



Douglas Partners
Geotechnics | Environment | Groundwater

Report on
Phase 2 Contamination Assessment

Tranche 7, Tranche 8 and Anthony Reserve
Oran Park

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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

	Signature	Date
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Executive Summary

This report describes the methodology and results of a Phase 2 Contamination Assessment conducted by Douglas Partners Pty Ltd (DP) on Tranche 7, Tranche 8 and Anthony Reserve at Oran Park. Tranche 7, Tranche 8 and Anthony Reserve will be referred to herein as the Site.

This assessment has been undertaken in accordance with the Sampling, Analysis and Quality Plan (SAQP) previously prepared by DP and reviewed by the Site Auditor.

The purpose of this assessment is to evaluate the contamination status of the Site and its suitability, from a contamination standpoint, for the proposed residential development.

Based on the desktop study conducted at the time of the Land Capability Assessment in 2006 and the historical aerial photography review in 2011, the Site has predominately been used for grazing purposes and that no areas of environment concern (AEC) were identified. However, several areas considered to have a potential for anthropogenic impacts were encountered during preparation of the SAQP (these included the creek line, drainage lines and vehicle tracks).

A total of 30 test pits were excavated as part of the investigation. The majority of the Site was covered by topsoil which was underlain by clay, silty clay and shale, with ironstone gravels noted in some parts of the Site. Fill was encountered in a number of locations on the Site generally to shallow depths, comprising clayey silt and silty clay with gravels, which is likely to be reworked natural materials. Additionally, a total of 60 test pits were excavated across the Site for salinity assessment and similar geological condition was encountered, though the pits were only extended to 0.5 m.

Anthropogenic materials were encountered in three of the test pits excavated during the investigation. The materials encountered included wood and ash, generally at a depth of less 0.5 m bgl.

Groundwater was encountered in one test pit (TP6) at a depth of 2.5 m. TP6 is located adjacent to the existing creek line along the northern boundary of Anthony Reserve. Groundwater samples were not collected at the time of investigation. Given the test pit is near the natural creek line, it is likely to be the localised perched aquifer in this part of the Oran Park Precinct.

Concentrations of TPH, BTEX, PAH, OCP and OPP were all below their respective laboratory limits of reporting in the soil samples submitted for analysis. Heavy metal concentrations were also below their respective SAC and PPIL. Asbestos was not observed during intrusive investigation and also not detected in the soil samples analysed.

Based on the field observations and laboratory results, no signs of unacceptable, broad scale contamination impacts were found. Whilst the potential for isolated contamination pockets cannot be scientifically ruled out, these can be removed and managed at the time of site development, with the implementation of standard operational protocols. It is considered that Tranche 7, Tranche 8 and Anthony Reserve are suitable for the proposed use, subject to implementation of an Unexpected Finds Protocol. Based on the investigation findings, no remedial works are warranted. The removal of surface rubbish is expected to be conducted as part of the initial site development works, as would normally occur for urban development sites.

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Report on Phase 2 Contamination Assessment

Tranche 7, Tranche 8 and Anthony Reserve

Oran Park

1. Introduction

1.1 Background and Purpose

This report describes the methodology and results of a Phase 2 Contamination Assessment conducted by Douglas Partners Pty Ltd (DP) on Tranche 7, Tranche 8 and Anthony Reserve, Oran Park. The work has been commissioned by Mr Greg Poole of Landcom.

The Oran Park Precinct has been divided into various development areas or tranches, with some of the tranches further subdivided into stages. All of the tranches are a part of the same overall site, with the divisions being conducted for development staging purposes.

Tranche 7, Tranche 8 and Anthony Reserve is part of the Oran Park Precinct which is being redeveloped for residential use with areas of associated commercial use (eg, retail), community facilities and supporting infrastructure. Tranche 7, Tranche 8 and Anthony Reserve will be referred to herein as the "Site". The remainder of the Oran Park Precinct is being assessed independently.

Drawings 1 and 2, Appendix B, show the location of the Oran Park Precinct and the boundaries of the Site.

The assessment process is subject to a Site Audit by Mr Graeme Nyland of Environ Australia, an auditor accredited by the Department of Environment, Climate Change and Water (DECCW) under the *Contaminated Land Management Act 1997*.

The purpose of this assessment is to evaluate the contamination status of the Site and its suitability, from a contamination standpoint, for the proposed residential development (see Section 1.2).

1.2 Proposed Development

The Oran Park Precinct is being developed for residential land use, with areas of supporting commercial use (e.g. retail), community facilities and supporting infrastructure.

Tranches 7 and 8 are designated for residential land use, with some open space and supporting infrastructure. Anthony Reserve is designated for recreational use.

The Site has been evaluated against the site assessment criteria for the most sensitive proposed land use which is residential with gardens and accessible soils.

1.3 Sampling, Analysis and Quality Plan

The report *Sample, Analysis and Quality Plan Stage 2 Contamination Assessment Tranche 7, Tranche 8 and Anthony Reserve, Oran Park* (Project No. 40740.98 dated 20 January 2011) [the SAQP] has previously been prepared by DP and reviewed by the Site Auditor.

The SAQP addresses the data quality objectives (DQO) and quality assurance plan for the assessment and a copy is provided in Appendix C.

A stratified sampling approach has been adopted for the Oran Park Precinct. This approach is in accordance with guidance and advice from the Department of Environment and Climate Change (DECC) (now DECCW), Department of Planning (DoP) (now Department of Industry and Investment – DI&I), and Camden Council Policy 3.12 for large sites. Given the Site was deemed to have a low contamination potential, sampling density of one sample location per hectare was adopted with concurrence of the site auditor.

Areas of Environmental Concern (AEC) have been defined on the Oran Park Precinct. AEC are identified as having specific potential for contamination (above the potential expected for grazing lands) based on a review of previous land uses and site inspections. Areas not identified as an AEC are defined as the Background Area (i.e. the Site area excluding the AEC), which were previously assessed to have a low risk of contamination.

AEC 25 is located on the boundary of Tranche 2 and Tranche 7. An investigation of AEC25 was undertaken during the assessment of Tranche 2 (AEC 25 was associated with the find of an asbestos fragment during the land capability assessment. No further fragments were found during the Phase 2 investigations at Tranche 2 and AEC 25 was not referred for further assessment.)

The remainder of the Site comprises the Background Area.

2. Scope of Works

The scope of works for the assessment was to undertake a Contamination Assessment following on from the earlier preliminary contamination assessments undertaken by DP and EES (refer to Section 4 and Section 6).

A total of 30 test pits were excavated over the 30 ha Site consisting of:

- 7 test pits in Anthony Reserve. The locations of the test pits were to target the drainage/creek line and to provide sufficient site coverage;
- 17 test pits in Tranche 7. The locations of the test pits were to target the drainage/creek line and to provide sufficient site coverage; and
- 6 test pits in Tranche 8, targeting both the drainage/creek line and providing sufficient site coverage.

All test pits were extended into natural material. Samples were collected from the near surface horizon at a depth of 0.1 – 0.2 m (referred to as 0.2 m) at all locations, with additional deeper samples collected from selected locations based on field observations made at each location and the expected variations in contamination potential with depth.

The investigation was carried out in conjunction with the salinity assessment where an additional 60 test pits were excavated across the Site. These test pits were used as observation pits in this investigation to confirm the presence or absence of buried fill.

Following a review of field results, selected samples were tested for the identified contaminants of potential concern. A total of 46 primary samples were selected for analysis. Additionally, three intra-laboratory replicates and two inter-laboratory replicate were also analysed for quality assurance and quality control (QA/QC) purposes.

Laboratory results were assessed against the selected site assessment criteria (SAC) as detailed in Section 3.

3. Site Assessment Criteria

3.1 Soil Investigation Levels

The analytical results have been assessed in accordance with the assessment criteria specified in the SAQP, as described below.

Based on the relatively low sampling density which has been adopted due to the low risk of contamination, the preliminary screening levels for assessment results are the published background ranges for Australian soils. These include background ranges published in:

- NEPC (1999). National Environmental Protection (Assessment of Site Contamination) Measure Schedule B(1) Guidelines on the Investigation Levels for Soil and Groundwater, Background Ranges;
- Australian and New Zealand Environment and Conservation Council/National Health and Medical Research Council (ANZECC/NHMRC): Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (1992), Environmental Soil Quality Guidelines Column A Background (ANZECC A).

For areas where contamination impacts that have been suitably characterised (e.g. by sampling in accordance with the NSW EPA *Contaminated Sites Sampling Design Guidelines*, 1995), the decision rule would be based on the requirements of the NSW DEC *Contaminated Sites Guidelines for the NSW Site Auditor Scheme* 2nd edition (2006).

The relevant threshold levels for assessment of contamination at the Site will be derived using the following publications:

Human Health Impacts:

The potential for health impacts will be assessed by comparison with levels published in:

- NSW DEC Contaminated Sites: Guidelines for the NSW Site Auditor Scheme 2nd edition (2006), Appendix II, Column 1; and
- NSW EPA, Contaminated Sites: Guidelines for Assessing Service Station Sites (1994).

Where an exceedance has been identified, and further investigation has been undertaken to appropriately characterise the area of the exceedance, statistical analysis may be appropriate (subject to concurrence by the Auditor and Camden Council). Where statistics are deemed appropriate, the site conditions would be stated to meet the human health guidelines if:

- The 95% Upper Confidence Limit (UCL) of the average concentrations for a site or area specific data set of samples of like material complies with the adopted comparative criteria;
- Individual concentrations of analytes (non-volatile) are less than 250% of the adopted guideline values; and
- The standard deviation of the population is <50% of the adopted guideline level.
- The material is in, or will be placed in, an area which is not proposed for residential development (i.e. roadways, parks etc) in accordance with Camden Council requirements.

Phytotoxicity Impacts:

The potential for phytotoxicity impacts will be assessed by comparison with provisional phytotoxicity investigation (guideline) levels published in:

- NSW DEC Contaminated Sites: Guidelines for the NSW Site Auditor Scheme 2nd edition (2006), Appendix II, Column 5.

It should be noted that the PPIL are "provisional" in nature. They have significant limitations as the phytotoxicity depends on the soil types and varies amongst plant species in ways that are not fully understood. The PPIL are thus used as a screening guide only. In other words, exceedance of PPIL criteria alone does not mean that further remediation is needed.

3.2 Groundwater Investigation Levels

Assessment of groundwater in Tranche 5 (approximately 500 m south of the Site) found the water to be present in the bedrock, but not in the overlying clays.

Groundwater was encountered in one test pit (TP6) at a depth of 2.5 m bgl. TP6 was located adjacent to the existing creek line within the boundary of Anthony Reserve. A groundwater sample was not collected at the time of investigation as:

- no signs of contamination were observed or detected at the Site;
- clay soils, such as encountered at the Site, are of low permeability; and

- previous groundwater assessment in the Oran Park Precinct has detected potential contaminants below the relevant guidelines and/or background levels, with the exception of localised contamination associated with petroleum underground storage tanks in Tranche 5.

On this basis it is considered that no significant risk of groundwater contamination is present at the Site. This is in line with previous assessment results for the Oran Park Precinct as discussed in Section 4.

It should be noted that free groundwater was not encountered in any other test pit excavated during this investigation.

4. Previous Investigations

The following relevant reports have previously been prepared for the Oran Park Precinct:

- Godden McKay Logan GCC Oran Park Precinct Heritage Assessment (reference 06-0496, March 2007) [the Heritage Assessment].
- Environmental & Earth Sciences NSW (EES), Preliminary Environmental Site Investigation and Geotechnical Appraisal of GDC Land Oran Park Precinct, New South Wales, October 2006 (Project No: 106070) (the EES report).
- DP Report on Land Capability and Contamination Assessment (Project 40740 dated 28 February 2007) [the Land Capability assessment].
- DP Sample Analysis and Quality Plan Stage 2 Contamination Assessment Tranche 7, Tranche 8 and Anthony Reserve, Oran Park (Project No. 40740.98 dated January 2011) (the SAQP).

