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Claymore Urban Renewal

Preliminary Contamination Assessment Report

Summary

This report presents the results of the preliminary contamination assessment (PCA), carried out by Geotechnique Pty Ltd (Geotechnique) for and on behalf of Landcom, for the Claymore Urban Renewal Project, a proposed residential subdivision at Claymore.

Objectives

The objective of the assessment was to ascertain whether the site is likely to present a risk of harm to human health and/or the environment, under the conditions of the proposed residential development.

In order to achieve the objective of this assessment, the scope of work included a site inspection, a desktop study of historical aerial photographs, acquisition of groundwater bore information for the region, review of soils and geological maps, test pit excavation, soil sampling and laboratory testing and preparation of this report.

Methods and findings

In order to formulate a picture of the site history and to assist in identification of any potential contamination, Geotechnique obtained and/or reviewed information including historical aerial photographs.

Historical aerial photographs indicate that the site and adjoining properties were part of a large parcel of farmland until residential development in the late 1960s to early 1970s. The area remains essentially unchanged since then.

An inspection by an Environmental Scientist from Geotechnique, to identify current site activities, site features and any visible or olfactory indicators of potential contamination was carried out on 29 April 2011. The inspection revealed that Residential houses occupied almost entire area of the site. Public amenities such as Claymore Public School, shopping centre, child care centre, community centre were located at the northern portion of the site along Dobell and Gould Roads. An open storm water drain system was running adjacent north of those amenities. A playing field was observed in the north eastern corner of the site. A soil stockpile, an earth mound and three area covered with bitumen were observed. Parks and open space with grass and tree growth occupied significant area of the site in between group

of houses. There were no signs of soil staining, plant distress or any other visible indicators of potential contamination. No chemical storage was noted within the site. There were no olfactory indicators of potential contamination. There were no visual indicators of underground storage tanks (past or present). The only site discharge is stormwater. There were no air emissions emanating from the site.

The site features are indicated on Drawing No 12467/2-AA1 in Appendix 1.

As part of the preliminary contamination assessment, sampling was carried out across the site at 74 test pit locations by using a backhoe on 2, 3, 4 and 5 May 2011 and two sample locations in a soil stockpile and an earth mound by using a trowel on 10 May 2011.

Topsoil, fill, stockpile and earth mound samples were recovered for chemical testing, with analytes including Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), Organochlorine Pesticides (OCP), Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethyl Benzene, Xylene (BTEX), Polycyclic Aromatic Hydrocarbons (PAH), Polychlorinated Biphenyls (PCB) and/or asbestos.

As the site is proposed for residential subdivision development, where lawns and domestic gardens could be established, the assessment criteria adopted were the available Health Investigation Levels for residential development with accessible soils (HIL'A'), the provisional phytotoxicity based investigation levels (PPBIL) and the ecological investigation levels (EIL). For asbestos assessment, the site must be free of asbestos-cement pieces and no asbestos fibres detected in the soils.

All chemical laboratory data and data sets, satisfied the criteria for stating that the analytes selected are either not present (i.e. at concentrations less than laboratory reporting limits), or present in the sampled soils at concentrations that do not pose a risk of hazard to human health or the environment, under a residential form of development, with the exception of topsoil sample TP7 (0-0.15m), which presents a risk of harm to human health due to elevated lead (Pb) concentration, and topsoil sample TP2 (0-0.15m) and soil stockpile sample SP1 (0-0.5m) which could potentially impact on the growth of certain plant species but would not present a risk of harm to human health due to elevated zinc (Zn) concentrations. The fibro-cement pieces encountered in the fill profile between 0.15m and 0.6m below ground level at test pit location TP74, contain Chrysotile Asbestos. Theses identified locations of concern are indicated and tabulated on Drawing No 12467/2-AA2 in Appendix 1.

Conclusions

The findings of this preliminary contamination assessment are summarised as follows:

- The site is a large public housing estate.
- The site is proposed for residential subdivision development.
- The site is underlain by topsoil and filling materials overlying residual clay and shale bedrock.
- In general, soils beneath the site do not appear to have been significantly impacted by past or present activities and/or the presence of fill materials, soil stockpile and earth mound.

- Topsoil, fill materials with demolition waste in isolated locations within the site and soil stockpile (see Drawing No 12467/2-AA2) were contaminated with lead, zinc and/or asbestos-cement pieces. Elevated lead (Pb) concentrations present a potential risk of harm to human health. Asbestos-cement pieces also present a potential risk of harm to human health. Elevated zinc (Zn) concentration could potentially impact on the growth of certain plant species but would not present a risk of harm to human health. Therefore remediation is required.

- Groundwater assessment was not carried out; however the potential for groundwater contamination is considered low.

Recommendations

The site is considered suitable for the proposed residential subdivision development, subject to the following;

- Detailed sampling and testing in the vicinity of locations of concern to delineate the extent of contamination.

- Development of a remedial action plan (RAP) to remediate the elevated lead and zinc concentrations and asbestos-cement pieces, followed by appropriate validation.

- Following demolition and removal of houses, garages and clearing of roads, an inspection and/or sampling and testing of soils beneath the feature should be carried out by an Environmental Consultant. In the event that soil beneath the site feature(s) is contaminated, detailed sampling, testing and remediation will be required. Demolition and removal of the houses and garage should be carried out by appropriately licensed contractors. A hazardous materials survey and controlled removal process must be carried out/implemented by an occupational hygienist prior to commencement of demolition works. Any fibro structures might impact on surface soils if demolition is not carried out properly.

- A site-specific Unexpected Finds Protocol (UFP) should be prepared and implemented throughout the construction works under the responsibility of the Principal Contractor.

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1. Objectives of assessment

At a glance

The objective of the preliminary contamination assessment (PCA) was to ascertain whether the site is likely to present a risk of harm to human health and/or the environment, under the conditions of the proposed residential development.

Introduction

Claymore Urban Renewal Project site (Claymore site), covering an area of 125 hectares (ha), will be developed for public and private housing in 11 Stages over 12 to 15 years. This project is understood to deliver 1,280 dwellings, including detached cottages and townhouses, in which a maximum of 30% of the final yield (or approximately 380 dwellings) will be retained for public housing out of total 1,096 public housing. The remaining 716 public housing and related roads and services will be demolished and removed from the site as a part of proposed development.

Landcom is preparing an environmental assessment for a Project Application. Geotechnique Pty Ltd (Geotechnique) was commissioned to carry out a preliminary contamination assessment (PCA) in order to identify potential contamination sources and potential hotspots specified in Director General Requirements. PCA was carried out in accordance with the scope of work outlined in the “Contract Document” signed by Geotechnique and Landcom on 5 April 2011.

2. Site analysis

At a glance

Claymore Urban Renewal Project site (Claymore site) is a large public housing estate, which occupies about 125 hectares (ha), as shown on the plan in Appendix 1. Residential houses occupied almost entire area of the site.

There is one soil stockpile and one earth mound on the site.

Location and Site Features

The Claymore site is located 2.0km northwest of Campbelltown CBD and is bound by the Hume Highway (M5) to the east, Eagle Vale suburb to the west and north and Badgally Road to the south. The Claymore site is a large public housing estate. There are about 1100 dwellings, cottages and townhouses, school, commercial centre and several parks and reserves within the site. As shown on Drawing No 12467/2-AA1, the site is an irregular shape, covering an area of approximately 125 hectares. The site is bound to the north by residential land, to the east vacant land then Hume High Way, south west by Badgally Road and west by residential land.

A soil stockpile (12m x 2m x0.5m high) and few bitumen covered areas are noted in the south western portion of the site. An earth mound (20m x 1m x 0.5m high) is observed in the north eastern portion of the site, as indicated on Drawing No 12467/2-AA1 in Appendix 1.

Topography

The Claymore site is undulating, with ridgeline generally extending along Badgally Road. There are several high points in the southern and middle portions of the site, with low points generally within the riparian area along the northern site boundary.

There is a significant drainage depression dipping towards the east along the northern site boundary. Several other minor drainage depressions were noted dipping from the southern portion of the site towards the main drainage depression in the northern portion.

In general, ground surface across the site dips from the south towards the north west. However, locally the ground surface dips easterly or westerly towards the minor drainage depressions. Although ground surface slopes in most portions of the site range from about 5% to 15%, isolated areas of steep slopes were also noted.

Geology and landscape

Based on the Geological Map of Port Hacking – Wollongong (scale 1:100,000), bedrock underlying the natural soil at the Claymore site is anticipated to be Ashfield Shale, comprising dark grey to black shale and laminite (Reference 1). However, Bringelly Shale comprising shale, carbonaceous claystone, laminite, fine to medium grained lithic sandstone, rare coal is anticipated in high points in the southern portion of the site.

Reference to the Soil Landscape Map (scale 1:100,000) of Port Hacking - Wollongong indicates that the landscapes at the Claymore site belong to the Blacktown Group, which is characterised by gently undulating rises on Wianamatta Group shales, with local relief to 30.0m, ground slope less than 5%, broad rounded crests and gently inclined slopes (Reference 2). The sub-surface soil in this landscape is likely to be up to 3.0m thick, moderately reactive, highly plastic and of poor drainage.

3. Regulatory context

At a glance

Department of Environment, Climate Change and Water (DECCW), now known as Office of Environment & Heritage.

Contaminated Land Management Act 1997 (CLM Act).

Managing Land Contamination – Planning Guidelines.

State Environmental Protection Policy No 55 (SEPP 55) – Remediation of Land.

Site Auditor.

In very broad terms, the management framework for contaminated land in NSW consists of two tiers:

- Office of Environment & Heritage, which uses its powers under the Contaminated Land Management Act 1997 (CLM Act) to deal with site contamination that is significant enough to warrant regulation under the CLM Act given a site's current or approved site use; and,
- State government and local councils deal with other contamination under the planning and development framework, including State Environmental Planning Policy No. 55 - Remediation of Land and the Managing Land Contamination - Planning Guidelines (the Guidelines)

SEPP 55 and the Guidelines aim to establish 'best practice' for managing land contamination through the planning and development control process.

The guidelines provide advice to planning authorities on the early identification of contaminated sites, consideration of contamination in rezoning and development applications, recording and use of information, and ways to prevent contamination and reduce the environmental impact of remediation activities.

Site auditors are highly experienced contaminated land consultants accredited by the DECCW under the *Contaminated Land Management Act 1997*, in order to improve access to competent technical advice and increase certainty in the 'sign-off' of contaminated site assessments and remediation.

4. Methods and results

At a glance

Historical aerial photos indicate the site was possibly used for agricultural activities prior to late 1960's. The field observation and laboratory analysis indicate that isolated locations within the site contains elevated Metals concentrations (lead and zinc). The fibro-cement pieces encountered in the fill profile at one test pit location, contain Chrysotile Asbestos.

Scope of works

The scope of works for preliminary contamination assessment include the following:

- A desktop study of the historical aerial photographs to assist in identification of potential contamination issues;
- Review of soils and geological maps.
- Acquisition of groundwater bore information for the region.
- An inspection by an Environmental Scientist from Geotechnique to identify current site activities, site features and any visible or olfactory indicators of potential contamination.
- Excavate seventy four (74) test pits (TP1 to TP74) using a medium sized backhoe, to assess the sub-surface profiles and collect soil samples for laboratory testing, aimed at ascertaining the presence of soil contaminants. Test pits were excavated at about the locations indicated by Landcom in a plan provided for preparation of this report. In addition two samples (SP1 and SP2) were recovered from a soil stockpile and an earth mound respectively by using a trowel. Approximate test pit and sample locations are indicated on Drawing No 12467/2-AA1 presented in Appendix 1. Excavation logs are also presented in Appendix 2.
- Chemical analysis by National Association of Testing Authorities (NATA) accredited testing laboratories, in accordance with chains of custody prepared by Geotechnique.
- Implementation of industry standard quality assurance (QA) and quality control (QC) measures. QC samples were also forwarded to the testing laboratories.
- Assessment of the laboratory analytical results against current applicable guidelines
- Assessment of field and laboratory QA and QC.

Historical Aerial Photographs

Aerial photographs taken in 1947, 1961, 1970, 1984, 1994, 2002 and 2005 were examined. Copies of the aerial photographs are presented in Appendix C. The writer made the following observations. Due to scale, some of the listed observations are best interpretations only.

1947 The site and adjoining properties are predominantly farmland. The southern and south western portions of the site comprise of many individual rural residential lots, whilst the northern portion appears to be one large pasture.

1961 Farming activities possibly ceased by this time in the northern portion of the site with overgrowth becoming more widespread. Some parts of the southern portion are perhaps still active agriculturally. Neighbouring properties remain essentially unchanged since 1947.

1970 The conditions of the site and adjoining properties are very much the same as in the 1961 aerial photograph.

1984 The site has been developed into a new residential estate so as the adjoining northern, western and southern properties. Hume Highway borders the site to the east.

1994 The layout of the site and the surrounding properties remain essentially unchanged except additional houses have been built within these established areas.

2002 The site and the surrounding properties remain essentially unchanged since 1994.

2005 The site and the surrounding properties remain essentially unchanged since 2002.

In summary, the aerial photographs reveal that the site and adjoining properties were part of a large parcel of farmland until residential development in the late 1960s to early 1970s. The area remains essentially unchanged since then.

Groundwater Bore Information

A site-specific groundwater analysis was outside the scope of this assessment. However, a search of the web site of the NSW Department of Natural Resources was carried out for any registered groundwater bore data within a radius of one and half kilometres of the site. The search revealed five bores within this radius. The information obtained is summarised in the following table and included in Appendix 4 of this report.

Bore	Date	Authorised/ Intended Purpose	AMG coordinates	Water Bearing Zone (m)	Standing Water Level (m)	Salinity (mg/L)
GW072777	9.03.1995	Domestic	$_{2}96.439_{E}$ & $_{62}31.343_{N}$	21.5-21.6 63.7-63.8	No Details	No Details
GW109212	14.08.2008	Monitoring Bore	$_{2}98.557_{E}$ & $_{62}28.642_{N}$	No Details	No Details	No Details
GW109213	14.08.2008	Monitoring Bore	$_{2}98.585_{E}$ & $_{62}28.665_{N}$	No Details	No Details	No Details

GW109214	14.08.2008	Monitoring Bore	$_{2}98.571_{E}$ & $_{62}28.660_{N}$	No Details	No Details	No Details
GW109215	15.08.2008	Monitoring Bore	$_{2}98.562_{E}$ & $_{62}28.650_{N}$	No Details	No Details	No Details

Based on the above, where groundwater bearing zone is in excess of 20m in one borehole, located about 800m from the western site boundary, the groundwater in the site is anticipated to be in excess of 10.0m below the existing ground surface. However, localised groundwater or perched water could be found in shallow depth.

Site Inspection

An inspection by an Environmental Scientist from Geotechnique, to identify current site activities, site features and any visible or olfactory indicators of potential contamination was carried out on 29 April 2011. The inspection revealed that Residential houses occupied almost entire area of the site. Public amenities such as Claymore Public School, shopping centre, child care centre, community centre were located at the northern portion of the site along Dobell and Gould Roads. An open storm water drain system was running adjacent north of those amenities. A playing field was observed in the north eastern corner of the site. A soil stockpile, an earth mound and three area covered with bitumen were observed. Parks and open space with grass and tree growth occupied significant area of the site in between group of houses. There were no signs of soil staining, plant distress or any other visible indicators of potential contamination. No chemical storage was noted within the site. There were no olfactory indicators of potential contamination. There were no visual indicators of underground storage tanks (past or present). The only site discharge is stormwater. There were no air emissions emanating from the site.

The site features are indicated on Drawing No 12467/2-AA1 in Appendix 1.

Sub-surface Condition

Engineering Logs in Appendix 2 indicates that the sub-surface profiles across the Claymore site comprise a sequence of topsoil/fill and natural soils underlain by bedrock. Natural soils in most test pits include alluvial soils and residual soils. However, only alluvial or residual soil was encountered in some test pit. Bedrock is predominantly shale, with bands of siltstone. The materials encountered across the site are generally described as follows.

Fill	Silty Clay, medium to high plasticity, orange, brown, grey, moist, with some roots, ironstone and crushed shale. Based on the contents, it appears that most of the fill material could have originated from the site.
Topsoil	Silty Sand, fine grained and Silty Clay, low plasticity, dark brown, moist, with some roots
Alluvial Soils	Silty Clay, medium to high plasticity, orange, grey, yellow; moisture content generally equal to or lower than the plastic limit; stiff to hard.
Residual Soil	Silty Clay, Shaley Clay, medium to high plasticity, orange, grey, yellow; moisture content generally equal to or lower than the plastic limit; stiff to hard, with some ironstone

Bedrock	Shale, Siltstone, grey, brown, extremely weathered, very low to medium strength, with some iron stained bands

Table 1 in Appendix 2 indicates that the soil stockpile consists of silty clay, low plasticity, brown, whist the earth mound consists of sandy silty clay, low plasticity, brown, with occasionally concrete and brick fragments.

