, Waste and Fill Material

Drums/chemicals or other waste were not observed during the inspection. Fill material appeared to have been used for the construction of the driveway in the western section of the site.

2.4.6 Drainage and Services

No major services were identified onsite. Surface water would generally be expected to flow overland towards the east.

2.4.7 Sensitive Environments

A creek (South Creek) appeared to be approximately 80m east and down-gradient of the site, running north to south. The creek bed appeared to be heavily vegetated.

2.4.8 Landscaped Areas and Visible Signs of Plant Stress

The site was grassed at the time of the inspection and there were no visible signs of stress.

2.5 Surrounding Land Use

During the site inspection, EIS observed the following land uses in the immediate surrounds:

- North – Vacant land and residential properties;
- South – Residential property beyond which was vacant land;
- East – South Creek and vacant land; and
- West – O'Keefe Drive and residential properties.

EIS did not observe any land uses in the immediate surrounds that were identified as potential contamination sources for the site.

2.6 Underground Services

The 'Dial Before You Dig' (DBYD) plans were reviewed for the assessment in order to establish whether any major underground services exist at the site or in the immediate vicinity that could act as a preferential pathway for contamination migration. Major services were not identified that would be expected to act as preferential pathways for contamination migration.

2.7 Local Meteorology

The meteorological data for Camden Airport AWS Observatory weather station available on the Bureau of Meteorology (BOM)[7] website was reviewed for the assessment. A copy of the summary sheet is attached in the appendices. EIS note the following key rainfall observations for 2018:

- The highest mean rainfall occurred in October 2018, with a total of 108mm;
- The lowest mean rainfall occurred in July 2018, with a total of 1.6mm; and
- In the lead up to the assessment, October and November received the maximum rainfall which may have influenced the groundwater levels at the site.

2.8 Section 10.7 Planning Certificate

The s10.7 (2 and 5) planning certificates were reviewed for the assessment. Copies of the certificates are attached in the appendices. A summary of the relevant information is outlined below:

- The site is not located in an area of ecological significance;
- The site is not deemed to be: significantly contaminated; subject to a management order; subject of an approved voluntary management proposal; or subject to an on-going management order under the provisions of the CLM Act 1997;
- The site is not the subject of a Site Audit Statement (SAS);
- The site is not located within an acid sulfate soil (ASS) risk area; and
- The site is not located in a heritage conservation area.

[7] http://www.bom.gov.au/climate/averages/tables/cw_068192.shtml

3 PREVIOUS INVESTIGATION

JK Geotechnics was commissioned by TSA Management to complete a geotechnical investigation for the proposed new primary school development in September 2018. The scope of work included: drilling twenty boreholes (BH1 to BH20) across the site to depths ranging from approximately 3.48m below ground level (BGL) to 6.0mBGL; groundwater observations during drilling; laboratory testing of selected samples for geotechnical parameters; and preparation of a report presenting the results of the investigation.

The boreholes drilled at the site encountered the following subsurface conditions:

- Fill – silty clay fill was encountered at the surface in the boreholes drilled to the west of the barbed wire fence and ranged in depth from approximately 0.2mBGL to 1.0mBGL. The fill contained inclusions of sandstone and igneous gravel. Silty clay topsoil was encountered at the surface in the boreholes drilled to the east of the barbed wire fence and ranged in depth from approximately 0.1mBGL to 0.3mBGL;
- Natural soil – residual clay was encountered beneath the fill or topsoil in all the boreholes;
- Bedrock – weathered siltstone bedrock was encountered in all the boreholes; and
- Groundwater – seepage was not detected in the boreholes during augering and a short time on completion of drilling.

Reference should be made to the JK report for further information.

4 GEOLOGY AND HYDROGEOLOGY

4.1 Regional Geology

Regional geological information presented in the Lotsearch report (attached in the appendices) indicated that the site is underlain by Bringelly Shale of the Wianamatta Group, which typically consists of shale, carbonaceous claystone, claystone, laminite, fine to medium grained lithic sandstone, rare coal and tuff.

4.2 Acid Sulfate Soil (ASS) Risk and Planning

A review of the ASS information presented in the Lotsearch report indicates that the site is in an area mapped as having an '*extremely low probability of ASS occurrence'*.

4.3 Dryland Salinity

A review of the dryland salinity national assessment data presented in the Lotsearch report indicates that the site is located in a high hazard or risk area.

The site is located within the area of Western Sydney included in the Salinity Potential Map. Based upon interpretation from the geological formations and soil groups presented on the map, the site is located in a region of moderate salinity potential. An area classed as having high potential was located approximately 200m to the north and east of the site.

The moderate classification is attributed to scattered areas of scalding and indicator vegetation, in areas where concentrations have not been mapped. Saline areas may occur in this zone, which have not been identified or may occur if risk factors change adversely.

4.4 Hydrogeology

Hydrogeological information presented in the Lotsearch report (attached in the appendices) indicated that the regional aquifer on-site and in the areas immediately surrounding the site includes porous, extensive aquifers of low to moderate productivity. There were a total of four registered bores within the report buffer of 2,000m. In summary:

- The nearest registered bore was located approximately 587m from the site. This was utilised for irrigation purposes;
- The majority of the bores were registered for irrigation purposes;
- The drillers log information from the closest registered bores typically identified fill and/or clay soil to depths of 0-6.70m, underlain by shale and sandstone bedrock. Standing water levels (SWLs) in the bores ranged from 3.2mBGL to 6.5mBGL.

The information reviewed for this assessment indicated that the subsurface conditions at the site are likely to consist of relatively low permeability (residual) soils overlying shallow bedrock. The potential for viable groundwater abstraction and use of groundwater under these conditions is considered to be low. Use of groundwater is not proposed as part of the development.

Considering the local topography and surrounding land features, EIS would generally expect groundwater to flow towards the east.

4.5 Receiving Water Bodies

The site location and regional topography indicates that excess surface water flows have the potential to enter the South Creek located 80m to the east of the site. This water body is a potential receptor.

5 SITE HISTORY INFORMATION

5.1 Review of Historical Aerial Photographs

Historical aerial photographs were included in the Lotsearch report (attached in the appendices). EIS has reviewed the photographs and summarised relevant information in the following table:

Table 5-1: Summary of Historical Aerial Photographs

Year	Details
1956	The site appeared to be vacant and grassed. Several trees (assumed to be remnant bushland) appeared to occupy the southern section of the site. The surrounds appeared similar to the site with an exception of the land to the south which was occupied by several structures and agricultural land (including a former orchard).
1961	The site and surrounding land use appeared similar to the 1956 aerial photograph.
1965	An oval track was visible around the perimeter of and adjacent to the site, the track appeared to be possibly consistent with racing horse training. The surrounding land use appeared to be similar to the 1961 aerial photograph.
1970	The site and surrounding land use appeared similar to the 1965 aerial photograph.
1984	The site and surrounding land use appeared similar to the 1970 aerial photograph.
1994	The circular track was no longer visible. All trees at the site appeared to have been removed. The surrounding land use appeared to be similar to the 1984 aerial photograph. However, surrounding vegetation to the north of the site appeared to have been removed.
2002	The site and surrounding land use appeared similar to the 1994 aerial photograph.
2009	The site and surrounding land use appeared similar to the 2002 aerial photograph. However the site and the area appeared to have recently been mowed.
2016	Earthworks appeared to have been undertaken in the west section of the site with a vehicle track was visible towards the central west of the site which was consistent with the layout observed by EIS during the site inspection on 1 November 2018. What appeared to be stockpiles of soil and potentially construction materials were visible in the north-wests section of the site. The surrounding land use appeared to be similar to the 2009 aerial photograph. However, subdivision of land and earthworks appeared to be underway to the west of the site. A dam was located to the north-west of the site.

5.2 Review of Historical Land Title Records

Historical land title records were reviewed for the assessment. The record search was undertaken by Advance Legal Searchers Pty Ltd. Copies of the title records are attached in the appendices. The title records indicate the following:

- Leppington Pastoral Company Pty. Ltd (2018-1984);
- Cleary Brothers (Camden) Pty Ltd (agricultural use 1959-1984);
- Daniel James Cleary, grazier (1945-1959); and
- Previous to 1945 assumed to be agricultural use.

The historical land title records did not identify any particular land uses which could have resulted in significant contamination. The professions of the individuals listed on the title records are unlikely to be associated with site related activities.

5.3 Review of Council Records

A search of council records is currently underway. The results will be summarised in a separate letter when received.

5.4 SafeWork NSW Records

SafeWork NSW records were reviewed for the assessment. Copies of relevant documents are attached in the appendices. The search did not identify any licences to store dangerous goods including underground fuel storage tanks (USTs), above ground storage tanks (ASTs) or chemicals at the site.

5.5 NSW EPA Records

The Lotsearch report (attached in the appendices) included information from the NSW EPA databases for the following:

- Records maintained in relation to contaminated land under Section 58 of the CLM Act 1997;
- Records of sites notified in accordance with the Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997 (2015)[8]; and
- Licensed activities under the Protection of the Environment Operations Act (1997)[9].

The search included the site area and surrounding areas in the report buffer of 1000m. The search indicated the following:

- There were no records for the site or any properties in the report buffer under Section 58 of the CLM Act 1997;
- There were no notifications for the site or any properties in the report buffer under the Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997; and

[8] NSW EPA, (2015). *Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997.* (referred to as Duty to Report Contamination)

[9] Protection of the Environment Operations Act 1997 (NSW) (referred to as POEO Act 1997)

- There were no records for licenced activities at the site under the POEO Act 1997. Historical licenses were identified for several properties within the report buffer, including the application of herbicides along waterways. These activities are unlikely to pose a contamination risk to the site due to the following:
  - The closest waterway with the former license was located approximately 97m to the east and north of the site;
  - The licenses were surrendered in early 2000's which was approximately 16-17 years ago. Research[10] indicates that herbicides (including persistent herbicides) will breakdown intermediate within approximately 1 to 3 years of application; and
  - Herbicides are not commonly found at residual concentrations likely to pose a risk to human health or the environment (*NSW DEC 2005, Guidelines for Assessing Former Orchards and Market Gardens*).

5.6 Historical Business Directory and Additional Lotsearch Information

Historical business records for the site and surrounding areas in the report buffer were included in the Lotsearch report (attached in the appendices). No records were found for historical businesses likely to be sources of contamination, EIS is of the opinion that the potential for offsite contamination is unlikely.

In addition to the above, EIS have reviewed additional information contained within the Lotsearch report and note the following:

- There were no local or state heritage items at the site; and
- Two possible creek receptors to the north and east of the site were identified which are state environmental conservation areas.

5.7 Summary of Site History Information

A time line summary of the historical land uses and activities is presented in the table below. The information presented in the table is based on a weight of evidence assessment of the site history documentation and observations made by EIS.

Table 5-2: Summary of Historical Land Uses

Year(s)	Potential Land Use / Activities
Pre 1945	Residential (assumed to be grazing land)
1945-2016	Agricultural (grazing)
2016-present	Major earthworks associated with the subdivision (possible uncontrolled filling in the west section of the site).

[10] https://compostingcouncil.org/persistent-herbicide-faq/

5.8 Integrity of Site History Information

The majority of the site history information was obtained from government organisations as outlined in the relevant sections of this report. The veracity of the information from these sources is considered to be relatively high. A certain degree of information loss can be expected given the lack of specific land use details over time. EIS have relied upon the Lotsearch report and have not independently verified any information contained within. However, it is noted that the Lotsearch report is generated based on databases maintained by various government agencies and is expected to be reliable.

6 CONCEPTUAL SITE MODEL

NEPM (2013) defines a CSM as a representation of site related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM for the site is presented in the following sub-sections and is based on the site information (including the site inspection information) and the review of site history information. Reference should also be made to the figures attached in the appendices.

A review of the CSM in relation to source, pathway and receptor (SPR) linkages has been undertaken as part of the Tier 1 risk assessment process, as outlined in Section 12.

6.1 Potential Contamination Sources/AEC and CoPC

The potential contamination sources/AEC and CoPC are presented in the following table:

Table 6-1: Potential (and/or known) Contamination Sources/AEC and Contaminants of Potential Concern

Source / AEC	CoPC
Fill material – The west section of the site appears to have been historically filled to achieve the existing levels and create the driveway. The fill may have been imported from various sources and could be contaminated.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), petroleum hydrocarbons (referred to as total recoverable hydrocarbons – TRHs), benzene, toluene, ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphate pesticides (OPPs), polychlorinated biphenyls (PCBs) and asbestos.
Historical agricultural use – The site appears to have been used for grazing purposes up until approximately 2016. This could have resulted in contamination across the site via use of machinery, application of pesticides. Irrigation pipes made from asbestos cement may also be associated with this AEC.	Heavy metals, TRH, PAHs, OCPs, PCBs and asbestos EIS note that pesticides only became commercially available in the 1940s. Prior to this time pesticides were predominantly heavy metal compounds.
Dryland Salinity – The site is located in an area classed as moderate risk of dryland salinity. Extreme saline conditions could impact the ecology and built environment.	Soil and groundwater parameters used to assess dryland salinity are: pH, electrical conductivity (EC), resistivity, sulphate and chloride.

6.2 Receptors and Exposure Pathways

6.2.1 Potential Receptors

A summary of potential receptors for the contamination sources identified at the site is summarised below:

6.2.1.1 Human Receptors

- On-site occupants/users and visitors (including adults and children);
- Off-site residents adjacent to the site (including adults and children);
- Workers undertaking maintenance of services/ infrastructure (adults);
- Construction workers (adults); and
- Future on-site and off-site users of groundwater.

6.2.1.2 Environmental Receptors

- Terrestrial organisms and plants within unpaved areas (including proposed landscaped areas);
- Soil and groundwater environments beneath the site and their associated ecosystems; and
- Built environment for dryland salinity.

6.2.2 Potential Exposure Pathways

Potential exposure pathways relevant to the human receptors include: ingestion; dermal absorption; and inhalation of dust (all contaminants) and vapours (volatile TRH, naphthalene and BTEX). The potential for exposure would typically be associated with the construction and excavation works, and future use of the site. Potential exposure pathways for ecological receptors include primary contact and ingestion.

Exposure during future site use could occur via direct contact with soil in unpaved areas such as gardens, inhalation of airborne asbestos fibres during soil disturbance, or inhalation of vapours within enclosed spaces such as buildings and basements.

6.2.3 Potential Transport Mechanisms

The transport and migration of contamination is dependent on factors such as:

- The site location;
- Site surface type and condition;
- Geological conditions;
- Groundwater flow velocity and direction including during dewatering activities;
- Underground services and backfill soils; and
- Other contamination specific transport mechanisms.

Potential transport mechanisms at the site for the nominated CoPC include the following:

- Surface run-off entering soils and migrating below the site;

- Surface spills/ leaks of chemicals via cracks in paving/ stormwater/ sewer lines during historical land uses;
- Lateral or vertical transport of contaminants through soil or into/ along backfill of service trenches or other preferential pathways;
- Migration of particulate contaminants in wind/dust;
- Leaching of soil contaminants to groundwater;
- Migration of contaminants via movement of shallow groundwater; and
- Volatilisation and lateral and/or vertical vapour migration of volatile organic compounds.

7 SAMPLING, ANALYSIS AND QUALITY PLAN

7.1 Data Quality Objectives (DQO)

Data Quality Objectives (DQOs) were developed to define the type and quality of data required to achieve the project objectives outlined in Section 1.2. The DQOs were prepared with reference to the process outlined in Schedule B2 of NEPM (2013) and the Guidelines for the NSW Site Auditor Scheme, 3rd Edition (2017)[11]. The seven-step DQO approach for this project is outlined in the following sub-sections.

The DQO process is validated in part by the Data Quality Assurance/Quality Control (QA/QC) Evaluation. The Data (QA/QC) Evaluation is summarised in Section 10.6 and the detailed evaluation is provided in the appendices.

7.1.1 Step 1 - State the Problem

The CSM identified potential sources of contamination/AEC at the site that may pose a risk to human health and the environment. Investigation data is required to assess the contamination status of the site, assess the risks posed by the contaminants in the context of the proposed development/intended land use, and assess whether remediation is required. This information will be considered by the consent authority in exercising its planning functions in relation to the development proposal.

An assessment is also required to evaluate the impacts of dryland salinity on the proposed development. This information will be considered by the consent authority in exercising its planning functions in relation to the development proposal.

A waste classification is required prior to off-site disposal of material excavated for the proposed development.

7.1.2 Step 2 - Identify the Decisions of the Study

The objectives of the assessment are outlined in Section 1.2. The decisions to be made reflect these objectives and are as follows:

- Did the site inspection, or does the historical information identify potential contamination sources/AEC at the site?
- Are any results above the SAC?
- Do potential risks associated with contamination exist, and if so, what are they?
- Is remediation required?
- Is the site characterisation sufficient to provide adequate confidence in the above decisions?
- Is the site suitable for the proposed development, or can the site be made suitable subject to further characterisation and/or remediation?

[11] NSW EPA (2017). *Guidelines for the NSW Site Auditor Scheme, 3rd ed.* (referred to as Site Auditor Guidelines 2017)

7.1.3 Step 3 - Identify Information Inputs

The primary information inputs required to address the decisions outlined in Step 2 include the following:

- Existing relevant environmental data from previous reports;
- Site information, including site observations and site history documentation;
- Sampling of potentially affected media, including soil and groundwater;
- Observations of sub-surface variables such as soil type, photo-ionisation detector (PID) concentrations, odours and staining, and groundwater physiochemical parameters;
- Laboratory analysis of soils, and groundwater for the CoPC identified in the CSM; and
- Field and laboratory QA/QC data.

7.1.4 Step 4 - Define the Study Boundary

The sampling will be confined to the site boundaries as shown in Figure 2 (spatial boundary). The sampling was completed between 31 October and 5 November 2018 (temporal boundary). The assessment of potential risk to adjacent land users has been made based on data collected within the site boundary.

7.1.5 Step 5 - Develop an Analytical Approach (or Decision Rule)

7.1.5.1 Tier 1 Screening Criteria

The laboratory data will be assessed against relevant Tier 1 screening criteria (referred to as SAC), as outlined in Section 0. Exceedances of the SAC do not necessarily indicate a requirement for remediation or a risk to human health and/or the environment. Exceedances are considered in the context of the CSM and valid SPR-linkages.

For this assessment, the individual results have been assessed as either above or below the SAC. Statistical evaluation of the dataset via calculation of mean values and/or 95% upper confidence limit (UCL) values has not been undertaken due to the spatial distribution of the data and the number of samples submitted for analysis.

Where appropriate, data are assessed against valid statistical parameters to characterise the data population. This may include calculation and application of mean values and/or 95% upper confidence limit (UCL) values for the data set, with regards to the NEPM (2013) framework and other relevant guidelines made under the CLM Act 1997. UCLs are considered acceptable where the UCL is below the SAC, the standard deviation of the data is less than 50% of the SAC and none of the individual concentrations are more than 250% of the SAC.

7.1.5.2 Dryland Salinity Screening Criteria

The criteria for assessing urban dryland salinity is outlined in Section 9.3. The criteria have been derived with reference to the following guidelines:

- Site Investigations for Urban Salinity (2002);

- Salinity Code of Practice (2004);
- Managing Urban Stormwater – Soil and Construction (4th ed.) (2004);
- Salinity Potential in Western Sydney Map (2002);
- Piling – Design and Installation AS2159-2009 (2009); and
- T56: Guide to Residential Slabs and Footings in Saline Environments (2005).

Further details regarding the above guidelines are outlined in the report references.

7.1.5.3 Field and Laboratory QA/QC – Contamination Assessment

Field QA/QC included analysis of inter-laboratory duplicates, intra-laboratory duplicates, trip spike, trip blank and rinsate samples. Further details regarding the sampling and analysis undertaken, and the acceptable limits adopted, is provided in the Data Quality (QA/QC) Evaluation in the appendices.

The suitability of the laboratory data is assessed against the laboratory QA/QC criteria which is outlined in the attached laboratory reports. These criteria were developed and implemented in accordance with the laboratory's National Association of Testing Authorities, Australia (NATA) accreditation and align with the acceptable limits for QA/QC samples as outlined in NEPM (2013) and other relevant guidelines.

In the event that acceptable limits are not met by the laboratory analysis, other lines of evidence are reviewed (e.g. field observations of samples, preservation, handling etc) and, where required, consultation with the laboratory is undertaken in an effort to establish the cause of the non-conformance. Where uncertainty exists, EIS typically adopt the most conservative concentration reported (or in some cases, consider the data from the affected sample as an estimate).

7.1.5.4 Appropriateness of Practical Quantitation Limits (PQLs)

The PQLs of the analytical methods are considered in relation to the SAC to confirm that the PQLs are less than the SAC. In cases where the PQLs are greater than the SAC, a discussion of this is provided.

7.1.6 Step 6 – Specify Limits on Decision Errors

To limit the potential for decision errors, a range of quality assurance processes are adopted. A quantitative assessment of the potential for false positives and false negatives in the analytical results is undertaken with reference to Schedule B(3) of NEPM (2013) using the data quality assurance information collected.

Decision errors can be controlled through the use of hypothesis testing. The test can be used to show either that the baseline condition is false or that there is insufficient evidence to indicate that the baseline condition is false. The null hypothesis is an assumption that is assumed to be true in the absence of contrary evidence. For this assessment, the null hypothesis has been adopted which is that,

there is considered to be a complete SPR linkage for the CoPC identified in the CSM unless this linkage can be proven not to (or unlikely to) exist. The null hypothesis has been adopted for this assessment.

7.1.7 Step 7 - Optimise the Design for Obtaining Data

The most resource-effective design will be used in an optimum manner to achieve the assessment objectives. Adjustment of the assessment design can occur following consultation or feedback from project stakeholders. For this investigation, the design was optimised via consideration of the various lines of evidence used to select the sample locations, the media being sampled, and also by the way in which the data were collected.

The sampling plan and methodology are outlined in the following sub-sections.

8 FIELDWORK METHODOLOGY

8.1 Soil Investigation

The soil sampling plan and methodology adopted for this assessment is outlined in the table below:

Table 8-1: Soil Sampling Plan and Methodology

Aspect	Input
Sampling Density	Soil samples were collected from 31 locations as shown on the attached Figure 2. Based on the site area of 20,800m^2 (2.08 hectares), this number of locations corresponded to a sampling density of approximately one sample per 671m^2. The total number of locations met the minimum sampling density recommended for hotspot identification outlined in the NSW EPA Contaminated Sites Sampling Design Guidelines (1995)[12].
Sampling Plan	The sampling locations were placed on a systematic plan with a grid spacing of approximately 25m between sampling locations. A systematic plan was considered suitable to identify hotspots to a 95% confidence level and calculate UCLs for specific data populations (if required).
Set-out and Sampling Equipment	Sampling locations were set out using a measuring wheel/hand held GPS unit (with an accuracy of ±2m). The locations were checked for underground services by an external contractor prior to sampling. Samples were collected using a drill rig equipped with spiral flight augers and an excavator. In boreholes drilled using the drill rig, soil samples were obtained from a Standard Penetration Test (SPT) split-spoon sampler or directly from the auger when conditions did not allow use of the SPT sampler. Samples collected from test pits using an excavator were obtained from test pit walls or directly from the bucket by hand. Where sampling occurred from the bucket, EIS collected samples from the central portion of large soil clods, or from material that was unlikely to have come into contact with the bucket.
Sample Collection and Field QA/QC	Soil samples were obtained from 31 October to 5 November 2018 in accordance with the standard sampling procedure (SSP). Soil samples were collected from the fill and natural profiles based on field observations. The sample depths are shown on the logs attached in the appendices. Samples were placed in glass jars with plastic caps and teflon seals with minimal headspace. Samples for asbestos analysis were placed in zip-lock plastic bags. During sampling, soil at selected depths was split into primary and duplicate samples for field QA/QC analysis.
Field Screening	A portable Photoionisation Detector (PID) fitted with a 10.6mV lamp was used to screen the samples for the presence of volatile organic compounds (VOCs). PID screening for VOCs was undertaken on soil samples using the soil sample headspace method. VOC data was obtained from partly filled zip-lock plastic bags following equilibration of the headspace gases. PID calibration records are maintained on file by EIS.

[12] NSW EPA, (1995), *Contaminated Sites Sampling Design Guidelines.* (referred to as EPA Sampling Design Guidelines 1995)

Aspect	Input
	Fill/spoil at the sampling locations was visually inspected during the works for the presence of fibre cement fragments.
Decontamination and Sample Preservation	Sampling personnel used disposable nitrile gloves during sampling activities. The decontamination procedure adopted during sampling is outlined in the SSP. During sampling, the SPT sampler was rinsed between sampling events with potable water. Rinsate sample was obtained during the decontamination process as part of the field QA/QC. Soil samples were preserved by immediate storage in an insulated sample container with ice in accordance with the SSP. On completion of the fieldwork, the samples were stored temporarily in fridges in the EIS warehouse before being delivered in the insulated sample container to a NATA registered laboratory for analysis under standard chain of custody (COC) procedures.
Laboratory Analysis	Selected soil samples were analysed for a range of CoPC as outlined in the Report Tables attached in the appendices. All primary samples and field QA/QC samples including (intra-laboratory duplicate, trip blank and field rinsate samples) were analysed by Envirolab Services Pty Ltd NSW, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance). The reports are attached in the appendices and include: 205081, 205868 205075 and 205080. An inter-laboratory duplicate sample was analysed by Envirolab Services Pty Ltd VIC, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance). The reports are attached in the appendices and include: 15327

8.2 Groundwater Investigation

The groundwater sampling plan and methodology is outlined in the table below:

Table 8-2: Groundwater Sampling Plan and Methodology

Aspect	Input
Sampling Plan	Groundwater monitoring wells were installed in BH101 (MW101), BH120 (MW120) and BH128 (MW128) shown on Figure 2. The wells were positioned to gain a snap-shot of the groundwater conditions. Considering the topography and the location of the nearest down-gradient water body, MW101 and MW128 was considered to be in the up-gradient area of the site and would be expected to provide an indication of groundwater flowing onto (beneath) the site from the west. MW120 was considered to be down-gradient of the site and would be expected to provide an indication of groundwater flowing across (beneath) the site and towards the east.