The Heritage Assessment recorded that European explorers were reported to have found herds of semi-wild cattle on grasslands in the Camden area in the 1790s. The region was divided up into land grants in the early 1800s, with the area of the Site granted as part of the original Harrington Park estate. The Harrington Park estate was further sub-divided and an estate, which included the area of the Site, was purchased by John Douglas Campbell in 1829 and was known as Oran Park. The property was held by the Campbell family until 1871, when it was purchased by Edward Lumas Moore, a grazier. A number of tenants (farmers) occupied the Oran Park estate whilst the land was owned by Campbell and Moore. In 1939 Hubert Harry Robbins bought the Estate, with the Estate being subdivided into two lots. During the 1960s subdivisions were advertised for hobby farms along Cobbitty Road. Oran Park Estate was acquired by Leppington Pastoral Company in 1985, since which time it has been used as part of a dairy. The main working buildings for the dairy were located on the "Greenways" portion of the Leppington Pastoral Company holdings, north of the Site (and north of the Oran Park Precinct).

The Heritage Assessment indicated that the Camden area was generally used for grazing (dairy) with some wheat growing.

The EES Preliminary Assessment and DP Land Capability assessment included a review of site history and test pitting for geotechnical purposes for the larger Oran Park development area.

The historical information from the previous assessments shows that the majority of the Oran Park Precinct has been used for agricultural purposes (grazing and fodder cropping) prior to 1962 since when a portion of the Oran Park Precinct (approximately 500 m south of Tranches 7 and 8) has been used for car racing. The original racing circuit was expanded into the Oran Park Raceway, with a number of circuits and associated facilities. Oran Park Raceway was closed in 2010.

Based on the historical information, the previous assessments identified a number of Areas of Environmental Concern (AEC) which require a targeted investigation of potential contaminants. No AEC were identified in the area of Anthony Reserve, Tranche 7 and Tranche 8. It is noted that AEC25, which is located within Tranche 7, was dealt with during the remediation of Tranche 2.

A total of two, four and two test pits were excavated at Anthony Reserve, Tranche 7 and Tranche 8, respectively, as part of the DP Land Capability assessment for geotechnical purposes (i.e. no contamination testing was undertaken). The pit locations are shown on Drawing 3 and the test pit records are provided as Appendix D. Six of the pits encountered topsoils underlain by natural clays and shales, whilst the other two encountered natural silty clay underlain by gravelly silty clay.

A review of the Oran Park Precinct's hydrogeology was undertaken as part of the Land Capability Assessment. The review examined regional groundwater, with limited investigation of surface and groundwater within the Oran Park Precinct. The monitoring well locations were selected on a catchment basis using geographical information system (GIS) interpretation of the topographic data. The bores were placed at the exit points of the major catchments at the Oran Park Precinct. There were no wells in the vicinity of the Site, however a number of drainage lines at the Site lead towards the tributary of South Creek, which passes through the eastern part of the Site.

Groundwater and surface water samples collected from the larger Oran Park Precinct. One surface water sample (SW7) was collected from within the Site as a part of the DP Land Capability Assessment. The ground water and surface water samples collected from the assessment (including SW7) were analysed at the laboratory for a range of common chemical contaminants including heavy metals, polycyclic aromatic hydrocarbons (PAH), TPH, BTEX, polychlorinated Biphenyls (PCB), organochlorine pesticides (OCP) and organophosphorus pesticides (OPP). All analytes returned results below the practical quantitation limit of the laboratory with the exception of heavy metals. The heavy metal results were considered to be within guidelines levels and/or expected background ranges.

5. Site Information

5.1 Site Identification

The Site is identified as follows:

- Tranche 7 is identified as Part 992 DP 1149179 and Part 3155 DP 1159092 and has an approximate area of 16.3 ha;
- Tranche 8 is identified as Part 3155 DP1159092 and Part 3156 DP 115902 and has an approximate area of 7.6 ha;
- Anthony Reserve is identified as Part 992 DP 1149179 and has an approximate area of 5.7 ha.

All three portions of the Site are located in the northern section of the Oran Park Precinct. The Site location is shown on Drawing 1, Appendix B.

It is understood, however, that the Lots and DP identifiers are in the process of being redefined and up-dated as part of the redevelopment process for the larger Oran Park Precinct.

5.2 Geology and Hydrogeology

Reference to the Wollongong – Port Hacking and Penrith 1:100 000 Geological Series Sheets indicates that the Site is underlain by Bringelly Shale (mapping unit Rwb) of the Wianamatta Group of Triassic age. This formation typically comprises shale, carbonaceous claystone, laminite and some minor coaly bands.

The published mapping also indicates the strata is gently deformed by the Camden Syncline which is aligned approximately north-south to the west of the Oran Park Precinct with the axis located near the alignment of The Northern Road.

McNally (2005) describes some general features of the hydrogeology of Western Sydney which are relevant to this Site. The shale terrain of much of Western Sydney is known for saline groundwater, resulting either from the release of connate salt in shales of marine origin or from the accumulation of windblown sea salt. Seasonal groundwater level changes of 1 – 2 m can occur in a shallow regolith aquifer or a deeper shale aquifer due to natural influences.

Groundwater investigations undertaken by DP in the Camden area and previous studies of areas underlain by the Wianamatta Group and Quaternary river alluvium indicate that:

- the shales have a very low intrinsic permeability, hence groundwater flow is likely to be dominated by fracture flow with resultant low yields (typically < 1 L/s) in bores;
- the groundwater in the Wianamatta Group is typically brackish to saline with total dissolved solids (TDS) in the range 4000 – 5000 mg/L (but with cases of TDS up to 31750 mg/L being reported). The dominant ions are typically sodium and chloride and the water being generally unsuitable for livestock or irrigation.

A search of groundwater wells recorded by the NSW Department of Natural Resources (DNR, the function has been incorporated into DECCW) on the NSW Natural Resources Atlas was undertaken on 3 April 2009.

No wells were identified within the Site boundaries or the Oran Park Precinct; however fifteen wells were identified within approximately 3 km of the Oran Park Precinct. The uses included exploration, monitoring, irrigation, domestic stock and one well recorded as having an authorised use of 'domestic'. The majority of recorded groundwater information was for deeper (>15 m) water bearing zones, although shallower groundwater bearing zones were recorded in three wells (3 – 5 m, 6 – 9 m and 0 – 36 m). Groundwater in the upper shale horizons generally appeared to be saline, whereas fresh water was encountered in deeper sandstone units.

5.3 Site Condition

The Site was inspected on 25 January, 2011. Site photographs are provided in Appendix G.

5.3.1 Tranche 7

Tranche 7 consisted of a grass covered paddock with the exception of the following:

- a track running in the north-south direction in the middle of Tranche 7;
- a patch of bare ground located in the north-eastern corner of Tranche 7 (identified as a saline salt scald in the Salinity Management Plan [40740.99]);
- a track running in the northeast-southwest direction at the south-eastern corner of Tranche 7, which extends to Tranche 8.

Mature trees were scattered across Tranche 7. No historical or current potentially contaminating activities were noted at the Site. The aerial photograph base map used in the drawing also shows a series of bare patches interspersed by grassed areas in straight lines. These areas are where feed carts (a train of connected trailers towed by tractor with cattle feed) were left on Site. The feed cars had been moved at the time of the aerial photo but the bare patches of soil around their base, created by cattle, remain.

5.3.2 Tranche 8

Tranche 8 consisted of a grass covered paddock with a drainage line currently adjacent to the newly constructed roadwork (the current limit of construction of Road 1b (Oran Park Drive). Water was noted in the drainage line and mature trees were also observed, towards the southern end of this portion of the Site.

The newly constructed roadwork (the turning head and over run of Road 1B) is located along the eastern and southern boundaries of Tranche 8 and noted to be approximately 1 m higher than the grass covered area. Some fill was noted in the vicinity of the roadworks but, based on information provided to DP, the fill material was locally won. Two farm tracks were noted in the central portion of Tranche 8.

5.3.3 Anthony Reserve

Anthony Reserve consisted of a grass covered paddock which is bounded by a creek line to the north, east and west. The creek line is surrounded by mature trees. No historical or current potentially contaminating activities were noted during the site visit.

6. Site History Review

A site history review was undertaken as part of this Phase 2 Contamination Assessment for the northern margin of Anthony Reserve that was not included in the Land Capability Assessment. The following information was reviewed:

- Relevant information provided in the EES Report; and
- Historical and current aerial photography.

6.1 EES Report

Based on the information provided in the EES Report, the Site had not been used as part of the Oran Park Raceway and remained agricultural. The Narellan Military Camp, identified during the site history review, was located in the south-western portion of the larger Oran Park Precinct. No AEC were identified within the Site by EES.

6.2 Aerial Photography Review

A review of the aerial photographs for the northern margin of Anthony Reserve is summarised below:

- 1947 – the area appears to be grass covered with sparse vegetation along the natural drainage line. No signs of development, filling or potentially contaminating activities were noted on the photograph;
- 1961 – the area was part of the land which was divided up and a fence line was present in the middle section of Anthony Reserve, which appears to be at the same location as the current fence line. Bare ground was noted in the eastern side of this area, however, signs of potentially contaminating activities were not noted;
- 1970 – the area appears to be grass covered for agricultural use;
- 1978 – part of the area appears to be cleared but no signs of contaminating activities were noted;
- 1984 – the area appears to be grass covered for agricultural use;
- 1994 – no significant changes were noted from previous photograph;
- 2004 – a track is noted in the eastern side of the area, the remainder of the area appears to be grass covered for agricultural use; and
- 2010 – no significant changes were noted from previous photograph.

7. Fieldworks, Sampling and Analysis Methodology

7.1 Sample Rationale

The sampling regime was based on the results of the preliminary contamination assessment undertaken as part of the Land Capability Assessment, and is devised in accordance with the general principle outlined in NSW EPA *Contaminated Sites Sampling Design Guidelines* (1995) and Camden Council's *Management of Contaminated Lands* (Policy No. 3.12, 26 February 2008). Given the Site was deemed to have a low contamination potential, a sampling density of one sample per hectare was adopted with the concurrence of the site auditor.

Drawing 2, Appendix B, shows the location of test locations within the Site. Table 1, provides a rationale for each location investigated and sample tested.