No asbestos-cement pieces were noted at the test pit and sample locations, with the exception of fibro-cement pieces in the fill profile at test pit location TP74. The test pit and sample locations are shown on Drawing No 12467/2-AA2 in Appendix 1.

Potential for Contamination

The historical aerial photographs reveal that the site and adjoining properties were part of a large parcel of farmland, where possible agricultural activities were carried out, until residential development in the late 1960s to early 1970s.

The soil profile encountered, as described in above sub-section of this report, did not reveal any visual (staining, dying) or olfactory indicators of potential contaminants with the exception of fibro-cement pieces in the fill profile at test pit location TP74.

During site inspection on 29 April 2011, no signs of soil staining, plant distress or any other visible indicators of potential contamination were noted on the site.

Based on the above, the potential for contamination is considered to be as follows:

- Past possible agricultural activities within the site indicates potential for applied agricultural chemicals and fertilisers.

- The use of agricultural chemicals and fertilisers could lead to Metals, Organophosphate Pesticides (OPP) and persistent Organochlorine Pesticides (OCP) contamination. The predicted persistence of OCP is less than 15 years and as possible agriculture activities were carried out at least 40 years ago, OCP are not a concern. The predicted persistence of OPP is typically less than one year, therefore OPP are not of concern.

  Metals generally of concern include arsenic, cadmium, copper, lead, mercury and zinc. Testing of chromium and nickel was recommended for screening purposes.

- The fibro-cement pieces may contain asbestos.

- Due to the age of the housing, concealed pipes (water, sewer or stormwater), walls etc., might contain asbestos. This can be ascertained by a hazardous materials survey of the houses. The fibro structures might impact on surface soils if demolition is not carried out properly.

Sampling & Analysis Plan and Sampling Methodology

Sampling and analyses for the contamination assessment were carried out to obtain a reasonable assessment of the following:

1. Nature, location and likely distribution of soil contaminants beneath the site.

2. The risks that the contaminants (if present) pose to human health or the environment under the conditions of the proposed development.

Site sampling was carried out on site at 74 test pit locations by using a backhoe on 2, 3, 4 and 5 May 2011 and two sample locations in a soil stockpile and an earth mound by using a trowel on 10 May 2011 by an Environmental Scientist and an Environment Engineer from Geotechnique, who were responsible for visually assessing the site, locating the test pits and sample locations as close as possible to nominated locations, recovery of soil samples, preparation of samples for delivery to NATA accredited laboratories and logging the sub-surface profile encountered at each test pit sample location.

The test pit and sample locations are shown on Drawing No 12467/2-AA2 in Appendix 1.

Prior to excavation using a backhoe, a services locater scanned all the test pit locations, so as to avoid any underground services.

The sampling procedures adopted were as follows:

- Bulk soil samples from test pits were excavated using a standard backhoe, whilst sample locations were excavated, using a stainless steel trowel, over the depth interval nominated by the Environmental Scientist.

- A representative soil sample was recovered directly from the bulk backhoe bucket sample, using a stainless steel trowel or the sample was recovered directly from the steel trowel. The stainless steel trowel was decontaminated prior to use, in order to prevent cross contamination

- To minimise the potential loss of volatiles, the soil sample was immediately transferred to a labelled, laboratory supplied, 250ml glass jar and sealed with an airtight, Teflon screw top lid. The fully filled jar was then placed in a chilled container.

- The recovered soil sample and fibro-cement pieces for asbestos analysis were transferred into separate small plastic zip-lock bags, which were placed in a chilled container.

In order to ensure the analytical performance of the primary laboratory, duplicate and split samples were prepared for analyses. Samples were kept in a labelled laboratory supplied glass jar (acid-washed and solvent-rinsed) and sealed with an airtight screw Teflon top lid. The fully filled jar was placed in a chilled container.

A rinsate water sample was collected and placed in a glass bottle supplied by the laboratory at the end of each day field work. The fully filled bottle was labelled and placed in a chilled container.

At completion of field sampling, the chilled container was transported to our Penrith office. The chilled container was then transferred to a refrigerator where the temperature was maintained below 4°C.

The chilled containers were forwarded to the primary laboratory SGS Environmental Services (SGS) and the secondary laboratory, Envirolab Services Pty Ltd (Envirolab), both NATA accredited. Chains of Custody (COC) were then forwarded to the laboratories.

On receipt of the samples and COC, the laboratories returned the Sample Receipt Confirmation, verifying the integrity of all samples received.

In order to maximise the spatial coverage of the analysis, discrete topsoil samples were composited in the laboratory for chemical analysis of non-volatiles. Compositing of soil samples is suggested in "*Sampling Design Guidelines for Contaminated Sites"*-1995, EPA.

The methodology for compositing samples was generally adapted from "*Composite Sampling, National Environmental Health Forum Monographs, Soil Services No 3*", 1996-William H Lock, as follows.

- Three (3) equal-mass constituent samples were included in a composite sample.
- Each constituent sample was homogenised before sub-sampling and compositing of material was undertaken.

The following table details the compositing undertaken by the primary laboratory, as specified in the COC prepared by Geotechnique:

COMPOSITE SAMPLE	SUB-SAMPLES
Composite C1	TP1 (0-0.2m) + TP15 (0.1-0.3m) + TP62 (0-0.3m)
Composite C2	TP2 (0-0.15m) + TP3 (0-0.15m) + TP4 (0-0.15m)
Composite C3	TP5 (0-0.15m) + TP6 (0-0.15m) + TP7 (0-0.15m)
Composite C4	TP8 (0-0.15m) + TP17 (0-0.1m) + TP18 (0-0.15m)
Composite C5	TP9 (0-0.15m) + TP10 (0-0.15m) + TP14 (0-0.15m)
Composite C6	TP11 (0-0.15m) + TP12 (0-0.15m) + TP43 (0-0.1m)
Composite C7	TP13 (0-0.15m) + TP41 (0-0.15m) + TP44 (0-0.15m)
Composite C8	TP16 (0-0.15m) + TP39 (0-0.15m) + TP40 (0-0.15m)
Composite C9	TP19 (0-0.15m) + TP20 (0-0.15m) + TP21 (0-0.15m)
Composite C10	TP22 (0-0.1m) + TP25 (0-0.15m) + TP26 (0-0.1m)
Composite C11	TP24 (0-0.1m) + TP27 (0-0.15m) + TP74 (0-0.15m)
Composite C12	TP28 (0-0.1m) + TP29 (0-0.15m) + TP30 (0-0.15m)
Composite C13	TP31 (0-0.1m) + TP32 (0-0.15m) + TP33 (0-0.1m)

Composite C14	TP34 (0-0.15m) + TP35 (0-0.15m) + TP36 (0-0.1m)
Composite C15	TP37 (0-0.15m) + TP38 (0-0.1m) + TP45 (0-0.15m)
Composite C16	TP46 (0-0.1m) + TP47 (0-0.1m) + TP48 (0-0.15m)
Composite C17	TP49 (0-0.15m) + TP50 (0-0.1m) + TP55 (0-0.1m)
Composite C18	TP51 (0-0.2m) + TP52 (0-0.2m) + TP53 (0-0.2m)
Composite C19	TP54 (0-0.15m) + TP56 (0-0.15m) + TP58 (0-0.15m)
Composite C20	TP57 (0-0.1m) + TP59 (0-0.1m) + TP60 (0-0.1m)
Composite C21	TP61 (0-0.15m) + TP63 (0-0.15m) + TP64 (0-0.1m)
Composite C22	TP65 (0-0.15m) + TP66 (0-0.1m) + TP67 (0-0.1m)
Composite C23	TP68 (0-0.1m) + TP69 (0-0.1m) + TP71 (0-0.1m)
Composite C24	TP70 (0-0.15m) + TP72 (0-0.15m) + TP73 (0-0.1m)
Composite C25	TP8 (0.2-0.5m) + TP9 (0.15-0.4m) + TP18 (0.15-0.45m)
Composite C26	TP9 (0.4-0.7m) + TP18 (0.9-1.2m) + TP25 (0.2-0.5m)
Composite C27	TP14 (0.2-0.5m) + TP40 (0.2-0.3m) + TP41 (0.2-0.4m)
Composite C28	TP19 (0.15-0.45m) + TP39 (0.2-0.5m) + TP43 (0.1-0.4m)
Composite C29	TP21 (0-0.15m) + TP28 (0.2-0.5) + TP36 (0.1-0.3m)
Composite C30	TP28 (0.7-1.0m) + TP51 (0.2-0.5m) + TP53 (0.2-0.4m)
Composite C31	TP55 (0.1-0.4m) + TP59 (0.1-0.4m) + TP60 (0.1-0.4m)
Composite C32	TP67 (0.1-0.4m) + TP70 (0.15-0.4m) + TP74 (0.2-0.5m)

The soil profile encountered, as described in above sub-section of this report, did not reveal any visual (staining, dying) or olfactory indicators of potential contaminants with the exception of fibro-cement pieces in the fill profile at test pit location TP74. As a result and based on the potential for contamination identified in above sub-section, the following laboratory analysis plan was implemented:

- Discrete and composited topsoil, fill samples, stockpile samples and earth mound samples were analysed for Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc). For screening purposes, those discrete and composited topsoil, fill samples, stockpile samples and earth mound samples were also analysed for Organochlorine Pesticides (OCP). One discrete topsoil and one discrete earth mound sample were also analysed for Total Petroleum Hydrocarbons (TPH) and

BTEX (Benzene, Toluene, Ethyl Benzene and Xylenes), Polycyclic Aromatic Hydrocarbons (PAH) and Polychlorinated Biphenyls (PCB) for screening purposes.

- Due to the presence of fibro-cement pieces at one test pit location, fibro-cement pieces and corresponding soil sample were analysed for asbestos. For screening purposes, a fill sample and earth mound sample with inclusion of demolition waste were also analysed for asbestos for screening purposes.

The laboratory testing schedule adopted is presented in Table A in Appendix 5.

Field Quality Assurance (QA) and Quality Control (QC)

Sampling Personnel

Geotechnique undertook all the sampling associated with this assessment. An Environmental Scientist from Geotechnique (An Nguyen) nominated test pit positions based on the project brief prepared by the Project Manager, supervised (full time) excavation of each test pit, logged the soil profile encountered, recovered soil samples at a frequency determined by the sampling plan (project brief) and packaged the samples (refer to Section 8.0).

Mr Nguyen has a Bachelor of Science degree and has been employed by Geotechnique as an Environmental Scientist since March 2008. At commencement of employment, Mr Nguyen underwent supervised training in Geotechnique procedures for sampling and logging.

Decontamination Procedures

Soil sampling was carried out using a standard backhoe. A stainless steel trowel was used to transfer the soil sample from the backhoe bulk sample or directly from sample locations to the laboratory supplied glass jar. Decontamination of the trowel involved the following:

- Removal of soils adhering to the trowel by scrubbing with a brush;
- Washing the trowel thoroughly in a solution of phosphate free detergent (Decon 90) using brushes and disposable towels (Bucket 1);
- Rinsing the trowel thoroughly with distilled water (Bucket 2);
- Repeating the washing / rinsing steps and rinsing with water (Bucket 3);
- Drying the trowel with a clean cloth.

A sample of the final rinsate water composite (Bucket 3) was recovered at completion of each day sampling.

Rinsate Samples

A rinsate water sample was recovered on completion of each of the four days of field works in order to identify possible cross contamination between the sampling locations. Therefore, four (4) rinsate water samples (Rinsates R1 to R4) were recovered. A sample of the same water source used for cleaning the equipment (clean distilled water) was previously analysed by the primary laboratory, thus with known concentrations of the selected analytes. The concentrations of analytes in the rinsate sample were then compared with the result of the original distilled water.

The rinsate water samples were analysed for Metals (arsenic, lead, and/or zinc), which were not anticipated to be non-detect. The test results for the rinsate water and distilled water samples are summarised in Table B in Appendix 5. The laboratory test results certificates are included in Appendix 6.

As indicated in Table B, concentrations of the analytes of the rinsate water samples were the same as those of the distilled water sample, indicating that the cleaning and decontamination processes adopted in the field were adequate.

Trip Spike Sample

Trip spike samples are obtained from the laboratory on a regular basis, prior to conducting field sampling where volatile substances are suspected. The samples are held in the Penrith office of Geotechnique, at less than 4 degrees Celsius. During the field work, the trip spike samples are kept in the chilled container with soil samples recovered from the site. The trip spike sample is then forwarded to the primary laboratory together with the soil samples recovered from the site.

The laboratory prepares the trip spike by adding a known amount of pure petrol standard to a clean sand sample. The sample is mixed thoroughly to ensure a relatively homogenous distribution of the spike throughout the sample. When the sample is submitted for analysis, the same procedure is adopted for testing as for the soil samples being analysed from the site.

The purpose of the trip spike is to detect any loss, or potential loss, of volatiles from the soil samples, during field work, transportation, sample extraction or testing.

A trip spike sample (TS1) was forwarded to the primary analytical laboratory with the samples collected from the site and was tested for BTEX. The test results for the trip spike sample, reported as a percentage recovery of the applied and known spike concentrations, are shown in Table C in Appendix 5. The laboratory test results certificates are included in Appendix 6.

As indicated in Table C, the results show generally good recovery of the spike concentrations, ranging from 97% to 98%. Applying the losses experienced in the spike sample (worst case scenario), the actual concentrations of BTEX in each soil sample analysed, might be at worst, 0.10mg/kg (Benzene), 0.10mg/kg (Toluene), 0.10mg/kg (Ethyl benzene) and 0.31mg/kg (Xylenes). The concentrations in this case would still be considerably less than the suggested Levels in the EPA service station guidelines (1mg/kg, 1.4mg/kg, 3.1mg/kg and 14mg/kg). Furthermore, all BTEX results were less than laboratory detection limits.

Based on the above, it is considered that any loss of volatiles from the recovered samples that might have occurred would not affect the outcome / conclusions of this report.

Duplicate Samples

A field duplicate sample is prepared in the field, as follows:

- A larger than normal quantity of soil is recovered from the sample location selected for duplication.
- The sample is placed in a decontaminated stainless mixing bowl and divided into two portions, using the decontaminated trowel.
- A portion of the sub-samples was immediately transferred, using the decontaminated trowel, into a labelled, laboratory supplied, 250ml glass jar and sealed with an airtight,

Teflon screw top lid. The fully filled jar was labelled as the duplicate sample and immediately placed in a chilled container.

- The remaining portion is stored in the same way and labelled as the original sample.
- The field duplicate samples (labelled X1 to X6) were composited by the laboratory in the same way as the original samples

Duplicate samples were prepared on the basis of sample numbers recovered during the field work overall. The duplicate sample frequency was computed using the total number of samples analysed as part of this assessment. The duplicate sample frequencies computed are as follows;

Metals:	38 samples analysed;	3 duplicates;	7.9% frequency
TPH:	2 samples analysed;	1 duplicate;	50% frequency
BTEX:	2 samples analysed;	1 duplicate;	50% frequency
PAH:	2 samples analysed;	1 duplicate;	50% frequency
OCP:	38 samples analysed;	3 duplicates;	7.9% frequency
PCB:	2 samples analysed;	1 duplicate;	50% frequency

The duplicate frequency adopted complies with the NEPM, which recommends a duplicate frequency of at least 5%.

The duplicate samples test results are summarised in Tables D1 and D2 in Appendix 5. The laboratory test results certificates are included in Appendix 6

A comparison was made of the laboratory test results for the duplicate sample with the original sample and the Relative Percentage Differences (RPD) were computed to assess the accuracy of the laboratory test procedures. RPD within 50% are generally considered acceptable. However, this variation can be higher for organic analysis than for inorganics and for low concentrations of analytes.

As indicated in Tables D1 and D2, the comparisons between the duplicate and corresponding original sample indicated acceptable RPD, indicating the test results provided by SGS are of adequate accuracy and reliability for this assessment.

Inter-laboratory Duplicate / Split Sample

The inter-laboratory duplicate / split sample provides a check on the analytical performance of the primary laboratory. Inter-laboratory duplicate/ Split sample was prepared on the basis of sample numbers recovered during field work and the analyses undertaken by the primary laboratory.

The inter-laboratory duplicate/ split sample was prepared in the same manner as the duplicate sample. Reference should be made to above sub-section.

The split sample frequency was computed using the total number of samples analysed as part of this assessment. The split sample frequencies computed are as follows;

Metals:	38 samples analysed;	3 splits;	7.9% frequency
TPH:	2 samples analysed;	1 split;	50% frequency
BTEX:	2 samples analysed;	1 split;	50% frequency
PAH:	2 samples analysed;	1 split;	50% frequency
OCP:	38 samples analysed;	3 splits;	7.9% frequency
PCB:	2 samples analysed;	1 split;	50% frequency

The split sample frequency adopted complies with the NEPM, which recommends a frequency of 5%.

The split samples test results are summarised in Tables E1 and E2 in Appendix 5. The laboratory test results certificates are included in Appendix 6

Based on Schedule B (3) of the NEPM, the difference in the results between the split samples should generally be within 30% of the mean concentration determined by both laboratories, i.e., RPD should be within 30%. However, this variation can be higher for organic analysis than for inorganics and for low concentrations of analytes.