Aspect	Input
Monitoring Well Installation Procedure	The monitoring well construction details are documented on the appropriate borehole logs attached in the appendices. The monitoring wells were installed to depths of approximately 6m below ground level. The wells were generally constructed as follows: • 50mm diameter Class 18 PVC (machine slotted screen) was installed in the lower section of the well to intersect groundwater; • 50mm diameter Class 18 PVC casing was installed in the upper section of the well (screw fixed); • A 2mm sand filter pack was used around the screen section for groundwater infiltration; • A hydrated bentonite seal/plug was used on top of the sand pack to seal the well; and • A standpipe that extended approximately 1m above ground level was installed at the surface with an envirocap to limit the inflow of surface water.
Monitoring Well Development	The monitoring wells were developed on 9 November 2018 using dedicated disposable plastic bailers. Monitoring well MW101 was dry. Due to the hydrogeological conditions, groundwater inflow into the other wells was relatively low, therefore the wells were pumped until they were effectively dry. The field monitoring records and calibration data are attached in the appendices.
Groundwater Sampling	The monitoring wells were allowed to recharge for approximately seven days after development. Groundwater sampling was undertaken on 16 November 2018. MW101 remained dry during the visit. Prior to sampling, the monitoring wells were checked for the presence of Light Non-Aqueous Phase Liquids (LNAPLs) using an inter-phase probe electronic dip meter. The monitoring well head space was checked for VOCs using a calibrated PID unit. The samples were obtained using a peristaltic pump. During sampling, the following parameters were monitored using calibrated field instruments: • SWL using an electronic dip meter; and • pH, temperature, EC, dissolved oxygen (DO) and redox potential (Eh) using a YSI Multi-probe water quality meter. Steady state conditions could not be achieved in the wells due to very low recharge associated with the perched aquifer conditions at the site. Groundwater samples were obtained directly from the single use PVC tubing and placed in the sample containers. Duplicate samples were obtained by alternate filling of sample containers. This technique was adopted to minimise disturbance of the samples and loss of volatile contaminants associated with mixing of liquids in secondary containers, etc. Groundwater removed from the wells during development and sampling was transported to EIS in jerry cans and stored in holding drums prior to collection by a licensed waste water contractor for off-site disposal. The field monitoring record and calibration data are attached in the appendices.

Aspect	Input
Decontaminant and Sample Preservation	During development, the pump was flushed between monitoring wells with potable water (single-use tubing was used for each well). The pump tubing was discarded after each sampling event and replaced therefore no decontamination procedure was considered necessary. The samples were preserved with reference to the analytical requirements and placed in an insulated container with ice. On completion of the fieldwork, the samples were temporarily stored in a fridge at the EIS office, before being delivered in the insulated sample container to a NATA registered laboratory for analysis under standard COC procedures.
Laboratory Analysis	Groundwater samples were analysed for a range of CoPC as outlined in the Report Tables attached in the appendices. All primary samples and field QA/QC samples including (intra-laboratory duplicate, trip blank and trip spike samples) were analysed by Envirolab Services Pty Ltd NSW, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance). The reports are attached in the appendices and include: 205865.

9 SITE ASSESSMENT CRITERIA (SAC)

The SAC were derived from the NEPM 2013 and other guidelines as discussed in the following sub-sections. The guideline values for individual contaminants are presented in the attached report tables and further explanation of the various criteria adopted is provided in the appendices.

9.1 Soil

Soil data were compared to relevant Tier 1 screening criteria in accordance with NEPM (2013) as outlined below.

9.1.1 Human Health

- Health Investigation Levels (HILs) for a 'preschools and primary schools' exposure scenario (HIL-A);
- Health Screening Levels (HSLs) for a 'low-high density residential' exposure scenario (HSL-A & HSL-B). HSLs were calculated based on the soil type and the depth of the sample from the existing ground surface as the proposed building floor level is expected to be constructed approximately at the existing grade.
- Where exceedances of the HSLs were reported for hydrocarbons (TRH/BTEX and naphthalene), the soil health screening levels for direct contact presented in the CRC Care Technical Report No. 10 – Heath screening levels for hydrocarbons in soil and groundwater Part 1: Technical development document (2011)[13] were considered; and
- Asbestos was assessed on the basis of presence/absence. Asbestos HSLs were not adopted as detailed asbestos quantification was not undertaken

9.1.2 Environment (Ecological – terrestrial ecosystems)

- Ecological Investigation Levels (EILs) and Ecological Screening Levels (ESLs) for an 'urban residential and public open space' (URPOS) exposure scenario. These have only been applied to the top 2m of soil as outlined in NEPM (2013).
- ESLs were calculated based on the soil type. EILs for selected metals were calculated based on the most conservative added contaminant limit (ACL) values presented in Schedule B(1) of NEPM (2013) and published ambient background concentration (ABC) values presented in the document titled Trace Element Concentrations in Soils from Rural and Urban Areas of Australia (1995)[14]. This method is considered to be adequate for the Tier 1 screening.

[13] Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC Care), (2011). Technical Report No. 10 - *Health screening levels for hydrocarbons in soil and groundwater Part 1: Technical development document*

[14] Olszowy, H., Torr, P., and Imray, P., (1995), *Trace Element Concentrations in Soils from Rural and Urban Areas of Australia. Contaminated Sites Monograph Series No. 4*. Department of Human Services and Health, Environment Protection Agency, and South Australian Health Commission.

9.1.3 Management Limits for Petroleum Hydrocarbons

Management limits for petroleum hydrocarbons (as presented in Schedule B1 of NEPM 2013) were considered (if required) following evaluation of human health and ecological risks, and risks to groundwater.

9.1.4 Waste Classification

Data for the waste classification assessment were assessed in accordance with the Waste Classification Guidelines, Part 1: Classifying Waste (2014)[15] as outlined in the following table:

Table 9-1: Waste Categories

Category	Description
General Solid Waste (non-putrescible)	• If Specific Contaminant Concentration (SCC) ≤ Contaminant Threshold (CT1) then Toxicity Characteristics Leaching Procedure (TCLP) not needed to classify the soil as general solid waste; and • If TCLP ≤ TCLP1 and SCC ≤ SCC1 then treat as general solid waste.
Restricted Solid Waste (non-putrescible)	• If SCC ≤ CT2 then TCLP not needed to classify the soil as restricted solid waste; and • If TCLP ≤ TCLP2 and SCC ≤ SCC2 then treat as restricted solid waste.
Hazardous Waste	• If SCC > CT2 then TCLP not needed to classify the soil as hazardous waste; and • If TCLP > TCLP2 and/or SCC > SCC2 then treat as hazardous waste.
Virgin Excavated Natural Material (VENM)	Natural material (such as clay, gravel, sand, soil or rock fines) that meet the following: • That has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial mining or agricultural activities; • That does not contain sulfidic ores or other waste; and • Includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved from time to time by a notice published in the NSW Government Gazette.

9.1.5 Acid Sulfate Soil

Soil data for the ASS assessment were compared to the action criteria for presented in the Acid Sulfate Soil Manual (1998)[16] as summarised below. The action criteria for 'fine textured soils' were adopted.

[15] NSW EPA, (2014). *Waste Classification Guidelines, Part 1: Classifying Waste.* (referred to as Waste Classification Guidelines 2014)

[16] Acid Sulfate Soils Management Advisory Committee (ASSMAC), (1998). *Acid Sulfate Soils Manual* (referred to as ASS Manual 1998)

Table 9-2: ASS Action Criteria

Category	Description	Criteria
Coarse Textured Soils	Sands to loamy sands	• pH - less than 5; • Total Actual Acidity (TAA)/Total Sulfide Acidity (TSA)/ Total Potential Acidity (TPA) (pH5.5) – greater than 18mol H^+/tonne; and • S_{pos} – greater than 0.03% sulfur oxidisable.
Medium Textured Soils	Sandy loams to light clays	• pH - less than 5; • TAA/TSA/TPA (pH5.5) – greater than 36mol H^+/tonne; and • S_{pos} – greater than 0.06% sulfur oxidisable.
Fine Textured Soils	Medium to heavy clays and silty clays	• pH - less than 5; • TAA/TSA/TPA (pH5.5) – greater than 62mol H^+/tonne; and • S_{pos} – greater than 0.1% sulfur oxidisable.

It is noted that where disturbance of greater than 1,000 tonnes of ASS is proposed, the action criteria for 'coarse textured soils' apply to all soil types.

9.2 Groundwater

Groundwater data were compared to relevant Tier 1 screening criteria in accordance with NEPM (2013), following an assessment of environmental values in accordance with the Guidelines for the Assessment and Management of Groundwater Contamination (2007)[17]. Environmental values for this assessment include aquatic ecosystems, human uses, and human-health risks in non-use scenarios.

9.2.1 Human Health

- HSLs for a 'low-high density residential' exposure scenario (HSL-A/HSL-B). HSLs were calculated based on the soil type and the observed depth to groundwater

9.2.2 Environment (Ecological - aquatic ecosystems)

- Groundwater Investigation Levels (GILs) for 95% trigger values for protection of freshwater species presented in Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)[18] The 99% trigger values were adopted where required to account for bioaccumulation. Low and moderate reliability trigger values were also adopted for some contaminants where high-reliability trigger values don't exist.

[17] NSW Department of Environment and Conservation, (2007). *Guidelines for the Assessment and Management of Groundwater Contamination*

[18] ANZECC, (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* (referred to as ANZECC 2000)

9.3 Dryland Salinity

9.3.1 Soil Salinity and Plant Growth

The electrical conductivity (EC) of a 1:5 soil:water extract is commonly used as an indicator of soil salinity conditions as the reading is directly related to the electrolyte (salt) concentration of the extract. In order to compare the laboratory data with published salinity classes, the results are converted to equivalent saturated paste (ECe) using texture adjustment values presented in DLWC 2002.

The following table provides a summary of plant response with reference to salinity:

Table 9-3: Plant Response to Soil Salinity

ECe (dS/m)	Salinity Class	Plant Response[1]
<2	Non-saline	Salinity effects mostly negligible
2-4	Slightly saline	Yields of very sensitive crops may be affected
4-8	Moderately saline	Yield of many crops affected
8-16	Very saline	Only tolerant crops yield satisfactorily
>16	Highly saline	Only a few very tolerant crops yield satisfactorily

Note:

1 - Plant Response to Salinity Class has been adopted from DLWC 2002

9.3.2 Soil pH and Plant Growth

Soil pH is a measure of the acidity or alkalinity of the soils and values have been assessed as an indicator of soil fertility with respect to plant growth. The optimal pH for plant growth is between 5.5 and 7. Beyond this range, effective revegetation of exposed soil following disturbance is increasingly difficult and the potential for erosion is considered to increase.

Highly alkaline soils are commonly associated with saline and sodic soil conditions and can limit the ability of plants to take up water and nutrients. Highly acidic soils exhibit aluminium toxicity toward plants and can limit the ability of plants to take up other essential nutrients including molybdenum.

Interpretation of soil pH with respect to plant growth is undertaken using the ratings published in Bruce and Rayment (1982[19]) presented below:

Table 9-4: Plant Response to Soil pH

pH	Rating
<4.5	Extremely acidic
4.5-5.0	Very strongly acidic
5.1-5.5	Strongly acidic
5.6 – 7.3	Optimal plant growth
7.4-7.8	Mildly alkaline
7.9-8.4	Moderately alkaline
8.5-9.0	Strongly alkaline

[19] Bruce, R.C. and Rayment, G.E., (1982). *Analytical Methods and Interpretations used by the Agricultural Chemistry Branch for Soil and Land Use Surveys,* (referred to as Bruce and Rayment 1982)

>9.1	Very strongly alkaline

9.3.3 Cation Exchange Capacity (CEC) in Soil

The ability of soils to attract, retain and exchange cations (positively charged ions) is estimated by the calculated CEC value. CEC represents the major controlling factor in stability of clay soil structure, nutrient availability for plant growth, soil pH and the reaction of the soil to chemical applications (fertilisers, conditioners etc.).

High CEC soils have a greater capacity to retain nutrients, however, deficient soils require greater applications of nutrients to correct imbalances. Low CEC soils have a reduced capacity to retain nutrients and may result in leaching of nutrients from the soil in the event of excess nutrient applications.

Metson (1961[20]) developed a set of ratings for effective CEC and the most abundant cations. These are summarised below (values are in meq/100g):

Table 9-5: CEC Rating

Rating	eCEC	Exch Na	Exch K	Exch Ca	Exch Mg
Very low	<6	0-0.1	0-0.2	0-2	0-0.3
Low	6-12	0.1-0.3	0.2-0.3	2-5	0.3-1
Moderate	12-25	0.3-0.7	0.3-0.7	5-10	1-3
High	25-40	0.7-2	0.7-2	10-20	3-8
Very high	>40	>2	>2	>20	>8

Note:
CEC – Cation Exchange Capacity, Na – Sodium, K – Potassium, Ca – Calcium, Mg – Magnesium

9.3.3.1 Ratio of Exchangeable Calcium to Magnesium

To maintain soil structure there should be a ratio of around 4:1 to 6:1 calcium to magnesium for a balanced soil (Eckert 1987[21]). At ratios of less than 4:1 calcium is considered to be deficient, whilst at ratios of greater than 6:1 are considered to be magnesium deficient.

9.3.4 Exchangeable Sodium Percentage or Sodicity (ESP%)

Exchangeable sodium is an important soil stability and salinity parameter. Excessive exchangeable sodium leads to unstable soils, increased runoff, potential salinity, dispersivity and water logging problems.

Normally the sodium content is expressed as a percentage of the CEC as other cations counteract the negative effects of sodium (known as ESP% and termed sodicity). The effect of the exchangeable

[20] Metson, A.J, (1961). *Methods of Chemical Analysis for Soil Survey Samples* (referred to as Metson 1961)
[21] Eckert, D.J, (1987) .*Soil Test Interpretation: Basic Cation Saturation Ratios and Sufficiency Levels* (referred to as Eckert 1987)

sodium (exchangeable sodium percentage, ESP) varies with other soil factors such as the type of clay, the relative quantity of magnesium and the quantity of organic matter. However, Charman & Murphy (2000[22]) indicate that a soil is generally considered sodic if the ESP exceeds 6% and extremely sodic if the ESP exceeds 15%.

9.3.5 Groundwater Salinity

EC values in groundwater are dependent on numerous factors and can vary with changes in temperature and pH conditions. Suttar (1990[23]) has classed water into different types based on EC values as outlined in the table below.

Table 9-6: EC Ranges in Water

Water Type	EC (µS/cm)
Deionised Water	0.5 – 3
Pure Rainwater	<15
Freshwater Rivers	0 – 800
Marginal River Water	800 – 1600
Brackish Water	1600 – 4800
Saline Water	>4800
Seawater	51,500
Industrial Waters	100 – 10,000

9.3.6 Recommendations for Concrete Slabs and Footings in Saline Soils

In the absence of endorsed recommendations for buildings in saline environments, reference is made to the CCAA 2005. The guide provides recommendations on the minimum concrete grade/strength required for slabs and footings in saline soils. Reference should be made to the CCAA 2005 publication for further information:

Table 9-7: Minimum Concrete Grade for Slabs and Footings in Saline Soils

ECe (dS/m)	Salinity Class	Concrete Grade[1]
<2	Non-saline	N20
2-4	Slightly saline	N20
4-8	Moderately saline	N25
8-16	Very saline	N32
>16	Highly saline	≥N40

Note:

1 - Concrete Grade for Salinity Class has been adopted from CCAA 2005

[22] Charman, P.E.V and Murphy, B.W (eds), (2000).*Soils: Their Management and Properties,* (referred to as Charman and Murphy 2000)

[23] Suttar, S., (1990). *Ribbons of Blue Handbook, Scitech*, Victoria (referred to as Suttar 1990)

9.3.7 Recommendations for Durability with Reference to AS2159-2009

In designing for durability, reference should be made to the requirements listed in the AS2159-2009. The exposure classification for concrete and steel piles and foundations is outlined in the following tables.

Table 9-8: Exposure Classification for Concrete Piles

Exposure Conditions				Exposure Classification	
Sulphate (expressed as SO_4)		pH	Chlorides in Groundwater (ppm)	Soil Conditions A[1]	Soil Conditions B[2]
In Soil (ppm)	In Groundwater (ppm)				
<5,000	<1,000	>5.5	<6,000	Mild	Non-aggressive
5,000-10,000	1,000-3,000	4.5-5.5	6,000-12,000	Moderate	Mild
10,000-20,000	3,000-10,000	4-4.5	12,000-30,000	Severe	Moderate
>20,000	>10,000	<4	>30,000	Very severe	Severe

Notes:

1 - High permeability soils (eg sands and gravels) which are in groundwater

2 – Low permeability soils (eg silts and clays) or all soils above groundwater

Table 9-9: Exposure Classification for Steel Piles

Exposure Conditions				Exposure Classifications	
pH	Chlorides		Resistivity (ohm.cm)	Soil Conditions A[1]	Soil Conditions B[2]
	In Soil (ppm)	In Groundwater (ppm)			
>5	<5,000	<1,000	>5,000	Non-aggressive	Non-aggressive
4-5	5,000-20,000	1,000-10,000	2,000-5,000	Mild	Non-aggressive
3-4	20,000-50,000	10,000-20,000	1,000-2,000	Moderate	Mild
<3	>50,000	>20,000	<1,000	Severe	Moderate

Notes:

1 - High permeability soils (eg sands and gravels) which are in groundwater

2 – Low permeability soils (eg silts and clays) or all soils above groundwater

10 RESULTS

10.1 Subsurface Conditions

A summary of the subsurface conditions encountered during the investigation is presented in the table below. Reference should be made to the borehole/test pit logs attached in the appendices for further details.

Table 10-1: Summary of Subsurface Conditions

Profile	Description
Fill/Topsoil	Fill and topsoil were encountered at the surface in all boreholes and extended to depths of approximately 0.15mBGL to 0.5mBGL. The fill typically comprised of gravelly sandy clay, silty clay and clayey silt with inclusions of ironstone and igneous gravels, root fibres, ash, shale and concrete fragments. No odours, staining or potential asbestos containing materials were identified in the fill material.
Natural Soil	Natural soil was encountered at depth between 0.15mBGL to 0.5mBGL. The natural soil typically comprised of silty clay with inclusions of ironstone gravel, root fibres, ash and iron indurated banding.
Bedrock	Bedrock was encountered in BH101, TP107, TP113, BH120 and BH128 at depths of 2.0mBGL, 1.7mBGL, 2.0mBGL, 1.4mBGL and 3.2mBGL. The bedrock typically comprised of claystone and siltstone with iron indurated bands.

10.2 Field Screening

A summary of the field screening results are presented in the table below.

Table 10-2: Summary of Field Screening

Aspect	Details
PID Screening of Soil Samples for VOCs	PID soil sample headspace readings are presented in attached report tables and the COC documents attached in the appendices. The results were all less than 1 ppm equivalent isobutylene and indicate a lack of PID detectable VOCs. Samples with elevated PID readings were analysed for TRH and BTEX.
Groundwater Depth & Flow	Groundwater seepage was not encountered in boreholes or test pits during drilling and excavation. A standing water level (SWL) was measured in boreholes BH120 and BH128 at depths ranging from 4.72mBGL to 5.5mBGL on the 16 November 2018. The remaining boreholes were dry during and on the 16 November 2018. SWLs measured in the monitoring wells installed at the site ranged from 4.72mBGL to 5.5mBGL.

Aspect	Details
Groundwater Field Parameters	Field measurements recorded during sampling were as follows: - pH ranged from 6.42 to 6.92; - EC ranged from 11,094µS/cm to 23,572µS/cm; - Eh ranged from 185.1mV to 205.1mV; and - DO ranged from 1.9ppm to 2.8ppm.
LNAPLs petroleum hydrocarbons	Phase separated product (i.e. LNAPL) were not detected using the interphase probe during groundwater sampling.

10.3 Soil Laboratory Results

The soil laboratory results are compared to the relevant SAC in the attached report tables. A summary of the results assessed against the SAC is presented below:

10.3.1 Human Health and Environmental (Ecological) Assessment

Table 10-3: Summary of Soil Laboratory Results – Human Health and Environmental (Ecological)

Analyte	Results Compared to SAC
Heavy Metals	All heavy metals results were below the SAC.
TRH	All TRH results were below the SAC.
BTEX	All BTEX results were below the SAC.
PAHs	All PAH results were below the SAC.
OCPs and OPPs	All OCP and OPP results were below the SAC. All pesticide concentrations were below the laboratory PQLs.
PCBs	All PCB results were below the SAC. All PCB concentrations were below the laboratory PQLs.
Asbestos	All asbestos results were below the SAC (i.e. asbestos was absent in the samples analysed for the investigation).

10.3.2 Waste Classification Assessment

The laboratory results were assessed against the criteria presented in Part 1 of the Waste Classification Guidelines, as summarised previously in this report. The results are presented in the report tables attached in the appendices. A summary of the results is presented below.

Table 10-4: Summary of Soil Laboratory Results Compared to CT and SCC Criteria

Analyte	No. of Samples Analysed	No. of Results > CT Criteria	No. of Results > SCC Criteria	Comments
Heavy Metals	41	0	0	-
TRH	41	0	0	-
BTEX	41	0	0	-
Total PAHs	41	0	0	-
Benzo(a)pyrene	41	0	0	-
OCPs & OPPs	38	0	0	-
PCBs	38	0	0	-
Asbestos	33	-	-	Asbestos was not detected in the samples analysed.

10.3.3 Acid Sulfate Soil Assessment

The soil laboratory results were assessed against the action criteria adopted for the assessment. The results are presented in the attached report tables and summarised below.

Table 10-5: Summary of ASS Results

Analyte	Results Compared to ASS Guidelines
pH_{kcl} and pH_{ox}	The pHKCl results ranged from 4.0 to 8.5. Two of the pHKCl results exceeded (i.e. were below) the action criterion of pH 5. Following oxidation, the pH_{ox} results for the samples ranged from 3.8 to 8.7. Two of the pH_{KCl} results exceeded (i.e. were below) the action criterion of pH 5.
Acid Trail	• TAA results ranged from less than the PQL to 56mol H^+/tonne. None of the results were above the action criterion of 62mol H^+/tonne; • TPA results ranged from less than the PQL to 70mol H^+/tonne. One of the results was above the action criterion of 62mol H^+/tonne; and • TSA results ranged from less than PQL to 16mol H^+/tonne. None of the results were above the action criterion of 62mol H^+/tonne.

Analyte	Results Compared to ASS Guidelines
Sulfur Trail	The S_{pos}% results ranged from less than the PQL to 0.01%. None of the samples exceeded the action criterion of 0.1%.
Liming Rate	The liming rate required for neutralisation ranged from less than action criteria $kgCaCO_3$/tonne to 5 $kgCaCO_3$/tonne.

10.4 Groundwater Laboratory Results

The groundwater laboratory results are compared to the relevant SAC in the attached report tables. A summary of the results assessed against the SAC is presented below:

Table 10-6: Summary of Groundwater Laboratory Results – Human Health and Environmental (Ecological)

Analyte	Results Compared to SAC
Heavy Metals	Elevated concentrations of heavy metals were encountered above the ecological SAC as outlined below: CoPC / GIL SAC / Samples & Concentration Cadmium / 0.2µg/L / MW120 – 1.2µg/L Copper / 1.4µg/L / MW120 – 4µg/L; MW128 – 2µg/L Nickel / 11µg/L / MW120 – 15µg/L Zinc / 8µg/L / MW120 – 63µg/L; MW128 – 22µg/L All other heavy metals results were below the human health and ecological SAC.
TRH	All TRH results were below the SAC.
BTEX	All BTEX results were below the SAC.
PAHs	All PAH results were below the SAC.
Other Parameters	The results for pH, EC and hardness are summarised below: • pH ranged from 6.9 to 7.4; and • EC ranged from 13000µS/cm to 27000µS/cm.

10.5 Analytical Results – Dryland Salinity

A summary of the results is presented below.

Table 10-7: Summary of Analytical Results – Dryland Salinity

Analyte	Results
EC & ECe	The EC results ranged from 68 µS/m to 600 µS/m. The ECe results ranged from <2 dS/m to 4.4 dS/m.
Resistivity	Resistivity values were calculated based on the raw EC values. The resistivity values for the soil samples ranged from 1,667 ohm.cm to 14,706 ohm.cm.
pH	The results of the analysis ranged from 5.1 to 8.5.
CEC	The total CEC results ranged from 9.2 meq/100g to 18 meq/100g. ESP values calculated from the CEC results ranged from 3.4% to 32.7%.
Sulphate	The results ranged from 47 mg/kg to 240 mg/kg.
Chloride	The results ranged from 34 mg/kg to 850 mg/kg.
Groundwater	The results of the analysis ranged from: • pH – 6.9 to 7.4; • EC – 13,000 µS/cm to 27,000 µS/cm; • Chloride – 3,900 mg/L to 9,600 mg/L; and • Sulphate – 310 mg/L to 810 mg/L.