Table 1 – Summary of Sample Rationale

Tranche	Location ID	Total depth (m bgl)	Depth of filling (m bgl)	Samples tested (location/depth)	Analytes	QA/QC samples	Location Target
Anthony Reserve	TP1	3.0	0	TP1/0.2 TP1/0.5	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	Creek line
Anthony Reserve	TP2	3.0	0	TP2/0.2	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	General paddock area
Anthony Reserve	TP3	3.2	0	TP3/0.2	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	Creek line
Anthony Reserve	TP4	3.1	0	TP4/0.2	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	General paddock area
Anthony Reserve	TP5	3.0	0	TP5/0.2 TP5/0.5	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	General paddock area
Anthony Reserve	TP6	3.0	0	TP6/0.2	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	Creek line
7	TP7	2.0	0	TP7/0.2 TP7/0.5	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	General paddock area
7	TP8	2.6	0	TP8/0.2	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	General paddock area
7	TP9	3.1	0	TP9/0.2	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	Within the bare ground
7	TP10	3.0	0	TP10/0.2 TP10/0.5	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	Within the bare ground
7	TP11	3.0	0	TP11/0.2 TP11/0.5	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	General paddock area
7	TP12	3.1	0	TP12/0.2 TP12/0.5	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	General paddock area
7	TP13	3.0	0	TP13/0.2 TP13/0.5	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	General paddock area
7	TP14	3.0	0	TP14/0.2	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	General paddock area
7	TP15	3.0	0	TP15/0.2	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	General paddock area
7	TP16	3.0	0	TP16/0.2	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	Drainage line

Tranche	Location ID	Total depth (m bgl)	Depth of filling (m bgl)	Samples tested (location/depth)	Analytes	QA/QC samples	Location Target
7	TP17	3.0	0	TP17/0.2	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	General paddock area
7	TP18	3.0	0	TP18/0.2 TP18/0.5	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	General paddock area
7	TP19	3.1	0	TP19/0.2	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	General paddock area
7	TP20	3.0	0	TP20/0.2 TP20/0.5	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	General paddock area
7	TP21	3.0	0	TP21/0.2	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	General paddock area
7	TP22	3.0	0	TP22/0.2 TP22/0.5	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	Vehicle access track
7	TP23	3.0	1.4	TP23/0.2	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	Adjacent vehicle access track
8	TP24	3.0	0	TP24/0.2 TP24/0.5	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	General paddock area
8	TP25	3.1	0	TP25/0.2	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	General paddock area
8	TP26	3.0	3.0	TP26/0.2 TP26/2.0	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	Adjacent to new roadwork embankment
8	TP27	3.0	0	TP27/0.2	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	General paddock area
8	TP28	3.0	0	TP28/0.2 TP28/0.5	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	Creek line
8	TP29	3.0	0	TP29/0.2	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	Adjacent to track
8	TP30	3.0	0.35	TP30/0.2 TP30/0.5	HM, PAH, TPH, BTEX, OCP, OPP, ASB	-	General paddock area

7.2 Sample Collection and Handling

Test pits were excavated using a backhoe with a 450 mm bucket. Samples were collected from exposed soils in the sidewalls (shallow samples) or from the centre of the bucket (deep samples) taking care to select soil which had not been in contact with the bucket.

Sample collection and handling was undertaken in accordance with DP's standard operating procedures. The general sampling, handling, transport and tracking procedures comprised:

- Provision of logs for all sample locations. Records include GIS coordinates of the locations, description of the conditions encountered, the depth of samples collected, logger and equipment used;
- The use of disposable sampling equipment (nitrile gloves);
- Transfer of the sample for chemical analysis into new glass jars supplied by the NATA accredited laboratories, sealed with a Teflon lined lid, with each jar individually sealed to eliminate cross contamination during transportation to the laboratory;

- Transfer of sample for asbestos analysis into new sealable plastic bag;
- Labelling of the sample containers with individual and unique identification including project number, test location identification and depth;
- Placement of the containers into a chilled, enclosed and secure container for transport to the laboratory; and
- Use of chain-of-custody documentation to enable sample tracking and custody to be cross-checked at any point in the transfer of samples from the field to hand-over to the laboratory.

7.3 Laboratory Analysis and Methodology

Selected samples were tested for the contaminants of potential concern identified in the SAQP.

Envirolab Services conducted analysis of primary samples and MGT Labmark was employed to undertake analysis of inter-laboratory replicate samples.

Both laboratories are accredited by the National Association of Testing Authorities (NATA) and are required to conduct in-house QA/QC procedures. These are normally incorporated into every analytical run and include assessment of reagent blanks, spike recovery, surrogate recovery and laboratory duplicates.

The analytical methods used are summarised in the Laboratory Reports, included in Appendix E.

8. Results

8.1 Quality Assurance and Quality Control Results

The methodology, results and discussion of the field and laboratory QA/QC assessment are provided in Appendix F. Based on the results of the QA/QC assessment the data is considered to be suitable for use in assessing contamination at the Site.

8.2 Field Results

The test pit logs are included in Appendix D, together with notes defining classification methods and descriptive terms. Sampling locations are shown on Drawing 2, Appendix B.

8.2.1 Tranche 7

A total of 17 test pits were excavated within Tranche 7 (TP7 to TP23). Fill was observed in one of the 17 test pits, comprising:

- TP23, located adjacent to a vehicle access track along the eastern boundary, with fill consisting of silty clay (possibly reworked topsoil) to 0.7 m and grey brown clay with ash and roots to 1.4 m. The fill was underlain by gravelly clay (ironstone gravel) and clay to 3.0 m. The presence of ash may associate with previous historic bushfire activities or burnt out tree roots from farm clearing.

The remaining pits generally encountered topsoil and natural clayey silt or silty clay to depths of 0.2 to 0.5 m, underlain by natural clay and weathered shale.

8.2.2 Tranche 8

A total of seven test pits were excavated within Tranche 8 (TP24 to TP30). Fill was encountered in two of the seven pits, comprising:

- TP26, located to the adjacent north of the road embankment, with fill consisting of brown silty clay and orange clay to a depth of 3.0 m (limit of investigation); and
- TP30, located at the northern corner of Tranche 8, with fill consisting of reworked natural orange brown clay with gravel to a depth of 0.35 m. The fill was underlain by clay and shale.

The remaining pits generally encountered topsoil which was underlain by clay, silty clay and shale, with ironstone gravels noted in most of the pits.

TP34, 35, 38, 41 and 43 from the salinity investigation (refer Section 8.2.4) also encountered fill to the limit of the investigation (0.5 m). Filling in this area (refer Drawing 2) rather than being uncontrolled filling is associated with the recent earthworks relating to the construction of Road 1 (Oran Park Drive). Fill material was placed under level 1 control and comprised material from cut sections of Road 1. No imported material was used in the creation of the embankment.

8.2.3 Anthony Reserve

A total of six test pits were excavated within Anthony Reserve (TP1 to TP6). No fill was encountered in any of the six test pits.

The test pits generally encountered topsoil which is underlain by clay and shale.

Free groundwater was encountered in TP6, located within Anthony Reserve, at a depth of 2.5 m. The test pit was located adjacent to the creek line bound to the north of the Site. No free groundwater was observed in other test pits excavated during this investigation.

8.2.4 Observation made from Salinity Assessment

A salinity assessment was undertaken as part of the intrusive investigation where a total of 60 test pits were excavated across the Site (TP31 to TP90). All 60 pits were excavated to a depth of 0.5 m. Although environmental samples were not collected, observations were made during excavation to confirm the presence or absence of potential filling across the Site.

Fill was observed in six of the 60 pits. Anthropogenic materials were encountered in three of the test pits, comprising:

- TP43, located within Tranche 8 and adjacent to the new road embankment. Fill comprised brown clay with gravel, glass and rootlets to a depth of 0.2 m;
- TP58, located in the central portion of Tranche 7. Ash and wood were noted within the topsoil layer to a depth of 0.25 m which was underlain by natural silty clay; and
- TP62, located in the central portion of Tranche 7 with ash noted at 0.2 m within the topsoil layer. The topsoil was underlain by natural clay to 0.5 m.

Anthropogenic materials were not observed in other pits where fill was encountered. The fill generally comprised brown orange silty clay or clay with some gravel and rootlets which is considered to be reworked natural materials.

8.3 Analytical Results

The analytical results for the recovered soil samples are summarised in Table 2, Appendix H, together with the SAC. The certified laboratory report is provided in Appendix E.

A total of 46 soil samples were assessed for heavy metals, TPH, BTEX, PAH, OCP, OPP and asbestos.

Concentrations of TPH, BTEX, PAH, OCP and OPP were reported below their respective laboratory limits of detection in all samples submitted for analysis. Asbestos was not detected in the samples submitted for analysis and also not observed during intrusive investigation.

Concentrations of all eight priority heavy metals were reported below their respective SAC (background values, refer Section 3) and PPIL.

9. Discussion and Conclusions

The Site, consisting of Tranche 7, Tranche 8 and Anthony Reserve, is located in the northern section of the Oran Park Precinct. Based on the desktop study conducted at the time of the Land Capability Assessment in 2006 and the historical aerial photography review in 2011, the Site has predominantly been used for grazing. No areas of environment concern were identified based on the desktop review. However, several areas considered to have a potential for anthropogenic impacts were encountered during the preparation of the SAQP. These were investigated and included the creek line, drainage lines, vehicle tracks etc. However, anthropogenic materials were only encountered in three of the test pits excavated during the investigation. The materials encountered included glass and ash, generally to a maximum depth of 0.5 m bgl.

A total of 30 test pits were excavated as part of the investigation. The majority of the Site was covered by topsoil which was underlain by clay, silty clay and shale, with ironstone gravels noted in some parts of the Site. Fill where encountered generally comprised clayey silt and silty clay with gravels which are likely to be reworked natural materials or material placed as part of the subdivision road construction. No evidence of extensive filling in creek lines was detected. The only area of significant fill was the area associated with the construction of Road 1B of the current development. This material was sourced from the Oran Park Precinct. Additionally, a total of 60 test pits were excavated across the Site for salinity assessment and only minor fill was encountered. Considering the minor amount of detected fill and the laboratory results from the filling, there is not considered to be a need for further investigation of the fill materials.

Groundwater was encountered in one test pit (TP6) at a depth of 2.5 m. TP6 is located adjacent to the existing creek line along the northern boundary of Anthony Reserve. Groundwater samples were not collected at the time of investigation. Given the test pit is near the natural creek line, it is likely to be the localised perched aquifer in this part of the Oran Park Precinct. Furthermore, as this part of the Oran Park Precinct has predominately been used for grazing and that the former Oran Park Raceway is located approximately 500 m south of the Site in a different catchment, it is not anticipated that this localised perched groundwater would be affected by the groundwater contamination identified near the petroleum underground storage system at the raceway in Tranche 5.

Concentrations of TPH, BTEX, PAH, OCP and OPP were all below their respective laboratory limits of reporting in the soil samples submitted for analysis. Heavy metal concentrations were also below their respective SAC and PPIL. Asbestos was not observed during intrusive investigation and also not detected in the soil samples analysed.

Based on the field observations and laboratory results, no signs of unacceptable, broad scale contamination impacts were found. Whilst the potential for isolated contamination pockets cannot be ruled out, these can be removed and managed at the time of site development with the implementation of standard operational protocols. It is considered that Tranche 7, Tranche 8 and Anthony Reserve are suitable for the proposed use. An Unexpected Finds Protocol should be implemented setting out the standard procedures for inspecting and managing any unexpected, potential contamination issues encountered during development works. It is understood that implementation of an appropriate Unexpected Finds Protocol is part of the contractual requirements for earthworks and excavation at the Site.

Based on the investigation findings, no remedial works are warranted. The removal of surface rubbish is expected to be conducted as part of the initial site development works, as would normally occur for urban development sites.

10. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for a project at Tranche 7, Tranche 8 and Anthony Reserve, Oran Park Precinct in accordance with Contract 490/10. The report is provided for the exclusive use of Landcom and Greenfields Development Company Pty Ltd for this project only and for the purpose(s) described in the report. It should not be used for other projects or by a third party. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the subsurface conditions only at the specific sampling or testing locations, and then only to the depths investigated and at the time the work was carried out. Subsurface conditions can change abruptly due to variable geological processes and also as a result of anthropogenic influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be limited by undetected variations in ground conditions between sampling locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached notes and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion given in this report.

Douglas Partners Pty Ltd

Appendix A

About this Report

About this Report

Douglas Partners



Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;

- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.



Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low

reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:
4,6,7
N=13
- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:
15, 30/40 mm

Sampling Methods

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Symbols & Abbreviations

Douglas Partners



Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core Drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U ₅₀	Undisturbed tube sample (50mm)
W	Water sample
pp	pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

Symbols & Abbreviations

Graphic Symbols for Soil and Rock

General



Asphalt



Road base



Concrete



Filling

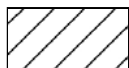
Soils



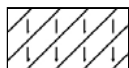
Topsoil



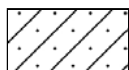
Peat



Clay



Silty clay



Sandy clay



Gravelly clay



Shaly clay



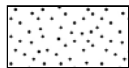
Silt



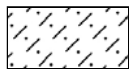
Clayey silt



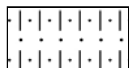
Sandy silt



Sand



Clayey sand



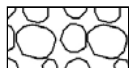
Silty sand



Gravel



Sandy gravel

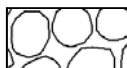


Cobbles, boulders



Talus

Sedimentary Rocks



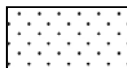
Boulder conglomerate



Conglomerate



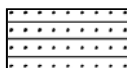
Conglomeratic sandstone



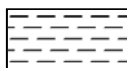
Sandstone



Siltstone



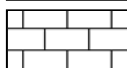
Laminite



Mudstone, claystone, shale

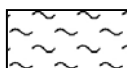


Coal

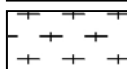


Limestone

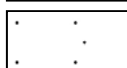
Metamorphic Rocks



Slate, phyllite, schist

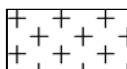


Gneiss

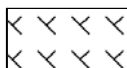


Quartzite

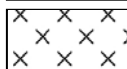
Igneous Rocks



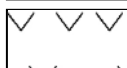
Granite



Dolerite, basalt, andesite



Dacite, epidote



Tuff, breccia



Porphyry



Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 - 5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

Soil Descriptions

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.



Rock Strength

Rock strength is defined by the Point Load Strength Index ($IS_{(50)}$) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The test procedure is described by Australian Standard 4133.4.1 - 1993. The terms used to describe rock strength are as follows:

Term	Abbreviation	Point Load Index $IS_{(50)}$ MPa	Approx Unconfined Compressive Strength MPa*
Extremely low	EL	<0.03	<0.6
Very low	VL	0.03 - 0.1	0.6 - 2
Low	L	0.1 - 0.3	2 - 6
Medium	M	0.3 - 1.0	6 - 20
High	H	1 - 3	20 - 60
Very high	VH	3 - 10	60 - 200
Extremely high	EH	>10	>200

* Assumes a ratio of 20:1 for UCS to $IS_{(50)}$

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Extremely weathered	EW	Rock substance has soil properties, i.e. it can be remoulded and classified as a soil but the texture of the original rock is still evident.
Highly weathered	HW	Limonite staining or bleaching affects whole of rock substance and other signs of decomposition are evident. Porosity and strength may be altered as a result of iron leaching or deposition. Colour and strength of original fresh rock is not recognisable
Moderately weathered	MW	Staining and discolouration of rock substance has taken place
Slightly weathered	SW	Rock substance is slightly discoloured but shows little or no change of strength from fresh rock
Fresh stained	Fs	Rock substance unaffected by weathering but staining visible along defects
Fresh	Fr	No signs of decomposition or staining

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with some fragments
Fractured	Core lengths of 40-200 mm with some shorter and longer sections
Slightly Fractured	Core lengths of 200-1000 mm with some shorter and longer sections
Unbroken	Core lengths mostly > 1000 mm

Rock Descriptions

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq 100 \text{ mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or better. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

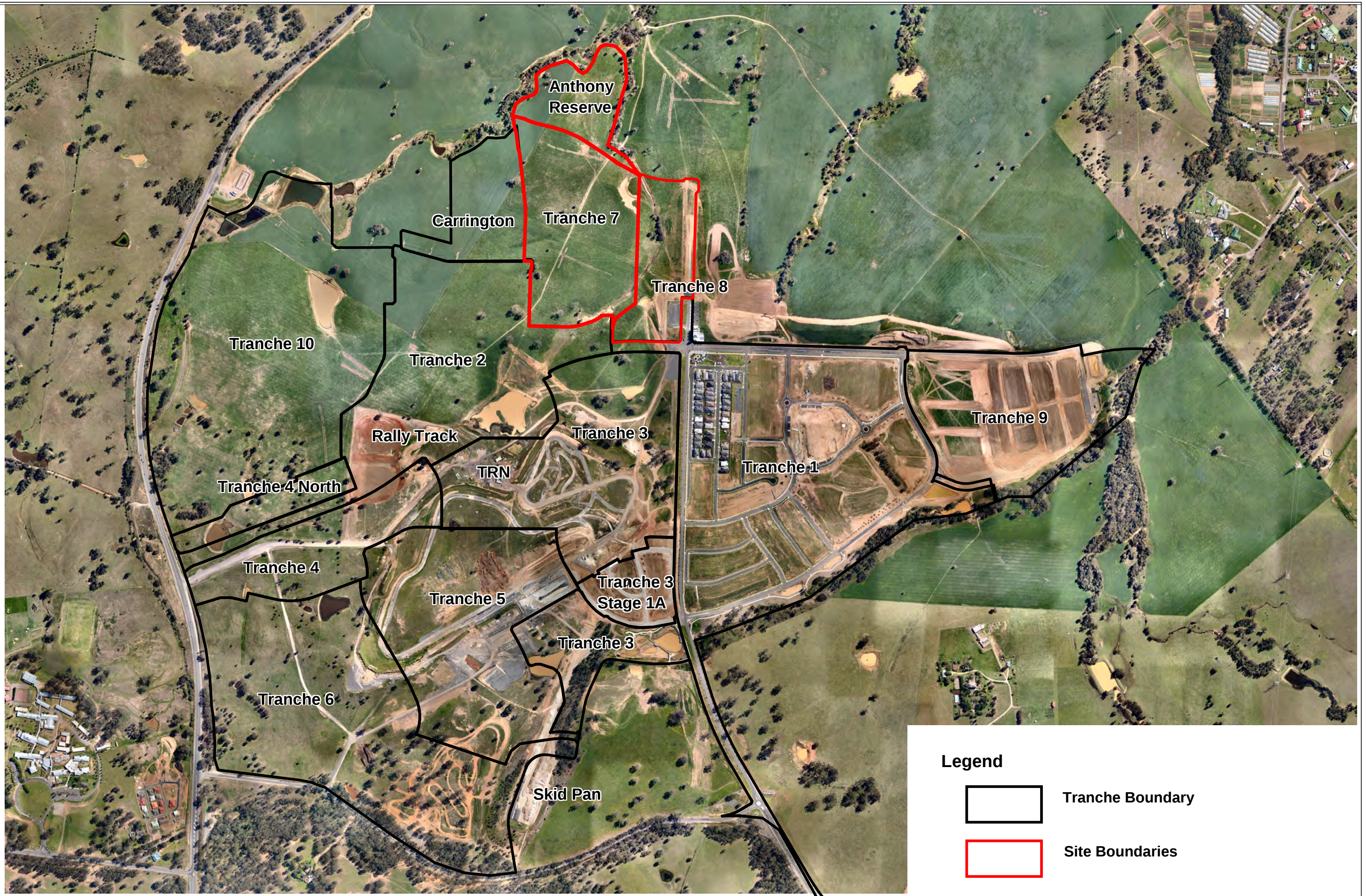
Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Appendix B

Drawings



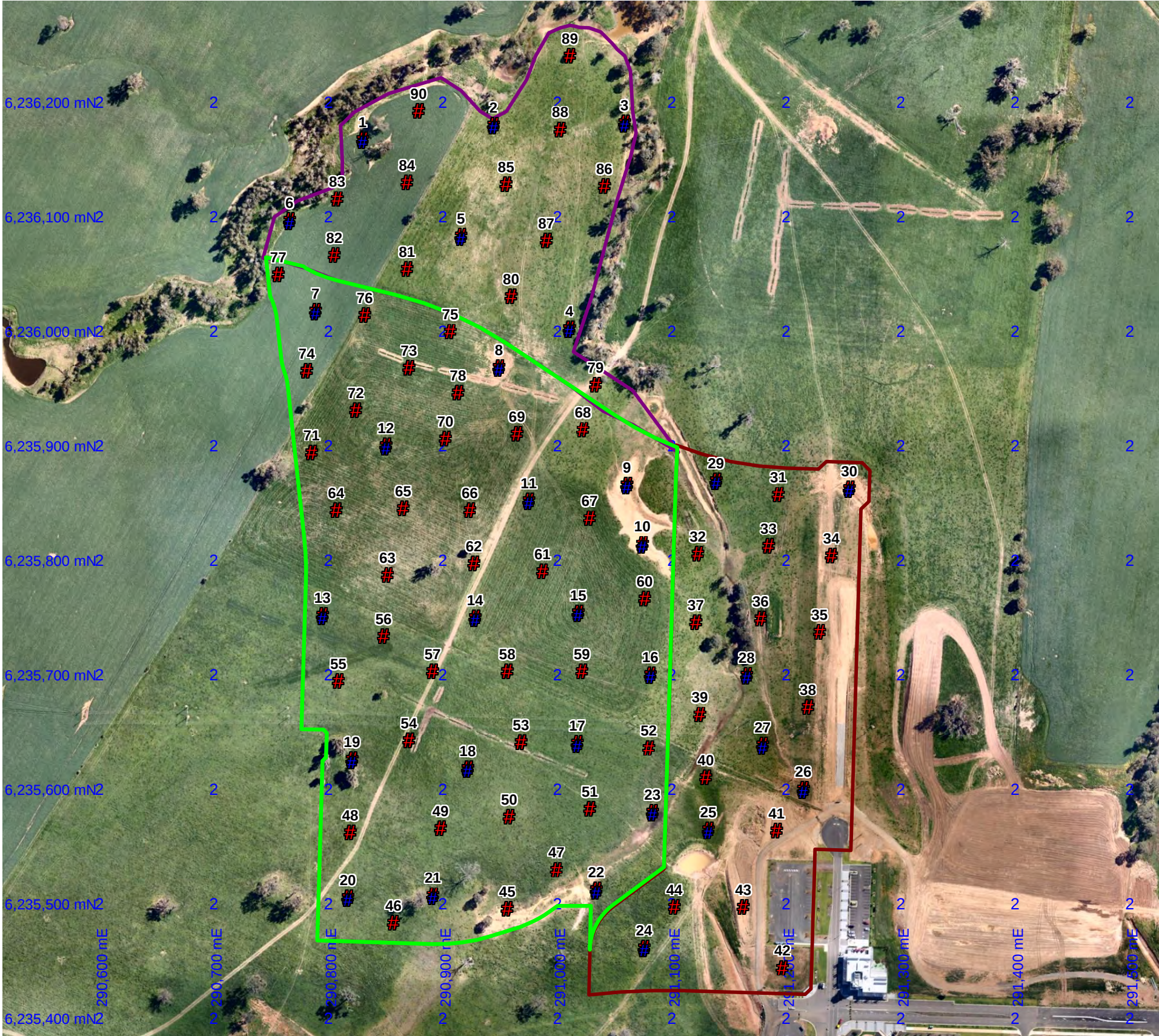
Legend



Tranche Boundary



Site Boundaries



LEGEND

2

Grid: GDA94 / MGA94 (Zone 56)