As shown in Tables E1 and E2, the comparisons between the splits and corresponding original samples indicated generally acceptable RPD overall. Higher RPD were computed for some metals, mainly due to heterogeneity of the samples. Therefore, the variations are not considered critical and the test results provided by the primary laboratory are deemed reliable for this assessment.

Laboratory QA & QC

Geotechnique uses only laboratories accredited by the National Association of Testing Authorities (NATA) for chemical analyses. The laboratory must also incorporate quality laboratory management systems, to ensure trained analysts, using validated methods and suitably calibrated equipment, in order to produce reliable results.

In addition to the quality control samples, the laboratory must also ensure that all analysts receive certification as to their competence in carrying out the analysis and participate in national and international proficiency studies.

SGS and Envirolab are accredited by NATA and operates a Quality System that is designed to comply with ISO 9002 and ISO Guide 25.

The test methods adopted by the laboratory are indicated with the laboratory test results certificates in Appendix F. As part of the analytical run for the project, the laboratory included laboratory blanks, duplicate samples, laboratory control samples and matrix spikes.

We have checked the QA/QC procedures and results adopted by the laboratory against the appropriate guidelines. The quality control sample numbers adopted by SGS and Envirolab are considered adequate for the analyses undertaken and generally conform to recommendations provided in the National Environment Protection Measure (NEPM) 1999

"*Guideline on Laboratory Analysis of Potentially Contaminated Soils*" and Australian and New Zealand Environment and Conservation Council (ANZECC)-1996 "*Guidelines for the Laboratory Analysis of Contaminated Soils*".

Overall, the quality control elements adopted by SGS and Envirolab indicate the analytical data to fall within acceptable levels of accuracy and precision for the analysis of soils. The analytical data provided is therefore considered to be reliable and useable for this assessment.

Assessment Criteria

The guidelines used in this assessment were as follows:

- The National Environment Protection (Assessment of Site Contamination) Measure (NEPM, 1999) in the National Environment Protection Council (NEPC) publications provide risk-based Health Investigation Levels (HIL) for selected organic and inorganic chemicals in Table 5-A of Schedule B(1) – Guideline on the Investigation Levels for Soil. These levels are provided for a variety of exposure settings.

  As the site is proposed for residential subdivision development, where lawns and domestic gardens could be established, with respect to human health, analytical results are assessed against risk based health investigation guidelines appropriate for *residential with access to soil* (HIL 'A').

- With regard to the protection of the environment, the provisional phytotoxicity based investigation levels (PPBIL) published in the *Guidelines for the NSW Site Auditor Scheme* (NSW DEC 2006) and Ecological Investigation Levels (EIL) published in the NEPM for inorganics are used.

- The *Guidelines for Assessing Service Station Sites* (NSW EPA, 1994) provide guidance regarding TPH and BTEX

The adopted assessment criteria are presented in the following table.

Contaminant	Assessment Criteria (mg/kg)			Source
	HIL 'A'	PPBIL/EIL	NSW EPA	
Inorganics				
Metals				
Arsenic	100	20	-	NEPM, 1999; NSW DEC,
Cadmium	20	3	-	NEPM, 1999; NSW DEC,
Chromium (III)	120,000	400	-	NEPM, 1999; NSW DEC,
Copper	1000	100	-	NEPM, 1999; NSW DEC,
Lead	300	600	-	NEPM, 1999; NSW DEC,
Mercury (Methyl / Inorganic)	10 / 15	1[a]	-	NEPM, 1999; NSW DEC,
Nickel	600	60	-	NEPM, 1999; NSW DEC,
Zinc	7,000	200	-	NEPM, 1999; NSW DEC,
Organics				
TPH/BTEX				

Contaminant	Assessment Criteria (mg/kg)			Source
C_6 to C_9 Fraction	-	-	65	NSW EPA, 1994
C_{10} to C_{40} Fraction	-	-	1,000	NSW EPA, 1994
Benzene	-	-	1	NSW EPA, 1994
Toluene	-	-	1.4	NSW EPA, 1994
Ethylbenzene	-	-	3.1	NSW EPA, 1994
Total Xylenes	-	-	14	NSW EPA, 1994
PAH				
Benzo(a)pyrene	1	-	-	NEPM, 1999
Total PAH	20	-	-	NEPM, 1999
OCP				
Aldrin + Dieldrin	10	-	-	NEPM, 1999
Chlordane	50	-	-	NEPM, 1999
DDT+DDD+DDE	200	-	-	NEPM, 1999
Heptachlor	10	-	-	NEPM, 1999
PCB (Total)	10	-	-	NEPM, 1999

a: Total Mercury

In order to detect any potential "hot spots" of contamination within an individual composite sample, an adjusted HIL'A' / PPBIL is recommended for assessment of results for individual composite samples, based on Method 1, Section 6 of the EPA "*Sampling Design Guidelines*" 1995. The Adjusted PPBIL / HIL'A', presented in the applicable tables, were calculated by dividing the PPBIL / HIL'A' by three (i.e. three sub-samples comprised the composite). Individual composite samples were assessed against the adjusted PPBIL / HIL'A'.

If the concentration of an analyte for a composite sample is in excess of the Adjusted PPBIL / HIL'A', then all sub-samples of the failed composite samples will be analysed individually. The purpose of this is to detect potentially contaminated sub-sample(s) within the failed composite sample.

For discrete samples, the individual concentrations of analytes were assessed against the PPBIL and HIL'A', or the suggested Levels in the EPA service station guidelines.

For asbestos assessment, the site must be free of asbestos-cement pieces and no asbestos fibre detected in the soils.

The site (or study area) will be deemed contaminated or containing contamination "hot spots" if the above criteria are unfulfilled. Further investigation, remediation and/or management will be recommended if the area of concern is found to be contaminated or contain contamination "hot spots".

Laboratory Test Results

Reference may be made to Appendix 6 for the actual laboratory test results certificates from SGS. The test results are also presented in Tables F to K in Appendix 5, together with the assessment criteria adopted. Discussion of the test data is presented in the following sub-sections.

Metals (As, Cd, Cr, Cu, Pb, Hg, Ni & Zn)

Some discrete samples were analysed for Metals. The metals test data for the discrete samples are presented in Table 6. As shown in the table, with the exception of highlighted zinc (Zn) concentration, the concentrations of other Metals were below the relevant provisional phytotoxicity based investigation levels (PPBIL) and the Health Investigation Levels (HIL) for residential development with access to soil (HIL 'A').

The highlighted Zn concentration exceeded the PPBIL, but was below the HIL'A'.

The metals test data for the composited samples are presented in Table G. As shown in the table, with the exception of highlighted arsenic (As), lead (Pb) and Zn concentrations, the concentrations of other Metals were below the relevant Adjusted PPBIL and the Adjusted HIL 'A'.

The highlighted As Pb and Zn concentrations exceeded the Adjusted PPBIL, but were below the HIL'A', whilst the highlighted Pb concentration exceeded both the Adjusted HIL'A' and Adjusted PPBIL.

The sub-samples of the failed composite samples were therefore analysed for As Pb and/or Zn. The test results are summarised in Tables G1 to G3.

As shown in Table G1, all As concentrations were below the PPBIL and the HIL'A'.

As shown in Table G2, with the exception of highlighted concentration, the remaining concentrations of Pb were below the PPBIL and the HIL'A'.

The highlighted Pb concentration exceeded both the HIL'A' and the PPBIL.

As shown in Table F6, with the exception of highlighted concentration, the remaining concentrations of Zn were below the PPBIL and the HIL'A'.

The highlighted Zn concentration exceeded the PPBIL, but was below the HIL'A'.

TPH and BTEX

The TPH and BTEX test data for the discrete samples are presented in Table H, as compositing is not appropriate for volatile analysis

As shown in Table H, all TPH and BTEX were below the suggested Levels in the EPA service station guidelines and were also less than the laboratory limits of reporting (LOR).

Polycyclic Aromatic Hydrocarbons (PAH)

The PAH test results for discrete samples are presented in Table I as Benzo(a)Pyrene and Total PAH. Benzo(a)pyrene is a known human carcinogen and in high concentrations presents a significant human health risk. The NSW EPA has produced health based assessment criteria for Benzo(a)Pyrene, as well as the sum of PAH.

As indicated in Table I, all Benzo(a)Pyrene and Total PAH were below the relevant HIL'A'. All Benzo(a)Pyrene concentrations were also less than laboratory LOR.

Organochlorine Pesticides (OCP)

The OCP test results for the discrete samples are presented in Table I and as indicated, the concentrations of OCP were all less than the laboratory LOR and below the HIL 'A'.

The OCP test results for the composited samples are presented in Table J and as indicated, the concentrations of OCP were all less than the laboratory LOR and below the Adjusted HIL 'A'.

Polychlorinated Biphenyls (PCB)

The PCB test results for the discrete samples are presented in Table I and as indicated, the concentrations of PCB were all less than the laboratory LOR and below the HIL 'A'.

Asbestos

The asbestos test results for discrete samples re are presented in Table K.

As shown in Table K, the fibro-cement pieces found in the fill profile at TP74 contain Chrysotile Asbestos.

As also shown in Table K, no asbestos was detected in the analysed soil samples.

5. Assessment

At a glance

Elevated lead (Pb) concentrations present a potential risk of harm to human health. Asbestos-cement pieces also present a potential risk of harm to human health. Elevated zinc (Zn) concentration could potentially impact on the growth of certain plant species but would not present a risk of harm to human health. Therefore remediation is required.

The elevated lead (Pb) concentration (2400mg/kg) in topsoil in test pit location TP7 exceeded both the HIL'A' and the PPBIL, which presents a potential risk of harm to human health and could impact on the growth of certain plant species. The elevated zinc (Zn) concentrations (280mg/kg) in topsoil in test pit locations TP2 and soil stockpile sample SP1 exceeded relevant PPBIL but were below the HIL'A', which might impact on the growth of certain plant species, but would not present a risk of harm to human health.

The fibro-cement pieces encountered in the fill profile at test pit location TP74, contain Chrysotile Asbestos, which presents a potential risk of harm to human health.

The above-mentioned locations of concern are indicated and tabulated on Drawing No 12467/2-AA3 in Appendix 1.

In order to estimate the impacted area, it is required to carry out detailed sampling and testing in the vicinity of locations of concern to delineate the extent of contamination. Some form of remediation is required to address the concern for the elevated metals concentrations and the presence of asbestos-cement pieces, followed by appropriate validation.

The earth mound observed on the site was found not contaminated.

Soils beneath existing houses

Due to the age of the housing, concealed pipes (water, sewer or stormwater), walls etc.might contain asbestos. This can be ascertained by a hazardous materials survey of the houses. The fibro structures might impact on surface soils if demolition is not carried out properly.

This chapter should contain the analysis about your findings. It should explain the significance of your findings and the main conclusions that support your recommendations.

Unexpected finds

There is the possibility of encountering an unexpected find in the course of construction on any part of the site. By way of examples, a find could be:

- underground storage tanks;
- filled pits or gullies;
- rubbish pits or buried building rubble;

- unusual soil staining or discolouration;
- odour emanating from the ground during excavation;
- fragments of asbestos-cement products on the surface or unearthed during excavation. There is potential asbestos cement conduits and pits throughout the site; and,
- ash, coal and coal dust.

An Unexpected Finds Protocol (UFP) is to be part of the Construction Environmental Management Plan (CEMP). Typically, the UFP will direct that when there is an unexpected find:

- work immediately ceases in the area;
- the area is cordoned off;
- a suitably qualified environmental engineer/scientist undertakes sampling and testing, undertakes a detailed assessment and prepares a Remediation Action Plan (RAP) to direct the remediation works;
- the report of the assessment and the RAP is reviewed and endorsed by the Site Auditor; and,
- the remediation works are undertaken and the environmental engineer/scientist validates the area(s) on completion of remediation to the satisfaction of the Site Auditor.

Responsibility for implementing and managing the UFP is principally with the Principal Contractor, however, Landcom, its environmental engineer/scientist and the Site Auditor also have key roles.

Construction workers are informed of the UFP and trained in the identified of unexpected finds as part of site induction and the likes of regular ‘tool box’ refresher sessions.

6. References

1. Sherwin, L. and Holmes, G.G (Ed) : Geology of the Wollongong and Port Hacking (Map sheets 9029-9129 scale 1 1:100,00), Geological Survey of New South Wales, Department of Mineral Resources, 1986.

2. Hazelton, P. A., Bannermann, S. M. and Tille, P. J. (Ed) : Soil Landscapes of the Wollongong and Port Hacking (Map sheets 9029-9129 scale 1 1:100,00), Soil Conservation Services of NSW, 1984.

Appendix 1: Drawings

DRAWING NO 12467/2-AA1	SITE FEATURES & TEST PIT LOCATIONS
DRAWING NO 12467/2-AA2	TEST PIT AND SAMPLE LOCATIONS
DRAWING NO 12467/2-AA3	LOCATIONS OF CONCERN

Aerial photograph obtained from nearmap.com

N

LEGEND

Open stormwater drainage system

0 75 150 225 300 375m

Scale 1:7500

GEOTECHNIQUE PTY LTD
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NOTES

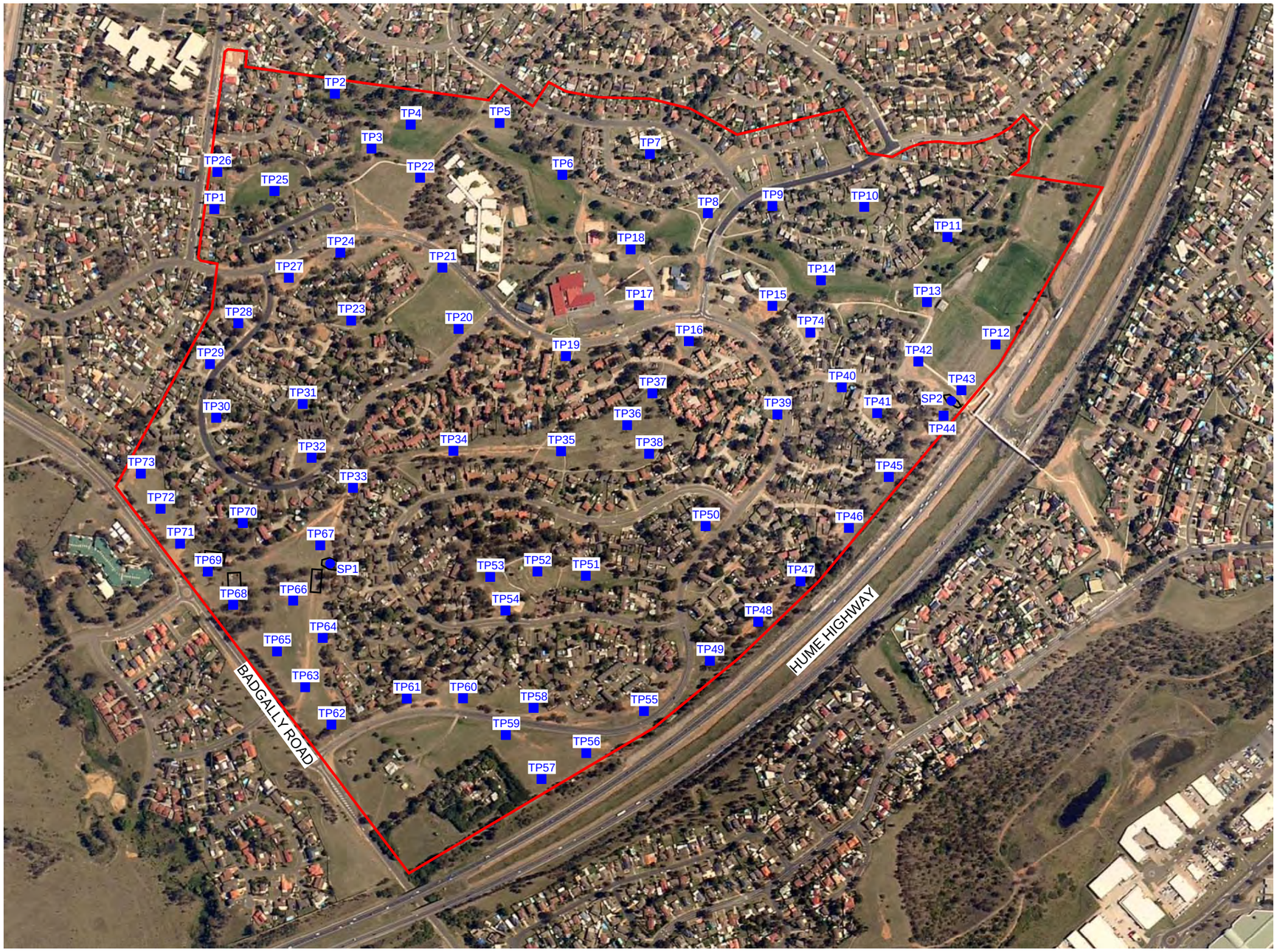
1. This drawing has been produced using a base plan provided by others, to which additional information e.g., test pits, borehole locations or notes have been added. Some or all of the information on this plan may not be relevant at the time of producing this drawing.
2. Site features are shown at approximate locations and are not to scale.