10.5.1 Interpretation of Dryland Salinity Results

The laboratory results were compared to the SAC in the attached report tables. Interpretation of the results is provided in the following table.

Table 10-8: Interpretation of Dryland Salinity Results

Parameter	Notes
Soil Salinity and Plant Growth	The ECe results ranged from non-saline to slightly saline. The majority of the samples were classed as slightly saline. The salinity values generally increased with depth.
Soil pH and Plant Growth	The soil pH results ranged strongly acidic to strongly alkaline. The majority of the surficial soils were generally slightly acidic for plant growth.
CEC in Soil	The CEC values ranged from low to moderate range which is typical of the soil formation encountered at the site and are generally indicative of the low levels of organic matter within the soils.

Parameter	Notes
ESP%	The ESP% results ranged from non-sodic to highly sodic. The majority of the ESP results were highly sodic.
Groundwater Salinity	The laboratory results indicate that the groundwater is generally saline and within the 'Saline Water' category.
Concrete Slabs and Footings in Saline Soils (CCAA 2005)	The proposed earthworks are anticipated to expose soils generally classed as slight to moderately saline. The CCAA 2005 recommended concrete grade for slabs and footings in moderately saline soils is concrete grade N25. Reference should also be made to AS2159-2009 for minimum concrete strengths and reinforcement cover for concrete piles/foundations.
Soil Conditions for Exposure Classification (AS2159-2009)	The boreholes drilled for the investigation have indicated that the subsurface conditions at the site generally comprise of low permeability soils (i.e. silts and clays). Based on this, the exposure classification outlined under 'Soil Conditions B' has been adopted for the assessment.
Exposure Classification for Concrete Piles/Foundations (AS2159-2009)	The soil pH and sulphate results indicate that the soils are mildly aggressive towards buried concrete. The groundwater pH, sulphate and chloride results indicate that the groundwater is mildly aggressive towards buried concrete.
Exposure Classification for Steel Piles/Foundations (AS2159-2009)	The soil resistivity, pH and chloride results indicate that the soils are moderately aggressive towards buried steel. The groundwater pH and chloride results indicate that the groundwater are non-aggressive towards buried steel.

10.6 Summary of Data (QA/QC) Evaluation

The data evaluation is presented in the appendices. In summary, EIS are of the opinion that the data are adequately precise, accurate, representative, comparable and complete to serve as a basis for interpretation to achieve the investigation objectives.

11 WASTE CLASSIFICATION ASSESSMENT

11.1 Waste Classification of Fill

Based on the results of the assessment, and at the time of reporting, the fill material is classified as **General Solid Waste (non-putrescible)**. Surplus fill should be disposed of to a facility that is appropriately licensed to receive this waste stream. The facility should be contacted to obtain the required approvals prior to commencement of excavation.

11.2 Classification of Natural Soil and Bedrock

Based on the scope of work undertaken for this assessment, and at the time of reporting, EIS are of the opinion that the natural soil and bedrock at the site meets the definition of **VENM** for off-site disposal or re-use purposes. VENM is considered suitable for re-use on-site, or alternatively, the information included in this report may be used to assess whether the material is suitable for beneficial reuse at another site as fill material. In accordance with Part 1 of the Waste Classification Guidelines, the VENM is pre-classified as general solid waste and can also be disposed of accordingly to a facility that is licensed to accept it.

11.3 Classification Limitations

The above classification is based on point source data and is indicative. Additional testing should be undertaken to confirm this classification during excavation works, and a letter should be prepared confirming the classification and providing details of the approximately volume(s) of waste to be disposed off-site.

12 DISCUSSION AND CONCLUSIONS

12.1 Tier 1 Risk Assessment and Review of CSM

For a contaminant to represent a risk to a receptor, the following three conditions must be present:

1. Source – The presence of a contaminant;
2. Pathway – A mechanism or action by which a receptor can become exposed to the contaminant; and
3. Receptor – The human or ecological entity which may be adversely impacted following exposure to contamination.

If one of the above components is missing, the potential for adverse risks is relatively low.

12.1.1 Soil

All of the soil results were below the SAC adopted for this ESA. On this basis there was no identified 'source' of contamination and therefore no complete source-pathway-receptor (SPR) linkage. The AEC are considered to pose a low risk to site receptors.

12.1.2 Groundwater

The groundwater samples encountered elevated concentrations of copper, zinc, nickel and cadmium above the ecological GIL SAC (ANZECC-fresh). These elevations are not considered to represent a significant ecological risk for the following reasons:

- Elevated concentrations of the heavy metals in the groundwater are most likely a regional issue as no significant elevations of these heavy metals were detected in the soil samples analysed (i.e. there was no indication of a point source on site);
- These elevated heavy metal concentrations are often encountered in urban groundwater as a result of leaking water infra-structure and surface water run-off;
- The significant earthworks associated with the subdivision to the west and up gradient of the site may have impacted local groundwater quality. The groundwater and the receiving water body (South Creek) could be considered to be disturbed system.

EIS understand that groundwater will not be used as a resource at the site and therefore there would be no SPR linkage for human receptors.

In the event that groundwater seepage management or dewatering is required for the development, additional testing and treatment of the groundwater may be required. Dewatering and/or groundwater disposal approvals should be sought from the relevant authorities.

12.2 ASS Conditions

The ASS results identified acidic conditions in two samples where the pH was less than pH 5 and above the action criteria. These results are considered to be indicative of mildly acidic soils associated with organic/humic material rather than potential ASS (PASS). Significant concentrations of oxidisable sulfur (indicated by the low S_{pos}% results) were not detected in the samples.

Based on the information reviewed for this assessment (risk maps, subsurface conditions etc), ASS conditions are not considered to be present in the development area to a depth of approximately 6mBGL. An ASS Management Plan (ASSMP) is not considered necessary for the proposed development.

12.3 Dryland Salinity Conditions

The ESA identified saline conditions at the site which warrant management. Landscaped areas and built structures exposed to soil and groundwater should be designed to withstand aggressive and saline conditions.

12.4 Decision Statements

The decision statements for the contamination assessment are addressed below:

Table 12-1: Review of Decision Statements

	Decision Statements	Decision Results
1.	Did the site inspection, or does the historical information identify potential contamination sources/AEC at the site?	Yes. The CSM identified fill as a potential AEC.
2.	Are any results above the SAC?	Soil contamination results were below the SAC. Elevated concentrations of heavy metals were in groundwater above the SAC.
3.	Do potential risks associated with contamination exist, and if so, what are they?	No. The CoPC do not pose a risk to site receptors. The heavy metals detected in the groundwater were attributed to regional issues.
4.	Is remediation required?	No.
5.	Is the site characterisation sufficient to provide adequate confidence in the above decisions?	Yes.
6.	Is the site suitable for the proposed development, or can the site be made suitable subject to further	From a contamination viewpoint the site is considered suitable for the purposed development. See Section 12.3 for comments regarding salinity.

Decision Statements	Decision Results
characterisation and/or remediation?	

12.5 Data Gaps

The assessment recommends additional waste classification testing for off-site disposal of material excavated during the development.

13 CONCLUSIONS AND RECOMMENDATIONS

EIS consider that the report objectives outlined in Section 1.3 have been addressed.

Based on the findings of the assessment, EIS are of the opinion that the site is suitable for the proposed development described in Section 1.1. A salinity management plan should be prepared and implemented when development plans have been finalised.

There is considered to be a relatively low potential for contamination-related unexpected finds to occur at the site during the proposed development works. Unexpected finds would typically be able to be identified by visual or olfactory indicators and could include:

- Fibre cement fragments (e.g. ACM);
- Stained fill/soil;
- Odorous soils (e.g. hydrocarbon odours); and/or
- Slag and/or coal wash.

The following should be implemented in the event of an unexpected find:

- All work in the immediate vicinity should cease and temporary barricades should be erected to isolate the area;
- A suitably qualified contaminated land consultant[24] should be engaged to inspect the find and provide advice on the appropriate course of action; and
- Any actions should be implemented and validated to demonstrate that there are no unacceptable risks to the receptors.

[24] EIS recommend that the consultancy engaged for the work be a member of the Australian Contaminated Land Consultants Associated (ACLCA), and/or the individual undertaking the works be certified under one of the NSW EPA endorsed certified practitioner schemes

14 LIMITATIONS

The report limitations are outlined below:

- EIS accepts no responsibility for any unidentified contamination issues at the site. Any unexpected problems/subsurface features that may be encountered during development works should be inspected by an environmental consultant as soon as possible;
- Previous use of this site may have involved excavation for the foundations of buildings, services, and similar facilities. In addition, unrecorded excavation and burial of material may have occurred on the site. Backfilling of excavations could have been undertaken with potentially contaminated material that may be discovered in discrete, isolated locations across the site during construction work;
- This report has been prepared based on site conditions which existed at the time of the investigation; scope of work and limitation outlined in the EIS proposal; and terms of contract between EIS and the client (as applicable);
- The conclusions presented in this report are based on investigation of conditions at specific locations, chosen to be as representative as possible under the given circumstances, visual observations of the site and immediate surrounds and documents reviewed as described in the report;
- Subsurface soil and rock conditions encountered between investigation locations may be found to be different from those expected. Groundwater conditions may also vary, especially after climatic changes;
- The investigation and preparation of this report have been undertaken in accordance with accepted practice for environmental consultants, with reference to applicable environmental regulatory authority and industry standards, guidelines and the assessment criteria outlined in the report;
- Where information has been provided by third parties, EIS has not undertaken any verification process, except where specifically stated in the report;
- EIS has not undertaken any assessment of off-site areas that may be potential contamination sources or may have been impacted by site contamination, except where specifically stated in the report;
- EIS accept no responsibility for potentially asbestos containing materials that may exist at the site. These materials may be associated with demolition of pre-1990 constructed buildings or fill material at the site;
- EIS have not and will not make any determination regarding finances associated with the site;
- Additional investigation work may be required in the event of changes to the proposed development or landuse. EIS should be contacted immediately in such circumstances;
- Material considered to be suitable from a geotechnical point of view may be unsatisfactory from a soil contamination viewpoint, and vice versa; and
- This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose.

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IMPORTANT INFORMATION ABOUT THIS REPORT

These notes have been prepared by EIS to assist with the assessment and interpretation of this report.

The Report is based on a Unique Set of Project Specific Factors
This report has been prepared in response to specific project requirements as stated in the EIS proposal document which may have been limited by instructions from the client. This report should be reviewed, and if necessary, revised if any of the following occur:

- The proposed land use is altered;
- The defined subject site is increased or sub-divided;
- The proposed development details including size, configuration, location, orientation of the structures or landscaped areas are modified;
- The proposed development levels are altered, eg addition of basement levels; or
- Ownership of the site changes.

EIS/J&K will not accept any responsibility whatsoever for situations where one or more of the above factors have changed since completion of the assessment. If the subject site is sold, ownership of the assessment report should be transferred by EIS to the new site owners who will be informed of the conditions and limitations under which the assessment was undertaken. No person should apply an assessment for any purpose other than that originally intended without first conferring with the consultant.

Changes in Subsurface Conditions
Subsurface conditions are influenced by natural geological and hydrogeological process and human activities. Groundwater conditions are likely to vary over time with changes in climatic conditions and human activities within the catchment (e.g. water extraction for irrigation or industrial uses, subsurface waste water disposal, construction related dewatering). Soil and groundwater contaminant concentrations may also vary over time through contaminant migration, natural attenuation of organic contaminants, ongoing contaminating activities and placement or removal of fill material. The conclusions of an assessment report may have been affected by the above factors if a significant period of time has elapsed prior to commencement of the proposed development.

This Report is based on Professional Interpretations of Factual Data
Site assessments identify actual subsurface conditions at the actual sampling locations at the time of the investigation. Data obtained from the sampling and subsequent laboratory analyses, available site history information and published regional information is interpreted by geologists, engineers or environmental scientists and opinions are drawn about the overall subsurface conditions, the nature and extent of contamination, the likely impact on the proposed development and appropriate remediation measures.

Actual conditions may differ from those inferred, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, but steps can be taken to help minimise the impact. For this reason, site owners should retain the services of their consultants throughout the development stage of the project, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

Assessment Limitations
Although information provided by a site assessment can reduce exposure to the risk of the presence of contamination, no environmental site assessment can eliminate the risk. Even a rigorous professional assessment may not detect all contamination on a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant which may occur; only the most likely contaminants are screened.

Misinterpretation of Site Assessments by Design Professionals

Costly problems can occur when other design professionals develop plans based on misinterpretation of an assessment report. To minimise problems associated with misinterpretations, the environmental consultant should be retained to work with appropriate professionals to explain relevant findings and to review the adequacy of plans and specifications relevant to contamination issues.

Logs Should not be Separated from the Assessment Report

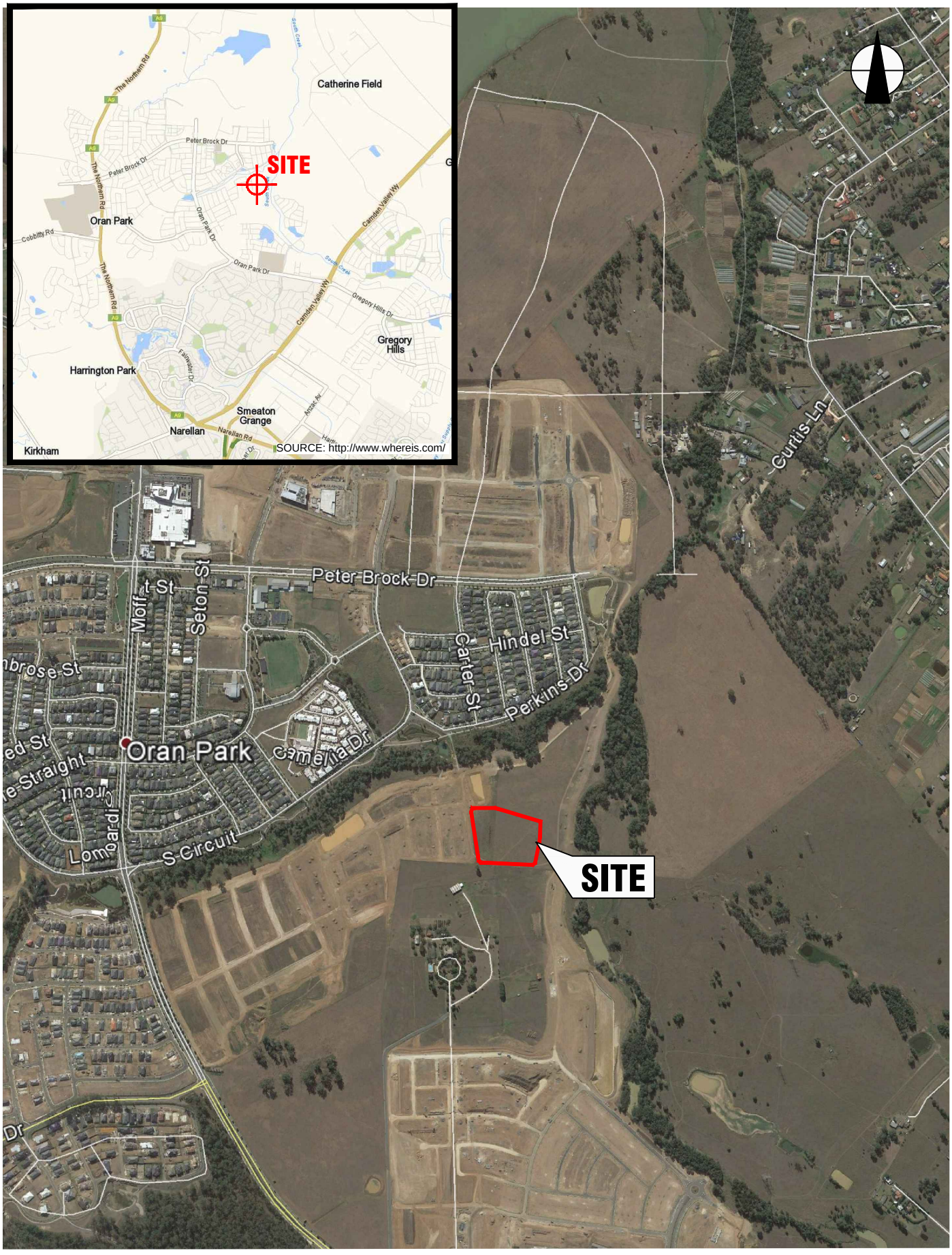
Borehole and test pit logs are prepared by environmental scientists, engineers or geologists based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these should not be re-drawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problem, however contractors can still misinterpret the logs during bid preparation if separated from the text of the assessment. If this occurs, delays, disputes and unanticipated costs may result. In all cases it is necessary to refer to the rest of the report to obtain a proper understanding of the assessment. Please note that logs with the 'Environmental Log' header are not suitable for geotechnical purposes as they have not been peer reviewed by a Senior Geotechnical Engineer.

To reduce the likelihood of borehole and test pit log misinterpretation, the complete assessment should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of subsurface information does not insulate an owner from the attendant liability. It is critical that the site owner provides all available site information to persons and organisations such as contractors.

Read Responsibility Clauses Closely

Because an environmental site assessment is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in written transmittals. These are definitive clauses designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the environmental site assessment, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to any questions.

REPORT FIGURES



AERIAL IMAGE SOURCE: GOOGLE EARTH PRO 7.1.5.1557
AERIAL IMAGE ©: 2015 GOOGLE INC.

This plan should be read in conjunction with the EIS report.

Title: **SITE LOCATION PLAN**

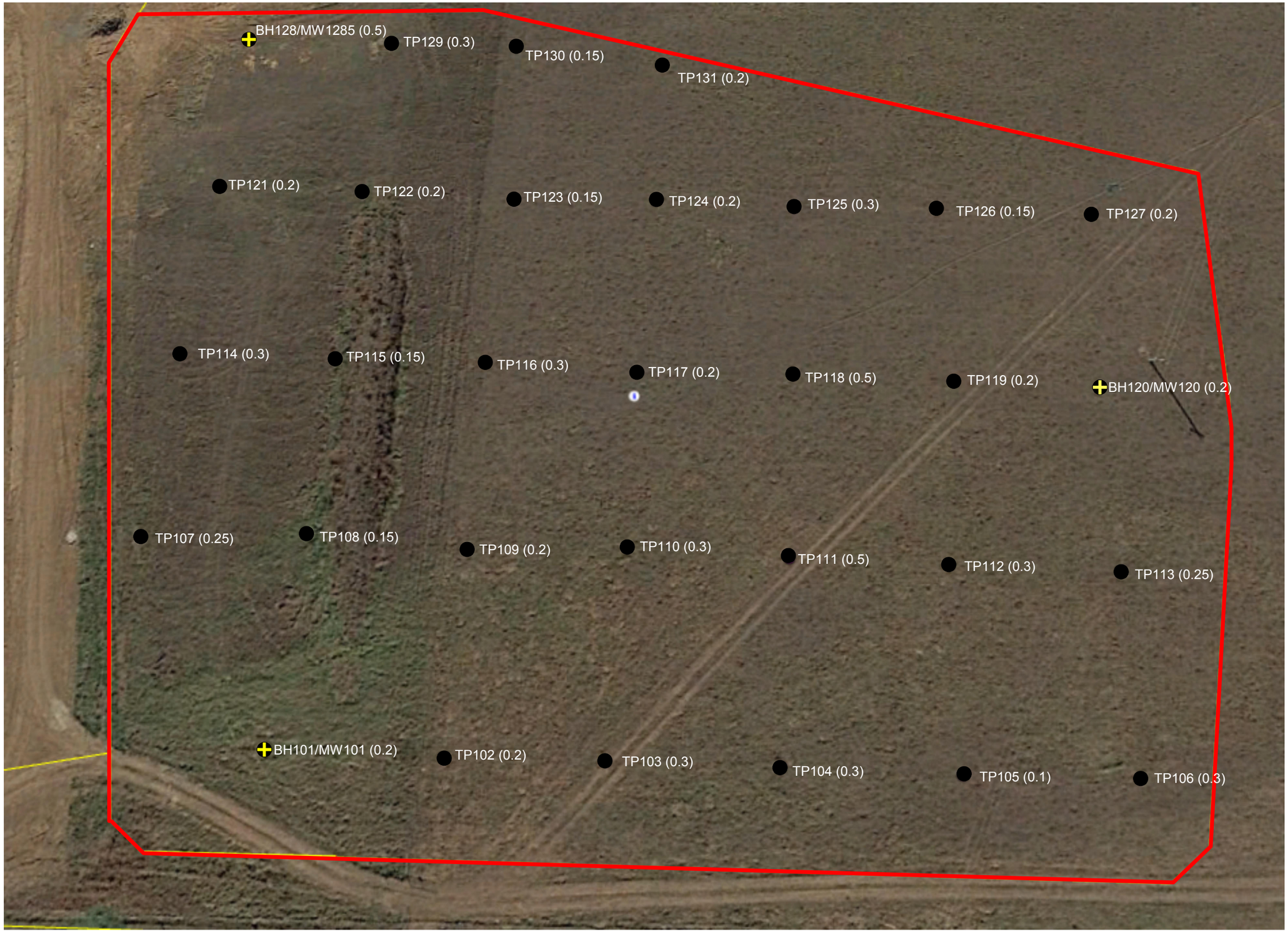
Location: CNR O'KEEFE ROAD & BANFIELD DRIVE
CATHERINE FIELDS, NSW

Report No: E31912KD

Figure No: 1

ENVIRONMENTAL INVESTIGATION SERVICES

PLOT DATE: 31/10/2018 4:30:58 PM DWG FILE: S:\5 EIS\5C EIS JOBS\31000'S\E31912KD CATHERINE FIELD\CAD\E31912KD.DWG



LEGEND:

APPROXIMATE SITE BOUNDARY

BH101 (0.3) — BOREHOLE/TESTPIT LOCATION, NUMBER AND DEPTH OF FILL (m)

MW101 — GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)

0 — 25

Scale — Metres

Notes: Reference should be made to the report text for a full understanding of this plan.

Image Sources:

Title: **SAMPLE LOCATION PLAN**

Location: CNR O'KEEFE ROAD & BANFIELD DRIVE, CATHERINE FIELDS, NSW

Report No: E31912KD

Figure No: 2

ENVIRONMENTAL INVESTIGATION SERVICES

EIS

LABORATORY SUMMARY TABLES

ABBREVIATIONS AND EXPLANATIONS

Abbreviations used in the Tables:

ABC: Ambient Background Concentration
ACM: Asbestos Containing Material
ADWG: AustralianDrinking Water Guidelines
AF: Asbestos Fines
ANZECC: Australian and New Zealand Environment Conservation Council
B(a)P: Benzo(a)pyrene
CEC: Cation Exchange Capacity
CRC: Cooperative Research Centre
CT: Contaminant Threshold
EILs: Ecological Investigation Levels
ESLs: Ecological Screening Levels
FA: Fibrous Asbestos
GIL: Groundwater Investigation Levels
HILs: Health Investigation Levels
HSLs: Health Screening Levels
HSL-SSA: Health Screening Level-SiteSpecific Assessment
NA: Not Analysed
NC: Not Calculated
NEPM: National Environmental Protection Measure
NHMRC: National Health and Medical Research Council
NL: Not Limiting
NSL: No Set Limit
OCP: Organochlorine Pesticides
OPP: Organophosphorus Pesticides
PAHs: Polycyclic Aromatic Hydrocarbons
ppm: Parts per million
PCBs: Polychlorinated Biphenyls
PCE: Perchloroethylene (Tetrachloroethylene or Teterachloroethene)
pH_{KCL} : pH of filtered 1:20, 1M KCL extract, shaken overnight
pH_{ox} : pH of filtered 1:20 1M KCl after peroxide digestion
PQL: Practical Quantitation Limit
RS: Rinsate Sample
RSL: Regional Screening Levels
SAC: Site Assessment Criteria
SCC: Specific Contaminant Concentration
S_{Cr}: Chromium reducible sulfur
S_{POS}: Peroxide oxidisable Sulfur
SSA: Site Specific Assessment
SSHSLs: Site Specific Health Screening Levels
TAA: Total Actual Acidity in 1M KCL extract titrated to pH6.5
TB: Trip Blank
TCA: 1,1,1 Trichloroethane (methyl chloroform)
TCE: Trichloroethylene (Trichloroethene)
TCLP: Toxicity Characteristics Leaching Procedure
TPA: Total Potential Acidity, 1M KCL peroxide digest
TS: Trip Spike
TRH: Total Recoverable Hydrocarbons
TSA: Total Sulfide Acidity (TPA-TAA)
UCL: Upper Level Confidence Limit on Mean Value
USEPA United States Environmental Protection Ager
VOCC: Volatile Organic Chlorinated Compounds
WHO: World Health Organisation

Table Specific Explanations:

HIL Tables:

- The chromium results are for Total Chromium which includes Chromium III and VI. For initial screening purposes, we have assumed that the samples contain only Chromium VI unless demonstrated otherwise by additional analysis.
- Carcinogenic PAHs is a toxicity weighted sum of analyte concentrations for a specific list of PAH compounds relative to B(a)P. It is also refered to as the B(a)P Toxic Equivalence Quotient (TEQ).
- Statistical calculations are undertaken using ProUCL (USEPA). Statistical calculation is usually undertaken using data from fill samples.