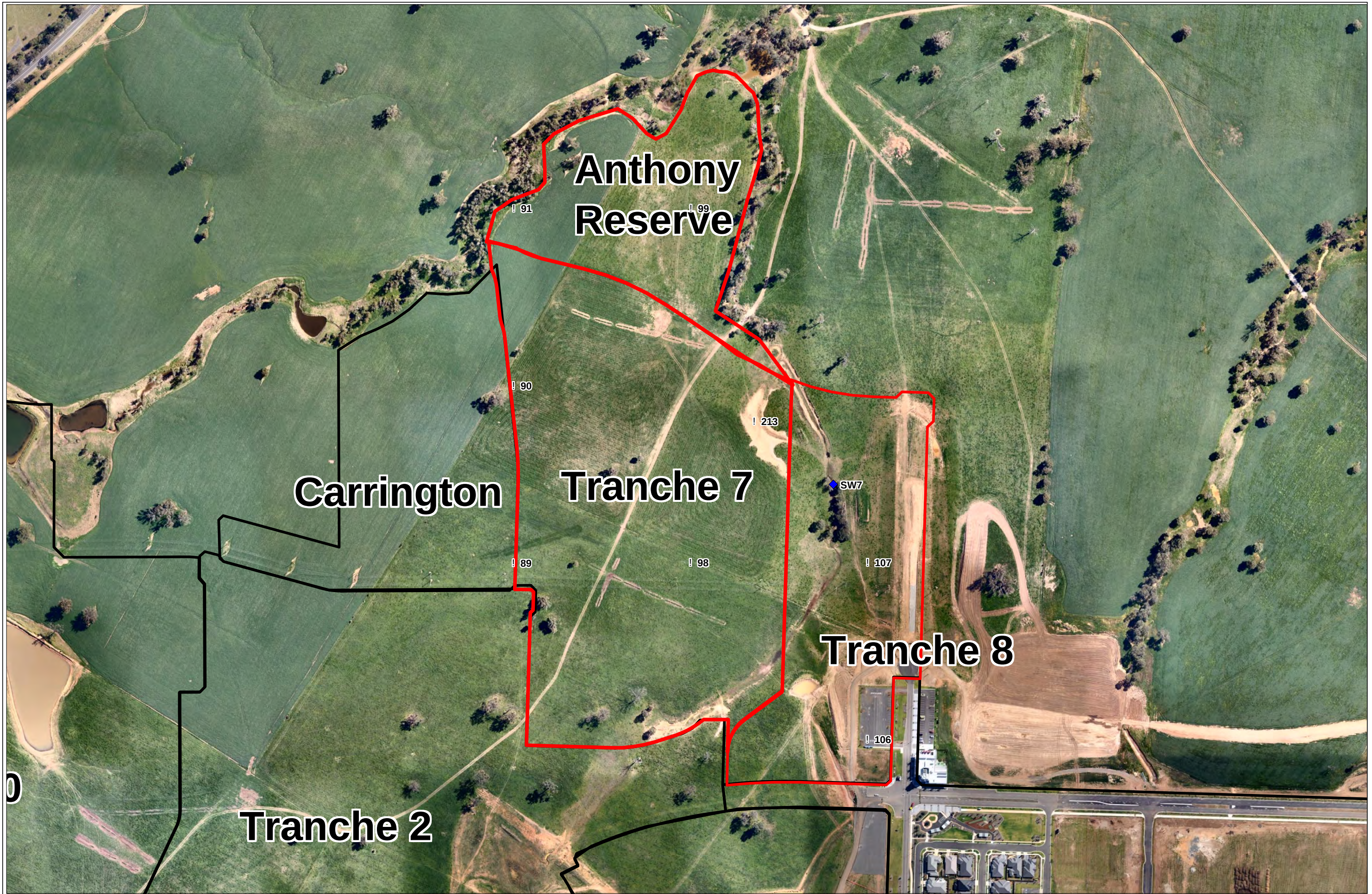
Tranche 7

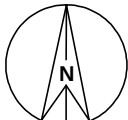
Tranche 8

Anthony Reserve

Test Pit (Salinity Assessment)

Test Pit (Contamination Assessment)



 Douglas Partners Geotechnics Environment Groundwater	CLIENT: Landcom		TITLE: Previous Test Pit Locations Anthony Reserve, Tranche 7 and Tranche 8 ORAN PARK			PROJECT No: 40740.98
	OFFICE: Campbelltown	DRAWN BY: FW				DRAWING No: 3
	SCALE: 1:10 000 @ A3	DATE: 12 Jan 11				REVISION: D

Appendix C

Sample, Analysis and Quality Plan

SAMPLING ANALYSIS PLAN: Anthony Reserve

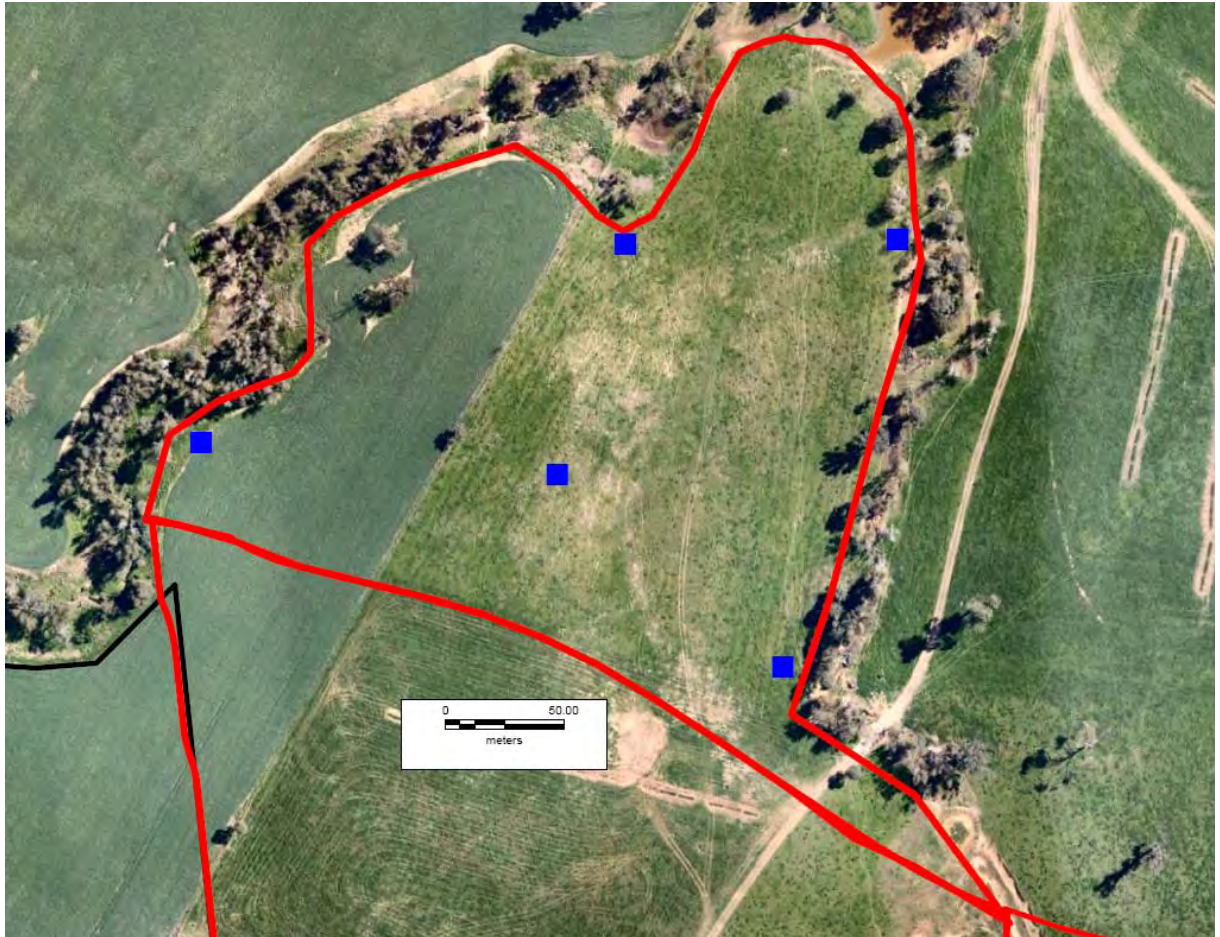
Details:

Area (ha):	5.7	Indicative Number of Sampling locations:	6
Sampling Pattern:	Judgmental	Indicative Number of Surface Samples:	-
DECCW required sampling locations	NA	Number of Deep Samples:	6
Max. depth of investigation:	0.5 m into natural	Analyte set: all samples:	HM, TPH, BTEX, PAH, OCP, OPP, Asbestos
Investigation Method	Test pits	Additional analysis: selected samples:	-

Additional Assessment Details:

- Background sampling - given no AECs have been identified.
- Sample locations have been selected to characterise the Reserve and taking into account physical features and the potential for anthropogenic impacts (eg: drainage lines, paddocks, fence lines). Drawing 4 shows the approximate sampling locations and the key rationale behind selection of each location. The report will include a description of the rationale behind the selection of each sampling location.
- Detailed site inspection could not be undertaken at the time of preparing the SAQP due to access constraints. Inspection will be undertaken at the time of fieldwork to verify the presence of possible filling areas. Should possible filling areas be identified, additional sampling will be undertaken.
- The sample locations will be identified using a handheld GPS/visual identification and then surveyed post sampling.

Drawing 4 – Proposed Sampling Locations: Anthony Reserve (Background Sampling only)



SAMPLING ANALYSIS PLAN: Tranche 7

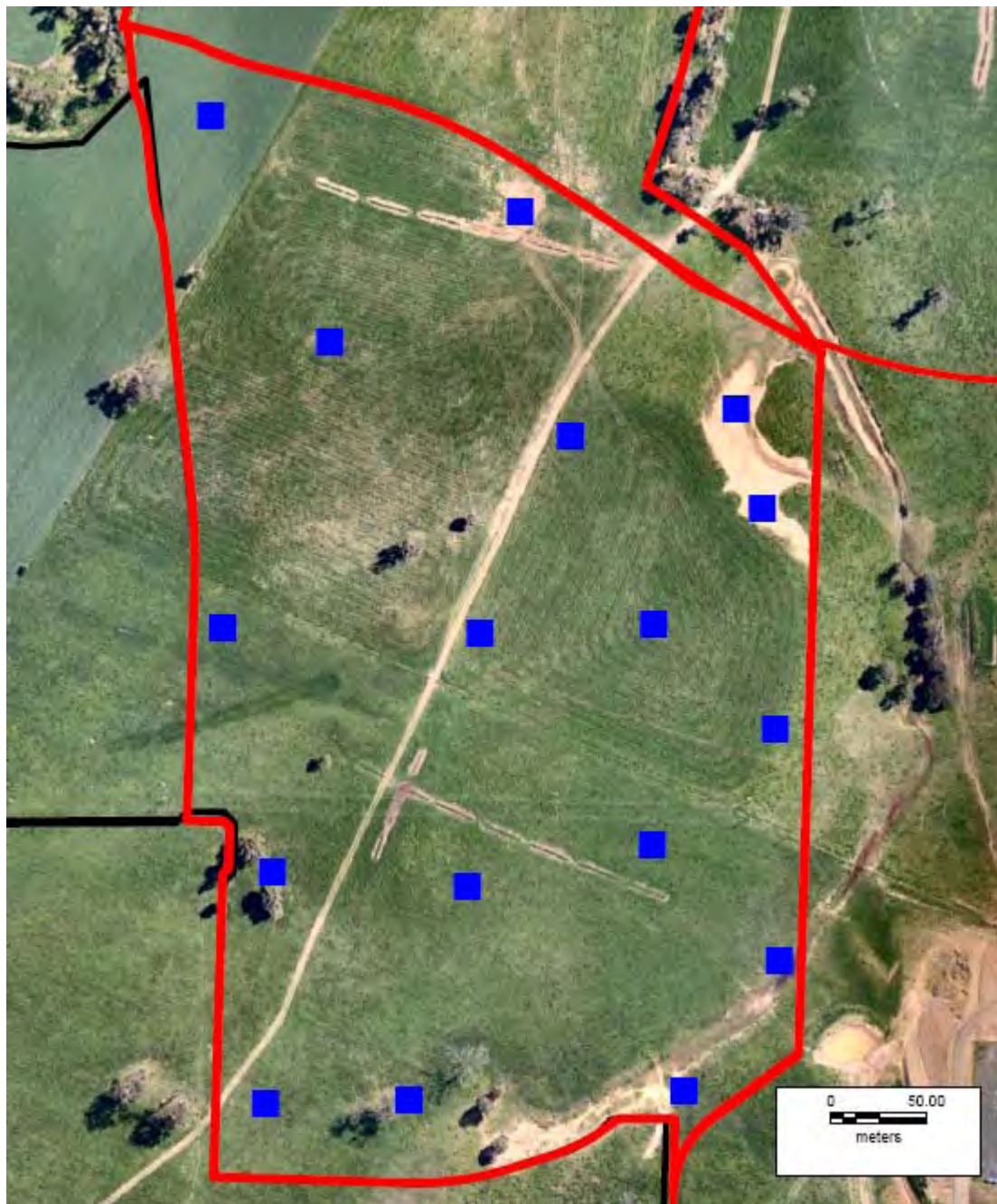
Details:

Area (ha):	16.3	Indicative Number of Sampling locations:	17
Sampling Pattern:	Judgmental	Indicative Number of Surface Samples:	-
DECCW required sampling locations	NA	Number of Deep Samples:	17
Max. depth of investigation:	0.5 m into natural	Analyte set: all samples:	HM, TPH, BTEX, PAH, OCP, OPP, Asbestos
Investigation Method	Test pits	Additional analysis: selected samples:	-

Additional Assessment Details:

- Background sampling - given no AECs have been identified.
- Sample locations have been selected to characterise the Tranche and taking into account physical features and the potential for anthropogenic impacts (eg: drainage lines, paddocks, fence lines). Drawing 5 shows the approximate sampling locations and the key rationale behind selection of each location. The report will include a description of the rationale behind the selection of each sampling location.
- Detailed site inspection could not be undertaken at the time of preparing the SAQP due to access constraints. Inspection will be undertaken at the time of fieldwork to verify the presence of possible filling areas. Should possible filling areas be identified, additional sampling will be undertaken.
- The sample locations will be identified using a handheld GPS/visual identification and then surveyed post sampling.