Landcom Parramatta
Claymore Urban Renewal
Badgally Road
Claymore

Site Features

Drawing No: 12467/2-AA1
Job No: 12467/2
Drawn By: MH
Date: 10 May 2011
Checked By: AB

File Ref: Drawing 12467-2
Layers: 0, AA1



Aerial photograph obtained from nearmap.com

N

LEGEND

- Test Pit
- Sample

0 75 150 225 300 375m

Scale 1:7500

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NOTES

1. This drawing has been produced using a base plan provided by others, to which additional information e.g., test pits, borehole locations or notes have been added. Some or all of the information on this plan may not be relevant at the time of producing this drawing.
2. Site features are shown at approximate locations and are not to scale.

Landcom Parramatta
Claymore Urban Renewal
Badgally Road
Claymore

Test Pit and Sample Locations

Drawing No: 12467/2-AA2
Job No: 12467/2
Drawn By: MH
Date: 17 May 2011
Checked By: AB

File Ref: Drawing 12467-2
Layers: 0, AA2

N

Sample Location	Depth (m)	Contaminant / Concern	Concentration (mg/kg)	Level (mg/kg)	
				PPBIL	**HIL 'A'**
TP2	0-0.15	Zinc (Zn)	**280**	Zn = 200	Zn = 7000
TP7	0-0.15	Lead (Pb)	**2400**	Pb = 600	Pb = 300
TP74	0.15-0.6	Asbestos-cement pieces	**NA**		
SP1	0-0.5	Zn	**280**		

Notes: PPBIL = Provisional Phytotoxicity-Based Investigation Level

HIL 'A' = Health Investigation Level for Residential with Access to Soil

NA : Not Applicable

LEGEND

- Test Pit
- Sample

Aerial photograph obtained from nearmap.com

0 75 150 225 300 375m

Scale 1:7500

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NOTES

1. This drawing has been produced using a base plan provided by others, to which additional information e.g., test pits, borehole locations or notes have been added. Some or all of the information on this plan may not be relevant at the time of producing this drawing.
2. Site features are shown at approximate locations and are not to scale.

Landcom Parramatta
Claymore Urban Renewal
Badgally Road
Claymore

Locations of Concern

Drawing No: 12467/2-AA3
Job No: 12467/2
Drawn By: MH
Date: 19 May 2011
Checked By: AB

File Ref: Drawing 12467-2
Layers: 0, AA3

Appendix 2: Engineering Logs and Sample Logs

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 1
Date : 05/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES		DS		0			FILL; Silty Clay, medium plasticity, brown				
	ES		U_{50}		0.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	VSt		Alluvial
					1		CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M≤PL	VSt		
			DS		1.5		CL-CI	Silty CLAY, low to medium plasticity, orange brown	M≤PL	St-VSt		
					2							
					2.5			Test Pit No 1 terminated at 2.5m				
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 2
Date : 05/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	VSt		Alluvial
			DS		0.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	VSt		
					1		CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M≤PL	VSt		Moisture content increases
			DS		1.5							
			DS		2							
DRY					2.5							
								Test Pit No 2 terminated at 2.7m				
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 3
Date : 05/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES			CONE 4	0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES			11			CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	St		Alluvial
				12								
				22								
			DB		0.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	St		
					1		CL-CI	Silty CLAY, low to medium plasticity, orange brown	M≤PL	St		
			DS		1.5							
			DS		2		CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M≥PL	St-VSt		
					2.5			Test Pit No 3 terminated at 2.5m				
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 4
Date : 05/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	St		Alluvial
					0.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	St		
							CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M≥PL	St		
			DS		1							
			DS		1.5							
					2							
			DS		2.5		CH	Silty CLAY, high plasticity, grey, with shale fragments	M≥PL	St		Residual
Dry					3			Test Pit No 4 terminated at 3.0m				
					3.5							
					4							
					4.5							

GEOTECHNIQUE
PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 5
Date : 05/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	VSt		Alluvial
			DS		0.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	VSt-H		
			DS		1							
			DS		1.5							
			DS		2							
DRY					2.5		CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
								Test Pit No 5 terminated at 2.6m due to refusal on shale bedrock				
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 6
Date : 05/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES		DS	CONE 7	0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES			11			CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	H		Alluvial
				7								
				13								
				13			CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	H		
				12	0.5							
				12								
				14								
				20								
			DS		1		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	H		
			DS		1.5							
DRY								SHALE, grey brown, extremely to distinctly weathered				Bedrock
					2			Test Pit No 6 terminated at 2.0m due to refusal on shale bedrock				
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 7
Date : 05/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe **R.L. surface :**

Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	VSt-H		Alluvial
			U_{50}		0.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	H		
			DS		1							
							CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
			DS		1.5			SHALE, grey brown, extremely to distinctly weathered				Bedrock
Dry								Test Pit No 7 terminated at 1.6m due to refusal on shale bedrock				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 8
Date : 05/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe **R.L. surface :**

Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES				0.5			FILL; Silty Clay, medium plasticity, brown				
	ES				1							
Dry	ES		DS		1.5		CL-CI	Silty CLAY, low to medium plasticity, orange brown	M≤PL	St-VSt		Alluvial
					2							
					2.5			Test Pit No 8 terminated at 2.8m				
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road Claymore

Job No : 12467/1&2
Pit No : 9
Date : 02/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe **R.L. surface :**

Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES		DS		0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES							FILL; Silty Clay, medium plasticity, brown, with brick fragments				
	ES				0.5			FILL; Silty Clay, low to medium plasticity, grey				
	ES		DS				CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	VSt		Alluvial
					1		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	H		
			DS		1.5							
					2							
			DS		2.5							
					3		CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	H		
					3.5		CH	Silty CLAY, high plasticity, orange brown, grey	M<PL	St		Residual
					4			Test Pit No 9 terminated at 3.7m				
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 10
Date : 02/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe **R.L. surface :**

Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	St		Alluvial
			DS		0.5							
			DB				CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	VSt-H		
					1							
			DS									
					1.5							
					2							
							CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M=PL	VSt-H		
			DS		2.5							
					3		CH	Silty CLAY, high plasticity, orange brown, grey, traces of ironstone	M=PL	VSt-H		Residual
Dry					3.5							
			DS									
					4			Test Pit No 10 terminated at 4.0m				
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 11
Date : 02/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES		DS				CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	St		Alluvial
			U_{50}		0.5		CH	Silty CLAY, high plasticity, orange brown, grey	M<PL	H		
					1		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M≤PL	VSt-H		
			DS		1.5							
					2							
			DS		2.5							
					3							
					3.5		CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M≤PL	VSt-H		
Dry												
					4			Test Pit No 11 terminated at 3.8m				
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 12
Date : 05/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES			CONE 3	0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
				8								
	ES			9			CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	H		Alluvial
				8								
				8								
				9	0.5							
			DS	17			CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	H		
				15								
				17			CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
			DS		1			SHALE, grey brown, extremely to distinctly weathered				Bedrock
								Test Pit No 12 terminated at 1.2m due to refusal on shale bedrock				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 13
Date : 02/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe **R.L. surface :**

Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES		DS				CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	St		Alluvial
					0.5		CH	Silty CLAY, high plasticity, orange brown, grey	M<PL	VSt		
							CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M≤PL	VSt		
			DS		1							
					1.5							
			DS		2							
					2.5		CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M≥PL	VSt		
					3			Test Pit No 13 terminated at 3.0m				
					3.5							
					4							
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 14
Date : 02/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe **R.L. surface :**

Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES		DS		0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES		U_{50}		0.5			FILL; Silty Clay, medium to high plasticity, brown, with shale fragments				
	ES		DS		1							
	ES		DS		1.5		CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	VSt-H		Alluvial
					2			SHALE, grey brown, extremely to distinctly weathered				Bedrock
					2.5			Test Pit No 14 terminated at 2.2m due to refusal on shale bedrock				
					3							
					3.5							
					4							
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 15
Date : 02/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			FILL; Silty Clay, high plasticity, orange brown, traces of roots				
	ES							FILL; Silty Clay, medium plasticity, brown				
	ES		DS		0.5		CH	Silty CLAY, high plasticity, orange brown, grey	M<PL	St		Residual
			DS									
			DS		1			SHALE, grey brown, extremely to distinctly weathered				Bedrock
Dry					1.5			Test Pit No 15 terminated at 1.1m due to refusal on shale bedrock				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 16
Date : 05/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe **R.L. surface :**

Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES		DS				CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	VSt		Alluvial
							CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	H		
			U_{50}		0.5		CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	H		
			DS		1		CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
Dry			DS		1.5			SHALE, grey brown, extremely to distinctly weathered				Bedrock
								Test Pit No 16 terminated at 1.5m due to refusal on shale bedrock				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road Claymore

Job No : 12467/1&2
Pit No : 17
Date : 05/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
dry	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	VSt		Alluvial
			DB		0.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	H		
			DS		1		CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
								SHALE, grey brown, extremely to distinctly weathered				Bedrock
								Test Pit No 17 terminated at 1.1m due to refusal on shale bedrock				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 18
Date : 05/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES		DS		0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES				0.5			FILL; Silty Clay, medium plasticity, brown		VSt		
	ES		DS		1			FILL; Clay, medium plasticity, dark grey		St		
	ES				1.5							
					2			Test Pit No 18 terminated at 2.2m				Test Pit located on drainage swale
					2.5							
					3							
					3.5							
					4							
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 19
Date : 05/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe **R.L. surface :**

Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES							FILL; Silty Clay, medium plasticity, brown				
	ES		U_{50}		0.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	VSt-H		Alluvial
			DS		1							
					1.5							
			DS				CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	H		
					2			Test Pit No 19 terminated at 2.2m due to refusal on extremely weathered shale				
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 20
Date : 05/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES		DS		0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	H		Alluvial
			DB		0.5		CH	Silty CLAY, high plasticity, orange brown, grey	M<PL	H		
					1							
			DS				CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
Dry					1.5			SHALE, grey brown, extremely to distinctly weathered				Bedrock
								Test Pit No 20 terminated at 1.5m due to refusal on shale bedrock				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 21
Date : 04/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES		DS	CONE 2	0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES			11				FILL; Silty Clay, medium to high plasticity, brown, with shale fragments	M<PL	St		
				12								
	ES			10								
				5								
				6	0.5		CH	Silty CLAY, high plasticity, orange brown, grey	M<PL	VSt		Alluvial
			DS	9								
				11								
				17			CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	H		
					1							
							CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
			DS		1.5							
								SHALE, grey brown, extremely to distinctly weathered				Bedrock
								Test Pit No 21 terminated at 1.8m due to refusal on shale bedrock				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road Claymore

Job No : 12467/1&2
Pit No : 22
Date : 05/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	VSt		Alluvial
							CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	H		
			U_{50}		0.5		CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	H		Residual
							CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		
			DS		1							
Dry			DS		1.5			SHALE, grey brown, extremely to distinctly weathered				Bedrock
								Test Pit No 22 terminated at 1.6m due to refusal on shale bedrock				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 23
Date : 04/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
dry	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	VSt		Alluvial
			DS		0.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	H		
					1		CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
			DS					SHALE, grey brown, extremely to distinctly weathered				Bedrock
					1.5			Test Pit No 25 terminated at 1.4m due to refusal on shale bedrock				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 24
Date : 04/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES		DS		0			TOPSOIL; Silty Sand, fine grained, dark brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	St		Alluvial
			U_{50}		0.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	VSt		
							CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
			DS		1.5			SHALE, grey brown, extremely to distinctly weathered				Bedrock
					2			Test Pit No24 terminated at 1.7m due to refusal on shale bedrock				
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 25
Date : 05/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES							FILL; Clay, medium plasticity, dark grey		VSt		
					0.5							
	ES											
					1		CL-CI	Silty CLAY, low to medium plasticity, orange brown	M>PL	VSt		Alluvial
	ES											
			DS				CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M>PL	VSt-H		
					1.5							
							CH	Silty CLAY, high plasticity, grey, with shale fragments	M>PL	H		Residual
			DS		2							
					2.5							
								Test Pit No 25 terminated at 2.6m				
					3							
					3.5							
					4							
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 26
Date : 05/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES			CONE 8	0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES			7			CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	VSt		Alluvial
				7								
				5								
				5	0.5		CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	H		
			DS	10								
				13								
				13			CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
				22								
			DS		1			SHALE, grey brown, extremely to distinctly weathered				Bedrock
								Test Pit No 26 terminated at 1.2m due to refusal on shale bedrock				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 27
Date : 04/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES				0			TOPSOIL; Silty Sand, fine grained, dark brown, traces of roots				
	ES		DS				CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	H		Alluvial
			DB		0.5		CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	H		
			DS		1		CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
					1.5			SHALE, grey brown, extremely to distinctly weathered				Bedrock
					2			Test Pit No 27 terminated at 1.9m due to refusal on shale bedrock				
					2.5							
					3							
					3.5							
					4							
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 28
Date : 04/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
dry	ES		DS	CONE 4	0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
				8				FILL; Silty Clay, medium to high plasticity, brown, with shale fragments				
	ES			11								
				16								
				27	0.5							
				35/ref								
	ES				1							
	ES		DS									
					1.5			Test Pit No 28 terminated at 1.4m due to refusal on concrete pipe				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 29
Date : 04/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES		DS		0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	VSt		Alluvial
					0.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	H		
			DS									
					1		CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
			DS		1.5							
Dry					2			SHALE, grey brown, extremely to distinctly weathered				Bedrock
								Test Pit No 29 terminated at 2.1m due to refusal on shale bedrock				
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 30
Date : 04/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe **R.L. surface :**

Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES		DS		0.5		CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	VSt		Alluvial
			U_{50}				CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	H		
					1		CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
Dry			DS		1.5			SHALE, grey brown, extremely to distinctly weathered				Bedrock
					2			Test Pit No 30 terminated at 2.0m due to refusal on shale bedrock				
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road Claymore

Job No : 12467/1&2
Pit No : 31
Date : 04/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES		DS	CONE 6	0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES			12			CL	Silty CLAY, low plasticity, grey, traces of root fibres, with ironstone	M<PL	VSt-H		Alluvial
				7								
				7	0.5							
			DS	11			CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	H		
				30	1							
							CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	H		
			DS		1.5							
							CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	H		
			DS		2							
					2.5							
					3			Test Pit No 31 terminated at 3.0m due to refusal on bedrock				
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 32
Date : 04/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	VSt		Alluvial
			DB		0.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	VSt		
							CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
Dry			DS		1			SHALE, grey brown, extremely to distinctly weathered				Bedrock
								Test Pit No 32 terminated at 1.1m due to refusal on shale bedrock				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 33
Date : 04/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES		DS		0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	H		Alluvial
			U_{50}		0.5		CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	H		
							CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		
			DS					SHALE, grey brown, extremely to distinctly weathered				Bedrock
					1			Test Pit No 33 terminated at 0.9m due to refusal on shale bedrock				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 34
Date : 04/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES		DS	CONE 10	0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES			11			CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	VSt		Alluvial
				8			CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	H		
				9								
				8	0.5							
			DS	14			CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
				23				SHALE, grey brown, extremely to distinctly weathered				Bedrock
					1			Test Pit No 34 terminated at 0.9m due to refusal on shale bedrock				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road Claymore

Job No : 12467/1&2
Pit No : 35
Date : 04/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	H		Alluvial
			DS		0.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	H		
			DS		1		CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
								SHALE, grey brown, extremely to distinctly weathered				Bedrock
					1.5			Test Pit No 35 terminated at 1.3m due to refusal on shale bedrock				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 36
Date : 04/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe **R.L. surface :**

Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES		DS		0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES							FILL; Silty Clay, medium to high plasticity, brown, with shale fragments				
	ES						CH	Silty CLAY, high plasticity, orange brown, grey	M<PL	H		Alluvial
					0.5		CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
Dry			DS		1			SHALE, grey brown, extremely to distinctly weathered				Bedrock
								Test Pit No 36 terminated at 1.1m due to refusal on shale bedrock				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road Claymore

Job No : 12467/1&2
Pit No : 37
Date : 04/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES		DS		0.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	VSt		Alluvial
							CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	VSt-H		Residual
Dry			DS		1			SHALE, grey brown, extremely to distinctly weathered				Bedrock
								Test Pit No 37 terminated at 1.0m due to refusal on shale bedrock				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 38
Date : 04/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES			CONE 5	0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES			7			CL	Silty CLAY, low plasticity, grey, traces of root fibres	M≤PL	VSt-H		Alluvial
			DS	8								
				6			CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	VSt-H		
				7	0.5							
			DS	20			CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
								SHALE, grey brown, extremely to distinctly weathered				Bedrock
					1			Test Pit No 38 terminated at 0.9m due to refusal on shale bedrock				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 39
Date : 03/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe **R.L. surface :**

Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
			DS					FILL; Silty Clay, medium plasticity, brown				
	ES				0.5							
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	St		Alluvial
			DB		1		CH	Silty CLAY, high plasticity, orange brown, grey				
			DS				CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	VSt-H		
			DS		1.5			SHALE, grey brown, extremely to distinctly weathered				Bedrock
					2			Test Pit No 39 terminated at 2.1m due to refusal on shale bedrock				
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road Claymore

Job No : 12467/1&2
Pit No : 40
Date : 02/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe **R.L. surface :**

Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES			CONE 5	0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES		DS	8				FILL; Silty Clay, medium to high plasticity, brown, with shale fragments		VSt-H		
				6	0.5							
				9								
				14								
				9								
				15								
				14								
				15			CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	H		Alluvial
			DS		1							
					1.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	H		
							CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	S-St		
			DS		2							
					2.5							
					3			Test Pit No 40 terminated at 3.0m				
					3.5							
					4							
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road Claymore

Job No : 12467/1&2
Pit No : 41
Date : 02/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES			CONE 12	0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
				11								
	ES			12				FILL; Silty Clay, low to medium plasticity, grey	M<PL	St		
				12								
	ES		U_{50}	12	0.5		CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	St		Alluvial
				14								
				15								
				17			CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	VSt		
				18								
				20	1		CH	Silty CLAY, high plasticity, orange brown, grey	M<PL	VSt		Residual
			DS		1.5							
							CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		
			DS		2							
					2.5			SHALE, grey brown, extremely to distinctly weathered				Bedrock
					3			Test Pit No 41 terminated at 2.8m due to refusal on shale bedrock				
					3.5							
					4							
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 42
Date : 02/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe **R.L. surface :**

Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES				0			FILL; Crushed Shale, with medium to high plasticity clay and ironstone				
	ES		DS				CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	St		Alluvial
					0.5		CH	Silty CLAY, high plasticity, orange brown, grey	M<PL	St-VSt		
					1		CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
			DS		1.5							
			DS		2			SHALE, grey brown, extremely to distinctly weathered				Bedrock
					2.5			Test Pit No 42 terminated at 2.5m due to refusal on shale bedrock				
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 43
Date : 03/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES							FILL; Silty Clay, medium plasticity, brown				
	ES		DS		0.5		CI-CH	Silty CLAY, medium to high plasticity, grey, with shale fragments	M<PL	H		Residual
			DS		1			SHALE, grey brown, extremely to distinctly weathered				Bedrock
					1.5			Test Pit No 43 terminated at 1.3m due to refusal on shale bedrock				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 44
Date : 03/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe **R.L. surface :**

Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	St		Alluvial
			DS		0.5		CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	VSt-H		
					1		CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
			DS		1.5							
			DS		2			SHALE, grey brown, extremely to distinctly weathered				Bedrock
					2.5			Test Pit No 44 terminated at 2.2m due to refusal on shale bedrock				
					3							
					3.5							
					4							
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 45
Date : 03/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES		DS				CH	Silty CLAY, high plasticity, orange brown, grey	M<PL	VSt		Residual
			DS		0.5							
							CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		
			DS		1							
Dry					1.5			SHALE, grey brown, extremely to distinctly weathered				Bedrock
								Test Pit No 45 terminated at 1.6m due to refusal on shale bedrock				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road Claymore

Job No : 12467/1&2
Pit No : 46
Date : 03/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
dry	ES			CONE 9 20	0		CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	VSt		Alluvial
			DS		0.5		CH	Silty CLAY, high plasticity, orange brown, grey	M<PL	H		
			DS		1		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	H		
			DS		1.5		CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	H		
			DS		2		CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
					2.5							
					3							
					3.5			Test Pit No 46 terminated at 3.5m on shale bedrock				
					4							
					4.5							

GEOTECHNIQUE PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road Claymore

Job No : 12467/1&2
Pit No : 47
Date : 02/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
dry	ES		DS		0			SHALE, grey brown, extremely to distinctly weathered				On the base of a drainage swale Bedrock
			DS		0.5							
					1							
					1.5			Test Pit No 47 terminated at 1.4m due to refusal on shale bedrock				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 48
Date : 03/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe **R.L. surface :**

Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES				0		CH	Silty CLAY, high plasticity, orange brown, grey	M≤PL	St		Residual
			U_{50}									
			DS		0.5		CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		
			DS		1							
			DS		1.5			SHALE, grey brown, extremely to distinctly weathered				Bedrock
					2			Test Pit No 48 terminated at 2.1m due to refusal on shale bedrock				
					2.5							
					3							
					3.5							
					4							
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 49
Date : 03/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	St		Alluvial
			DS		0.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, grey	M<PL	VSt		
			DB		1							
							CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	VSt-H		
			DS		1.5							
					2		CI-CH	Silty CLAY, medium to high plasticity, brown red, traces of ironstone and shale fragments	M<PL	H		
Dry			DS		2.5			Test Pit No 49 terminated at 2.5m				
					3							
					3.5							
					4							
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road Claymore

Job No : 12467/1&2
Pit No : 50
Date : 03/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe **R.L. surface :**

Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES		DS		0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	St		Alluvial
			U_{50}		0.5		CH	Silty CLAY, high plasticity, orange brown, grey	M<PL	VSt		
			DS		1			SHALE, grey brown, extremely to distinctly weathered				Bedrock
					1.5			Test Pit No 50 terminated at 1.3m due to refusal on shale bedrock				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 51
Date : 05/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES		DS		0			TOPSOIL; Silty Sand, fine grained, dark brown, traces of roots				
	ES							FILL; Silty Clay, medium plasticity, brown		H		
			U_{50}		0.5							
			DS									
	ES				1							
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	H		Alluvial
			DS		1.5		CL-CI	Silty CLAY, low to medium plasticity, orange brown	M≤PL	H		
Dry					2		CI-CH	Silty CLAY, medium to high plasticity, grey, with shale fragments	M<PL	H		
					2.5			Test Pit No 51 terminated at 2.5m				
					3							
					3.5							
					4							
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 52
Date : 05/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES		DS	CONE 10, 11, 14, 22	0			TOPSOIL; Silty Sand, fine grained, dark brown, traces of roots				
	ES		DS		0.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	H		Alluvial
			DS		1		CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	H		
			DS		1.5							
					2			Test Pit No 52 terminated at 2.2m due to refusal on siltstone				
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road Claymore

Job No : 12467/1&2
Pit No : 53
Date : 05/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe **R.L. surface :**

Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES		DS		0			TOPSOIL; Silty Sand, fine grained, dark brown, traces of roots				
	ES							FILL; Silty Clay, medium plasticity, brown				
	ES				0.5		CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	H		Alluvial
			DS		1		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	H		
					1.5			Test Pit No 53 terminated at 1.5m due to refusal on siltstone/sandstone bedrock				Bedrock
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road Claymore

Job No : 12467/1&2
Pit No : 54
Date : 05/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	VSt		Alluvial
			DB		0.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	VSt-H		
							CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	H		
			DS		1		CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
Dry			DS		1.5			SHALE, grey brown, extremely to distinctly weathered				Bedrock
					2			Test Pit No 54 terminated at 1.6m due to refusal on shale bedrock				
					2.5							
					3							
					3.5							
					4							
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 55
Date : 03/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES		DS					FILL; Silty Clay, medium to high plasticity, brown, with shale fragments				
								ASPHALTIC CONCRETE				Former road
	ES				0.5			FILL; Crushed Sandstone, with fine to medium grained sand, yellow brown				
	ES						CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
Dry			DS		1.5			SHALE, grey brown, extremely to distinctly weathered				Bedrock
								Test Pit No 55 terminated at 1.6m due to refusal on shale bedrock				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 56
Date : 03/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe **R.L. surface :**

Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES		DS		0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	St		Alluvial
					0.5		CH	Silty CLAY, high plasticity, orange brown, grey	M<PL	VSt		
			DS		1		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	H		
					1.5							
					2		CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
			DS					SHALE, grey brown, extremely to distinctly weathered				Bedrock
					2.5			Test Pit No 56 terminated at 2.5m due to refusal on shale bedrock				
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road Claymore

Job No : 12467/1&2
Pit No : 57
Date : 03/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES		DS	CONE 5	0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES			6			CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
			U_{50}	6	0.5							
				8								
			DS	14								
				20				SHALE, grey brown, extremely to distinctly weathered				Bedrock
					1			Test Pit No 57 terminated at 0.9m due to refusal on shale bedrock				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 58
Date : 03/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES		DS		0.5		CL	Silty CLAY, low plasticity, grey, traces of root fibres, with ironstone	M<PL	St		Alluvial
			U_{50}		1		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	VSt		
			DS		1.5		CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	VSt-H		Residual
Dry								SHALE, grey brown, extremely to distinctly weathered				Bedrock
					2			Test Pit No 58 terminated at 1.8m due to refusal on shale bedrock				
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 59
Date : 03/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES		DS					FILL; Silty Clay, medium to high plasticity, brown, with shale fragments				
	ES		DS		0.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	VSt-H		Alluvial
			DS		1			SHALE, grey brown, extremely to distinctly weathered				Bedrock
					1.5			Test Pit No 59 terminated at 1.3m due to refusal on shale bedrock				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road Claymore

Job No : 12467/1&2
Pit No : 60
Date : 03/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
dry	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES		DS					FILL; Silty Clay, medium to high plasticity, brown, with shale fragments				
	ES				0.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	VSt-H		Alluvial
			DS					SHALE, grey brown, extremely to distinctly weathered				Bedrock
								Test Pit No 60 terminated at 0.7m due to refusal on shale bedrock				
					1							
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 61
Date : 03/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	St-VSt		Alluvial
			DS				CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	VSt-H		
			DS		0.5		CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
					1			SHALE, grey brown, extremely to distinctly weathered				Bedrock
					1.5			Test Pit No 61 terminated at 1.3m due to refusal on shale bedrock				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road Claymore

Job No : 12467/1&2
Pit No : 62
Date : 03/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe **R.L. surface :**

Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES		DS		0			FILL; Silty Clay, medium plasticity, brown				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	VSt		Alluvial
			DS		0.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	H		
			DS		1		CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
Dry			DS		1.5			SHALE, grey brown, extremely to distinctly weathered				Bedrock
					2			Test Pit No 62 terminated at 2.2m due to refusal on shale bedrock				
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 63
Date : 03/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	VSt-H		Alluvial
			DS		0.5							
							CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
					1							
			DS					SHALE, grey brown, extremely to distinctly weathered				Bedrock
					1.5			Test Pit No 63 terminated at 1.5m due to refusal on shale bedrock				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 64
Date : 04/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES			CONE 3	0			TOPSOIL; Silty Clay, low plasticity, brown,				
	ES			12			CL	traces of roots Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	H		Alluvial
				11								
				12			CH	Silty CLAY, high plasticity, orange brown, grey	M<PL	H		
			U_{50}	11	0.5							
				10			CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual Layer of shale
				15								
				25								
				22								
				15								
			DS		1							
			DS		1.5			SHALE, grey brown, extremely to distinctly weathered				Bedrock
								Test Pit No 64 terminated at 1.7m due to refusal on shale bedrock				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 65
Date : 03/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES		DS		0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	VSt-H		Alluvial
			DS		0.5							
							CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
					1							
								SHALE, grey brown, extremely to distinctly weathered				Bedrock
			DS		1.5							
DRY					2			Test Pit No 65 terminated at 2.0m due to refusal on shale bedrock				
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 66
Date : 04/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES		DS		0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	VSt		Alluvial
					0.5		CH	Silty CLAY, high plasticity, orange brown, grey	M<PL	H		
			DS		1		CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	H		
							CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
					1.5			SHALE, grey brown, extremely to distinctly weathered				Bedrock
								Test Pit No 66 terminated at 1.5m due to refusal on shale bedrock				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 67
Date : 04/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe **R.L. surface :**

Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES							FILL; Silty Clay, medium to high plasticity, brown, with shale fragments				
	ES		DS		0.5		CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	H		Alluvial
							CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstones	M<PL	H		
			DS		1		CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
			DS		1.5			SHALE, grey brown, extremely to distinctly weathered				Bedrock
								Test Pit No 67 terminated at 1.7m due to refusal on shale bedrock				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 68
Date : 03/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	VSt		Alluvial
			DS		0.5		CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	H		
							CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
Dry			DS		1			SHALE, grey brown, extremely to distinctly weathered				Bedrock
								Test Pit No 68 terminated at 1.1m due to shale bedrock				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
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engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 69
Date : 03/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
Dry	ES			CONE 4	0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES		DS	5			CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	St		Alluvial
				5								
				7			CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	VSt-H		
			DB	10	0.5							
				12								
				14								
				29/ref			CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
			DS		1							
					1.5							
			DS					SHALE, grey brown, extremely to distinctly weathered				Bedrock
					2							
								Test Pit No 69 terminated at 2.1m due to refusal on shale bedrock				
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road Claymore

Job No : 12467/1&2
Pit No : 70
Date : 04/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe **R.L. surface :**

Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES							FILL; Silty Clay, medium plasticity, brown				
	ES		DS		0.5		CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	H		Alluvial
							CH	Silty CLAY, high plasticity, orange brown, grey	M<PL	H		
			DS		1							
							CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	H		Residual
			DS		1.5							
Dry								SHALE, grey brown, extremely to distinctly weathered				Bedrock
					2			Test Pit No 70 terminated at 1.8m due to refusal on shale bedrock				
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road Claymore

Job No : 12467/1&2
Pit No : 71
Date : 03/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	St		Alluvial
			U_{50}				CI-CH	Silty CLAY, medium to high plasticity, orange brown, traces of ironstone	M<PL	VSt-H		
			DS		0.5							
			DS		1		CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
			DS		1.5			SHALE, grey brown, extremely to distinctly weathered				Bedrock
Dry					2			Test Pit No 71 terminated at 2.0m due to refusal on shale bedrock				
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 72
Date : 04/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES		DS		0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
	ES						CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	St		Alluvial
					0.5		CH	Silty CLAY, high plasticity, orange brown, grey	M<PL	VSt		
			DS		1		CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	H		
			DS		1.5							
					2			Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
Dry					2.5			SHALE, grey brown, extremely to distinctly weathered				Bedrock
								Test Pit No 72 terminated at 2.5m due to refusal on shale bedrock				
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 73
Date : 04/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES			CONE 12	0			TOPSOIL; Silty Clay, low plasticity, brown, traces of roots				
				20			CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	H		Alluvial
	ES			22			CH	Silty CLAY, high plasticity, orange brown, grey	M<PL	H		
				20								
				26								
			DS	32	0.5							
							CI-CH	Silty CLAY, medium to high plasticity, brown, with ironstones and shale fragments	M<PL	H		
			DS		1							
							CH	Silty CLAY, high plasticity, grey, with shale fragments	M<PL	H		Residual
			DS		1.5							
DRY								SHALE, grey brown, extremely to distinctly weathered				Bedrock
					2			Test Pit No 73 terminated at 2.0m due to refusal on shale bedrock				
					2.5							
					3							
					3.5							
					4							
					4.5							

GEOTECHNIQUE
PTY LTD

engineering log - excavation

Client : Landcom Parramatta
Project : Claymore Urban Renewal
Location : Badgally Road
Claymore

Job No : 12467/1&2
Pit No : 74
Date : 02/05/2011
Logged/Checked by: AN.JK/AB.IJ

Equipment type and model: Backhoe
R.L. surface :
Excavation dimensions : 2.0 **m long** 0.5 **m wide** **datum :**

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
	ES				0			TOPSOIL; Silty Sand, fine grained, dark brown, traces of roots				
	ES		DS		0.5			FILL; Silty Clay, medium plasticity, brown, traces of concrete, brick and fibro cement fragments				
	ES		DS				CL	Silty CLAY, low plasticity, grey, traces of root fibres	M<PL	St		Alluvial
					1		CH	Silty CLAY, high plasticity, orange brown, grey	M<PL	St		Residual
Dry			DS		1.5			SHALE, grey brown, extremely to distinctly weathered				Bedrock
								Test Pit No 74 terminated at 1.5m due to refusal on shale bedrock				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

EXPLANATORY NOTES

Introduction
These notes have been provided to simplify the geotechnical report with regard to investigation procedures, classification methods and certain matters relating to the Discussion and Comments section. Not all notes are necessarily relevant to all reports.

Geotechnical reports are based on information gained from finite sub-surface probing, excavation, boring, sampling or other means of investigation, supplemented by experience and knowledge of local geology. For this reason they must be regarded as interpretative rather than factual documents, limited to some extent by the scope of information on which they rely.

Description and Classification Methods
The methods of description and classification of soils and rocks used in this report are based on AS1726 - 1993 "Geotechnical Site Investigations". In general, descriptions cover the following properties; strength or density, colour, structure, soil or rock type, and inclusions. Identification and classification of soil and rock involves, to a large extent, judgement within the acceptable level commonly adopted by current geotechnical practices.