EIL/ESL Table:

- ABC Values for selected metals have been adopted from the published background concentrations presented in Olszowy et. al., (1995), Trace Element Concentrations in Soils from Rural and Urban New South Wales (the 25th percentile values for new suburbs with low traffic have been quoted).

Waste Classification and TCLP Table:

- Data assessed using the NSW EPA Waste Classification Guidelines, Part 1: Classifying Waste (2014).
- The assessment of Total Moderately Harmful pesticides includes: Dichlorovos, Dimethoate, Fenitrothion, Ethion, Malathion and Parathion.
- Assessment of Total Scheduled pesticides include: HBC, alpha-BHC, gamma-BHC, beta-BHC, Heptachlor, Aldrin, Heptachlor Epoxide, gamma-Chlordane, alpha-chlordane, pp-DDE, Dieldrin, Endrin, pp-DDD, pp-DDT, Endrin Aldehyde.

TABLE A
SOIL LABORATORY RESULTS COMPARED TO NEPM 2013.
HIL-A: 'Residential with garden/accessible soils; children's day care centers; preschools; and primary schools'

All data in mg/kg unless stated otherwise			HEAVY METALS								PAHs		ORGANOCHLORINE PESTICIDES (OCPs)							OP PESTICIDES (OPPs)	TOTAL PCBs	ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium VI	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	Carcinogenic PAHs	HCB	Endosulfan	Methoxychlor	Aldrin & Dieldrin	Chlordane	DDT, DDD & DDE	Heptachlor	Chlorpyrifos		
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	100
Site Assessment Criteria (SAC)			100	20	100	6000	300	40	400	7400	300	3	10	270	300	6	50	240	6	160	1	Detected/Not Detected
Sample Reference	**Sample Depth**	**Sample Description**																				
BH101	0-0.1	F: Silty Clay	7	<0.4	16	18	18	0.3	8	41	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH101	0.5-0.95	Silty Clay	<4	<0.4	9	18	10	<0.1	3	16	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
TP102	0-0.1	F: Silty CLay	9	<0.4	19	18	22	<0.1	10	41	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP103	0-0.1	Silty Clay	6	<0.4	17	23	16	<0.1	10	50	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP104	0-0.1	Silty Clay	7	<0.4	21	17	20	<0.1	10	25	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP105	0-0.1	F: Silty Clay	9	<0.4	23	17	24	<0.1	10	28	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP106	0-0.1	F: Silty Clay	7	<0.4	17	19	22	<0.1	10	32	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP107	0-0.1	F: Silty Clay	6	<0.4	18	20	21	<0.1	12	37	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP107	0.3-0.4	Silty Clay	4	<0.4	14	24	12	<0.1	5	24	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
TP108	0-0.1	F: Silty Clay	6	<0.4	16	17	19	<0.1	9	39	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP109	0-0.1	F: Silty Clay	7	<0.4	23	17	23	<0.1	10	30	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP110	0-0.1	F: Silty Clay	11	<0.4	25	18	23	0.1	10	33	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP111	0-0.1	F: Silty Clay	7	<0.4	16	19	20	<0.1	9	43	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP112	0-0.1	F: Silty Clay	8	<0.4	18	16	23	<0.1	10	26	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP113	0-0.1	F: Silty Clay	7	<0.4	21	17	20	<0.1	10	28	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP113	0.3-0.4	Silty Clay	9	<0.4	28	28	26	<0.1	11	40	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP114	0-0.1	F: Silty Clay	6	<0.4	18	23	20	<0.1	14	58	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP115	0-0.1	F: Silty Clay	8	<0.4	18	25	24	<0.1	10	45	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP116	0-0.1	F: Clayey Silt	8	<0.4	27	17	24	<0.1	11	43	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP117	0-0.1	F: Silty Clay	6	<0.4	18	24	19	<0.1	15	51	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP118	0-0.1	F: Silty Clay	4	<0.4	17	22	21	0.1	13	36	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP118	0.3-0.4	F: Silty Clay	4	<0.4	21	29	14	<0.1	9	41	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP118	0.7-0.8	Silty Clay	<4	<0.4	15	23	14	<0.1	5	24	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
TP119	0-0.1	F: Silty Clay	7	<0.4	21	20	21	<0.1	7	43	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH120	0-0.2	F: Silty Clay	6	<0.4	21	17	21	<0.1	9	33	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP121	0-0.1	F: Silty Clay	10	<0.4	16	20	18	<0.1	9	40	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP122	0-0.1	F: Sandy Gravelly Clay	6	<0.4	14	22	16	<0.1	9	44	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP123	0-0.1	F: Silty Clay	6	<0.4	19	23	21	<0.1	13	46	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP124	0-0.1	F: Silty Clay	8	<0.4	26	22	27	<0.1	11	36	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP125	0-0.1	F: Silty Clay	8	<0.4	22	19	24	<0.1	9	33	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP125	0.2-0.3	F: Silty Clay	6	<0.4	20	20	17	<0.1	12	26	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
TP125	0.6-0.7	Silty Clay	7	<0.4	18	24	13	<0.1	7	27	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP126	0-0.1	F: Silty Clay	6	<0.4	23	17	23	<0.1	11	31	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
T1P26	0.7-0.8	Silty Clay	<4	<0.4	15	34	13	<0.1	9	44	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
TP127	0-0.1	F: Silty Clay	5	<0.4	22	19	23	<0.1	11	32	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH128	0-0.2	F: Silty Clay	8	<0.4	17	21	18	<0.1	9	45	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH128	0.5-0.95	Silty Clay	9	<0.4	17	20	13	<0.1	7	32	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
TP129	0-0.1	F: Sandy Gravelly Clay	7	<0.4	20	18	20	<0.1	9	35	0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP129	0.4-0.5	Silty Clay	5	<0.4	18	17	13	<0.1	7	21	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
TP130	0-0.1	F: Silty Clay	7	<0.4	20	20	22	<0.1	10	44	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP131	0-0.1	F: Silty Clay	7	<0.4	22	22	25	0.2	12	53	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
Total Number of Samples			41	41	41	41	41	41	41	41	41	41	38	38	38	38	38	38	38	38	38	33
Maximum Value			11	<PQL	28	34	27	0.3	15	58	0.1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	NC

Concentration above the SAC **VALUE**

TABLE B
SOIL LABORATORY RESULTS COMPARED TO HSLs
All data in mg/kg unless stated otherwise

					C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	Field PID Measurement
PQL - Envirolab Services					25	50	0.2	0.5	1	1	1	ppm
NEPM 2013 HSL Land Use Category					**HSL-A/B:LOW/HIGH DENSITY RESIDENTIAL**							
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**								
BH101	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH101	0.5-0.95	Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP102	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP103	0-0.1	Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP104	0-0.1	Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP105	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP106	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP107	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP107	0.3-0.4	Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP108	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP109	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP110	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP111	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP112	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP113	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP113	0.3-0.4	Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP114	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP115	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP116	0-0.1	F: Clayey Silt	0m to < 1m	Silt	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP117	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP118	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP118	0.3-0.4	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP118	0.7-0.8	Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP119	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH120	0-0.2	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP121	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP122	0-0.1	F: Sandy Gravelly Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP123	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP124	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP125	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP125	0.2-0.3	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP125	0.6-0.7	Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP126	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
T1P26	0.7-0.8	Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP127	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH128	0-0.2	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH128	0.5-0.95	Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP129	0-0.1	F: Sandy Gravelly Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP129	0.4-0.5	Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP130	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
TP131	0-0.1	F: Silty Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<1	<1	0
Total Number of Samples					41	41	41	41	41	41	41	41
Maximum Value					<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL

Concentration above the SAC **VALUE**

The guideline corresponding to the elevated value is highlighted in grey in the Site Assessment Criteria Table below

SITE ASSESSMENT CRITERIA

					C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene
PQL - Envirolab Services					25	50	0.2	0.5	1	1	1
NEPM 2013 HSL Land Use Category					**HSL-A/B:LOW/HIGH DENSITY RESIDENTIAL**						
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**							
BH101	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH101	0.5-0.95	Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP102	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP103	0-0.1	Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP104	0-0.1	Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP105	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP106	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP107	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP107	0.3-0.4	Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP108	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP109	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP110	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP111	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP112	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP113	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP113	0.3-0.4	Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP114	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP115	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP116	0-0.1	F: Clayey Silt	0m to < 1m	Silt	40	230	0.6	390	NL	95	4
TP117	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP118	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP118	0.3-0.4	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP118	0.7-0.8	Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP119	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH120	0-0.2	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP121	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP122	0-0.1	F: Sandy Gravelly Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP123	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP124	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP125	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP125	0.2-0.3	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP125	0.6-0.7	Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP126	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
T1P26	0.7-0.8	Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP127	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH128	0-0.2	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH128	0.5-0.95	Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP129	0-0.1	F: Sandy Gravelly Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP129	0.4-0.5	Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP130	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
TP131	0-0.1	F: Silty Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5

EIS

TABLE C
SOIL LABORATORY RESULTS COMPARED TO NEPM 2013 EILs AND ESLs
All data in mg/kg unless stated otherwise

Land Use Category				URBAN RESIDENTIAL AND PUBLIC OPEN SPACE																		
							AGED HEAVY METALS-EILs						EILs		ESLs							
				pH	CEC (cmol$_c$/kg)	Clay Content (% clay)	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
PQL - Envirolab Services				-	1	-	4	1	1	1	1	1	0.1	0.1	25	50	100	100	0.2	0.5	1	3	0.05
Ambient Background Concentration (ABC)				-	-	-	NSL	9	11	17	5	24	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL
Sample Reference	**Sample Depth**	**Sample Description**	**Soil Texture**																			
BH101	0-0.1	F: Silty Clay	Fine	NA	NA	NA	7	16	18	18	8	41	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH101	0.5-0.95	Silty Clay	Fine	NA	NA	NA	<4	9	18	10	3	16	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP102	0-0.1	F: Silty Clay	Fine	NA	NA	NA	9	19	18	22	10	41	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP103	0-0.1	Silty Clay	Fine	NA	NA	NA	6	17	23	16	10	50	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP104	0-0.1	Silty Clay	Fine	NA	NA	NA	7	21	17	20	10	25	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP105	0-0.1	F: Silty Clay	Fine	NA	NA	NA	9	23	17	24	10	28	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP106	0-0.1	F: Silty Clay	Fine	NA	NA	NA	7	17	19	22	10	32	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP107	0-0.1	F: Silty Clay	Fine	NA	NA	NA	6	18	20	21	12	37	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP107	0.3-0.4	Silty Clay	Fine	NA	NA	NA	4	14	24	12	5	24	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP108	0-0.1	F: Silty Clay	Fine	NA	NA	NA	6	16	17	19	9	39	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP109	0-0.1	F: Silty Clay	Fine	NA	NA	NA	7	23	17	23	10	30	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP110	0-0.1	F: Silty Clay	Fine	NA	NA	NA	11	25	18	23	10	33	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP111	0-0.1	F: Silty Clay	Fine	NA	NA	NA	7	16	19	20	9	43	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP112	0-0.1	F: Silty Clay	Fine	NA	NA	NA	8	18	16	23	10	26	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP113	0-0.1	F: Silty Clay	Fine	NA	NA	NA	7	21	17	20	10	28	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP113	0.3-0.4	Silty Clay	Fine	NA	NA	NA	9	28	28	26	11	40	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP114	0-0.1	F: Silty Clay	Fine	NA	NA	NA	6	18	23	20	14	58	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP115	0-0.1	F: Silty Clay	Fine	NA	NA	NA	8	18	25	24	10	45	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP116	0-0.1	F: Clayey Silt	Fine	NA	NA	NA	8	27	17	24	11	43	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP117	0-0.1	F: Silty Clay	Fine	NA	NA	NA	6	18	24	19	15	51	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP118	0-0.1	F: Silty Clay	Fine	NA	NA	NA	4	17	22	21	13	36	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP118	0.3-0.4	F: Silty Clay	Fine	NA	NA	NA	4	21	29	14	9	41	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP118	0.7-0.8	Silty Clay	Fine	NA	NA	NA	<4	15	23	14	5	24	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP119	0-0.1	F: Silty Clay	Fine	NA	NA	NA	7	21	20	21	7	43	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH120	0-0.2	F: Silty Clay	Fine	NA	NA	32	6	21	17	21	9	33	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP121	0-0.1	F: Silty Clay	Fine	NA	NA	NA	10	16	20	18	9	40	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP122	0-0.1	F: Sandy Gravelly Clay	Fine	NA	NA	NA	6	14	22	16	9	44	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP123	0-0.1	F: Silty Clay	Fine	NA	NA	NA	6	19	23	21	13	46	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP124	0-0.1	F: Silty Clay	Fine	NA	NA	NA	8	26	22	27	11	36	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP125	0-0.1	F: Silty Clay	Fine	NA	NA	NA	8	22	19	24	9	33	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP125	0.2-0.3	F: Silty Clay	Fine	NA	NA	NA	6	20	20	17	12	26	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP125	0.6-0.7	Silty Clay	Fine	NA	NA	NA	7	18	24	13	7	27	<0.1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP126	0-0.1	F: Silty Clay	Fine	NA	NA	NA	6	23	17	23	11	31	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
T1P26	0.7-0.8	Silty Clay	Fine	NA	NA	NA	<4	15	34	13	9	44	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP127	0-0.1	F: Silty Clay	Fine	NA	NA	NA	5	22	19	23	11	32	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH128	0-0.2	F: Silty Clay	Fine	NA	NA	28	8	17	21	18	9	45	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH128	0.5-0.95	Silty Clay	Fine	NA	NA	NA	9	17	20	13	7	32	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP129	0-0.1	F: Sandy Gravelly Clay	Fine	NA	NA	NA	7	20	18	20	9	35	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP129	0.4-0.5	Silty Clay	Fine	NA	NA	NA	5	18	17	13	7	21	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP130	0-0.1	F: Silty Clay	Fine	NA	NA	NA	7	20	20	22	10	44	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP131	0-0.1	F: Silty Clay	Fine	NA	NA	NA	7	22	22	25	12	53	<0.1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
Total Number of Samples				NA	NA	2	20	20	20	20	20	20	20	18	20	20	20	20	20	20	20	20	20
Maximum Value				NA	NA	32	10	26	34	27	13	53	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL

Concentration above the SAC — VALUE

The guideline corresponding to the elevated value is highlighted in grey in the EIL and ESL Assessment Criteria Table below

EIL AND ESL ASSESSMENT CRITERIA

Land Use Category				URBAN RESIDENTIAL AND PUBLIC OPEN SPACE																		
							AGED HEAVY METALS-EILs						EILs		ESLs							
				pH	CEC (cmol$_c$/kg)	Clay Content (% clay)	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
PQL - Envirolab Services				-	1	-	4	1	1	1	1	1	0.1	0.1	25	50	100	100	0.2	0.5	1	3	0.05
Ambient Background Concentration (ABC)				-	-	-	NSL	9	11	17	5	24	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL
Sample Reference	**Sample Depth**	**Sample Description**	**Soil Texture**																			
BH101	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
BH101	0.5-0.95	Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP102	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP103	0-0.1	Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP104	0-0.1	Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP105	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP106	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP107	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP107	0.3-0.4	Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP108	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP109	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP110	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP111	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP112	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP113	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP113	0.3-0.4	Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	--	180	120	1300	5600	60	105	125	45	33
TP114	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP115	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP116	0-0.1	F: Clayey Silt	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP117	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP118	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP118	0.3-0.4	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP118	0.7-0.8	Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP119	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
BH120	0-0.2	F: Silty Clay	Fine	NA	NA	32	100	409	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP121	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP122	0-0.1	F: Sandy Gravelly Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP123	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP124	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP125	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP125	0.2-0.3	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	--	180	120	1300	5600	60	105	125	45	33
TP125	0.6-0.7	Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	--	180	120	1300	5600	60	105	125	45	33
TP126	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
T1P26	0.7-0.8	Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP127	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
BH128	0-0.2	F: Silty Clay	Fine	NA	NA	28	100	409	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
BH128	0.5-0.95	Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP129	0-0.1	F: Sandy Gravelly Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP129	0.4-0.5	Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP130	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33
TP131	0-0.1	F: Silty Clay	Fine	NA	NA	NA	100	199	71	1117	35	94	170	180	180	120	1300	5600	60	105	125	45	33

TABLE D
SOIL LABORATORY RESULTS COMPARED TO WASTE CLASSIFICATION GUIDELINES
All data in mg/kg unless stated otherwise

			HEAVY METALS								PAHs		OC/OP PESTICIDES				Total PCBs	TRH					BTEX COMPOUNDS				ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	B(a)P	Total Endosulfans	Chloropyrifos	Total Moderately Harmful	Total Scheduled		C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Total C_{10}-C_{36}	Benzene	Toluene	Ethyl benzene	Total Xylenes	
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.05	0.1	0.1	0.1	0.1	0.1	25	50	100	100	250	0.2	0.5	1	3	100
General Solid Waste CT1			100	20	100	NSL	100	4	40	NSL	200	0.8	60	4	250	<50	<50	650		NSL		10,000	10	288	600	1,000	-
General Solid Waste SCC1			500	100	1900	NSL	1500	50	1050	NSL	200	10	108	7.5	250	<50	<50	650		NSL		10,000	18	518	1,080	1,800	-
Restricted Solid Waste CT2			400	80	400	NSL	400	16	160	NSL	800	3.2	240	16	1000	<50	<50	2600		NSL		40,000	40	1,152	2,400	4,000	-
Restricted Solid Waste SCC2			2000	400	7600	NSL	6000	200	4200	NSL	800	23	432	30	1000	<50	<50	2600		NSL		40,000	72	2,073	4,320	7,200	-
Sample Reference	**Sample Depth**	**Sample Description**																									
BH101	0-0.1	F: Silty Clay	7	<0.4	16	18	18	0.3	8	41	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
BH101	0.5-0.95	Silty Clay	<4	<0.4	9	18	10	<0.1	3	16	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	NA
TP102	0-0.1	F: Silty CLay	9	<0.4	19	18	22	<0.1	10	41	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP103	0-0.1	Silty Clay	6	<0.4	17	23	16	<0.1	10	50	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP104	0-0.1	Silty Clay	7	<0.4	21	17	20	<0.1	10	25	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP105	0-0.1	F: Silty Clay	9	<0.4	23	17	24	<0.1	10	28	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP106	0-0.1	F: Silty Clay	7	<0.4	17	19	22	<0.1	10	32	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP107	0-0.1	F: Silty Clay	6	<0.4	18	20	21	<0.1	12	37	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP107	0.3-0.4	Silty Clay	4	<0.4	14	24	12	<0.1	5	24	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	NA
TP108	0-0.1	F: Silty Clay	6	<0.4	16	17	19	<0.1	9	39	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP109	0-0.1	F: Silty Clay	7	<0.4	23	17	23	<0.1	10	30	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP110	0-0.1	F: Silty Clay	11	<0.4	25	18	23	0.1	10	33	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP111	0-0.1	F: Silty Clay	7	<0.4	16	19	20	<0.1	9	43	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP112	0-0.1	F: Silty Clay	8	<0.4	18	16	23	<0.1	10	26	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP113	0-0.1	F: Silty Clay	7	<0.4	21	17	20	<0.1	10	28	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP113	0.3-0.4	Silty Clay	9	<0.4	28	28	26	<0.1	11	40	<0.05	<0.5	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	NA
TP114	0-0.1	F: Silty Clay	6	<0.4	18	23	20	<0.1	14	58	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP115	0-0.1	F: Silty Clay	8	<0.4	18	25	24	<0.1	10	45	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP116	0-0.1	F: Clayey Silt	8	<0.4	27	17	24	<0.1	11	43	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP117	0-0.1	F: Silty Clay	6	<0.4	18	24	19	<0.1	15	51	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP118	0-0.1	F: Silty Clay	4	<0.4	17	22	21	0.1	13	36	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP118	0.3-0.4	F: Silty Clay	4	<0.4	21	29	14	<0.1	9	41	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP118	0.7-0.8	Silty Clay	<4	<0.4	15	23	14	<0.1	5	24	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	NA
TP119	0-0.1	F: Silty Clay	7	<0.4	21	20	21	<0.1	7	43	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
BH120	0-0.2	F: Silty Clay	6	<0.4	21	17	21	<0.1	9	33	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP121	0-0.1	F: Silty Clay	10	<0.4	16	20	18	<0.1	9	40	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP122	0-0.1	F: Sandy Gravelly Clay	6	<0.4	14	22	16	<0.1	9	44	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP123	0-0.1	F: Silty Clay	6	<0.4	19	23	21	<0.1	13	46	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP124	0-0.1	F: Silty Clay	8	<0.4	26	22	27	<0.1	11	36	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP125	0-0.1	F: Silty Clay	8	<0.4	22	19	24	<0.1	9	33	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP125	0.2-0.3	F: Silty Clay	6	<0.4	20	20	17	<0.1	12	26	<0.05	<0.5	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP125	0.6-0.7	Silty Clay	7	<0.4	18	24	13	<0.1	7	27	<0.05	<0.5	NA	NA	NA	NA	NA	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	NA
TP126	0-0.1	F: Silty Clay	6	<0.4	23	17	23	<0.1	11	31	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
T1P26	0.7-0.8	Silty Clay	<4	<0.4	15	34	13	<0.1	9	44	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	NA
TP127	0-0.1	F: Silty Clay	5	<0.4	22	19	23	<0.1	11	32	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
BH128	0-0.2	F: Silty Clay	8	<0.4	17	21	18	<0.1	9	45	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
BH128	0.5-0.95	Silty Clay	9	<0.4	17	20	13	<0.1	7	32	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	NA
TP129	0-0.1	F: Sandy Gravelly Clay	7	<0.4	20	18	20	<0.1	9	35	0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP129	0.4-0.5	Silty Clay	5	<0.4	18	17	13	<0.1	7	21	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	NA
TP130	0-0.1	F: Silty Clay	7	<0.4	20	20	22	<0.1	10	44	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
TP131	0-0.1	F: Silty Clay	7	<0.4	22	22	25	0.2	12	53	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<PQL	<0.2	<0.5	<1	<1	Not Detected
Total Number of samples			41	41	41	41	41	41	41	41	41	41	38	38	38	38	38	41	41	41	41	41	41	41	41	41	33
Maximum Value			11	<PQL	28	34	27	0.3	15	58	0.1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	NC

Concentration above the CT1 — VALUE
Concentration above SCC1 — VALUE
Concentration above the SCC2 — VALUE

TABLE E

SUMMARY OF LABORATORY RESULTS - ACID SULFATE SOIL ANALYSIS (sPOCAS)

		Analysis	pH_{KCL}	TAA	pH_{ox}	TPA	TSA	S_{POS}	Liming Rate
				pH 6.5		pH 6.5	pH 6.5	%w/w	kg $CaCO_3$/tonne
Acid Sulfate Soil Manual (1998) -Action Criteria		Fine Textured Soil	pH 5.0	62molH+/ tonne	pH 5.0	62molH+/ tonne	62molH+/ tonne	0.1% w/w	0.1% w/w
Sample Reference	**Sample Depth (m)**	**Sample Description**							
BH101	0.2-0.5	Silty Clay	4.0	56	3.8	70	14	0.01	5
BH101	5.0-5.2	Siltstone	7.0	<5	8.3	<5	<5	<0.005	<0.75
BH120	4.0-4.2	Siltstone	8.5	<5	8.7	<5	<5	<0.005	<0.75
BH128	1.5-1.95	Silty Clay	4.1	24	4.3	40	16	0.009	2.7
BH128	5.0-5.2	Silty Clay	6.8	<5	7.7	<5	<5	0.008	<0.75
Total Number of Samples			5	5	5	5	5	5	5
Minimum Value			4	24	3.8	40	14	0.008	2.7
Maximium Value			8.5	56	8.7	70	16	0.01	5

Values Exceeding Action Criteria — **VALUE**

TABLE F
GROUNDWATER LABORATORY RESULTS COMPARED TO HSLs
All data in µg/L unless stated otherwise

				C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	PID
PQL - Envirolab Services				10	50	1	1	1	3	1	
NEPM 2013 - Land Use Category				**HSL-A/B: LOW/HIGH DENSITY RESIDENTIAL**							
Sample Reference	**Water Depth**	**Depth Category**	**Soil Category**								
MW120	4.9	4m to <8m	Clay	<10	<50	<1	<1	<1	<3	<1	0
MW128	5.6	4m to <8m	Clay	<10	<50	<1	<1	<1	<3	<1	0
Total Number of Samples				2	2	2	2	2	2	2	2
Maximum Value				<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	0

Concentration above the SAC VALUE
Site specific assesment (SSA) required VALUE

The guideline corresponding to the elevated value is highlighted in grey in the Site Assessment Criteria Table below

HSL GROUNDWATER ASSESSMENT CRITERIA										
				C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene
PQL - Envirolab Services				10	50	1	1	1	3	1
NEPM 2013 - Land Use Category				**HSL-A/B: LOW/HIGH DENSITY RESIDENTIAL**						
Sample Reference	**Water Depth**	**Depth Category**	**Soil Category**							
MW120	4.9	4m to <8m	Clay	NL	NL	5000	NL	NL	NL	NL
MW128	5.6	4m to <8m	Clay	NL	NL	5000	NL	NL	NL	NL

TABLE G

SUMMARY OF GROUNDAWATER LABORATORY RESULTS COMPARED TO ECOLOGICAL GILs SAC

All results in µg/L unless stated otherwise.