Drawing 5 – Proposed Sampling Locations: Tranche 7 (Background Sampling only)



SAMPLING ANALYSIS PLAN: Tranche 8

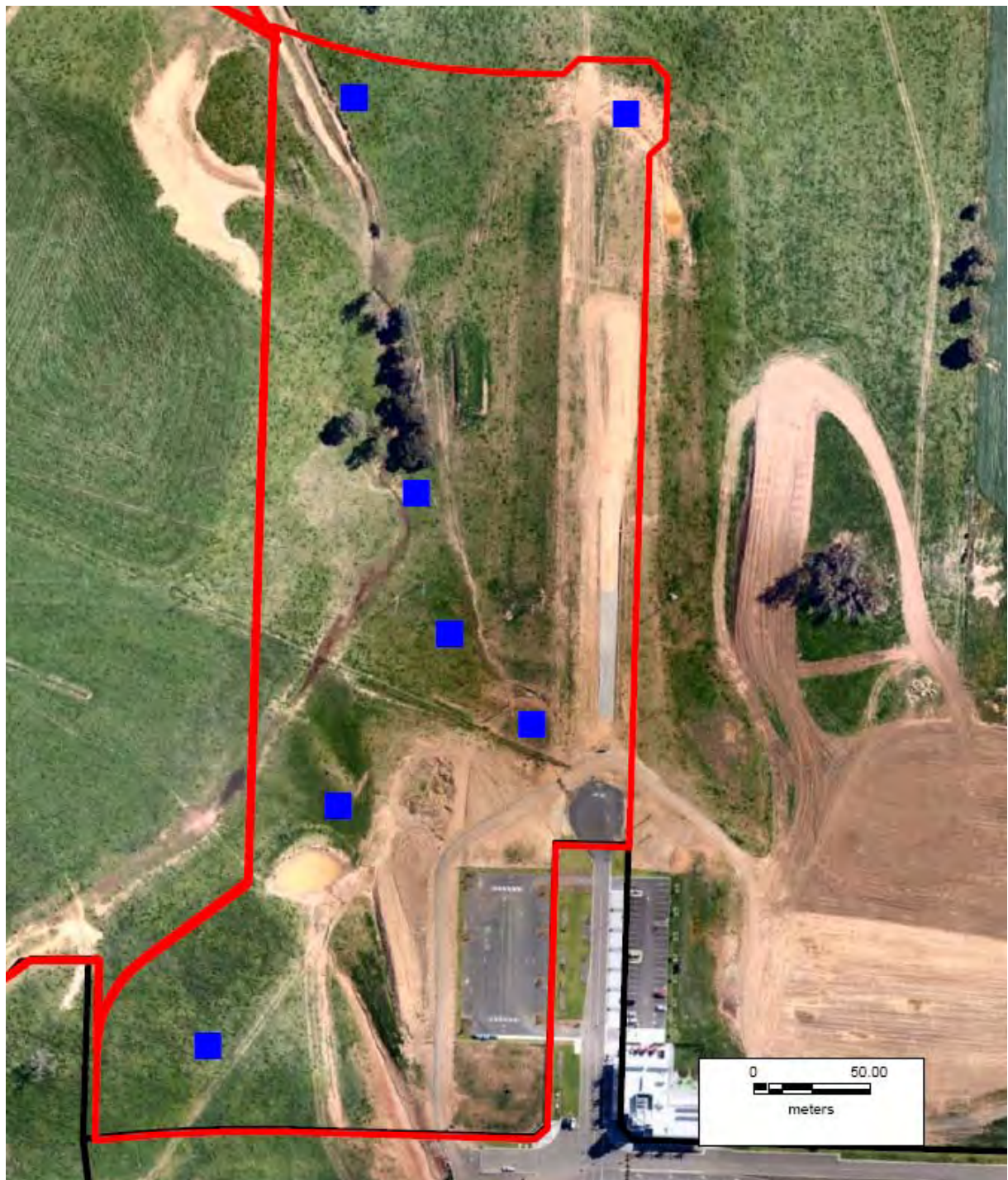
Details:

Area (ha):	7.6	Indicative Number of Sampling locations:	7
Sampling Pattern:	Judgmental	Indicative Number of Surface Samples:	-
DECCW required sampling locations	NA	Number of Deep Samples:	7
Max. depth of investigation:	0.5 m into natural	Analyte set: all samples:	HM, TPH, BTEX, PAH, OCP, OPP, Asbestos
Investigation Method	Test pits	Additional analysis: selected samples:	-

Additional Assessment Details:

- Background sampling - given no AECs have been identified.
- Sample locations have been selected to characterise the Tranche and taking into account physical features and the potential for anthropogenic impacts (eg: drainage lines, paddocks, fence lines). Drawing 6 shows the approximate sampling locations and the key rationale behind selection of each location. The report will include a description of the rationale behind the selection of each sampling location.
- Detailed site inspection could not be undertaken at the time of preparing the SAQP due to access constraints. Inspection will be undertaken at the time of fieldwork to verify the presence of possible filling areas. Should possible filling areas be identified, additional sampling will be undertaken.
- The sample locations will be identified using a handheld GPS/visual identification and then surveyed post sampling.

Drawing 6 – Proposed Sampling Locations: Tranche 8 (Background Sampling only)



Appendix D

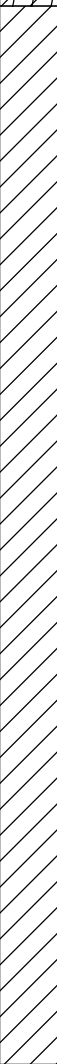
Test Pit Logs

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
Oran Park

SURFACE LEVEL: 88 mAHD
EASTING: 290829.9
NORTHING: 6236168.51
DIP/AZIMUTH: 90°/--

PIT No: 1
PROJECT No: 40740.99
DATE: 27/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		TOPSOIL - brown silty clay with trace rootlets		D*	0.2							
	0.3	CLAY - brown mottled orange clay with trace rootlets		D*	0.5							
		- becoming grey brown clay below 0.9m		D	1.0							
		- becoming dark brown mottled light brown clay below 1.4m		D	1.5							
		- becoming wet below 2.0m		D	2.0							
		- becoming grey and brown clay below 2.4m		D	2.5							
				D	3.0							
	3.1	Pit discontinued at 3.1m - limit of investigation										

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
Oran Park

SURFACE LEVEL: 86 mAHD
EASTING: 290944.3
NORTHING: 6236181.2
DIP/AZIMUTH: 90°/--

PIT No: 2
PROJECT No: 40740.99
DATE: 25/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
8	0.25	TOPSOIL - brown clayey silt with some rootlets		D*	0.2							
		CLAY - light orange/yellow mottled brown clay with rootlets		D*	0.5							
		- becoming dark orange mottled brown clay with trace ironstone gravel below 0.6m										
				D*	1.0							
		- becoming orange mottled grey clay with trace ironstone gravel below 1.2m										
8	1			D	1.5							
		- becoming wet below 1.6m										
				D	2.0							
8	2											
		- gravel content increasing with depth below 2.4m		D	2.5							
8	3.0	Pit discontinued at 3.0m - limit of investigation		D	3.0							

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 86 mAHD
EASTING: 291058.6
NORTHING: 6236183.11
DIP/AZIMUTH: 90°/--

PIT No: 3
PROJECT No: 40740.99
DATE: 25/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
8		TOPSOIL - brown silty clay with some rootlets										
	0.25	CLAY - orange brown clay with rootlets		D*	0.2							
	0.6	SILTY CLAY - orange silty clay with trace ironstone gravel		D*	0.5							
8-1												
		- becoming brown mottled grey orange silty clay below 1.6m		D*	1.0							
8-2												
		- damp below 2.0m		D	1.8							
												
		- wet below 2.4m		D	2.2							
												
				D	2.5							
8-3												
	3.2	Pit discontinued at 3.2m - limit of investigation		D	3.2							

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: Free groundwater observed at 3.2m

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected

☐ Cone Penetrometer AS1289.6.3.2

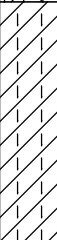
SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 87 mAHD
EASTING: 291010.5
NORTHING: 6236003.47
DIP/AZIMUTH: 90°/--

PIT No: 4
PROJECT No: 40740.99
DATE: 25/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
87		TOPSOIL - light brown clayey silt		D*	0.2							
	0.35	SILTY CLAY - orange mottled light brown silty clay with trace ironstone gravel, very dry		D*	0.5							
				D*	1.0							
		- becoming orange silty clay with ironstone gravel below 1.3m		D	1.5							
				D	2.0							
	2.4	CLAY - grey mottled orange brown clay, damp		D	2.5							
		- becoming wet below 2.8		D	3.0							
	3.1	Pit discontinued at 3.1m - limit of investigation										

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: Free groundwater observed at 3.1m

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 88 mAHD
EASTING: 290915.7
NORTHING: 6236084
DIP/AZIMUTH: 90°/--

PIT No: 5
PROJECT No: 40740.99
DATE: 25/5/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
8		TOPSOIL - brown clay with some silt and rootlets		D*	0.2							
	0.3	CLAY - orange mottled brown clay with some rootlets		D*#	0.5							
		- becoming white mottled orange clay below 0.85m		D*	1.0							
	1.4	SHALE - extremely low strength, extremely weathered, red grey shale		D	1.5							
8				D	2.0							
		- becoming very low strength, highly weathered, red brown grey shale		D	2.5							
		- becoming medium strength, dark grey shale below 2.8m		D	3.0							
8	3.0	Pit discontinued at 3.0m - limit of investigation		D	3.0							

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected; # BD5/250111 collected

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 89 mAHD
EASTING: 290766
NORTHING: 6236097.82
DIP/AZIMUTH: 90°/--

PIT No: 6
PROJECT No: 40740.99
DATE: 27/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		CLAYEY SILT - brown clayey silt with some rootlets		D*	0.2							
				D*	0.5							
	0.8	CLAY - mottled orange brown clay										
				D*	1.0							
				D	1.5							
		- becoming grey mottled orange clay below 1.6m										
				D	2.0							
		- becoming saturated, trace ironstone gravel below 2.45m - water infilling below 2.5m		D	2.5							
		- increasing proportions of ironstone gravel										
	3.0	Pit discontinued at 3.0m - limit of investigation		D	3.0							

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: Free groundwater observed at 2.5m

- ☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

REMARKS: * 40740.98 samples collected

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
Oran Park

SURFACE LEVEL: 91 mAHD
EASTING: 290788.7
NORTHING: 6236018.88
DIP/AZIMUTH: 90°/--

PIT No: 7
PROJECT No: 40740.99
DATE: 27/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
89.1	0.0	TOPSOIL - brown silty clay with rootlets										
	0.2	CLAY - orange mottled brown clay with trace rootlets		D*	0.2							
				D*	0.5							
		- becoming grey mottled red clay below 0.8m										
90.1	1.0			D	1.0				1			
	1.4	SHALE - extremely low strength extremely weathered, brown red shale		D	1.5							
		- becoming low strength, gry brown red shale below 1.6m										
		- strength increasing with depth										
89.2	2.0	Pit discontinued at 2.0m - refusal on medium strength shale		D	2.0				2			
88.3	3.0								3			

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

REMARKS: * 40740.98 samples collected

☐ Sand Penetrometer AS1289.6.3.3

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	WS	Water seep
E	Environmental sample	WL	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		PP	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

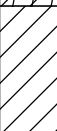


TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 89 mAHD
EASTING: 290949
NORTHING: 6235969.5
DIP/AZIMUTH: 90°/--

PIT No: 8
PROJECT No: 40740.99
DATE: 27/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
0.0		TOPSOIL - brown silty clay with rootlets		D*	0.2							
0.3		CLAY - red clay with some ironstone gravel		D*	0.5							
		- becoming mottled orange clay below 0.6m										
1.1		SHALE - extremely low strength, extremely weathered, grey orange shale		D	1.0			1				
				D	1.5							
2.0				D	2.0			2				
		- becoming medium strength, extremely weathered, brown black below 2.3m										
2.6		Pit discontinued at 2.6m		D	2.5							
		- refusal on medium strength shale										
3.0								3				

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
Oran Park

SURFACE LEVEL: 88 mAHD
EASTING: 291060.7
NORTHING: 6235866.96
DIP/AZIMUTH: 90°/-

PIT No: 9
PROJECT No: 40740.99
DATE: 27/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
88	0.3	CLAYEY SILT - brown clayey silt, damp		D*	0.2							
		SILTY CLAY - dark black/grey silty clay with roots, wet		D*	0.5							
	1	- becoming orange mottled grey clay with some gravel below 0.9m		D*	1.0							
				D	1.5							
	1.7	GRAVELLY CLAY - orange grey gravelly clay		D	2.0							
88	2			D	2.5							
				D	3.0							
	2.95	CLAY - grey mottled orange clay with some gravel (sandstone)		D	3.0							
88	3											
	3.1	Pit discontinued at 3.1m - limit of investigation										

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 88 mAHD
EASTING: 291074.3
NORTHING: 6235815.31
DIP/AZIMUTH: 90°/--

PIT No: 10
PROJECT No: 40740.99
DATE: 27/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
8	0.1	CLAYEY SILT - brown clayey silt		D*	0.2							
		SILTY CLAY - dark brown silty clay										
	0.3	CLAY - orange mottled grey clay										
1		- trace gravel below 0.9m		D*	1.0							
		- some gravel below 1.3m										
2	1.8	GRAVELLY CLAY - orange mottled grey gravelly (sandstone) clay		D	2.0							
3	2.8	CLAY - grey mottled orange clay		D	2.5							
	3.0	Pit discontinued at 3.0m - limit of investigation		D	3.0							

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 91 mAHD
EASTING: 290975
NORTHING: 6235853.22
DIP/AZIMUTH: 90°/--

PIT No: 11
PROJECT No: 40740.99
DATE: 27/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
91.0		TOPSOIL - brown silty clay with rootlets		D*#	0.2							
	0.3	CLAY - mottled orange brown clay with trace rootlets		D*	0.5							
		- becoming red mottled grey clay below 0.8m										
90.1				D	1.0			1				
		- becoming grey mottled orange clay below 1.2m										
				D	1.5							
	1.8	SHALE - extremely low strength, extremely weathered, grey red shale										
90.2				D	2.0			2				
				D	2.5							
90.3	3.0	Pit discontinued at 3.0m - limit of investigation		D	3.0			3				

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected; # BD7/270111

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

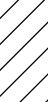
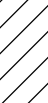
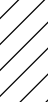
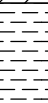
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 95 mAHD
EASTING: 290850.2
NORTHING: 6235901.14
DIP/AZIMUTH: 90°/--

PIT No: 12
PROJECT No: 40740.99
DATE: 25/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		TOPSOIL - brown silty clay with rootlets		D*#	0.2							
	0.3	CLAY - red mottled brown clay with rootlets		D*	0.5							
		- becoming grey mottled orange clay with trace low strength siltstone gravel below 0.9m		D*	1.0							
		- becoming grey mottled red clay with low strength siltstone below 1.2m		D	1.5							
	1.8	SHALE - extremely low strength, extremely weathered, red grey shale		D	2.0							
				D	2.5							
		- becoming low strength, red brown shale below 2.8m		D	3.0							
	3.1	Pit discontinued at 3.1m - limit of investigation										

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected; # BD4/250111

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

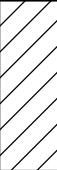
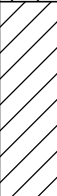
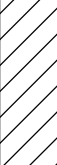
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 101 mAHD
EASTING: 290794.8
NORTHING: 6235753.02
DIP/AZIMUTH: 90°/--

PIT No: 13
PROJECT No: 40740.99
DATE: 24/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
101		CLAY - brown clay with rootlets (reworked natural)		D*	0.2							
	0.45	CLAY - brown grey red clay with rootlets		D*	0.5							
		- becoming red mottled grey clay below 0.8m										
100	1			D*	1.0			1				
	1.4	SHALE - extremely low strength, extremely weathered, red grey shale		D	1.5							
98	2			D	2.0			2				
				D	2.5							
98	3	Pit discontinued at 3.0m - limit of investigation		D	3.0			3				

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 94 mAHD
EASTING: 290928.1
NORTHING: 6235751.1
DIP/AZIMUTH: 90°/--

PIT No: 14
PROJECT No: 40740.99
DATE: 25/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
0.3		TOPSOIL - brown silty clay with rootlets		D*	0.2							
		CLAY - red mottled brown clay with rootlets		D*	0.5							
		- becoming grey mottled red clay below 0.9m		D*	1.0							
1.2		SHALE - extremely low strength, extremely weathered, grey, red, orange shale		D	1.5							
		- becoming grey red shale below 1.6m										
		- becoming very low strength, darker red		D	2.0							
				D	2.5							
3.0		Pit discontinued at 3.0m - limit of investigation		D	3.0							

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

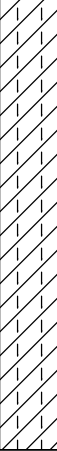
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 92 mAHD
EASTING: 291018.1
NORTHING: 6235755.3
DIP/AZIMUTH: 90°/--

PIT No: 15
PROJECT No: 40740.99
DATE: 25/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
8	0.3	TOPSOIL - brown clayey silt		D*	0.2							
		CLAY - dark brown mottled orange clay with rootlets		D*	0.5							
8	1	- becoming orange mottled brown clay below 0.6m										
				D*	1.0							
		- becoming orange mottled grey clay below 1.4m		D	1.5							
8	2	SILTY CLAY - light orange and grey silty clay										
				D	2.0							
		- becoming damp with trace ironstone gravel below 2.5m		D	2.5							
8	3.0	Pit discontinued at 3.0m - limit of investigation		D	3.0							

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected

☐ Cone Penetrometer AS1289.6.3.2

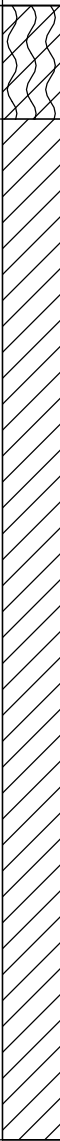
SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 91 mAHD
EASTING: 291081.2
NORTHING: 6235701.36
DIP/AZIMUTH: 90°/--

PIT No: 16
PROJECT No: 40740.99
DATE: 25/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
91.0	0.3	TOPSOIL - brown clayey silt with rootlets		D*	0.2							
		CLAY - mottled orange brown clay with rootlets		D*	0.5							
	1.0	- becoming dark orange clay mottled light brown clay with some sand and trace gravel below 0.8m		D*	1.0							
		- becoming brown mottled orange clay with trace sand below 1.4m		D	1.5							
	2.0	- becoming mottled grey orange clay with some gravel, wet below 1.9m		D	2.0							
90.0	3.0	Pit discontinued at 3.0m - limit of investigation		D	3.0							

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

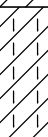
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 92 mAHD
EASTING: 291017.4
NORTHING: 6235641.35
DIP/AZIMUTH: 90°/--

PIT No: 17
PROJECT No: 40740.99
DATE: 27/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		TOPSOIL - brown silty clay with rootlets		D*	0.2							
	0.4	CLAY - red mottled brown clay with trace rootlets		D*	0.5							
	0.8	SILTY CLAY - orange silty clay		D*	1.0							
	1			D	1.5							
	2			D	2.0							
		- with some ironstone gravel below 2.4m		D	2.5							
		- with some grey clay and some ironstone gravel below 2.85m		D	3.0							
	3.0	Pit discontinued at 3.0m - limit of investigation										

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

REMARKS: * 40740.98 samples collected

- ☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

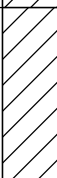
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
Oran Park

SURFACE LEVEL: 95 mAHD
EASTING: 290921.6
NORTHING: 6235619.33
DIP/AZIMUTH: 90°/--

PIT No: 18
PROJECT No: 40740.99
DATE: 24/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)				
				Type	Depth	Sample	Results & Comments		5	10	15	20	
94		TOPSOIL - brown clayey silt with rootlets		D*#	0.2								
	0.3	CLAY - brown red clay with rootlets, dry (reworked natural material)											
	0.5	CLAY - red mottled brown clay		D*	0.5								
94	1			D*	1.0					1			
		- becoming grey mottled red clay below 1.4m		D	1.5								
		SHALE - extremely low strength, extremely weathered, grey red shale		D	2.0					2			
93	2												
	2.3			D	2.5								
92	3	Pit discontinued at 3.0m - limit of investigation		D	3.0					3			

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

SAMPLING AND TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test (s(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test (s(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)



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TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 98 mAHD
EASTING: 290820.6
NORTHING: 6235626.93
DIP/AZIMUTH: 90°/--

PIT No: 19
PROJECT No: 40740.99
DATE: 24/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
8		TOPSOIL - orange brown clayey silt with rootlets										
	0.2	SILTY CLAY - orange silty clay with trace rootlets		D*	0.2							
				D*	0.5							
		- band of dark brown/black clay with ironstone gravel at 0.7 -1.0m										
				D*	1.0							
8	1											
				D	1.5							
	1.8	CLAY - grey mottled red clay										
8	2			D	2.0							
	2.2	SHALE - extremely low strength, extremely weathered red grey shale										
				D	2.5							
8	3			D	3.0							
	3.1	Pit discontinued at 3.1m - limit of investigation										

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 99 mAHD
EASTING: 290817
NORTHING: 6235506.61
DIP/AZIMUTH: 90°/--

PIT No: 20
PROJECT No: 40740.99
DATE: 24/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
0.0		TOPSOIL - brown silty clay with rootlets										
	0.2	CLAY - orange clay with rootlets		D*#	0.2							
				D*	0.5							
0.9		SHALE - extremely low strength, extremely weathered, red grey shale		D*	1.0							
				D	1.5							
				D	2.0							
2.0				D	2.5							
3.0		- becoming low strength, grey red shale below 2.8m										
	3.0	Pit discontinued at 3.0m - limit of investigation		D	3.0							

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected; # BD2/240111 collected