Soil types are described according to the predominating particle size, qualified by the grading or other particles present (e.g. sandy clay) on the following basis:

Soil Classification	Particle Size
Clay	Less than 0.002mm
Silt	0.002 to 0.06mm
Sand	0.06 to 2.00mm
Gravel	2.00mm to 60.00mm

Cohesive soils are classified on the basis of strength, either by laboratory testing or engineering examination. The strength terms are defined as follows:

Classification	Undrained Shear Strength kPa
Very Soft	Less than 12
Soft	12 – 25
Firm	25 – 50
Stiff	50 – 100
Very Stiff	100 – 200
Hard	Greater than 200

Non-cohesive soils are classified on the basis of relative density, generally from the results of standard penetration tests (SPT) or Dutch cone penetrometer tests (CPT), as below:

Relative Density	SPT 'N' Value (blows/300mm)	CPT Cone Value (q_c-MPQ)
Very Loose	Less than 5	Less than 2
Loose	5 – 10	2 – 5
Medium Dense	10 – 30	5 – 15
Dense	30 – 50	15 – 25
Very Dense	>50	>25

Rock types are classified by their geological names, together with descriptive terms on degrees of weathering, strength, defects and other minor components. Where relevant, further information regarding rock classification is given on the following sheet.

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

Disturbed samples taken during drilling provide information on plasticity, grain size, colour, type, moisture content, 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 (normally known as U_{50}) into the soil and withdrawing 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. Details of the type and method of sampling are given in the report.

Field Investigation Methods
The following is a brief summary of investigation methods currently carried out by this Company and comments on their use and application.

Hand Auger Drilling
The borehole is advanced by manually operated equipment. The diameter of the borehole ranges from 50mm to 100mm. Penetration depth of hand augered boreholes may be limited by premature refusal on a variety of materials, such as hard clay, gravels or ironstone.

Test Pits
These are excavated with a tractor-mounted backhoe or a tracked excavator, allowing close examination of the insitu soils if it is safe to descend into the pit. The depth of penetration is limited to about 3.0m for a backhoe and up to 6.0m for an excavator. A potential disadvantage is the disturbance caused by the excavation.

Care must be taken if construction is to be carried out near, or within the test pit locations, to either adequately recompact the backfill during construction, or to design the structure to accommodate the poorly compacted backfill.

Large Diameter Auger (e.g. Pengo)
The hole is advanced by a rotating plate or short spiral auger, generally 300mm or larger in diameter. The cuttings are returned to the surface at intervals (generally of not more than 0.5m) 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 sampling.

Continuous Spiral Flight Augers
The hole is advanced by using 90mm-115mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling or insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are very disturbed and may be highly mixed with soil of other stratum.

Information from the drilling (as distinct from specific sampling by SPT or undisturbed samples) is of relatively lower reliability due to remoulding, mixing or softening of samples by groundwater, resulting in uncertainties of the original sample depth.

The spiral augers are usually advanced by using a V-bit through the soil profile to refusal, followed by Tungsten Carbide (TC) bit, to penetrate into bedrock. The quality and continuity of the bedrock may be assessed by examination of recovered rock fragments and through observation of the drilling penetration resistance.

Non-core Rotary Drilling (Wash Boring)
The hole is advanced by a rotary bit, with water being pumped down the drill rod 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 feel and rate of penetration.

Rotary Mud Stabilised Drilling
This is similar to rotary drilling, but uses drilling mud as a circulating fluid, which may consist of a range of products from bentonite to polymers such as Revert or Biogel. The mud tends to mask the cuttings and reliable identification is again only possible from separate intact sampling (e.g. SPT and U_{50}) samples).

Continuous Core Drilling
A continuous core sample is obtained using a diamond tipped core barrel. Providing full core recovery is achieved (which is not always possible in very low strength rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation. In rocks, an NMLC triple tube core barrel, which gives a core of about 50mm diameter, is usually used with water flush.

Portable Proline Drilling
This is manually operated equipment and is only used in sites which require bedrock core sampling and there is restricted site access to truck mounted drill rigs. The boreholes are usually advanced initially using a tricone roller bit and water circulation to penetrate the upper soil profile. In some instances, a hand auger may be used to penetrate the soil profile. Subsequent drilling into bedrock involves the use of NMLC triple tube equipment, using water as a lubricant.

Standard Penetration Tests
Standard penetration tests are used mainly in non-cohesive soils, but occasionally also in cohesive soils, as a means of determining density or strength and of obtaining a relatively undisturbed sample. The test procedure is described in AS1289 6.3.1.

The test is carried out in a borehole by driving a 50mm diameter split sample tube under the impact of a 63kg hammer with a free fall of 769mm. It is normal for the tube to be driven in three successive 150mm increments and the 'N' value is taken as the number of blows for the last 300mm. In dense sands, very hard clays or weak rock, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

- In a case where full penetration is obtained with successive blow counts for each 150mm of, say 4, 6 and 7 blows as;

  N = 13
  4,6,7

- In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm as;

  15, 30/40mm

The results of the tests can be related empirically to the engineering properties of the soil. Occasionally the test method is used to obtain samples in 50mm diameter thin walled sample tubes in clays. In these circumstances, the test results are shown on the bore logs in brackets.

Cone Penetrometer Testing and Interpretation
Cone penetrometer testing (sometimes referred to as Dutch Cone-CPT) described in this report, has been carried out using an electrical friction cone penetrometer and the test is described in AS1289 6.5.1.

In the test, a 35mm diameter rod with cone tipped end is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig, which is fitted with a hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the friction resistance on a separate 130mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are connected by electrical wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck.

As penetration occurs (at a rate of approximately 20mm per second) the information is output on continuous chart recorders. The plotted results given in this report have been traced from the original records. The information provided on the charts comprises:

- Cone resistance - the actual end bearing force divided by the cross sectional area of the cone, expressed in MPa *
- Sleeve friction - the frictional force on the sleeve divided by the surface area, expressed in kPa

The ratios of the sleeve resistance to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1% to 2% are commonly encountered in sands and very soft clays, rising to 4% to 10% in stiff clays.

In sands, the relationship between cone resistance and SPT value is commonly in the range:

$$q_c \text{ (MPa)} = (0.4 \text{ to } 0.6)\ N \text{ (blows per 300mm)}$$

In clays, the relationship between undrained shear strength and cone resistance is commonly in the range:

$$q_c=(12 \text{ to } 18)C_u$$

Interpretation of CPT values can also be made to allow estimate of modulus or compressibility values, to allow calculation of foundation settlements. Inferred stratification, as shown on the attached report, is assessed from the cone and friction traces, from experience and information from nearby boreholes etc.

This information is presented for general guidance, but must be regarded as being to some extent interpretive. The test method provides a continuous profile of engineering properties and where precise information or soil classification is required, direct drilling and sampling may be preferable.

Portable Dynamic Cone Penetrometer (DCP)
Portable Dynamic Cone Penetrometer tests are carried out by driving a rod into the ground with a falling weight hammer and measuring the blows per successive 100mm increment of penetration.

There are two similar tests, Cone Penetrometer (commonly known as Scala Penetrometer) AS1289 6.3.2 and the Perth Sand Penetrometer AS1289 6.3.3. Scala Penetrometer is commonly adopted by this company and consists of a 16mm rod with a 20mm diameter cone end, driven with a 9kg hammer, dropping 510mm (AS1289 Test P3.2).

Laboratory Testing
Laboratory testing is carried out in accordance with Australian Standard 1289 "Methods of Testing Soil for Engineering Purposes". Details of the test procedures are given on the individual report forms.

Engineering Logs
The engineering logs presented herein are an engineering and/or geological interpretation of the sub-surface conditions and their reliability will depend to some extent on frequency of sampling and the method of drilling. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, however, this is not always practicable or possible to justify economically. As it is, the boreholes represent only a small sample of the total sub-surface profile. Interpretation of the information and its application to design and construction should take into account the spacing of boreholes, frequency of sampling and the possibility of other than 'straight line' variations between the boreholes.

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

- in low permeability soils groundwater, although present, may enter the hole slowly or perhaps not at all during the investigation period
- 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 due to the seasons or recent weather changes. They may not be the same at the time of construction as indicated in the report
- 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 be washed out of the hole if water observations are to be made

More reliable measurements can be achieved by installing standpipes that are read at intervals over several days, or 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 or surface water.

Engineering Reports
Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, perhaps a three-storey building, the information and interpretation may not be relevant if the design proposal is changed, say to a twenty-storey building. If this occurs, the Company will be pleased to review the report and sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of sub-surface conditions, discussions of geotechnical aspects and recommendations or suggestions for design and construction. However, the Company cannot always anticipate or assume responsibility for:

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

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

Site Anomalies
In the event that conditions encountered on-site during construction appear to vary from those that were expected from the information contained in the report, the Company requests immediate notification. Most problems are much more easily resolved when conditions are exposed rather than at some later stage, well after the event.

Reproduction of Information for Contractual Purposes
Attention is drawn to the document "Guidelines for the Provision of Geotechnical Information in Tender Documents", published by the Institute of Engineers Australia. Where information obtained from this Investigation 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. The Company would be pleased to assist in this regard and/or make additional copies of the report available for contract purposes, at a nominal charge.

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

Review of Design
Where major civil or structural developments are proposed, or where only a limited investigation has been completed, or where the geotechnical conditions are complex, it is prudent to have the design reviewed by a Senior Geotechnical Engineer.

GEOTECHNIQUE PTY LTD

Project	**Claymore Urban Renewal**	**Job No**	**12467/2**
Location	**Badgally Road, Claymore**	**Refer to Drawing No**	**12467/2-AA2**
		Logged & Sampled by	**AN**

TABLE 1

Sample	Depth (m)	Sample Depth (m)	Date	Time	Material Description	Remarks*
SP1	0.0-0.5	0.0-0.5	10/05/2011	-	STOCKPILE; Silty Clay, low plasticity, brown, trace of roots	
SP2	0.0-0.5	0.0-0.5	"	-	STOCKPILE; Sandy Silty Clay, low plasticity, brown, with ironstones and sandstone fragment, occasionally concrete and brick fragments	

*Odour (O), Discolouration (D), Petroleum Hydrocarbon Staining (PHS), Asbestos Pieces (ASBP), Ash Material (ASHM), Demolition Waste (DW), Groundwater (GW), Perched Water (PW) PID reading etc.