	PQL Envirolab Services	ANZECC 2000 Fresh Waters	SAMPLES	
			MW120	MW128
Inorganic Compounds and Parameters				
pH	0.1	6.5 - 8.5	7.4	6.9
Electrical Conductivity (µS/cm)	1	NSL	13000	27000
Metals and Metalloids				
Arsenic (As lll)	1	24	<1	<1
Cadmium	0.1	0.2	**1.2**	<0.1
Chromium (SAC for Cr III adopted)	1	3.3	2	<1
Copper	1	1.4	**4**	**2**
Lead	1	3.4	<1	<1
Total Mercury (inorganic)	0.05	0.06	<0.05	<0.05
Nickel	1	11	**15**	1
Zinc	1	8	**63**	**22**
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)				
Benzene	1	950	<1	<1
Toluene	1	180	<1	<1
Ethylbenzene	1	80	<1	<1
m+p-xylene	2	75	<2	<2
o-xylene	1	350	<1	<1
Total xylenes	2	NSL	<3	<3
Polycyclic Aromatic Hydrocarbons (PAHs)				
Naphthalene	0.2	16	<0.2	<0.2
Acenaphthylene	0.1	NSL	<0.1	<0.1
Acenaphthene	0.1	NSL	<0.1	<0.1
Fluorene	0.1	NSL	<0.1	<0.1
Phenanthrene	0.1	0.6	<0.1	<0.1
Anthracene	**0.1**	0.01	<0.1	<0.1
Fluoranthene	0.1	1	<0.1	<0.1
Pyrene	0.1	NSL	<0.1	<0.1
Benzo(a)anthracene	0.1	NSL	<0.1	<0.1
Chrysene	0.1	NSL	<0.1	<0.1
Benzo(b,j+k)fluoranthene	0.2	NSL	<0.2	<0.2
Benzo(a)pyrene	0.1	0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	0.1	NSL	<0.1	<0.1
Dibenzo(a,h)anthracene	0.1	NSL	<0.1	<0.1
Benzo(g,h,i)perylene	0.1	NSL	<0.1	<0.1

Concentration above the GIL — VALUE
PQL exceeds GIL — **BOLD/RED**

TABLE H
SOIL INTRA-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS
All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = TP107 (0-0.1)	Arsenic	4	6	7	6.5	15
Dup Ref = DUP1	Cadmium	0.4	<0.4	<0.4	NC	NC
	Chromium	1	18	19	18.5	5
Envirolab Report: 205081	Copper	1	20	21	20.5	5
	Lead	1	21	21	21.0	0
	Mercury	0.1	<0.1	<0.1	NC	NC
	Nickel	1	12	11	11.5	9
	Zinc	1	37	41	39.0	10
	Naphthalene	0.1	<0.1	<0.1	NC	NC
	Acenaphthylene	0.1	<0.1	<0.1	NC	NC
	Acenaphthene	0.1	<0.1	<0.1	NC	NC
	Fluorene	0.1	<0.1	<0.1	NC	NC
	Phenanthrene	0.1	<0.1	<0.1	NC	NC
	Anthracene	0.1	<0.1	<0.1	NC	NC
	Fluoranthene	0.1	<0.1	<0.1	NC	NC
	Pyrene	0.1	<0.1	<0.1	NC	NC
	Benzo(a)anthracene	0.1	<0.1	<0.1	NC	NC
	Chrysene	0.1	<0.1	<0.1	NC	NC
	Benzo(b,j+k)fluoranthene	0.2	<0.2	<0.2	NC	NC
	Benzo(a)pyrene	0.05	<0.05	<0.05	NC	NC
	Indeno(123-cd)pyrene	0.1	<0.1	<0.1	NC	NC
	Dibenzo(ah)anthracene	0.1	<0.1	<0.1	NC	NC
	Benzo(ghi)perylene	0.1	<0.1	<0.1	NC	NC
	TRH C_6-C_{10} (F1)	25	<25	<25	NC	NC
	TRH >C_{10}-C_{16} (F2)	50	<50	<50	NC	NC
	TRH >C_{16}-C_{34} (F3)	100	<100	<100	NC	NC
	TRH >C_{34}-C_{40} (F4)	100	<100	<100	NC	NC
	Benzene	0.2	<0.2	<0.2	NC	NC
	Toluene	0.5	<0.5	<0.5	NC	NC
	Ethylbenzene	1	<1	<1	NC	NC
	m+p-xylene	2	<2	<2	NC	NC
	o-xylene	1	<1	<1	NC	NC

Explanation:

The RPD value is calculated as the absolute value of the difference between the initial and repeat results divided by the average value expressed as a percentage. The following acceptance criteria will be used to assess the RPD results:

Results > 10 times PQL = RPD value <= 50% are acceptable
Results between 5 & 10 times PQL = RPD value <= 75% are acceptable
Results < 5 times PQL = RPD value <= 100% are acceptable
If result is LPQL then 50% of the PQL is used for the calculation

RPD Results Above the Acceptance Criteria VALUE

TABLE I

SOIL INTRA-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS

All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = TP113 (0-0.1)	Arsenic	4	7	7	7.0	0
Dup Ref = DUP2	Cadmium	0.4	<0.4	<0.4	NC	NC
	Chromium	1	21	21	21.0	0
Envirolab Report: 205081	Copper	1	17	16	16.5	6
	Lead	1	20	21	20.5	5
	Mercury	0.1	<0.1	<0.1	NC	NC
	Nickel	1	10	9	9.5	11
	Zinc	1	28	26	27.0	7
	Naphthalene	0.1	<0.1	<0.1	NC	NC
	Acenaphthylene	0.1	<0.1	<0.1	NC	NC
	Acenaphthene	0.1	<0.1	<0.1	NC	NC
	Fluorene	0.1	<0.1	<0.1	NC	NC
	Phenanthrene	0.1	<0.1	<0.1	NC	NC
	Anthracene	0.1	<0.1	<0.1	NC	NC
	Fluoranthene	0.1	<0.1	<0.1	NC	NC
	Pyrene	0.1	<0.1	<0.1	NC	NC
	Benzo(a)anthracene	0.1	<0.1	<0.1	NC	NC
	Chrysene	0.1	<0.1	<0.1	NC	NC
	Benzo(b,j+k)fluoranthene	0.2	<0.2	<0.2	NC	NC
	Benzo(a)pyrene	0.05	<0.05	<0.05	NC	NC
	Indeno(123-cd)pyrene	0.1	<0.1	<0.1	NC	NC
	Dibenzo(ah)anthracene	0.1	<0.1	<0.1	NC	NC
	Benzo(ghi)perylene	0.1	<0.1	<0.1	NC	NC
	TRH C6-C10 (F1)	25	<25	<25	NC	NC
	TRH >C10-C16 (F2)	50	<50	<50	NC	NC
	TRH >C16-C34 (F3)	100	<100	<100	NC	NC
	TRH >C34-C40 (F4)	100	<100	<100	NC	NC
	Benzene	0.2	<0.2	<0.2	NC	NC
	Toluene	0.5	<0.5	<0.5	NC	NC
	Ethylbenzene	1	<1	<1	NC	NC
	m+p-xylene	2	<2	<2	NC	NC
	o-xylene	1	<1	<1	NC	NC

Explanation:

The RPD value is calculated as the absolute value of the difference between the initial and repeat results divided by the average value expressed as a percentage. The following acceptance criteria will be used to assess the RPD results:

Results > 10 times PQL = RPD value <= 50% are acceptable

Results between 5 & 10 times PQL = RPD value <= 75% are acceptable

Results < 5 times PQL = RPD value <= 100% are acceptable

If result is LPQL then 50% of the PQL is used for the calculation

RPD Results Above the Acceptance Criteria VALUE

TABLE J

SOIL INTRA-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS

All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = BH120 (0-0.2)	Arsenic	4	6	6	6.0	0
Dup Ref = DUPHLS1	Cadmium	0.4	<0.4	<0.4	NC	NC
	Chromium	1	21	21	21.0	0
Envirolab Report: 205081	Copper	1	17	18	17.5	6
	Lead	1	21	22	21.5	5
	Mercury	0.1	<0.1	<0.1	NC	NC
	Nickel	1	9	10	9.5	11
	Zinc	1	33	35	34.0	6
	Naphthalene	0.1	<0.1	<0.1	NC	NC
	Acenaphthylene	0.1	<0.1	<0.1	NC	NC
	Acenaphthene	0.1	<0.1	<0.1	NC	NC
	Fluorene	0.1	<0.1	<0.1	NC	NC
	Phenanthrene	0.1	<0.1	<0.1	NC	NC
	Anthracene	0.1	<0.1	<0.1	NC	NC
	Fluoranthene	0.1	<0.1	<0.1	NC	NC
	Pyrene	0.1	<0.1	<0.1	NC	NC
	Benzo(a)anthracene	0.1	<0.1	<0.1	NC	NC
	Chrysene	0.1	<0.1	<0.1	NC	NC
	Benzo(b,j+k)fluoranthene	0.2	<0.2	<0.2	NC	NC
	Benzo(a)pyrene	0.05	<0.05	<0.05	NC	NC
	Indeno(123-cd)pyrene	0.1	<0.1	<0.1	NC	NC
	Dibenzo(ah)anthracene	0.1	<0.1	<0.1	NC	NC
	Benzo(ghi)perylene	0.1	<0.1	<0.1	NC	NC
	Total OCPs	0.1	<0.1	<0.1	NC	NC
	Total OPPs	0.1	<0.1	<0.1	NC	NC
	Total PCBs	0.1	<0.1	<0.1	NC	NC
	TRH C6-C10 (F1)	25	<25	<25	NC	NC
	TRH >C10-C16 (F2)	50	<50	<50	NC	NC
	TRH >C16-C34 (F3)	100	<100	<100	NC	NC
	TRH >C34-C40 (F4)	100	<100	<100	NC	NC
	Benzene	0.2	<0.2	<0.2	NC	NC
	Toluene	0.5	<0.5	<0.5	NC	NC
	Ethylbenzene	1	<1	<1	NC	NC
	m+p-xylene	2	<2	<2	NC	NC
	o-xylene	1	<1	<1	NC	NC

Explanation:

The RPD value is calculated as the absolute value of the difference between the initial and repeat results divided by the average value expressed as a percentage. The following acceptance criteria will be used to assess the RPD results:

Results > 10 times PQL = RPD value <= 50% are acceptable

Results between 5 & 10 times PQL = RPD value <= 75% are acceptable

Results < 5 times PQL = RPD value <= 100% are acceptable

If result is LPQL then 50% of the PQL is used for the calculation

RPD Results Above the Acceptance Criteria VALUE

TABLE K

SOIL INTRA-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS

All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = BH117 (0-0.1)	Arsenic	4	6	6	6.0	0
Dup Ref = DUP3	Cadmium	0.4	<0.4	<0.4	NC	NC
	Chromium	1	18	17	17.5	6
Envirolab Report: 205081	Copper	1	24	25	24.5	4
	Lead	1	19	19	19.0	0
	Mercury	0.1	<0.1	<0.1	NC	NC
	Nickel	1	15	15	15.0	0
	Zinc	1	51	55	53.0	8
	Naphthalene	0.1	<0.1	<0.1	NC	NC
	Acenaphthylene	0.1	<0.1	<0.1	NC	NC
	Acenaphthene	0.1	<0.1	<0.1	NC	NC
	Fluorene	0.1	<0.1	<0.1	NC	NC
	Phenanthrene	0.1	<0.1	<0.1	NC	NC
	Anthracene	0.1	<0.1	<0.1	NC	NC
	Fluoranthene	0.1	<0.1	<0.1	NC	NC
	Pyrene	0.1	<0.1	<0.1	NC	NC
	Benzo(a)anthracene	0.1	<0.1	<0.1	NC	NC
	Chrysene	0.1	<0.1	<0.1	NC	NC
	Benzo(b,j+k)fluoranthene	0.2	<0.2	<0.2	NC	NC
	Benzo(a)pyrene	0.05	<0.05	<0.05	NC	NC
	Indeno(123-cd)pyrene	0.1	<0.1	<0.1	NC	NC
	Dibenzo(ah)anthracene	0.1	<0.1	<0.1	NC	NC
	Benzo(ghi)perylene	0.1	<0.1	<0.1	NC	NC
	Total OCPs	0.1	<0.1	<0.1	NC	NC
	Total OPPs	0.1	<0.1	<0.1	NC	NC
	Total PCBs	0.1	<0.1	<0.1	NC	NC
	TRH C6-C10 (F1)	25	<25	<25	NC	NC
	TRH >C10-C16 (F2)	50	<50	<50	NC	NC
	TRH >C16-C34 (F3)	100	<100	<100	NC	NC
	TRH >C34-C40 (F4)	100	<100	<100	NC	NC
	Benzene	0.2	<0.2	<0.2	NC	NC
	Toluene	0.5	<0.5	<0.5	NC	NC
	Ethylbenzene	1	<1	<1	NC	NC
	m+p-xylene	2	<2	<2	NC	NC
	o-xylene	1	<1	<1	NC	NC

Explanation:

The RPD value is calculated as the absolute value of the difference between the initial and repeat results divided by the average value expressed as a percentage. The following acceptance criteria will be used to assess the RPD results:

Results > 10 times PQL = RPD value <= 50% are acceptable

Results between 5 & 10 times PQL = RPD value <= 75% are acceptable

Results < 5 times PQL = RPD value <= 100% are acceptable

If result is LPQL then 50% of the PQL is used for the calculation

RPD Results Above the Acceptance Criteria VALUE

TABLE L

SOIL INTER-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS

All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	Envirolab VIC PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = TP127 (0-0.1)	Arsenic	4	4	5	6	5.5	18
Dup Ref = DUP4	Cadmium	0.4	0.4	<0.4	<0.4	NC	NC
	Chromium	1	1	22	23	22.5	4
Envirolab Report: 205081	Copper	1	1	19	20	19.5	5
Envirolab VIC Report: 15327	Lead	1	1	23	25	24.0	8
	Mercury	0.1	0.1	<0.1	<0.1	NC	NC
	Nickel	1	1	11	11	11.0	0
	Zinc	1	1	32	34	33.0	6
	Naphthalene	0.1	0.1	<0.1	<0.1	NC	NC
	Acenaphthylene	0.1	0.1	<0.1	<0.1	NC	NC
	Acenaphthene	0.1	0.1	<0.1	<0.1	NC	NC
	Fluorene	0.1	0.1	<0.1	<0.1	NC	NC
	Phenanthrene	0.1	0.1	<0.1	<0.1	NC	NC
	Anthracene	0.1	0.1	<0.1	<0.1	NC	NC
	Fluoranthene	0.1	0.1	<0.1	<0.1	NC	NC
	Pyrene	0.1	0.1	<0.1	<0.1	NC	NC
	Benzo(a)anthracene	0.1	0.1	<0.1	<0.1	NC	NC
	Chrysene	0.1	0.1	<0.1	<0.1	NC	NC
	Benzo(b,j+k)fluoranthene	0.2	0.2	<0.2	<0.2	NC	NC
	Benzo(a)pyrene	0.05	0.05	<0.05	<0.05	NC	NC
	Indeno(123-cd)pyrene	0.1	0.1	<0.1	<0.1	NC	NC
	Dibenzo(ah)anthracene	0.1	0.1	<0.1	<0.1	NC	NC
	Benzo(ghi)perylene	0.1	0.1	<0.1	<0.1	NC	NC
	Total OCPs	0.1	0.1	<0.1	<0.1	NC	NC
	Total OPPs	0.1	0.1	<0.1	<0.1	NC	NC
	Total PCBs	0.1	0.1	<0.1	<0.1	NC	NC
	TRH C6-C10 (F1)	25	25	<25	<25	NC	NC
	TRH >C10-C16 (F2)	50	50	<50	<50	NC	NC
	TRH >C16-C34 (F3)	100	100	<100	<100	NC	NC
	TRH >C34-C40 (F4)	100	100	<100	<100	NC	NC
	Benzene	0.2	0.2	<0.2	<0.2	NC	NC
	Toluene	0.5	0.5	<0.5	<0.5	NC	NC
	Ethylbenzene	1	1	<1	<1	NC	NC
	m+p-xylene	2	2	<2	<2	NC	NC
	o-xylene	1	1	<1	<1	NC	NC

Explanation:

The RPD value is calculated as the absolute value of the difference between the initial and repeat results divided by the average value expressed as a percentage. The following acceptance criteria will be used to assess the RPD results:

Results > 10 times PQL = RPD value <= 50% are acceptable

Results between 5 & 10 times PQL = RPD value <= 75% are acceptable

Results < 5 times PQL = RPD value <= 100% are acceptable

If result is LPQL then 50% of the PQL is used for the calculation

RPD Results Above the Acceptance Criteria VALUE

TABLE M

SOIL INTER-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS

All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	Envirolab VIC PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = BH128 (0-0.2)	Arsenic	4	4	8	8	8.0	0
Dup Ref = DUPHLS2	Cadmium	0.4	0.4	<0.4	<0.4	NC	NC
	Chromium	1	1	17	21	19.0	21
Envirolab Report: 205081	Copper	1	1	21	20	20.5	5
Envirolab VIC Report: 15327	Lead	1	1	18	23	20.5	24
	Mercury	0.1	0.1	<0.1	<0.1	NC	NC
	Nickel	1	1	9	9	9.0	0
	Zinc	1	1	45	46	45.5	2
	Naphthalene	0.1	0.1	<0.1	<0.1	NC	NC
	Acenaphthylene	0.1	0.1	<0.1	<0.1	NC	NC
	Acenaphthene	0.1	0.1	<0.1	<0.1	NC	NC
	Fluorene	0.1	0.1	<0.1	<0.1	NC	NC
	Phenanthrene	0.1	0.1	<0.1	<0.1	NC	NC
	Anthracene	0.1	0.1	<0.1	<0.1	NC	NC
	Fluoranthene	0.1	0.1	<0.1	<0.1	NC	NC
	Pyrene	0.1	0.1	<0.1	<0.1	NC	NC
	Benzo(a)anthracene	0.1	0.1	<0.1	<0.1	NC	NC
	Chrysene	0.1	0.1	<0.1	<0.1	NC	NC
	Benzo(b,j+k)fluoranthene	0.2	0.2	<0.2	<0.2	NC	NC
	Benzo(a)pyrene	0.05	0.05	<0.05	<0.05	NC	NC
	Indeno(123-cd)pyrene	0.1	0.1	<0.1	<0.1	NC	NC
	Dibenzo(ah)anthracene	0.1	0.1	<0.1	<0.1	NC	NC
	Benzo(ghi)perylene	0.1	0.1	<0.1	<0.1	NC	NC
	Total OCPs	0.1	0.1	<0.1	<0.1	NC	NC
	Total OPPs	0.1	0.1	<0.1	<0.1	NC	NC
	Total PCBs	0.1	0.1	<0.1	<0.1	NC	NC
	TRH C6-C10 (F1)	25	25	<25	<25	NC	NC
	TRH >C10-C16 (F2)	50	50	<50	<50	NC	NC
	TRH >C16-C34 (F3)	100	100	<100	<100	NC	NC
	TRH >C34-C40 (F4)	100	100	<100	<100	NC	NC
	Benzene	0.2	0.2	<0.2	<0.2	NC	NC
	Toluene	0.5	0.5	<0.5	<0.5	NC	NC
	Ethylbenzene	1	1	<1	<1	NC	NC
	m+p-xylene	2	2	<2	<2	NC	NC
	o-xylene	1	1	<1	<1	NC	NC

Explanation:

The RPD value is calculated as the absolute value of the difference between the initial and repeat results divided by the average value expressed as a percentage. The following acceptance criteria will be used to assess the RPD results:

Results > 10 times PQL = RPD value <= 50% are acceptable

Results between 5 & 10 times PQL = RPD value <= 75% are acceptable

Results < 5 times PQL = RPD value <= 100% are acceptable

If result is LPQL then 50% of the PQL is used for the calculation

RPD Results Above the Acceptance Criteria VALUE

TABLE N
GROUNDWATER INTRA-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS
All results in µg/L unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = MW120	Arsenic	1	<1	<1	NC	NC
Dup Ref = DUP1	Cadmium	0.1	<0.1	<0.1	NC	NC
	Chromium	1	2	2	2	0
Envirolab Report: 205868	Copper	1	2	1	2	67
	Lead	1	<1	<1	NC	NC
	Mercury	0.05	<0.05	<0.05	NC	NC
	Nickel	1	1	1	1	0
	Zinc	1	22	21	22	5
	Naphthalene	0.2	<0.2	<0.2	NC	NC
	Acenaphthylene	0.1	<0.1	<0.1	NC	NC
	Acenaphthene	0.1	<0.1	<0.1	NC	NC
	Fluorene	0.1	<0.1	<0.1	NC	NC
	Phenanthrene	0.1	<0.1	<0.1	NC	NC
	Anthracene	0.1	<0.1	<0.1	NC	NC
	Fluoranthene	0.1	<0.1	<0.1	NC	NC
	Pyrene	0.1	<0.1	<0.1	NC	NC
	Benzo(a)anthracene	0.1	<0.1	<0.1	NC	NC
	Chrysene	0.1	<0.1	<0.1	NC	NC
	Benzo(b,j+k)fluoranthene	0.2	<0.2	<0.2	NC	NC
	Benzo(a)pyrene	0.1	<0.1	<0.1	NC	NC
	Indeno(123-cd)pyrene	0.1	<0.1	<0.1	NC	NC
	Dibenzo(ah)anthracene	0.1	<0.1	<0.1	NC	NC
	Benzo(ghi)perylene	0.1	<0.1	<0.1	NC	NC
	TRH C6-C10 (F1)	10	<10	<10	NC	NC
	TRH >C10-C16 (F2)	50	<50	<50	NC	NC
	TRH >C16-C34 (F3)	100	<100	<100	NC	NC
	TRH >C34-C40 (F4)	100	<100	<100	NC	NC
	Benzene	1	<1	<1	NC	NC
	Toluene	1	<1	<1	NC	NC
	Ethylbenzene	1	<1	<1	NC	NC
	m+p-xylene	2	<2	<2	NC	NC
	o-xylene	1	<1	<1	NC	NC

Explanation:

The RPD value is calculated as the absolute value of the difference between the initial and repeat results divided by the average value expressed as a percentage. The following acceptance criteria will be used to assess the RPD results:

Results > 10 times PQL = RPD value <= 50% are acceptable
Results between 5 & 10 times PQL = RPD value <= 75% are acceptable
Results < 5 times PQL = RPD value <= 100% are acceptable
If result is LPQL then 50% of the PQL is used for the calculation

RPD Results Above the Acceptance Criteria VALUE

TABLE O

SUMMARY OF FIELD QA/QC RESULTS

ANALYSIS	Envirolab PQL		TB1[S]	TB[W]	RS1[S]	TS[W]
			31/10/2018	16/11/2018	31/10/2018	16/11/2018
	mg/kg	µg/L	mg/kg	µg/L	mg/kg	% Recovery
Benzene	1	0.2	<0.2	<1	<1	100%
Toluene	1	0.5	<0.5	<1	<1	98%
Ethylbenzene	1	1	<1	<1	<1	104%
m+p-xylene	2	2	<2	<2	<2	105%
o-xylene	1	1	<1	<1	<1	105%

Explanation:

[W] Sample type (water)

[S] Sample type (sand)

BTEX concentrations in trip spikes are presented as % recovery

Values above PQLs/Acceptance criteria **VALUE**

TABLE P
SUMMARY OF SOIL LABORATORY RESULTS - EC and ECe

Borehole Number	Sample Depth (m)	Sample Description	EC (µS/cm)	ECe (dS/m)	Salinity Class[1]
Sample Depth Range - 0m to 2m					
BH101	0.8-1.0	Silty Clay	480	3.3	**Slightly Saline**
BH107	0-0.1	F: Silty Clay	68	0.4	**Non-saline**
TP113	0.3-0.4	Silty Clay	220	1.5	**Non-saline**
BH128	0.2-0.5	Silty Clay	140	<2	**Non-saline**
BH107	1.0-1.1	Silty Clay	600	3.6	**Slightly Saline**
BH120	1.5-1.6	Siltstone	520	4.4	**Moderately Saline**
TP113	2.1-2.2	Claystone	500	3.5	**Slightly Saline**
BH120	2.2-2.5	Siltstone	360	3.1	**Slightly Saline**
BH101	3.2-3.5	Siltstone	280	2.3	**Slightly Saline**
BH128	5.2-5.5	Siltstone	470	4.2	**Moderately Saline**
Total Number of Samples			10	9	-
Minimum Value			68	<2	-
Maximum Value			600	4.42	-

Explanation

1 - Salinity Class has been adopted from '*Site Investigations for Urban Salinity*' DLWC 2002.