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
Oran Park

SURFACE LEVEL: 95 mAHD
EASTING: 290891.3
NORTHING: 6235508.43
DIP/AZIMUTH: 90°/--

PIT No: 21
PROJECT No: 40740.99
DATE: 24/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		TOPSOIL - brown silty clay with rootlets										
	0.2	CLAY - brown red grey clay with roots (reworked natural material)		D*	0.2							
	0.5	CLAY - mottled orange grey clay		D*	0.5							
-1	1.1	SHALE - extremely low strength, extremely weathered, grey red shale		D*	1.0			1				
		- becoming low strength, brown grey shale below 1.6m		D	1.5							
-2	2.4	SHALE - low to medium strength, black grey shale		D*	2.0			2				
		- becoming black gry shale		D	2.5							
-3	3.0	Pit discontinued at 3.0m - limit of investigation		D*	3.0			3				

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 93 mAHD
EASTING: 291033.9
NORTHING: 6235513.32
DIP/AZIMUTH: 90°/-

PIT No: 22
PROJECT No: 40740.99
DATE: 27/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
8	0.2	CLAY - brown mottled red clay with rootlets										
		CLAY - orange mottled brown clay		D*	0.2							
8	1	- becoming orange mottled grey clay with trace ironstone gravel below 0.6m		D*	0.5							
				D	1.0							
				D	1.5							
8	2	CLAY - grey mottled orange clay with some ironstone gravel, damp		D	2.0							
				D	2.5							
				D	3.0							
8	3	Pit discontinued at 3.0m - limit of investigation		D	3.0							

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 92 mAHD
EASTING: 291083.1
NORTHING: 6235581.16
DIP/AZIMUTH: 90°/--

PIT No: 23
PROJECT No: 40740.99
DATE: 24/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
0.7		TOSOIL - brown silty clay with rootlets		D*#	0.2							
				D*	0.5							
0.7		FILLING - grey brown clay with ash and roots, wet (possibly reworked natural material)										
1.0				D*	1.0							
1.4		GRAVELLY CLAY - red orange brown gravelly clay (ironstone gravel)		D*	1.5							
2.0				D*	2.0							
				D	2.5							
2.9		CLAY - grey orange clay										
3.0		Pit discontinued at 3.0m - limit of investigation		D	3.0							

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected; # BD1/240111

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

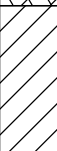
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 94 mAHD
EASTING: 291075.8
NORTHING: 6235462.65
DIP/AZIMUTH: 90°/--

PIT No: 24
PROJECT No: 40740.99
DATE: 24/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		TOPSOIL - brown clayey silt with rootlets		D*	0.2							
	0.4	CLAY - red mottled grey clay with rootlets		D*	0.5							
	0.8	SHALE - extremely low strength, extremely weathered, grey red shale		D*	1.0							
	1			D	1.5							
	2	- becoming very low strength, highly weathered, brown red grey shale below 1.8m		D*	2.0							
		- becoming extremely weathered below 2.4m		D	2.5							
		- becoming medium strength shale below 2.8										
	3.0	Pit discontinued at 3.0m - refusal on medium strength shale		D*	3.0							

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 91 mAHD
EASTING: 291131.8
NORTHING: 6235565.75
DIP/AZIMUTH: 90°/--

PIT No: 25
PROJECT No: 40740.99
DATE: 27/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		TOPSOIL - brown silty clay with rootlets		D*	0.2							
	0.3	CLAY - mottled orange light brown clay with trace rootlets		D*	0.5							
	1.0	- becoming orange mottled grey clay with trace gravel below 1.0m		D*	1.0							
	1.2	SILTY CLAY - orange mottled grey silty clay		D	1.5							
	2.0			D	2.0							
	2.3	SHALE - extremely low strength, extremely weathered, orange grey red shale		D	2.5							
		- becoming very low strength, red grey shale below 2.5m		D	3.0							
	3.1	Pit discontinued at 3.1m - limit of investigation										

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
Oran Park

SURFACE LEVEL: 94 mAHD
EASTING: 291214.8
NORTHING: 6235600.95
DIP/AZIMUTH: 90°/--

PIT No: 26
PROJECT No: 40740.99
DATE: 27/1/2011
SHEET 1 OF 1

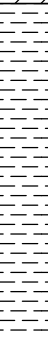
RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
0.0		FILLING - brown silty clay with some rootlets		D*	0.2							
0.6		FILLING - orange clay filling		D*	0.5							
0.8	1	- becoming dark red clay below 1.1m		D*	1.0				1			
		- becoming both dark red and orange clay below 1.5m	D	1.5								
	1.9	- becoming red mottled dark brown clay below 1.8m										
2.0	2	FILLING - brown silty clay filling with red and orange clay filling		D*	2.0			2				
				D	2.5							
3.0	3	Pit discontinued at 3.0m - limit of investigation		D*	3.0			3				

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
Oran Park

SURFACE LEVEL: 92 mAHD
EASTING: 291179.3
NORTHING: 6235639.82
DIP/AZIMUTH: 90°/--

PIT No: 27
PROJECT No: 40740.99
DATE: 27/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
8		TOPSOIL - brown clayey silt with rootlets		D*	0.2							
	0.3	CLAY - dark orange mottled brown clay with trace rootlets		D*	0.5							
				D	1.0							
				D	1.5							
		- some gravel noted below 1.7m		D	2.0							
				D	2.5							
	2.1	SHALE - extremely low strength, extremely weathered, red brown grey shale		D	2.5							
		- becoming very low to low strength, red brown, black shale										
	3.0	Pit discontinued at 3.0m - limit of investigation		D	3.0							

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 90 mAHD
EASTING: 291165.3
NORTHING: 6235700.72
DIP/AZIMUTH: 90°/-

PIT No: 28
PROJECT No: 40740.99
DATE: 27/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
0		TOPSOIL - brown clayey silt with rootlets		D*#	0.2							
	0.3	CLAY - orange mottled brown clay with trace rootlets		D*	0.5							
		- becoming orange mottled grey clay below 0.8m										
-0.1				D	1.0							
		- some gravel below 1.4m										
				D	1.5							
	1.7	SHALE - extremely low strength, extremely weathered, grey red orange shale										
-0.2				D	2.0							
		- becoming very low strength, grey shale below 2.4m										
				D	2.5							
-0.3	3.0	Pit discontinued at 3.0m - limit of investigation		D	3.0							

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected; # BD8/270111 collected

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 91 mAHD
EASTING: 291138.5
NORTHING: 6235870.63
DIP/AZIMUTH: 90°/--

PIT No: 29
PROJECT No: 40740.99
DATE: 27/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
91	0.3	TOPSOIL - brown silty clay with rootlets		D*	0.2							
		CLAY - red mottled brown clay with rootlets		D*	0.5							
90	1	- becoming grey mottled red clay with trace rootlets below 0.8m		D	1.0							
		- band of red clay at 1.2 - 1.3m - becoming grey mottled red clay below 1.3m		D	1.5							
89	2	SHALE - extremely low strength, extremely weathered, grey red shale		D	2.0							
				D	2.5							
88	2.7	- becoming very low to low strength, brown red shale, wet below 2.7m		D	3.0							
87	3.0	Pit discontinued at 3.0m - limit of investigation		D	3.0							

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: * 40740.98 samples collected

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
Oran Park

SURFACE LEVEL: 95 mAHD
EASTING: 291255
NORTHING: 6235863.73
DIP/AZIMUTH: 90°/--

PIT No: 30
PROJECT No: 40740.99
DATE: 27/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
94		FILLING - orange brown clay with gravel (reworked natural material)		D*	0.2							
94	0.35	CLAY - red mottled brown clay with rootlets		D*	0.5							
94	-	- becoming grey mottled red clay below 0.8m										
94	1			D*	1.0				1			
94	1.4	SHALE - extremely low strength, extremely weathered, red grey shale		D	1.5							
94	-	- becoming extremely low strength, extremely weathered, grey shale below 1.6m										
93	2			D	2.0				2			
93	-	- becoming very low to low strength, black grey brown shale below 2.1m										
93	-	- becoming stronger with depth										
92	2.4	Pit discontinued at 2.4m - refusal on medium strength shale		D	2.4							
92	-											
92	3								3			

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

REMARKS: * 40740.98 samples collected

☐ Sand Penetrometer AS1289.6.3.3

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)



TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 93 mAHD
EASTING: 291193
NORTHING: 6235858.1
DIP/AZIMUTH: 90°/--

PIT No: 31
PROJECT No: 40740.99
DATE: 27/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
93.0		TOPSOIL - brown silty clay with rootlets										
92.8	0.2	CLAY - red mottled brown clay with some rootlets		D	0.2							
92.5	0.5	Pit discontinued at 0.5m - limit of investigation		D	0.5							
92.0	1											
91.5	2											
91.0	3											

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

- ☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

REMARKS:

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 90 mAHD
EASTING: 291122.7
NORTHING: 6235806.66
DIP/AZIMUTH: 90°/--

PIT No: 32
PROJECT No: 40740.99
DATE: 27/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
0		TOPSOIL - brown clayey silt with some rootlets		D	0.2							
0.25		CLAY - brown mottled orange clay with rootlets										
0.5		Pit discontinued at 0.5m - limit of investigation		D	0.5							
1												
2												
3												

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

- ☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

REMARKS:

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 91 mAHD
EASTING: 291184.5
NORTHING: 6235813.51
DIP/AZIMUTH: 90°/--

PIT No: 33
PROJECT No: 40740.99
DATE: 27/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
91.00		TOPSOIL - brown clayey silt with rootlets		D	0.2							
	0.35	CLAY - orange mottled grey clay with rootlets										
	0.5	Pit discontinued at 0.5m - limit of investigation		D	0.5							
90.00	1											
89.00	2											
88.00	3											

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

- ☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

REMARKS:

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 92 mAHD
EASTING: 291239.4
NORTHING: 6235804.94
DIP/AZIMUTH: 90°/--

PIT No: 34
PROJECT No: 40740.99
DATE: 27/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
8		FILLING - brown grey gravelly clay with some silt (reworked natural material)		D	0.2							
	0.25	FILLING - orange mottled brown clay with gravel and rootlets (reworked natural material)										
	0.5	Pit discontinued at 0.5m - limit of investigation		D	0.5							
8-1												
8-2												
8-3												

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

- ☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

REMARKS:

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
Oran Park

SURFACE LEVEL: 95 mAHD
EASTING: 291229.1
NORTHING: 6235738.05
DIP/AZIMUTH: 90°/--

PIT No: 35
PROJECT No: 40740.99
DATE: 27/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
		FILLING - brown orange silty clay filling with gravel		D	0.2							
	0.5	Pit discontinued at 0.5m - limit of investigation		D	0.5							
	1											
	2											
	3											

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

☐ Sand Penetrometer AS1289.6.3.3

REMARKS: On large embankment

☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 90 mAHD
EASTING: 291177.6
NORTHING: 6235750.06
DIP/AZIMUTH: 90°/--

PIT No: 36
PROJECT No: 40740.99
DATE: 27/1/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
0		TOPSOIL - brown silty clay with rootlets		D	0.2							
0.25		CLAY - brown mottled orange clay with rootlets										
0.5		Pit discontinued at 0.5m - limit of investigation		D	0.5							
1												
2												
3												

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

- ☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

REMARKS:

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Landcom
PROJECT: Salinity Management Plan
LOCATION: Tranche 7, 8 and Anthony Reserve
 Oran Park

SURFACE LEVEL: 90 mAHD
EASTING: 291121
NORTHING: 6235746.64
DIP/AZIMUTH: 90°/--

PIT No: 37
PROJECT No: 40740.99
DATE: 25/5/2011
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
0		TOPSOIL - brown clayey silt with some rootlets		D	0.2							
	0.35	CLAY - red mottled brown clay with rootlets										
	0.5	Pit discontinued at 0.5m - limit of investigation		D	0.5							
-0.5												
-1												
-2												
-3												

RIG: Komatsu WB97R - 450 bucket

LOGGED: BAH

SURVEY DATUM:

WATER OBSERVATIONS: No free groundwater observed

- ☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

REMARKS:

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)