Appendix 3: Historical Aerial Photos

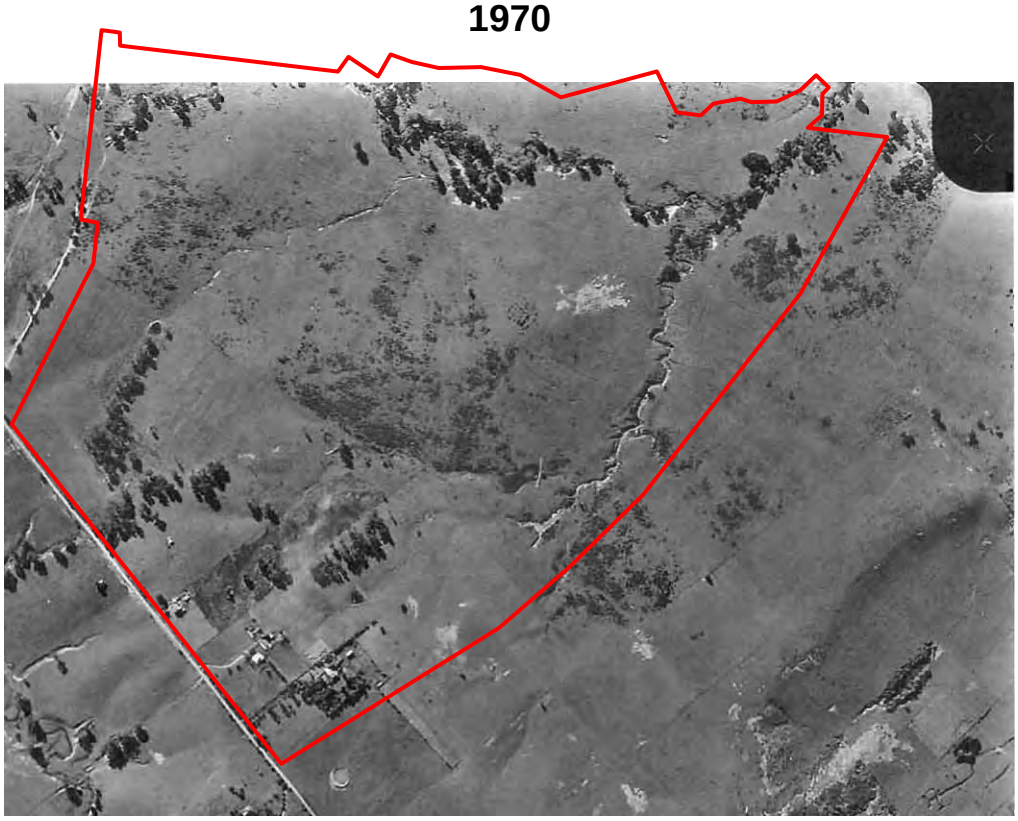
2005

2002

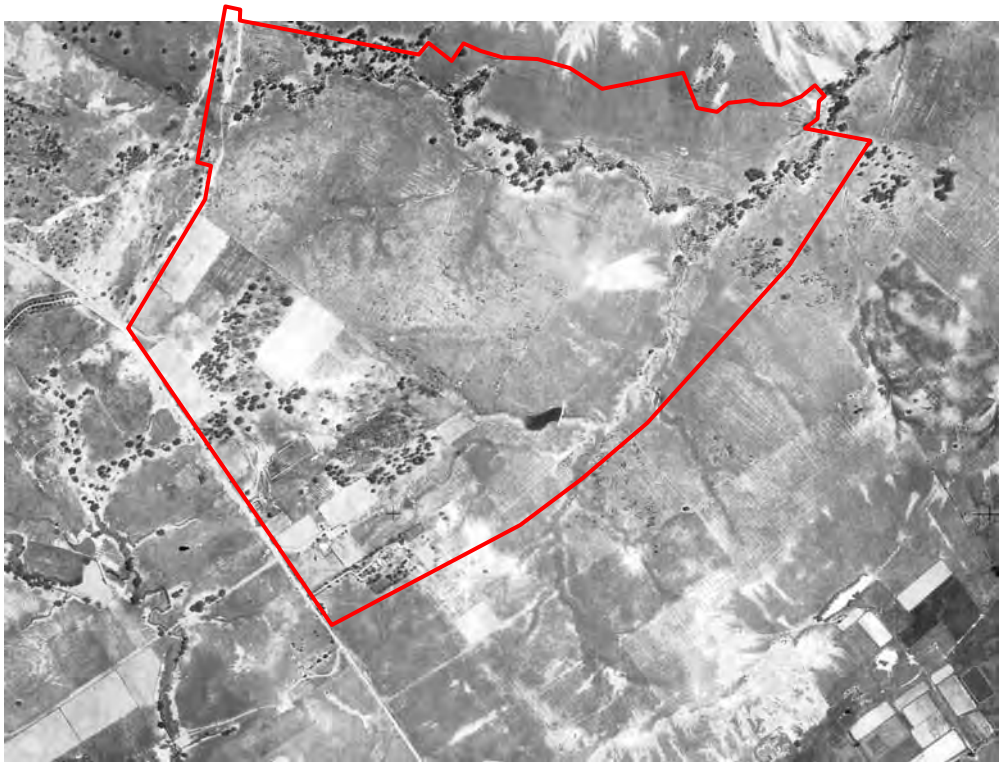
1994

1984

1970



1961



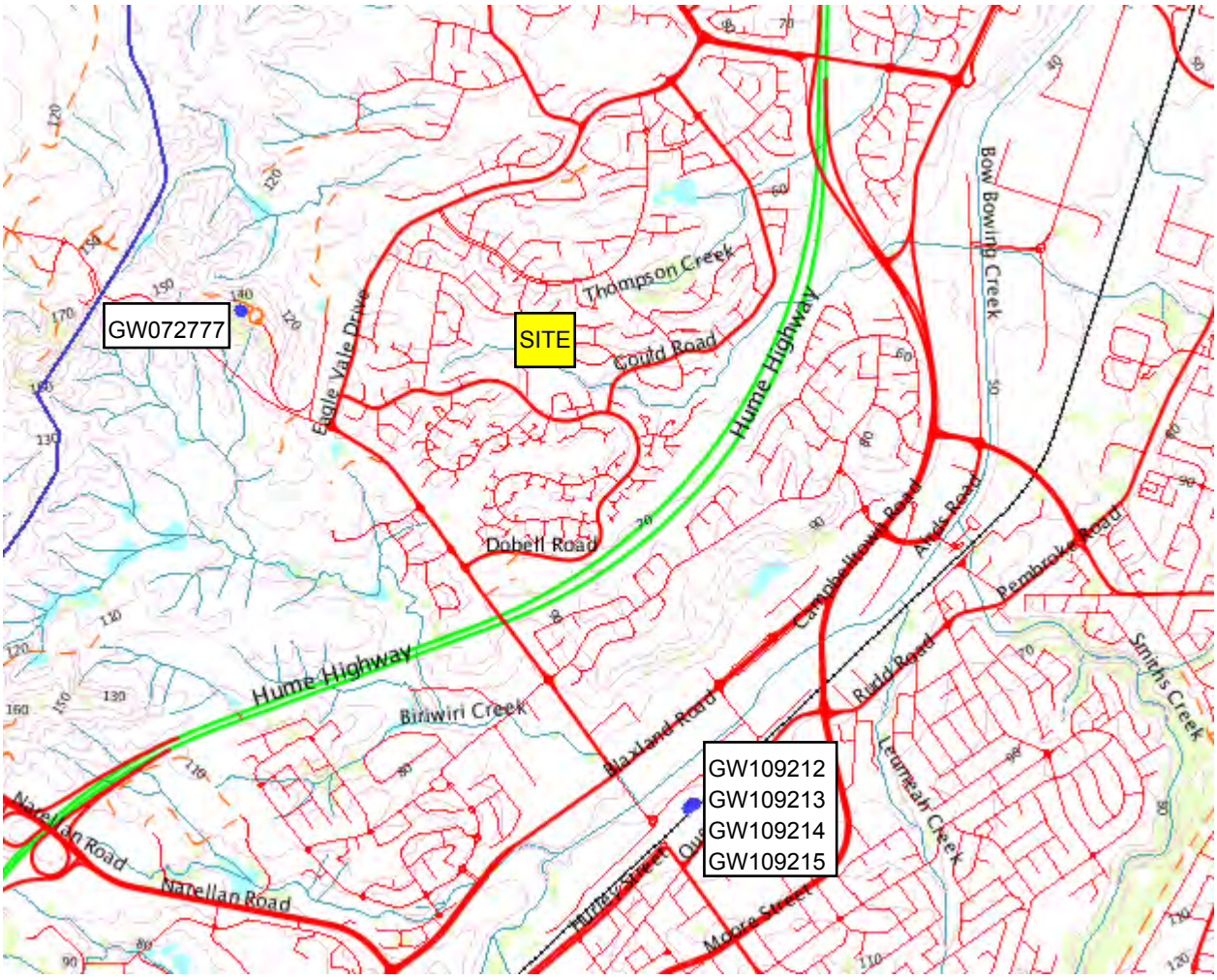
1947

Appendix 4: Groundwater Bore Data

12467/2 Groundwater Map

Map created with NSW Natural Resource Atlas - http://nratlas.nsw.gov.au

Monday, May 16, 2011



0 5 Km

Legend

Symbol	Layer	Custodian
	Cities and large towns renderImage: Cannot build image from features	
Cowra	Populated places renderImage: Cannot build image from features	
	Towns	
	Groundwater Bores	
	Catchment Management Authority boundaries	
	Major rivers	
Primary/arterial road Motorway/freeway Railway Runway Contour Background	Topographic base map	

Copyright © 2011 New South Wales Government. Map has been compiled from various sources and may contain errors or omissions. No representation is made as to its accuracy or suitability.

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, May 16, 2011

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW072777

Works Details (top)

GROUNDWATER NUMBER	GW072777
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	DOMESTIC STOCK
WORK-TYPE	Bore open thru rock
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	Rotary Air
OWNER-TYPE	Private
COMMENCE-DATE	
COMPLETION-DATE	1995-03-09
FINAL-DEPTH (metres)	252.00
DRILLED-DEPTH (metres)	250.00
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	10 - SYDNEY SOUTH COAST
RIVER-BASIN	213 - SYDNEY COAST - GEORGES RIVER
AREA-DISTRICT	
CMA-MAP	9029-1N
GRID-ZONE	56/1
SCALE	1:25,000
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6231343.00
EASTING	296439.00
LATITUDE	34 2' 20"
LONGITUDE	150 47' 42"
GS-MAP	
AMG-ZONE	56
COORD-SOURCE	GD.,ACC.GIS
REMARK	

Form-A (top)

COUNTY	CUMBERLAND
PARISH	ST PETER
PORTION-LOT-DP	L325 DP810338

Licensed (top)

no details

Water Bearing Zones (top)

FROM-DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK-CAT-DESC	S-W-L	D-D-L	YIELD	TEST-HOLE-DEPTH (metres)	DURATION	SALINITY
21.50	21.60	0.10	Fractured						
63.70	63.80	0.10	Fractured						

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	0.30	0.30			
0.30	1.50	1.20			
1.50	88.50	87.00	Dark Grey Shale		
88.50	250.00	161.50	White Sandstone		

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Groundwater Works Summary

For information on the meaning of fields please see Glossary
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Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW109212

Works Details (top)

GROUNDWATER NUMBER	GW109212
LIC-NUM	10BL602480
AUTHORISED-PURPOSES	MONITORING BORE
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	
CONSTRUCTION-METHOD	
OWNER-TYPE	Private
COMMENCE-DATE	
COMPLETION-DATE	2008-08-14
FINAL-DEPTH (metres)	9.00
DRILLED-DEPTH (metres)	9.00
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	CALTEX OIL (AUST) PTY LTD
GWMA	-
GW-ZONE	-
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	10 - SYDNEY SOUTH COAST
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6228642.00
EASTING	298557.00
LATITUDE	34 3' 49"
LONGITUDE	150 49' 2"
GS-MAP	
AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

COUNTY	CUMBERLAND
PARISH	ST PETER
PORTION-LOT-DP	1//524225

Licensed (top)

COUNTY	CUMBERLAND
PARISH	ST PETER
PORTION-LOT-DP	1 524225

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL DETAIL
1		Hole	Hole	0.00	9.00			

Water Bearing Zones (top)

no details

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	0.40	0.40	FILL, SAND		
0.40	0.60	0.20	FILL, SANDY CLAY,GRAINED GRAVEL		
0.60	1.10	0.50	SILTY CLAY.ORANGE RED		
1.10	1.50	0.40	SILTY CLAY,PALE GREY,RED/BROWN MOTTLING.		
1.50	2.70	1.20	SILTY CLAY MED/PLASTICITY,SOME GRAVEL		
2.70	3.50	0.80	SILTY CLAY,MED PLASTICITY,GREY AND BROWN		
3.50	4.50	1.00	SHALE, GREY		
4.50	5.30	0.80	SHALE,DARK GREY		
5.30	9.00	3.70	SHALE,GREY TO DARK GREY		

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Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, May 16, 2011

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW109213

Works Details (top)

GROUNDWATER NUMBER	GW109213
LIC-NUM	10BL602480
AUTHORISED-PURPOSES	MONITORING BORE
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	
CONSTRUCTION-METHOD	
OWNER-TYPE	Private
COMMENCE-DATE	
COMPLETION-DATE	2008-08-14
FINAL-DEPTH (metres)	5.00
DRILLED-DEPTH (metres)	5.00
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	CALTEX OIL (AUST) PTY LTD
GWMA	-
GW-ZONE	-
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	10 - SYDNEY SOUTH COAST
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6228665.00
EASTING	298585.00
LATITUDE	34 3' 48"
LONGITUDE	150 49' 3"
GS-MAP	
AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

COUNTY	CUMBERLAND
PARISH	ST PETER
PORTION-LOT-DP	1//524225

Licensed (top)

COUNTY	CUMBERLAND
PARISH	ST PETER
PORTION-LOT-DP	1 524225

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL DETAIL
1		Hole	Hole	0.00	5.00			

Water Bearing Zones (top)

no details

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	0.10	0.10	CONCRETE		
0.10	0.20	0.10	FILL. SAND,FINETO MEDIUM GRAINED		
0.20	0.60	0.40	FILL, GRAVELLY CLAY		
0.60	0.90	0.30	SILTY CLAY. MEDIUM PLASTICITY,GREY /BROWN		
0.90	1.20	0.30	SILTY CLAY ,GREY /ORANGE		
1.20	2.40	1.20	SILTY CLAY,GREY AND RED BROWN MOTTLED.		
2.40	3.30	0.90	SILTY CLAY,PALE WITH SOME PALE ORANGE MOTT.		
3.30	4.20	0.90	SILTY CLAY,MED. PLASTICITY		
4.20	5.00	0.80	SHALE GREY		

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Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, May 16, 2011

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW109214

Works Details (top)

GROUNDWATER NUMBER	GW109214
LIC-NUM	10BL602480
AUTHORISED-PURPOSES	MONITORING BORE
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	
CONSTRUCTION-METHOD	
OWNER-TYPE	Private
COMMENCE-DATE	
COMPLETION-DATE	2008-08-14
FINAL-DEPTH (metres)	7.00
DRILLED-DEPTH (metres)	7.00
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	CALTEX OIL (AUST) PTY LTD
GWMA	-
GW-ZONE	-
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	10 - SYDNEY SOUTH COAST
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6228660.00
EASTING	298571.00
LATITUDE	34 3' 48"
LONGITUDE	150 49' 3"
GS-MAP	
AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

COUNTY	CUMBERLAND
PARISH	ST PETER
PORTION-LOT-DP	1//524225

Licensed (top)

COUNTY	CUMBERLAND
PARISH	ST PETER
PORTION-LOT-DP	1 524225

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL DETAIL
1		Hole	Hole	0.00	7.00			

Water Bearing Zones (top)

no details

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	0.10	0.10	CONCRETE		
0.10	0.20	0.10	FILL,SAND		
0.20	0.30	0.10	FILL, SANDY CLAY,LOW TO MED. PLASTICITY		
0.30	0.60	0.30	SILTY CLAY,RED BROWN AND ORANGE		
0.60	1.70	1.10	SILTY CLAY, MED TO HIGH PLASTICITY,RED,BROWN		
1.70	2.30	0.60	SILTY CLAY,GREY AND PALE YELLOW MOTTLED		
2.30	3.10	0.80	SILTY CLAY PALE GREY ,PALE YELLOW		
3.10	3.20	0.10	SILTY CLAY,LOW TO MED PLASTICITY.,GRAVELS		
3.20	4.20	1.00	SILTY CLAY,PALE GREY AND PALE ORANGE MOTT.		
4.20	7.00	2.80	SHALE GREY,GREY TO DARK GREY.		

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Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, May 16, 2011

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW109215

Works Details (top)

GROUNDWATER NUMBER	GW109215
LIC-NUM	10BL602480
AUTHORISED-PURPOSES	MONITORING BORE
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	
CONSTRUCTION-METHOD	
OWNER-TYPE	Private
COMMENCE-DATE	
COMPLETION-DATE	2008-08-15
FINAL-DEPTH (metres)	5.00
DRILLED-DEPTH (metres)	5.00
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	CALTEX OIL (AUST) PTY LTD
GWMA	-
GW-ZONE	-
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	10 - SYDNEY SOUTH COAST
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6228650.00
EASTING	298562.00
LATITUDE	34 3' 49"
LONGITUDE	150 49' 2"
GS-MAP	
AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

COUNTY	CUMBERLAND
PARISH	ST PETER
PORTION-LOT-DP	1//524225

Licensed (top)

COUNTY	CUMBERLAND
PARISH	ST PETER
PORTION-LOT-DP	1 524225

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	5.00				

Water Bearing Zones (top)

no details

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	0.10	0.10	CONCRETE		
0.10	0.40	0.30	FILL,SILTY CLAY,ORANGE,GREY,M/GRAVEL		
0.40	0.80	0.40	SILTY CLAY RED BROWN AND GREY		
0.80	1.50	0.70	SILTY CLAY MED TO HIGH PLASTICITY,RED BROWN AND GREY		
1.50	3.60	2.10	SILTY CLAY MED. PLASTICITY,SOME GRAVEL		
3.60	4.40	0.80	SILTY CLAY,MED. PLASTICITY ,DARK GREY.GRAINED SAND		
4.40	5.00	0.60	SHALE GREY TO DARK GREY		

Warning To Clients: This raw data has been supplied to the Department of Infrastructure, Planning and Natural Resources (DIPNR) by drillers, licensees and other sources. The DIPNR does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

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TABLE A
SCHEDULE OF LABORATORY TESTING
(Ref No: 12467/2-AA)

Analyte / Analyte Group Sample	Depth (m)	TYPE	SAMPLING DATE	DUPLICATE	SPLIT	METALS	TPH & BTEX	PAH	OCP	PCB	ASBESTOS
DISCRETE SAMPLE											
TP9	0.15-0.4	F	2/05/2011								✓
TP15	0-0.1	F	2/05/2011			✓			✓		
TP23	0-0.1	T	4/05/2011			✓			✓		
TP42	0-0.15	F	2/05/2011			✓			✓		
TP52	0-0.2	T	5/05/2011				✓	✓		✓	
TP55	0.5-0.7	F	3/05/2011			✓			✓		
TP74	-	FCP	2/05/2011								✓
TP74	0.2-0.5	F	2/05/2011								✓
SP1	0-0.5	SP	10/05/2011			✓			✓		
SP2	0-0.5	EM	10/05/2011	D3	SS3	✓	✓	✓	✓	✓	✓
COMPOSITE SAMPLES											
Composite C1		F	2,3&5/05/2011			✓			✓		
Composite C2		T	5/05/2011			✓			✓		
Composite C3		T	5/05/2011			✓			✓		
Composite C4		T	5/05/2011			✓			✓		
Composite C5		T	2/05/2011	D1		✓			✓		
Composite C6		T	2,3&5/05/2011			✓			✓		
Composite C7		T	2&3/05/2011		SS1	✓			✓		
Composite C8		T	2,3&5/05/2011			✓			✓		
Composite C9		T	4&5/05/2011			✓			✓		
Composite C10		T	5/05/2011			✓			✓		
Composite C11		T	2&4/05/2011			✓			✓		
Composite C12		T	4/05/2011			✓			✓		
Composite C13		T	4/05/2011			✓			✓		
Composite C14		T	4/05/2011		SS2	✓			✓		
Composite C15		T	3&4/05/2011			✓			✓		
Composite C16		N	2&3/05/2011			✓			✓		
Composite C17		T	3/05/2011			✓			✓		
Composite C18		T	5/05/2011			✓			✓		
Composite C19		T	3&5/05/2011			✓			✓		
Composite C20		T	3/05/2011			✓			✓		
Composite C21		T	3&4/05/2011			✓			✓		
Composite C22		T	3&4/05/2011			✓			✓		
Composite C23		T	3/05/2011			✓			✓		
Composite C24		T	4/05/2011	D2		✓			✓		
Composite C25		F	2&5/05/2011			✓			✓		
Composite C26		F	2&5/05/2011			✓			✓		
Composite C27		F	2/05/2011			✓			✓		
Composite C28		F	3&5/05/2011			✓			✓		
Composite C29		F	4/05/2011			✓			✓		
Composite C30		F	4&5/05/2011			✓			✓		
Composite C31		F	3/05/2011			✓			✓		
Composite C32		F	2&4/05/2011			✓			✓		

Notes
METALS: arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc
TPH: Total Petroleum Hydrcarbons
BTEX: Benzene, Toluene, Ethyl Benzene, Xylenes
F, T, SP, EM : Fill, Topsoil, Stockpile, Earth Mound
OCP : Organochlorine Pesticides
PCB : Polychlorinated Biphenyls
FCP: Fibro-cement piece

TABLE B
RINSATE SAMPLES
(Ref No: 12467/2-AA)

ANALYTE	RINSATE R1 (mg/L) 2/05/2011	RINSATE R2 (mg/L) 3/05/2011	RINSATE R3 (mg/L) 4/05/2011	RINSATE R4 (mg/L) 5/05/2011	CLEAN DISTILLED WATER (mg/L)
METALS					
Arsenic	<0.05	<0.05	<0.05	<0.05	<0.05
Lead	-	-	-	<0.02	<0.02
Zinc	-	-	-	<0.010	<0.010

TABLE C
TRIP SPIKE SAMPLE
(Ref No: 12467/2-AA)

ANALYTE	TRIP SPIKE TS1
BTEX	
Benzene	98%
Toluene	98%
Ethyl Benzene	97%
Total Xylenes	98%

Note : results are reported as percentage recovery of known spike concentration

TABLE D1
DUPLICATE SAMPLE
(Ref No: 12467/2-AA)

ANALYTE	ORIGINAL SAMPLE mg/kg	DUPLICATE SAMPLE mg/kg	RELATIVE PERCENTAGE DIFFERENCE %
	COMPOSITE C5	DUPLICATE D1	
METALS			
Arsenic	4	5	22
Cadmium	<0.3	<0.3	-
Chromium	8.5	11	26
Copper	14	13	7
Lead	15	17	13
Mercury	<0.05	<0.05	-
Nickel	7.5	7	7
Zinc	37	36	3
ORGANOCHLORINE PESTICIDES (OCP)			
Heptachlor	<0.1	<0.1	-
Aldrin	<0.1	<0.1	-
Dieldrin	<0.05	<0.05	-
DDD	<0.2	<0.2	-
DDE	<0.2	<0.2	-
DDT	<0.2	<0.2	-
Chlordane (trans & cis)	<0.2	<0.2	-
	COMPOSITE C24	DUPLICATE D2	
METALS			
Arsenic	6	6	0
Cadmium	<0.3	<0.3	-
Chromium	12	12	0
Copper	17	18	6
Lead	21	24	13
Mercury	<0.05	<0.05	-
Nickel	11	11	0
Zinc	44	50	13
ORGANOCHLORINE PESTICIDES (OCP)			
Heptachlor	<0.1	<0.1	-
Aldrin	<0.1	<0.1	-
Dieldrin	<0.05	<0.05	-
DDD	<0.2	<0.2	-
DDE	<0.2	<0.2	-
DDT	<0.2	<0.2	-
Chlordane (trans & cis)	<0.2	<0.2	-