(dS/m)	Salinity Class
<2	**Non-Saline**
2 to 4	**Slightly Saline**
4 to 8	**Moderately Saline**
8 to 16	**Very Saline**
>16	**Highly Saline**

Abbreviations

EC - Electrical Conductivity
ECe - Extract Electrical Conductivity

TABLE Q
SUMMARY OF SOIL LABORATORY RESULTS - pH

Borehole Number	Sample Depth (m)	Sample Description	pH	Classification for Concrete Piles[1] Soil Condition B[2]	Classification for Steel Piles[1] Soil Condition B[2]
Sample Depth Range - 0m to 2m					
BH101	0.8-1.0	Silty Clay	5.2	**Mildly Aggressive**	0.4
BH107	0-0.1	F: Silty Clay	6.6	**Non-Aggressive**	1.5
TP113	0.3-0.4	Silty Clay	5.9	**Non-Aggressive**	Non-Aggressive
BH128	0.2-0.5	Silty Clay	6.4	**Non-Aggressive**	Non-Aggressive
BH107	1.0-1.1	Silty Clay	5.1	**Mildly Aggressive**	4.4
BH120	1.5-1.6	Siltstone	5.6	**Non-Aggressive**	Non-Aggressive
TP113	2.1-2.2	Claystone	6.3	**Non-Aggressive**	Non-Aggressive
BH120	2.2-2.5	Siltstone	6.9	**Non-Aggressive**	Non-Aggressive
BH101	3.2-3.5	Siltstone	8.5	**Non-Aggressive**	Non-Aggressive
BH128	5.2-5.5	Siltstone	7.7	**Non-Aggressive**	Non-Aggressive
Total Number of Samples			10	-	-
Minimum Value			5.1	-	-
Maximum Value			8.5	-	-

Explanation

1 - pH Classification derived from the Australian Standard 2159-2009 Piling Design and Installation (Tables 6.4.2 [C] & 6.5.2 [C])

2 - Classification is based on Soil condition 'B' - low permeability soils (e.g. silts & clays) or all soils above groundwater.

pH Value	Classification for Concrete Piles	pH Value
>5.5	**Non-Aggressive**	>5
4.5 - 5.5	**Mildly Aggressive**	4.0 - 5.0
4 - 4.5	**Moderately Aggressive**	3.0 - 4.0
<4	**Severely Aggressive**	<3

TABLE R
SUMMARY OF RESISTIVITY CALCULATION ON SOIL EC RESULTS

Borehole Number	Sample Depth (m)	Sample Description	EC (µS/cm)	Resistivity[1] (ohm.cm)	Classification[2] Condition B
Sample Depth Range - 0m to 2m					
BH101	0.8-1.0	Silty Clay	480	2,083	Non-Aggressive
BH107	0-0.1	F: Silty Clay	68	14,706	0.4
TP113	0.3-0.4	Silty Clay	220	4,545	1.5
BH128	0.2-0.5	Silty Clay	140	7,143	Non-Aggressive
BH107	1.0-1.1	Silty Clay	600	1,667	**Mildly Aggressive**
BH120	1.5-1.6	Siltstone	520	1,923	4.4
TP113	2.1-2.2	Claystone	500	2,000	**Mildly Aggressive**
BH120	2.2-2.5	Siltstone	360	2,778	Non-Aggressive
BH101	3.2-3.5	Siltstone	280	3,571	Non-Aggressive
BH128	5.2-5.5	Siltstone	470	2,128	Non-Aggressive
Total Number of Samples			10	10	-
Minimum Value			68	1,667	-
Maximum Value			600	14,706	-

Explanation

1 - Resistivity values have been calculated on the laboratory EC values presented in Table B

2 - Classification derived from the Australian Standard 2159-2009 Piling Design and Installation (Table 6.5.2 [A] & [C])
Classification is based on Soil condition 'B' - low permeability soils (e.g. silts & clays) or all soils above groundwater.

Resistivity Values (ohm.cm)	Classification for Steel Piles
>5,000	**Non-Aggressive**
2,000 - 5,000	**Non-Aggressive**
1,000 - 2,000	**Mildly Aggressive**
<1,000	**Moderately Aggressive**

Abbreviations

EC - Electrical Conductivity

TABLE S
SUMMARY OF SOIL LABORATORY RESULTS - SULPHATE & CHLORIDES

Borehole Number	Sample Depth (m)	Sample Description	Sulphate (mg/kg)	Chloride (mg/kg)	Classification for Concrete Piles[1] SO4 - Soil Condition B[2]	Classification for Steel Piles[1] Cl - Soil Condition B[2]
Sample Depth Range - 0m to 2m						
BH101	0.8-1.0	Silty Clay	160	670	0.4	Non-Aggressive
BH107	0-0.1	F: Silty Clay	47	34	1.5	Non-Aggressive
TP113	0.3-0.4	Silty Clay	130	250	Non-Aggressive	Non-Aggressive
BH128	0.2-0.5	Silty Clay	120	69	Non-Aggressive	Non-Aggressive
BH107	1.0-1.1	Silty Clay	240	730	4.4	Non-Aggressive
BH120	1.5-1.6	Siltstone	130	850	Non-Aggressive	Non-Aggressive
TP113	2.1-2.2	Claystone	110	620	Non-Aggressive	Non-Aggressive
BH120	2.2-2.5	Siltstone	130	470	Non-Aggressive	Non-Aggressive
BH101	3.2-3.5	Siltstone	64	310	Non-Aggressive	Non-Aggressive
BH128	5.2-5.5	Siltstone	120	590	Non-Aggressive	Non-Aggressive
Total Number of Samples			10	10	-	-
Minimum Value			47	34	-	-
Maximum Value			240	850	-	-

Explanation

1 - Classification derived from the Australian Standard 2159-2009 Piling Design and Installation (Tables 6.4.2 [C] & 6.5.2 [C])

2 - Classification is based on Soil condition 'B' - low permeability soils (e.g. silts & clays) or all soils above groundwater.

Sulphate (SO4) Values	Classification for Concrete Piles
<5,000	Non-Aggressive
5,000 - 10,000	Mildly Aggressive
10,000 - 20,000	Moderately Aggressive
>20,000	Severely Aggressive

Chloride (Cl) Values	Classification for Steel Piles
<5,000	Non-Aggressive
5,000 - 20,000	Non-Aggressive
20,000 - 50,000	Mildly Aggressive
>50,000	Moderately Aggressive

TABLE T
SUMMARY OF SOIL LABORATORY RESULTS - CEC & ESP

Borehole Number	Sample Depth (m)	Sample Description	Total CEC	Ca	K	Mg	Na	ESP[1]
			(meq/100g)					%
BH101	0.8-1.0	Silty Clay	9.2	0.1	0.1	6	2.9	**31.5**
BH128	0.2-0.5	Silty Clay	18	9.3	0.4	7.3	0.61	3.4
BH107	1.0-1.1	Silty Clay	11	<0.1	0.4	7.8	3.1	**28.2**
TP113	2.1-2.2	Claystone	16	0.3	1.5	10	5.2	**32.5**
BH120	2.2-2.5	Siltstone	11	0.1	0.2	7.3	3.6	**32.7**
BH101	3.2-3.5	Siltstone	12	1.7	0.3	7.2	3.1	**25.8**
BH128	5.2-5.5	Siltstone	10	0.6	4.4	6.5	2.9	**29.0**
Total Number of Samples			7	6	7	7	7	7
Minimum Value			9.20	0.10	0.10	6.00	0.61	3.4
Maximum Value			18.00	9.30	4.42	10.00	5.20	32.7

Explanation

1 - Sodicity rating has been adopted from the publication *'Site Investigations for Urban Salinity' DLWC* 2002.

ESP Value	Sodicity Rating
< 5%	**Non-Sodic**
5% to 15%	**Sodic**
> 15%	**Highly Sodic**

Abbreviation

CEC: Cation Exchange Capacity
ESP: Exchangeable Sodium Percentage (Each Na/CEC)
Mg: Exchangeable Magnesium
Na: Exchangeable Sodium
K: Exchangeable Potassium
Ca: Exchangeable Calcium

0
0

TABLE U
SUMMARY OF GROUNDWATER LABORATORY RESULTS

Sample Reference	Field Measurements[1]						Laboratory Results				Classification for Concrete Piles[2] Soil Condition B[3]	Classification for Steel Piles[2] Soil Condition B[3]
	SWL (m)	pH	EC (µS/cm)	Temp (°C)	Eh (mV)	DO (mg/L)	pH	EC (µS/cm)	SO4 (mg/L)	Cl (mg/L)		
MW120	4.72	6.92	11094	18	185.1	1.9	7.4	13000	310	3900	Non-Aggressive	Non-Aggressive
MW128	5.55	6.42	23572	19.6	0.4	2.8	6.9	27000	810	9600	**Mildly Aggressive**	Non-Aggressive
Total Number of Samples	2	2	2	2	1.5	2	2	2	2	2	-	-
Minimum Value	4.72	6.42	11094	18	0.4	1.9	6.9	13000	310	3900	-	-
Maximum Value	5.55	6.92	23572	19.6	185.1	2.8	7.4	27000	810	9600	-	-

4.4

Explanation

1 - Field Measurements were obtained on 16 November 2018

Exposure Classification for Concrete Piles

2 - Classification derived from the Australian Standard 2159-2009 Piling Design and Installation (Tables 6.4.2 [A] & [C])

3 - Classification is based on Soil condition 'B' - low permeability soils (e.g. silts and clays) or all soils above groundwater.

pH	Sulphate (mg/L)	Chloride (mg/L)	Classification
> 5.5	<1,000	<6,000	**Non-Aggressive**
4.5 - 5.5	1,000 - 3,000	6,000 - 12,000	**Mildly Aggressive**
4.0 - 4.5	3,000 - 10,000	12,000 - 30,000	**Moderately Aggressive**
< 4	>10,000	>30,000	**Severely Aggressive**

Exposure Classification for Steel Piles

2 - Classification derived from the Australian Standard 2159-2009 Piling Design and Installation (Tables 6.5.2 [A] & [C])

3 - Classification is based on Soil condition 'B' - low permeability soils (e.g. silts and clays) or all soils above groundwater.

pH	Chloride (mg/L)	Classification
> 5	<1,000	**Non-Aggressive**
4.0 - 5.0	1,000 - 10,000	**Non-Aggressive**
3.0 - 4.0	10,000 - 20,000	**Mildly Aggressive**
<3	>20,000	**Moderately Aggressive**

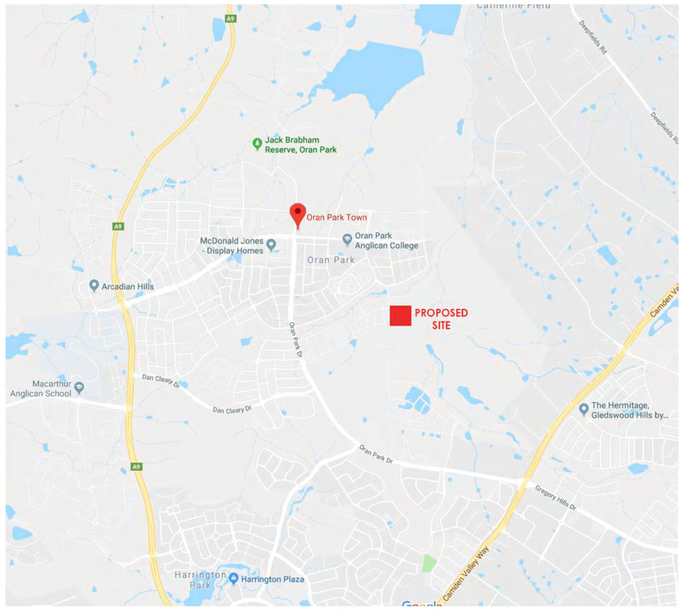
Abbreviation

SWL - Standing Water Level
EC - Electrical Conductivity
Eh - Redox Potential
SO4 - Sulphate
Cl - Chloride
DO - Dissolved Oxygen

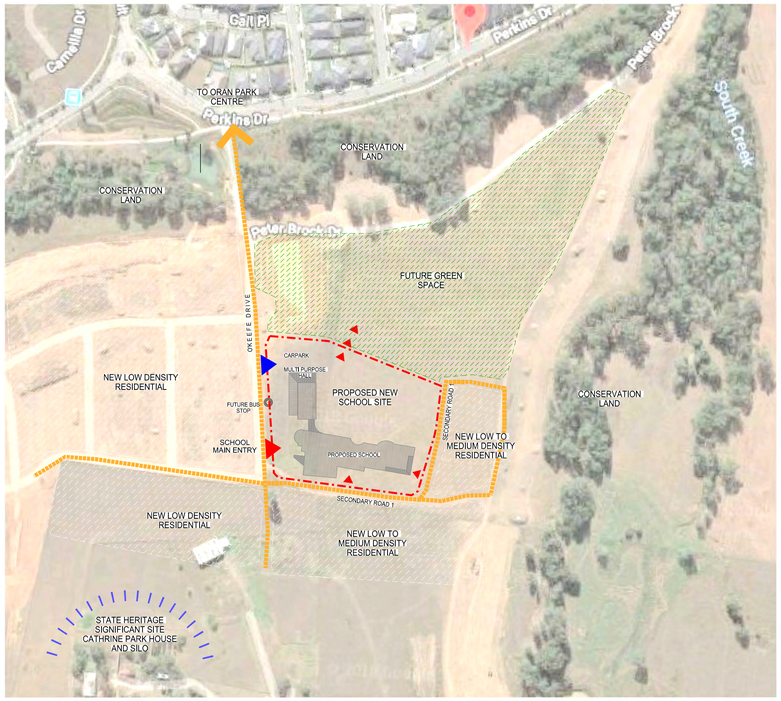
0
0

Appendix A: Site Information including Site History

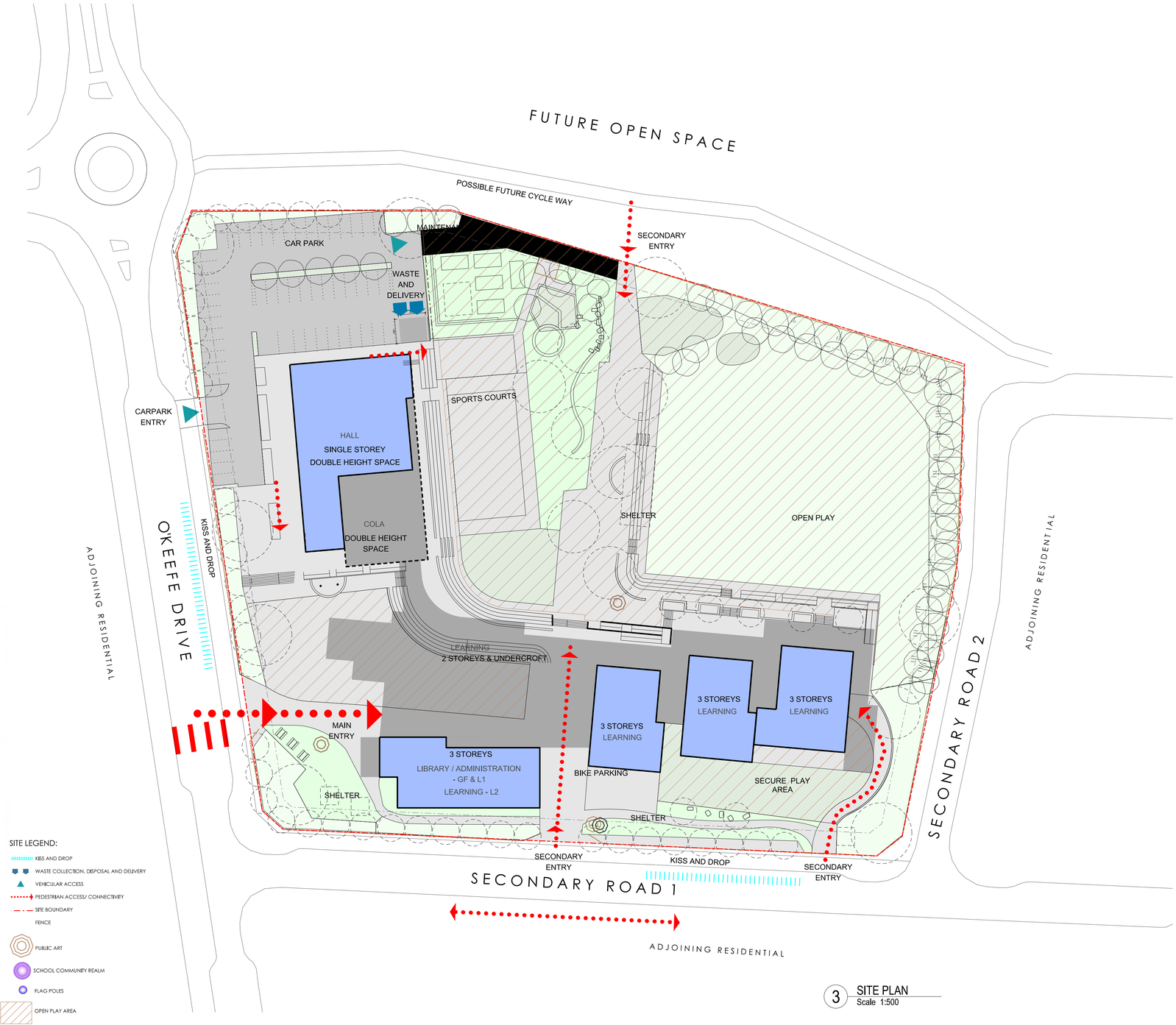
Proposed Concept Design Plan



1 **SITE PRECINCT PLAN**
Scale NTS



2 **SITE LOCATION PLAN**
Scale NTS



SITE LEGEND:
- KISS AND DROP
- WASTE COLLECTION, DISPOSAL AND DELIVERY
- VEHICULAR ACCESS
- PEDESTRIAN ACCESS/ CONNECTIVITY
- SITE BOUNDARY
- FENCE
- PUBLIC ART
- SCHOOL COMMUNITY REALM
- FLAG POLES
- OPEN PLAY AREA

3 **SITE PLAN**
Scale 1:500

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nominated architects
Stephen Arlom
reg. no. 7645
Robert McNamara
reg. no. 7271

DATE: 13/11/2018
PRELIMINARY

1 SITE PLAN
Scale 1:500

SITE LEGEND:

- KISS AND DROP
- WASTE COLLECTION, DISPOSAL AND DELIVERY
- VEHICULAR ACCESS
- PEDESTRIAN ACCESS/ CONNECTIVITY
- SITE BOUNDARY
- FENCE
- PUBLIC ART
- SCHOOL COMMUNITY REALM
- FLAG POLES

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1 FLOOR PLAN - GROUND FLOOR
Scale 1:200

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LEGEND:

- HALL
- COLA
- CANTEEN
- STORE
- CLEANERS ROOM
- COMMS ROOM
- ADMINISTRATION
- TEACHING SPACES / SPECIAL PROGRAMS
- LIBRARY / PRESENTATION
- OUTDOORS / BALCONY
- AMENITIES / CLEANERS
- STAIRS
- OSHC
- BUILDING OVER
- OPEN PLAY / LANDSCAPING
- WITHDRAWAL
- PRACTICAL ACTIVITIES
- FENCE
- SITE BOUNDARY

1 FLOOR PLAN - FIRST FLOOR
Scale 1:200

CONCEPT DESIGN REPORT
CATHERINE FIELD NEW PRIMARY SCHOOL

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NSW GOVERNMENT Education
TSA MANAGEMENT

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NORTH

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PRELIMINARY

LEGEND:

- HALL
- COLA
- CANTEEN
- STORE
- CLEANERS ROOM
- COMMS ROOM
- ADMINISTRATION
- TEACHING SPACES / SPECIAL PROGRAMS
- LIBRARY / PRESENTATION
- OUTDOORS / BALCONY
- AMENITIES / CLEANERS
- STAIRS
- OSHC
- BUILDING OVER
- OPEN PLAY / LANDSCAPING
- WITHDRAWAL
- PRACTICAL ACTIVITIES
- FENCE
- SITE BOUNDARY

1 FLOOR PLAN - SECOND FLOOR
Scale 1:200

CONCEPT DESIGN REPORT
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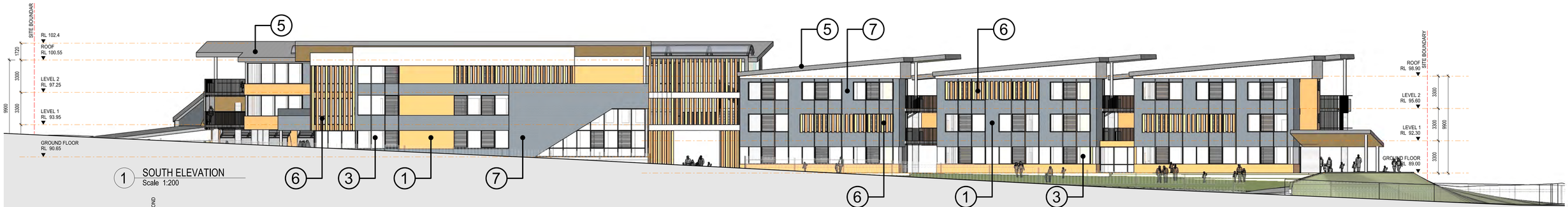
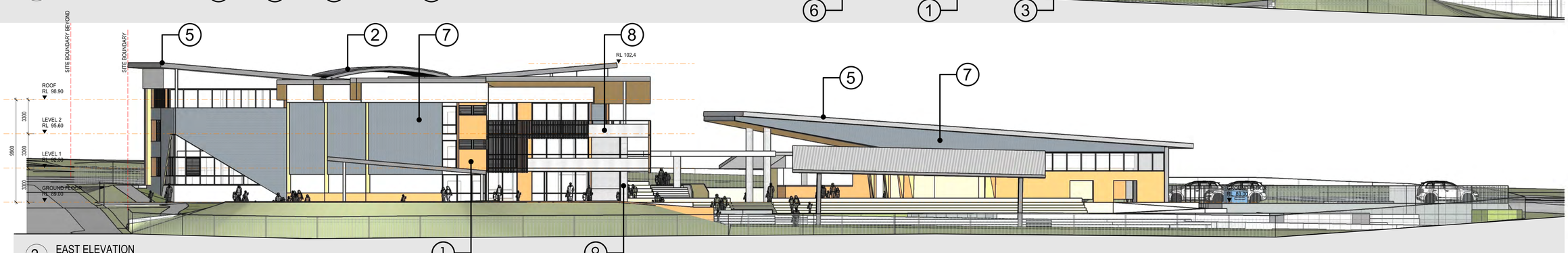
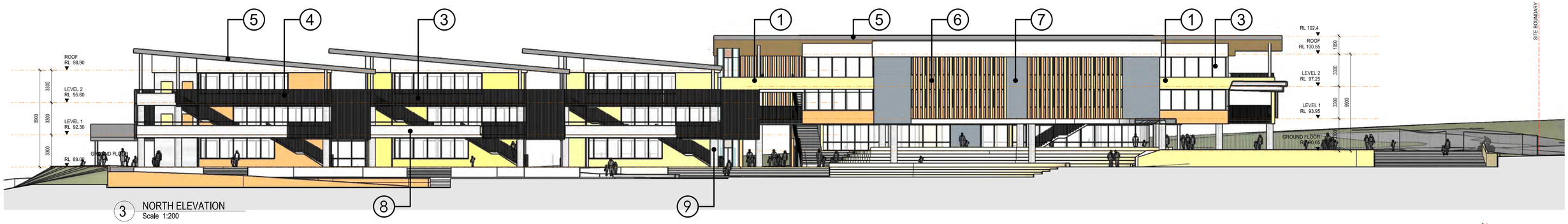


1 SOUTH ELEVATION
Scale 1:200



2 EAST ELEVATION
Scale 1:200



3 NORTH ELEVATION
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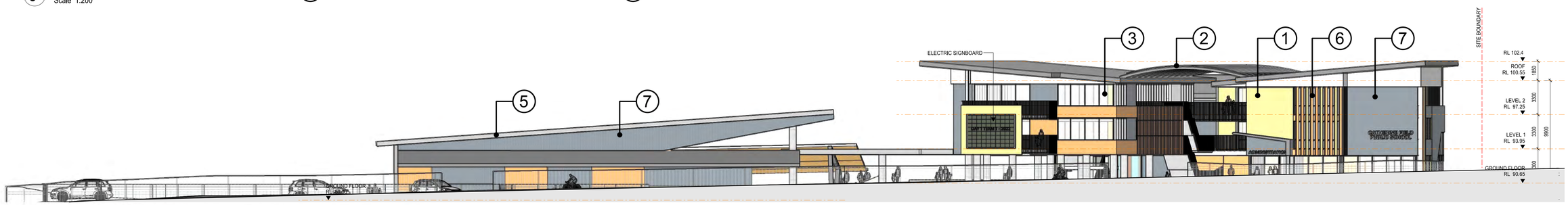

4 WEST ELEVATION
Scale 1:200

MATERIAL LEGEND

1. FC CLADDING (COLOR AS SPECIFIED)
2. POLYCARBONATE CLADDING
3. GLASS
4. GALVANISED BALUSTRADE
5. ROOF SHEETING
6. VERTICAL LOUVRE (COLOR AS SPECIFIED)
7. CORRUGATED METAL SHEETING
8. METAL CLADDING
9. CONCRETE

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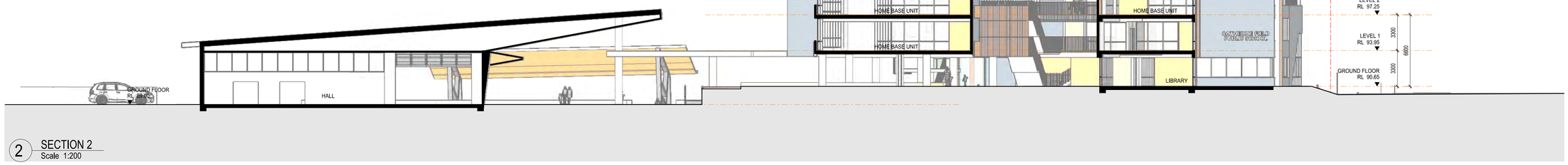
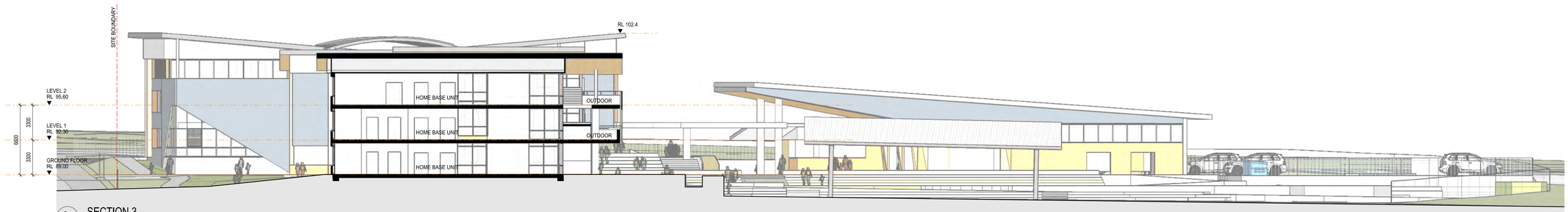
1 SECTION 1
Scale 1:200



2 SECTION 2
Scale 1:200



3 SECTION 3
Scale 1:200

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PRELIMINARY

Lotsearch Environmental Risk and Planning Report

LOTSEARCH

LOTSEARCH ENVIRO PROFESSIONAL

Date: 21 Oct 2018 18:53:34

Reference: LS004434 EP

Address: O'Keefe Drive, Oran Park, NSW 2570

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Location Confidences

Where Lotsearch has had to georeference features from supplied addresses, a location confidence has been assigned to the data record. This indicates a confidence to the positional accuracy of the feature. Where applicable, a confidence is given under the field heading “LocConf” or “Location Confidence”.

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

Dataset Listing

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

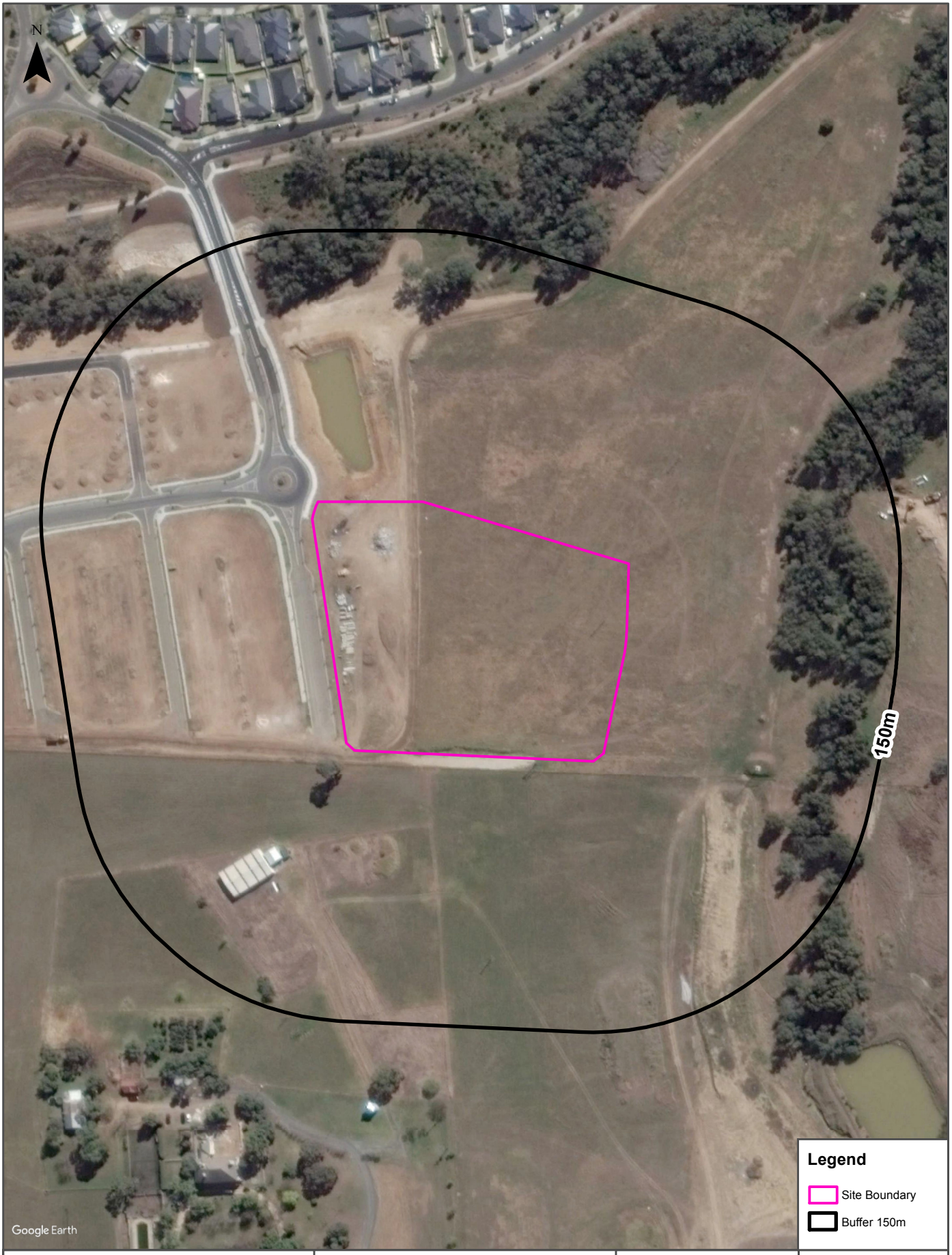
Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features Onsite	No. Features within 100m	No. Features within Buffer
Cadastre Boundaries	Dept. Finance, Services & Innovation	21/10/2018	21/10/2018	Daily	-	-	-	-
Topographic Data	Dept. Finance, Services & Innovation	17/07/2018	17/07/2018	As required	-	-	-	-
List of NSW contaminated sites notified to EPA	Environment Protection Authority	17/10/2018	17/10/2018	Monthly	1000	0	0	0
Contaminated Land Records of Notice	Environment Protection Authority	10/10/2018	10/10/2018	Monthly	1000	0	0	0
Former Gasworks	Environment Protection Authority	04/10/2018	11/10/2017	Monthly	1000	0	0	0
National Waste Management Site Database	Geoscience Australia	07/08/2018	07/03/2017	Quarterly	1000	0	0	0
EPA PFAS Investigation Program	Environment Protection Authority	05/10/2018	05/10/2018	Monthly	2000	0	0	0
EPA Other Sites with Contamination Issues	Environment Protection Authority	11/01/2018	11/01/2018	As required	1000	0	0	0
Licensed Activities under the POEO Act 1997	Environment Protection Authority	03/10/2018	03/10/2018	Monthly	1000	0	0	0
Delicensed POEO Activities still Regulated by the EPA	Environment Protection Authority	03/10/2018	03/10/2018	Monthly	1000	0	0	0
Former POEO Licensed Activities now revoked or surrendered	Environment Protection Authority	03/10/2018	03/10/2018	Monthly	1000	0	4	4
UPSS Environmentally Sensitive Zones	Environment Protection Authority	14/04/2015	12/01/2010	As required	1000	0	0	0
UBD Business to Business Directory 1991 (Premise & Intersection Matches)	Hardie Grant			Not required	150	0	0	0
UBD Business to Business Directory 1991 (Road & Area Matches)	Hardie Grant			Not required	150	-	0	0
UBD Business to Business Directory 1986 (Premise & Intersection Matches)	Hardie Grant			Not required	150	0	0	0
UBD Business to Business Directory 1986 (Road & Area Matches)	Hardie Grant			Not required	150	-	0	0
UBD Business Directory 1982 (Premise & Intersection Matches)	Hardie Grant			Not required	150	0	0	0
UBD Business Directory 1982 (Road & Area Matches)	Hardie Grant			Not required	150	-	0	0
UBD Business Directory 1970 (Premise & Intersection Matches)	Hardie Grant			Not required	150	0	0	0
UBD Business Directory 1970 (Road & Area Matches)	Hardie Grant			Not required	150	-	0	0
UBD Business Directory 1961 (Premise & Intersection Matches)	Hardie Grant			Not required	150	0	0	0
UBD Business Directory 1961 (Road & Area Matches)	Hardie Grant			Not required	150	-	0	0
UBD Business Directory 1950 (Premise & Intersection Matches)	Hardie Grant			Not required	150	0	0	0
UBD Business Directory 1950 (Road & Area Matches)	Hardie Grant			Not required	150	-	0	0
UBD Business Directory Drycleaners & Motor Garages/Service Stations (Premise & Intersection Matches)	Hardie Grant			Not required	500	0	0	0
UBD Business Directory Drycleaners & Motor Garages/Service Stations (Road & Area Matches)	Hardie Grant			Not required	500	-	0	0
Points of Interest	Dept. Finance, Services & Innovation	12/10/2018	12/10/2018	Quarterly	1000	0	0	5
Tanks (Areas)	Dept. Finance, Services & Innovation	15/10/2018	15/10/2018	Quarterly	1000	0	0	0
Tanks (Points)	Dept. Finance, Services & Innovation	15/10/2018	15/10/2018	Quarterly	1000	0	0	0

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features Onsite	No. Features within 100m	No. Features within Buffer
Major Easements	Dept. Finance, Services & Innovation	12/10/2018	12/10/2018	Quarterly	1000	0	0	3
State Forest	Dept. Finance, Services & Innovation	18/01/2018	18/01/2018	As required	1000	0	0	0
NSW National Parks and Wildlife Service Reserves	NSW Office of Environment & Heritage	18/01/2018	30/09/2017	Annually	1000	0	0	0
Hydrogeology Map of Australia	Commonwealth of Australia (Geoscience Australia)	08/10/2014	17/03/2000	As required	1000	1	1	1
Botany Groundwater Management Zones	NSW Department of Primary Industries	15/03/2018	01/10/2005	As required	1000	0	0	0
Groundwater Boreholes	NSW Dept. of Primary Industries - Water NSW; Commonwealth of Australia (Bureau of Meteorology)	24/07/2018	23/07/2018	Annually	2000	0	0	4
Geological Units 1:100,000	NSW Dept. of Industry, Resources & Energy	20/08/2014		None planned	1000	1	-	3
Geological Structures 1:100,000	NSW Dept. of Industry, Resources & Energy	20/08/2014		None planned	1000	0	-	2
Naturally Occurring Asbestos Potential	NSW Dept. of Industry, Resources & Energy	04/12/2015	24/09/2015	Unknown	1000	0	0	0
Soil Landscapes	NSW Office of Environment & Heritage	12/08/2014		None planned	1000	1	-	5
Atlas of Australian Soils	CSIRO	19/05/2017	17/02/2011	As required	1000	1	1	1
Standard Local Environmental Plan Acid Sulfate Soils	NSW Planning and Environment	07/10/2016	07/10/2016	As required	500	0	-	-
Atlas of Australian Acid Sulfate Soils	CSIRO	19/01/2017	21/02/2013	As required	1000	1	1	1
Dryland Salinity - National Assessment	National Land and Water Resources Audit	18/07/2014	12/05/2013	None planned	1000	1	1	1
Dryland Salinity Potential of Western Sydney	NSW Office of Environment & Heritage	12/05/2017	01/01/2002	None planned	1000	1	4	12
Mining Subsidence Districts	Dept. Finance, Services & Innovation	13/07/2017	01/07/2017	As required	1000	0	0	0
SEPP 14 - Coastal Wetlands	NSW Planning and Environment	17/12/2015	24/10/2008	Annually	1000	0	0	0
SEPP 26 - Littoral Rainforest	NSW Planning and Environment	17/12/2015	05/02/1988	Annually	1000	0	0	0
SEPP 71 - Coastal Protection	NSW Planning and Environment	17/12/2015	01/08/2003	Annually	1000	0	0	0
SEPP Major Developments 2005	NSW Planning and Environment	09/03/2013	25/05/2005	Under Review	1000	0	0	0
SEPP Strategic Land Use Areas	NSW Planning and Environment	01/08/2017	28/01/2014	Annually	1000	1	1	1
LEP - Land Zoning	NSW Planning and Environment	23/07/2018	29/06/2018	Quarterly	1000	1	2	17
LEP - Minimum Subdivision Lot Size	NSW Planning and Environment	23/07/2018	13/07/2018	Quarterly	0	0	-	-
LEP - Height of Building	NSW Planning and Environment	09/08/2018	22/06/2018	Quarterly	0	1	-	-
LEP - Floor Space Ratio	NSW Planning and Environment	23/07/2018	06/07/2018	Quarterly	0	0	-	-
LEP - Land Application	NSW Planning and Environment	23/07/2018	29/06/2018	Quarterly	0	1	-	-
LEP - Land Reservation Acquisition	NSW Planning and Environment	23/07/2018	13/07/2018	Quarterly	0	0	-	-
State Heritage Register - Curtilages	NSW Office of Environment & Heritage	18/10/2018	19/01/2018	Quarterly	1000	0	1	1
Environmental Planning Instrument - Heritage	NSW Planning and Environment	10/09/2018	27/07/2018	Quarterly	1000	0	1	1
Bush Fire Prone Land	NSW Rural Fire Service	08/08/2018	31/07/2018	Quarterly	1000	1	2	3
Remnant Vegetation of the Cumberland Plain	NSW Office of Environment & Heritage	07/10/2014	04/08/2011	Unknown	1000	0	1	6
RAMSAR Wetlands	Commonwealth of Australia Department of the Environment	08/10/2014	24/06/2011	As required	1000	0	0	0
Groundwater Dependent Ecosystems	Bureau of Meteorology	14/08/2017	15/05/2017	Unknown	1000	0	1	3
Inflow Dependent Ecosystems Likelihood	Bureau of Meteorology	14/08/2017	15/05/2017	Unknown	1000	0	1	4

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features Onsite	No. Features within 100m	No. Features within Buffer
NSW BioNet Species Sightings	NSW Office of Environment & Heritage	16/10/2018	16/10/2018	Daily	10000	-	-	-

Aerial Imagery 2017

O'Keefe Drive, Oran Park, NSW 2570



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Coordinate System: GDA 1994 MGA Zone 56

Date: 20 October 2018

Contaminated Land & Waste Management Facilities

O'Keefe Drive, Oran Park, NSW 2570

List of NSW contaminated sites notified to EPA

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

Map Id	Site	Address	Suburb	Activity	Management Class	Status	Location Confidence	Dist (m)	Direction
N/A	No records in buffer								

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

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

NSW EPA Contaminated Land List Data Source: Environment Protection Authority

Contaminated Land & Waste Management Facilities

O'Keefe Drive, Oran Park, NSW 2570

Contaminated Land: Records of Notice

Record of Notices within the dataset buffer:

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

Contaminated Land Records of Notice Data Source: Environment Protection Authority

Former Gasworks

Former Gasworks within the dataset buffer:

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

Former Gasworks Data Source: Environment Protection Authority

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
N/A	No records in buffer											

Waste Management Facilities Data Source: Geoscience Australia

EPA PFAS Investigation Program

O'Keefe Drive, Oran Park, NSW 2570

EPA PFAS Investigation Program

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

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

EPA PFAS Investigation Program: Environment Protection Authority

EPA Other Sites with Contamination Issues

O'Keefe Drive, Oran Park, NSW 2570

EPA Other Sites with Contamination Issues

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

- James Hardie asbestos manufacturing and waste disposal sites
- Radiological investigation sites in Hunter's Hill

Sites within the dataset buffer:

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

EPA Activities

O'Keefe Drive, Oran Park, NSW 2570

Licensed Activities under the POEO Act 1997

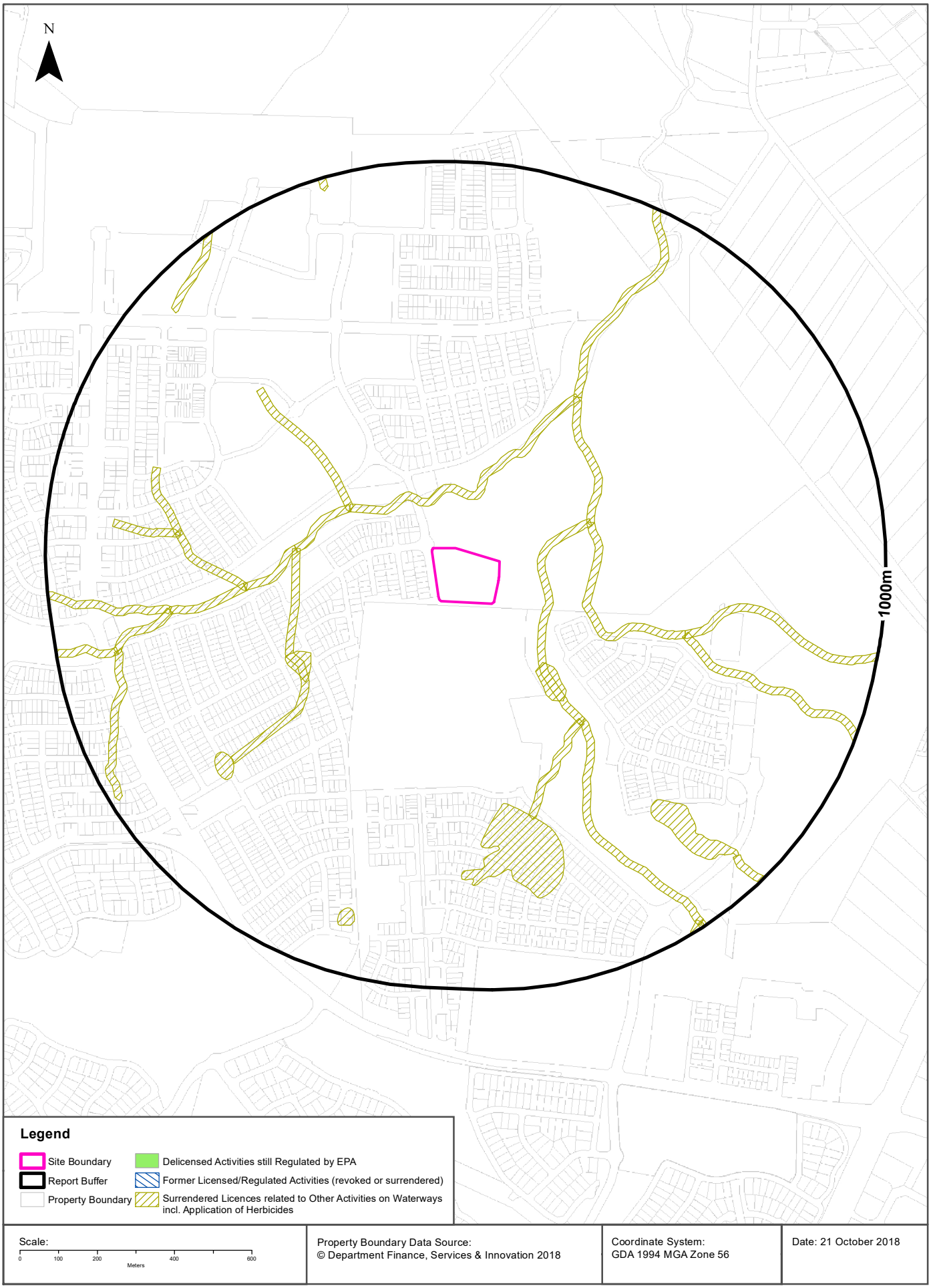
Licensed activities under the Protection of the Environment Operations Act 1997, within the dataset buffer:

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

POEO Licence Data Source: Environment Protection Authority

Delicensed & Former Licensed EPA Activities

O'Keefe Drive, Oran Park, NSW 2570



EPA Activities

O'Keefe Drive, Oran Park, NSW 2570

Delicensed Activities still regulated by the EPA

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

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

Delicensed Activities Data Source: Environment Protection Authority

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

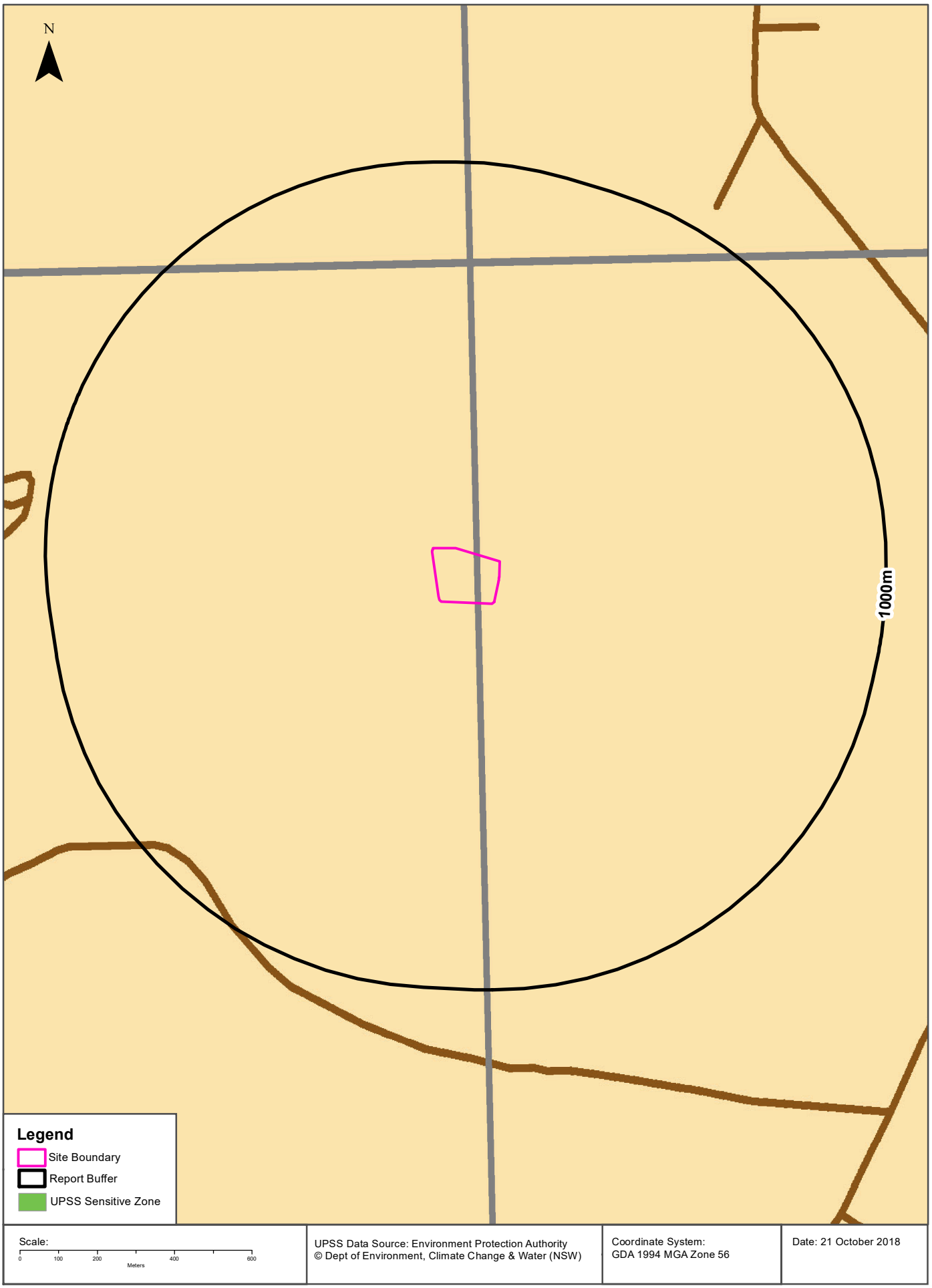
Former Licensed activities under the Protection of the Environment Operations Act 1997, now revoked or surrendered, within the dataset buffer:

Licence No	Organisation	Location	Status	Issued Date	Activity	Loc Conf	Distance	Direction
4653	LUHRMANN ENVIRONMENT MANAGEMENT PTY LTD	WATERWAYS THROUGHOUT NSW	Surrendered		Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	97m	-
4838	Robert Orchard	Various Waterways throughout New South Wales - SYDNEY NSW 2000	Surrendered		Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	97m	-
5093	CAMDEN COUNCIL	WATERWAYS OF CAMDEN LOCAL GOVERNMENT AREA, -, CAMDEN	Surrendered	28/08/2000	Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	97m	-
6630	SYDNEY WEED & PEST MANAGEMENT PTY LTD	WATERWAYS THROUGHOUT NSW - PROSPECT, NSW, 2148	Surrendered		Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	97m	-

Former Licensed Activities Data Source: Environment Protection Authority

UPSS Sensitive Zones

O'Keefe Drive, Oran Park, NSW 2570



Historical Business Directories

O'Keefe Drive, Oran Park, NSW 2570

1991 Business to Business Directory Records Premise or Road Intersection Matches

Records from the 1991 UBD Business to Business Directory, mapped to a premise or road intersection, within the dataset buffer:

Business Activity	Premise	Ref No.	Location Confidence	Distance to Feature Point	Direction
N/A	No records in buffer				

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

1991 Business to Business Directory Records Road or Area Matches

Records from the 1991 UBD Business to Business Directory, 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:

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

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

Historical Business Directories

O'Keefe Drive, Oran Park, NSW 2570

1986 Business to Business Directory Records Premise or Road Intersection Matches

Records from the 1986 UBD Business to Business Directory, mapped to a premise or road intersection, within the dataset buffer:

Business Activity	Premise	Ref No.	Location Confidence	Distance to Feature Point	Direction
N/A	No records in buffer				

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

1986 Business to Business Directory Records Road or Area Matches

Records from the 1986 UBD Business to Business Directory, 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:

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

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

Historical Business Directories

O'Keefe Drive, Oran Park, NSW 2570

1982 Business Directory Records
Premise or Road Intersection Matches

Records from the 1982 UBD Business Directory, mapped to a premise or road intersection, within the dataset buffer:

Business Activity	Premise	Ref No.	Location Confidence	Distance to Feature Point	Direction
N/A	No records in buffer				

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

1982 Business Directory Records
Road or Area Matches

Records from the 1982 UBD Business Directory, 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:

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

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

Historical Business Directories

O'Keefe Drive, Oran Park, NSW 2570

1970 Business Directory Records
Premise or Road Intersection Matches

Records from the 1970 UBD Business Directory, mapped to a premise or road intersection, within the dataset buffer:

Business Activity	Premise	Ref No.	Location Confidence	Distance to Feature Point	Direction
N/A	No records in buffer				

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

1970 Business Directory Records
Road or Area Matches

Records from the 1970 UBD Business Directory, 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:

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

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

Historical Business Directories

O'Keefe Drive, Oran Park, NSW 2570

1961 Business Directory Records
Premise or Road Intersection Matches

Records from the 1961 UBD Business Directory, mapped to a premise or road intersection, within the dataset buffer:

Business Activity	Premise	Ref No.	Location Confidence	Distance to Feature Point	Direction
N/A	No records in buffer				

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

1961 Business Directory Records
Road or Area Matches

Records from the 1961 UBD Business Directory, 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:

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

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

Historical Business Directories

O'Keefe Drive, Oran Park, NSW 2570

1950 Business Directory Records
Premise or Road Intersection Matches

Records from the 1950 UBD Business Directory, mapped to a premise or road intersection, within the dataset buffer:

Business Activity	Premise	Ref No.	Location Confidence	Distance to Feature Point	Direction
N/A	No records in buffer				

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

1950 Business Directory Records
Road or Area Matches

Records from the 1950 UBD Business Directory, 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:

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

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

Historical Business Directories

O'Keefe Drive, Oran Park, NSW 2570

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

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

Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Feature Point	Direction
N/A	No records in buffer					

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

Historical Business Directories

O'Keefe Drive, Oran Park, NSW 2570

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

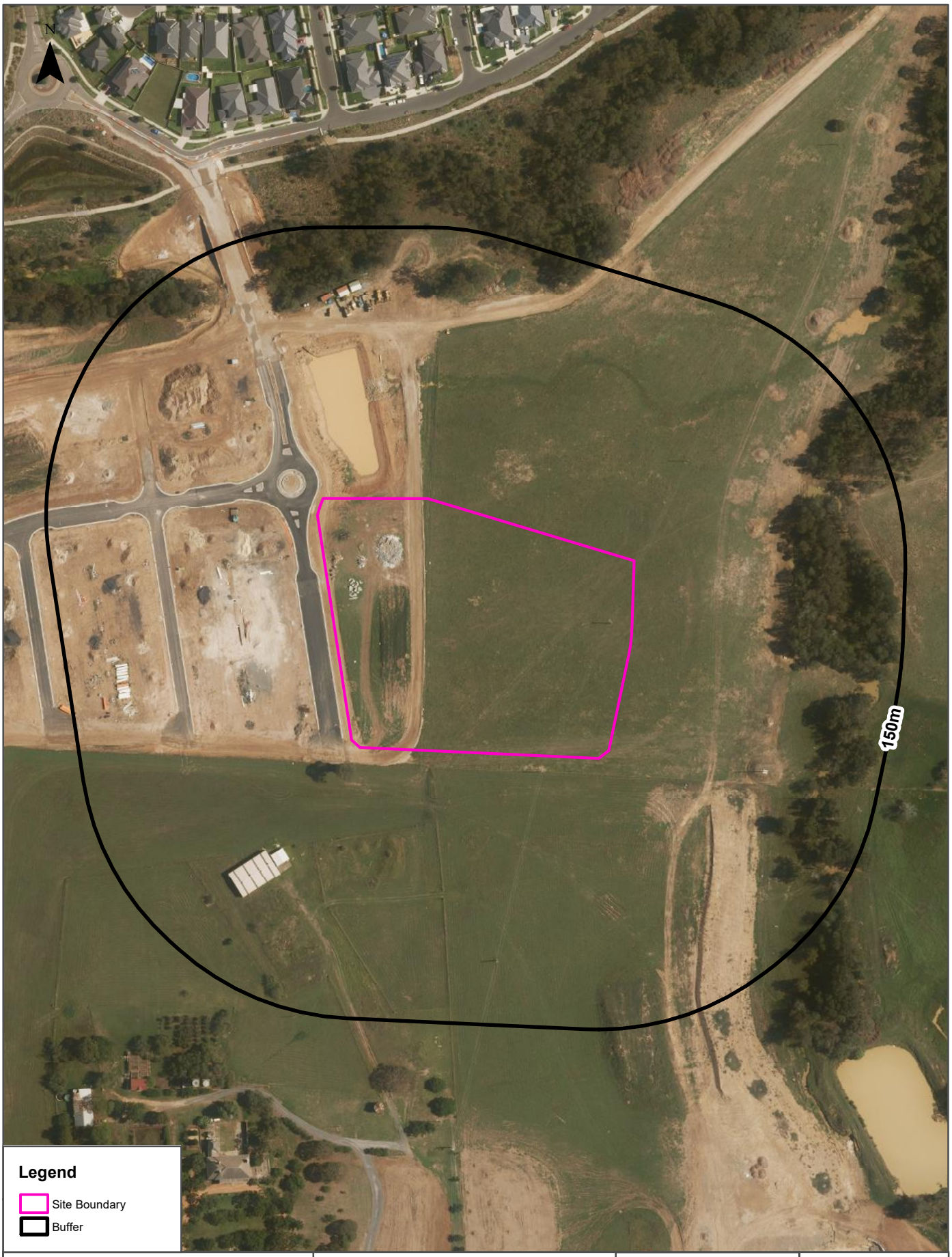
Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published:

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

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

Aerial Imagery 2016

O'Keefe Drive, Oran Park, NSW 2570



Aerial Imagery 2009

O'Keefe Drive, Oran Park, NSW 2570

Scale:
0 25 50 100
Meters

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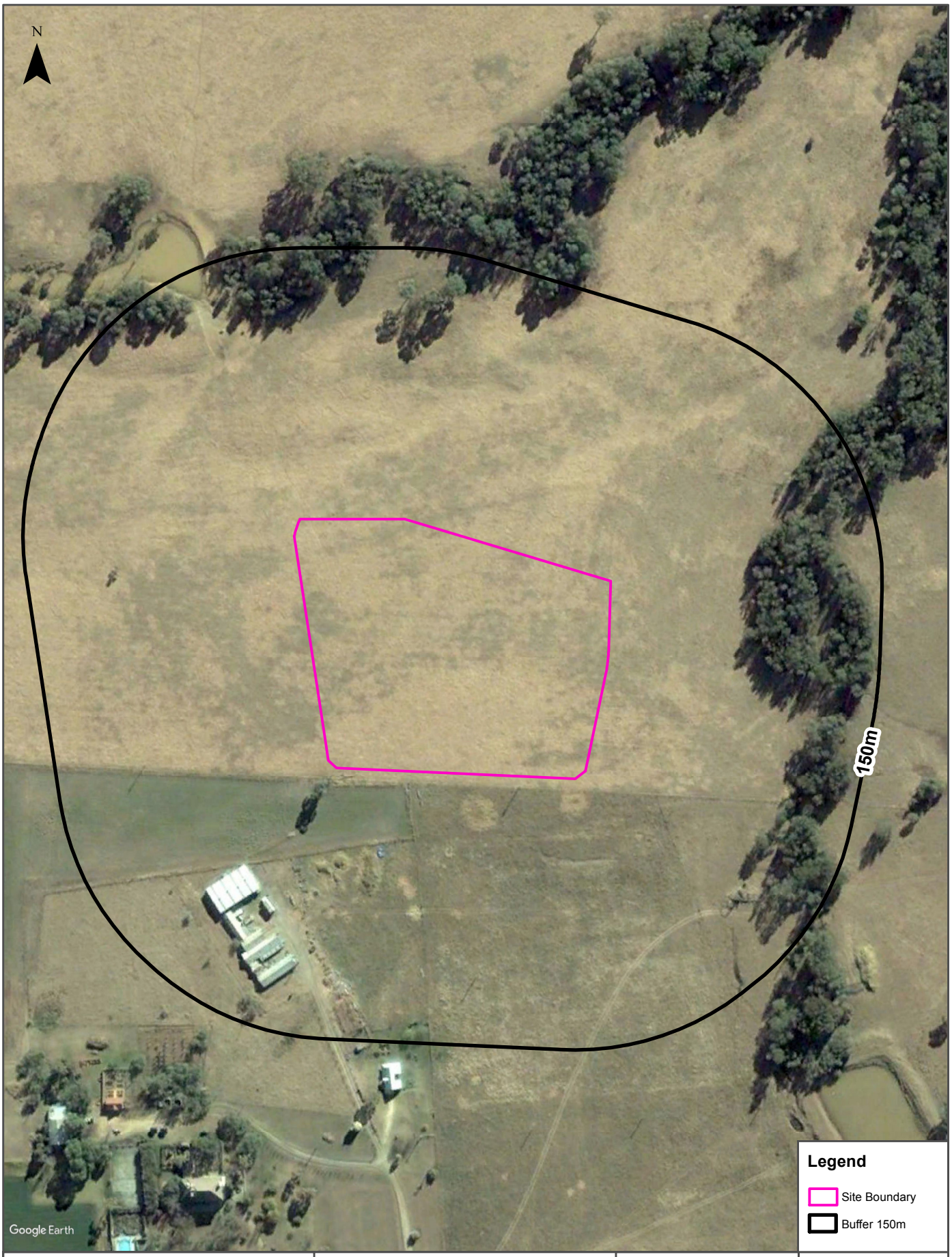
Coordinate System:
GDA 1994 MGA Zone 56

Date: 20 October 2018

Aerial Imagery 2002

O'Keefe Drive, Oran Park, NSW 2570



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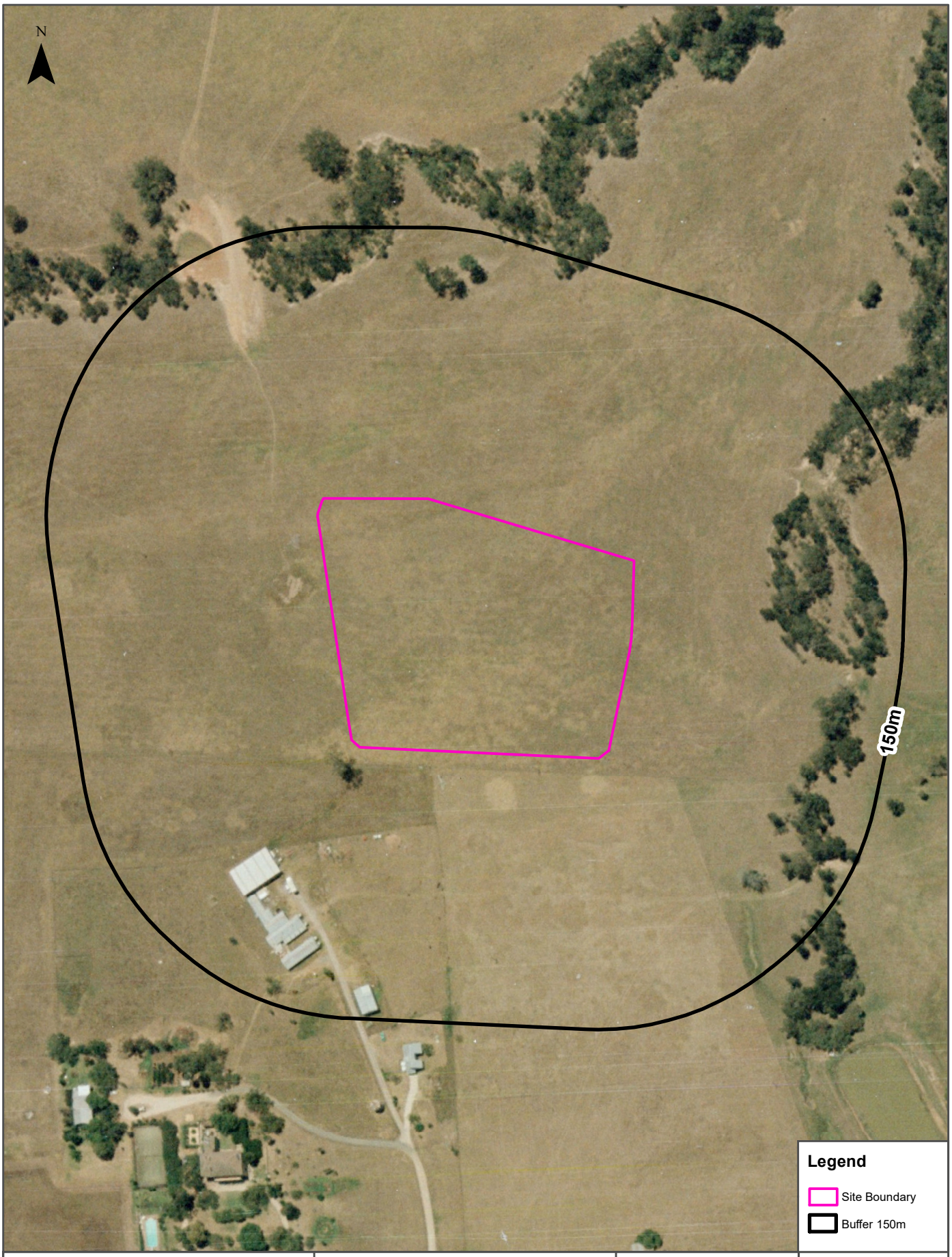
Aerial Imagery 1994

O'Keefe Drive, Oran Park, NSW 2570



Data Source Aerial Imagery:
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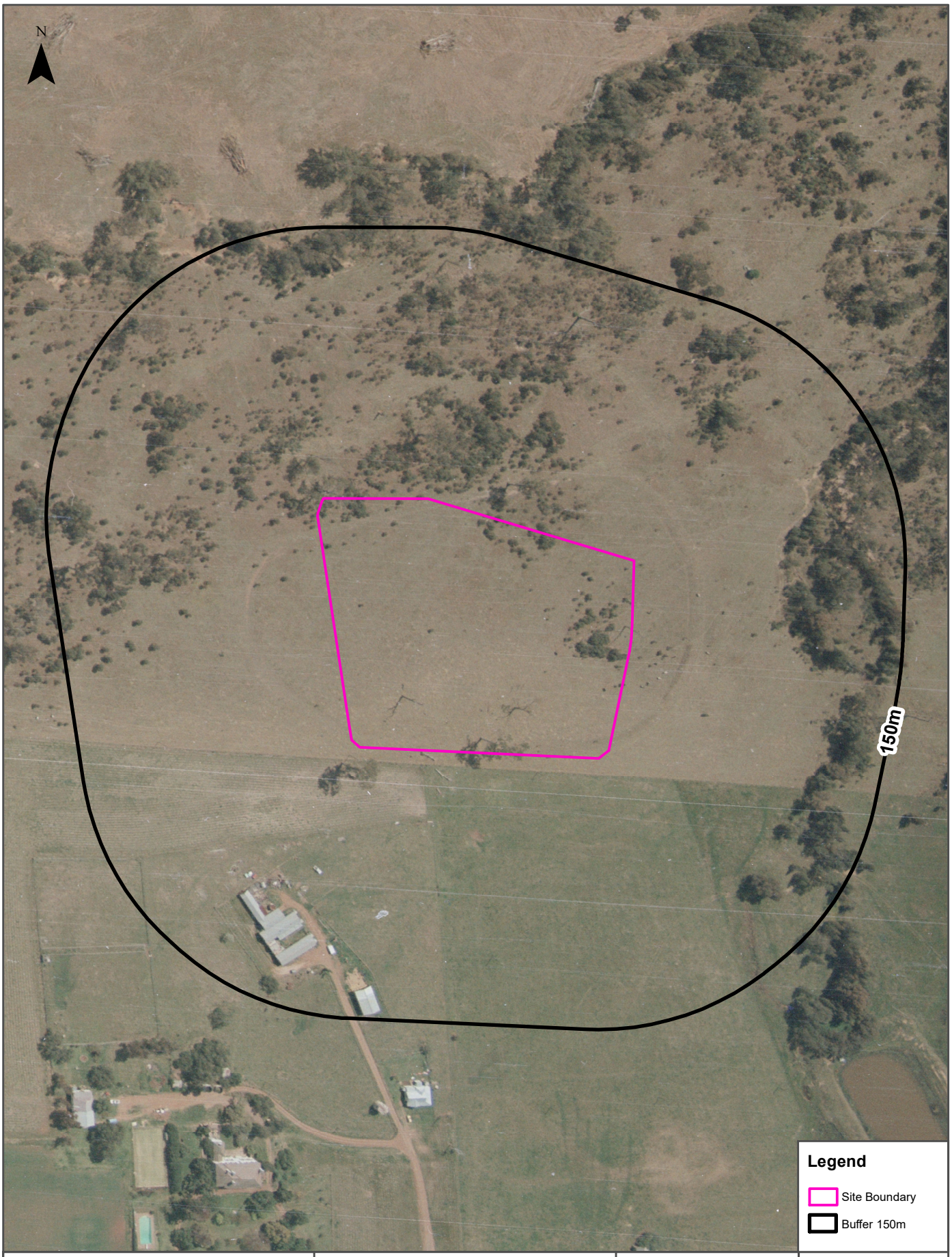
Coordinate System:
GDA 1994 MGA Zone 56

Date: 22 October 2018

Aerial Imagery 1984

O'Keefe Drive, Oran Park, NSW 2570

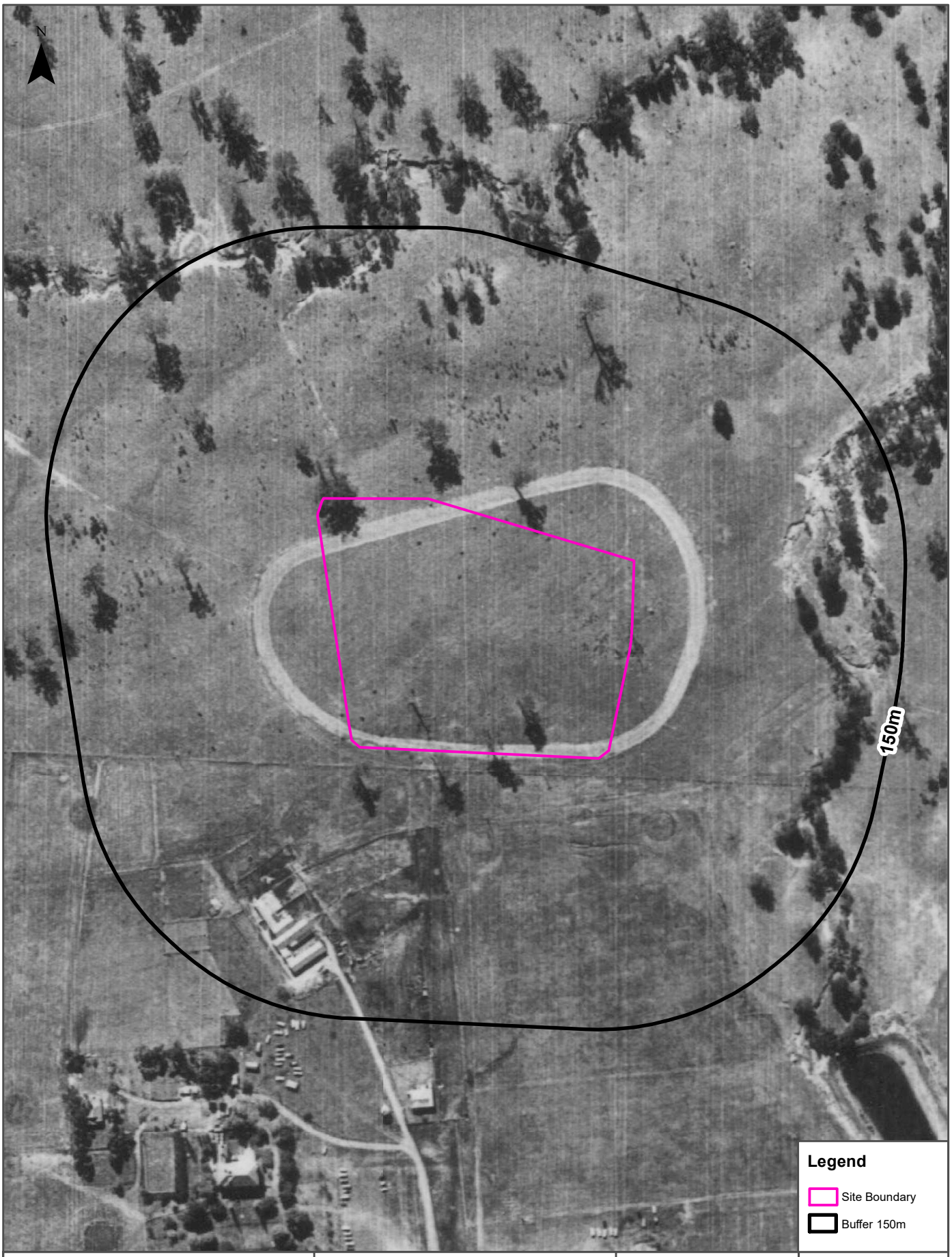


Aerial Imagery 1970

O'Keefe Drive, Oran Park, NSW 2570

Aerial Imagery 1965

O'Keefe Drive, Oran Park, NSW 2570

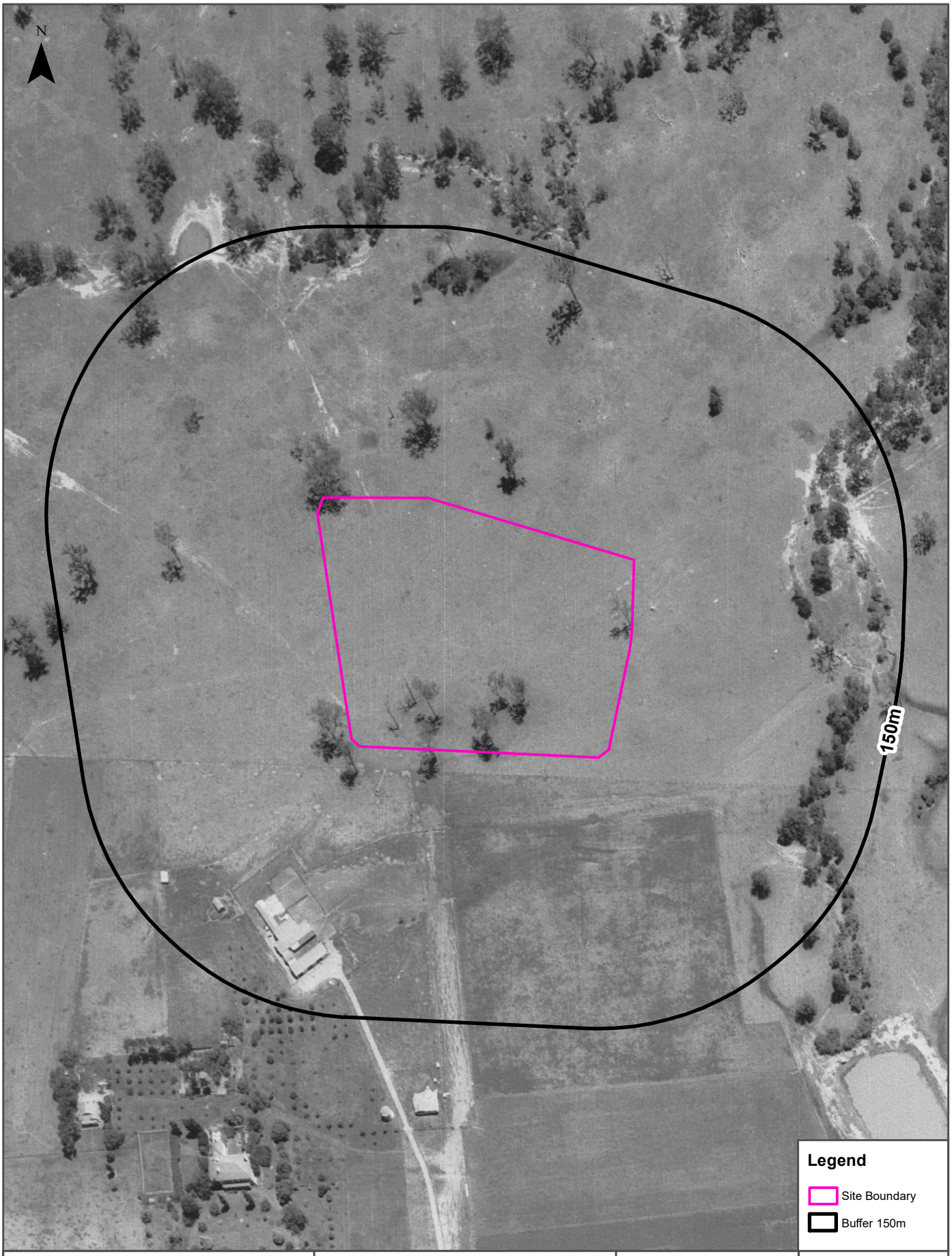


Aerial Imagery 1961

O'Keefe Drive, Oran Park, NSW 2570

Aerial Imagery 1956

O'Keefe Drive, Oran Park, NSW 2570



Topographic Map 2015

O'Keefe Drive, Oran Park, NSW 2570