TABLE D2
DUPLICATE SAMPLE
(Ref No: 12467/2-AA)

ANALYTE	SP2 0-0.5m mg/kg	DUPLICATE D3 mg/kg	RELATIVE PERCENTAGE DIFFERENCE %
HEAVY METALS			
Arsenic	<3	<3	-
Cadmium	<0.3	<0.3	-
Chromium	23	32	33
Copper	12	11	9
Lead	38	36	5
Mercury	<0.05	<0.05	-
Nickel	2.5	2.1	17
Zinc	88	78	12
TOTAL PETROLEUM HYDROCARBONS (TPH)			
C6 - C9	<20	<20	-
C10 - C14	<20	<20	-
C15 - C28	<50	<50	-
C29 - C40	<150	<150	-
BTEX			
Benzene	<0.1	<0.1	-
Toluene	<0.1	<0.1	-
Ethyl Benzene	<0.1	<0.1	-
Total Xylenes	<0.3	<0.3	-
POLYCYCLIC AROMATIC HYDROCARBONS (PAH)			
Benzo(a)Pyrene	<0.10	<0.10	-
Total PAH	<1.8	<1.8	-
ORGANOCHLORINE PESTICIDES (OCP)			
Heptachlor	<0.1	<0.1	-
Aldrin	<0.1	<0.1	-
Dieldrin	<0.05	<0.05	-
DDD	<0.2	<0.2	-
DDE	<0.2	<0.2	-
DDT	<0.2	<0.2	-
Chlordane (trans & cis)	<0.2	<0.2	-
POLYCHLORINATED BIPHENYLS (PCB)			
Total PCB	<0.9	<0.9	-

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TABLE E1
SPLIT SAMPLES
(Ref No: 12467/2-AA)

ANALYTE	ORIGINAL SAMPLE mg/kg (SGS)	SPLIT SAMPLE mg/kg (ENVIROLAB)	RELATIVE PERCENTAGE DIFFERENCE %
	COMPOSITE C7	SPLIT SAMPLE SS1	
METALS			
Arsenic	7	8	13
Cadmium	0.3	<0.5	-
Chromium	14	15	7
Copper	19	19	0
Lead	41	37	10
Mercury	<0.05	<0.1	-
Nickel	8.6	10	15
Zinc	51	48	6
ORGANOCHLORINE PESTICIDES (OCP)			
Heptachlor	<0.1	<0.1	-
Aldrin	<0.1	<0.1	-
Dieldrin	<0.05	<0.1	-
DDD	<0.2	<0.2	-
DDE	<0.2	<0.2	-
DDT	<0.2	<0.2	-
Chlordane (trans & cis)	<0.2	<0.2	-
	COMPOSITE C14	SPLIT SAMPLE SS2	
METALS			
Arsenic	5	6	18
Cadmium	<0.3	<0.5	-
Chromium	9.2	10	8
Copper	15	14	7
Lead	24	16	40
Mercury	<0.05	<0.1	-
Nickel	6.1	6	2
Zinc	71	34	70
ORGANOCHLORINE PESTICIDES (OCP)			
Heptachlor	<0.1	<0.1	-
Aldrin	<0.1	<0.1	-
Dieldrin	<0.05	<0.1	-
DDD	<0.2	<0.2	-
DDE	<0.2	<0.2	-
DDT	<0.2	<0.2	-
Chlordane (trans & cis)	<0.2	<0.2	-

TABLE E2
SPLIT SAMPLE
(Ref No: 12467/2-AA)

ANALYTE	SP2 0-0.5m mg/kg (SGS)	SPLIT SAMPLE SS3 mg/kg (ENVIROLAB)	RELATIVE PERCENTAGE DIFFERENCE %
HEAVY METALS			
Arsenic	<3	<4	-
Cadmium	<0.3	<0.5	-
Chromium	23	28	20
Copper	12	13	8
Lead	38	42	10
Mercury	<0.05	0.1	-
Nickel	2.5	4	46
Zinc	88	100	13
TOTAL PETROLEUM HYDROCARBONS (TPH)			
C6 - C9	<20	<25	-
C10 - C14	<20	<50	-
C15 - C28	<50	<100	-
C29 - C40 or *** C29-C36 for Envirolab***	<150	<100	-
BTEX			
Benzene	<0.1	<0.2	-
Toluene	<0.1	<0.5	-
Ethyl Benzene	<0.1	<1.0	-
Total Xylenes	<0.3	<3.0	-
POLYCYCLIC AROMATIC HYDROCARBONS (PAH)			
Benzo(a)Pyrene	<0.10	<0.05	-
Total PAH	<1.8	<1.6	-
ORGANOCHLORINE PESTICIDES (OCP)			
Heptachlor	<0.1	<0.1	-
Aldrin	<0.1	<0.1	-
Dieldrin	<0.05	<0.1	-
DDD	<0.2	<0.2	-
DDE	<0.2	<0.2	-
DDT	<0.2	<0.2	-
Chlordane (trans & cis)	<0.2	<0.2	-
POLYCHLORINATED BIPHENYLS (PCB)			
Total PCB	<0.9	<0.6	-

TABLE F
METALS TEST RESULTS
DISCRETE SAMPLES
(Ref No: 12467/2-AA)

Analyte / Sample Location	Depth (m)	METALS (mg/kg) ARSENIC	CADMIUM	CHROMIUM	COPPER	LEAD	MERCURY	NICKEL	ZINC
TP15	0-0.1	7	0.3	20	18	23	<0.05	7.8	38
TP23	0-0.1	5	<0.3	7.7	9.9	16	<0.05	4.8	28
TP42	0-0.15	6	<0.3	6	27	17	<0.05	16	54
TP55	0.5-0.7	<3	<0.3	6	4	12	<0.05	6.6	24
SP1	0-0.5	4	1.7	17	54	93	<0.05	8.3	**280**
SP2	0-0.5	<3	<0.3	23	12	38	<0.05	2.5	88
TP5	0.2-0.3	-	-	-	-	20	-	-	-
TP6	0.2-0.3	-	-	-	-	18	-	-	-
TP7	0.2-0.3	-	-	-	-	160	-	-	-
Limits of Reporting (LOR)		3	0.3	0.3	0.5	1	0.05	0.5	0.5
GUIDELINES FOR THE NSW SITE AUDITOR SCHEME (2006)									
Provisional Phytotoxity-Based Investigation Levels		20	3	400/1 [b]	100	600	1	60	200
NATIONAL ENVIRONMENT PROTECTION MEASURE (1999)									
Health Investigation Levels (HIL) [a] (HIL 'A')		100	20	12%/100 [c]	1000	300	10/15 [d]	600	7000

Notes
a: Residential with gardens and accessible soil including children's day-care centres, preschools, primary schools, townhouses and villas.
b: 400mg/kg for Chromium (+3) and 1mg/kg for Chromium (+6). Chromium (Cr) may exist in a number of states. Cr (+6) is easily reduced to form the most stable Cr (+3) whenever exposed to the atmosphere. Therefore Cr (+3) is adopted for this assessment.
c: 12% (120000mg/kg) for Chromium (+3) and 100mg/kg for Chromium (+6).
d: 10mg/kg for Methyl Mercury and 15mg/kg for Inorganic Mercury.

TABLE G
METALS TEST RESULTS
COMPOSITED SAMPLES
(Ref No: 12467/2-AA)

Analyte / Composite Number	METALS (mg/kg)							
	ARSENIC	CADMIUM	CHROMIUM	COPPER	LEAD	MERCURY	NICKEL	ZINC
Composite C1	6	<0.3	10	16	20	<0.05	7.3	34
Composite C2	6	<0.3	9.5	18	23	<0.05	8.6	**110**
Composite C3	**8**	0.8	11	16	**600**	<0.05	6.6	35
Composite C4	**8**	<0.3	12	17	19	<0.05	8.6	37
Composite C5	4	<0.3	8.5	14	15	<0.05	7.5	37
Composite C6	4	<0.3	12	14	17	<0.05	7.3	28
Composite C7	**7**	0.3	14	19	41	<0.05	8.6	51
Composite C8	5	<0.3	8.6	13	19	<0.05	6.7	37
Composite C9	**7**	<0.3	9.4	14	21	<0.05	6.4	50
Composite C10	**7**	<0.3	10	15	20	<0.05	8.6	37
Composite C11	<3	<0.3	8.3	8.6	18	<0.05	5	25
Composite C12	3	<0.3	7.8	14	16	<0.05	5.7	42
Composite C13	4	<0.3	8.2	12	15	<0.05	5.2	30
Composite C14	5	<0.3	9.2	15	24	<0.05	6.1	**71**
Composite C15	6	<0.3	12	14	19	<0.05	6.3	31
Composite C16	**10**	<0.3	15	19	22	<0.05	7.9	40
Composite C17	6	<0.3	12	16	23	<0.05	8.6	40
Composite C18	**7**	<0.3	11	11	16	<0.05	5	27
Composite C19	**8**	<0.3	8.6	15	21	<0.05	5.6	44
Composite C20	**7**	<0.3	8.5	16	24	<0.05	6.8	46
Composite C21	6	<0.3	9.3	14	24	<0.05	6	44
Composite C22	5	<0.3	9.1	14	30	<0.05	7.4	50
Composite C23	5	<0.3	12	17	23	<0.05	9.3	47
Composite C24	6	<0.3	12	17	21	<0.05	11	44
Composite C25	**7**	<0.3	14	16	18	<0.05	9.8	34
Composite C26	**8**	<0.3	11	19	15	<0.05	7.2	29
Composite C27	**7**	<0.3	11	19	18	<0.05	8.3	31
Composite C28	**7**	<0.3	13	24	20	<0.05	7.4	35
Composite C29	6	<0.3	7.9	16	15	<0.05	6	35
Composite C30	**9**	<0.3	9.2	16	16	<0.05	5.5	30
Composite C31	**8**	<0.3	6.1	25	16	<0.05	11	57
Composite C32	**7**	<0.3	14	18	23	<0.05	8.5	38
Limits of Reporting (LOR)	3	0.3	0.3	0.5	1	0.05	0.5	0.5
GUIDELINES FOR THE NSW SITE AUDITOR SCHEME (2006)								
Provisional Phytotoxity-Based Investigation Levels (PPBIL)	20	3	400/1 [d]	100	600	1	60	200
Adjusted PPBIL [a]	6.7	1	133/0.33	33	200	0.33	20	67
NATIONAL ENVIRONMENT PROTECTION MEASURE (1999)								
Health Investigation Levels [b] (HIL 'A')	100	20	12%/100 [e]	1000	300	10/15 [f]	600	7000
Adjusted HIL 'A' [c]	33	6.7	4%/33	333	100	3.3/5	200	2333

Notes

a: Adjusted PPBIL=PPBIL/3

b: Residential with gardens and accessible soil including children's day-care centres, preschools, primary schools, townhouses and villas.

c: Adjusted HIL 'A' = HIL 'A'/3

d: 400mg/kg for Chromium (+3) and 1mg/kg for Chromium (+6). Chromium (Cr) may exist in a number of states. Cr (+6) is easily reduced to form the most stable Cr (+3) whenever exposed to the atmosphere. Therefore Cr (+3) is adopted for this assessment.

e: 12% (120000mg/kg) for Chromium (+3) and 100mg/kg for Chromium (+6).

f: 10mg/kg for Methyl Mercury and 15mg/kg for Inorganic Mercury.

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TABLE G1
ARSENIC TEST RESULTS
SUB-SAMPLES
(Ref No: 12467/2-AA)

Analyte			ARSENIC (mg/kg)		
			Concentration of	Sub-Sample	
Composite Number	Sub-Samples	Depth (m)	Composite Sample	Concentration	Mean
	TP57	0-0.1		8	
	TP59	0-0.1		8	
	TP60	0-0.1		8	
C20			7		8
	TP8	0.2-0.5		8	
	TP9	0.15-0.4		7	
	TP18	0.15-0.45		9	
C25			7		8
	TP9	0.4-0.7		7	
	TP18	0.9-1.2		11	
	TP25	0.2-0.5		4	
C26			8		7
	TP14	0.2-0.5		7	
	TP40	0.2-0.3		9	
	TP41	0.2-0.4		9	
C27			7		8
	TP19	0.15-0.45		10	
	TP39	0.2-0.5		11	
	TP43	0.1-0.4		7	
C28			7		9
	TP28	0.7-1.0		19	
	TP51	0.2-0.5		6	
	TP53	0.2-0.4		9	
C30			9		11
	TP55	0.1-0.4		9	
	TP59	0.1-0.4		9	
	TP60	0.1-0.4		8	
C31			8		9
	TP67	0.1-0.4		7	
	TP70	0.15-0.4		6	
	TP74	0.2-0.5		8	
C32			7		7
Limits of Reporting (LOR)			3	3	NA
GUIDELINES FOR THE NSW SITE AUDITOR SCHEME (2006)					
Provisional Phytotoxity-Based Investigation Level				20	
NATIONAL ENVIRONMENT PROTECTION MEASURE (1999)					
Health Investigation Levels (HIL) [a] (HIL 'A')				100	

Notes
a: Residential with gardens and accessible soil including children's day-care centres, preschools, primary schools, townhouses and villas.
NA: Not Applicable

TABLE G2
LEAD TEST RESULTS
SUB-SAMPLES
(Ref No: 12467/2-AA)

Analyte			LEAD (mg/kg)		
			Concentration of	Sub-Sample	
Composite Number	Sub-Samples	Depth (m)	Composite Sample	Concentration	Mean
	TP5	0-0.15		16	
	TP6	0-0.15		20	
	TP7	0-0.15		**2400**	
C3			600		812
Limits of Reporting (LOR)			1	1	NA
GUIDELINES FOR THE NSW SITE AUDITOR SCHEME (2006)					
Provisional Phytotoxity-Based Investigation Level				600	
NATIONAL ENVIRONMENT PROTECTION MEASURE (1999)					
Health Investigation Levels (HIL) [a] (HIL 'A')				300	

Notes
a: Residential with gardens and accessible soil including children's day-care centres, preschools, primary schools, townhouses and villas.
NA: Not Applicable

TABLE G3
ZINC TEST RESULTS
SUB-SAMPLES
(Ref No: 12467/2-AA)

Analyte			ZINC (mg/kg)		
			Concentration of	Sub-Sample	
Composite Number	Sub-Samples	Depth (m)	Composite Sample	Concentration	Mean
	TP2	0-0.15		**280**	
	TP3	0-0.15		33	
	TP4	0-0.15		68	
C2			110		127
	TP34	0-0.15		40	
	TP35	0-0.15		29	
	TP36	0-0.1		30	
C14			71		33
Limits of Reporting (LOR)			0.5	0.5	NA
GUIDELINES FOR THE NSW SITE AUDITOR SCHEME (2006)					
Provisional Phytotoxity-Based Investigation Level				200	
NATIONAL ENVIRONMENT PROTECTION MEASURE (1999)					
Health Investigation Levels (HIL) [a] (HIL 'A')				7000	

Notes
a: Residential with gardens and accessible soil including children's day-care centres, preschools, primary schools, townhouses and villas.
NA: Not Applicable

TABLE H
TOTAL PETROLEUM HYDROCARBONS (TPH) AND BTEX TEST RESULTS
DISCRETE SAMPLES
(Ref No: 12467/2-AA)

Analyte / Sample Location	Depth (m)	TPH (mg/kg) C6-C9	C10-C14	C15-C28	C29-C40	C10-C40 [a]	BTEX (mg/kg) BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES
TP52	0-0.2	<20	<20	<50	<150	220	<0.1	<0.1	<0.1	<0.3
SP2	0-0.5	<20	<20	<50	<150	220	<0.1	<0.1	<0.1	<0.3
Limits of Reporting (LOR)		20	20	50	150	NA	0.1	0.1	0.1	0.3
EPA Levels [b]		65	C10-C40 =1000				1	1.4	3.1	14

Notes
a: C10-C40 = (C10-C14) + (C15-C28) + (C29-C40); concentrations less than LOR are assumed equal to LOR.
b: Contaminated Sites: "Guidelines for Assessing Service Station Sites", 1994, EPA
NA: Not Applicable

TABLE I
BENZO(a)PYRENE, TOTAL POLYCYCLIC AROMATIC HYDROCARBONS (PAH), ORGANOCHLORINE PESTICIDES (OCP) AND POLYCHLORINATED BIPHENYLS (PCB) TEST DISCRETE SAMPLES
(Ref No: 12467/2-AA)

Analyte / Sample Location	Depth (m)	PAH (mg/kg)		Organochlorine Pesticides (mg/kg)							TOTAL PCB (mg/kg)
		BENZO(a)PYRENE (mg/kg)	TOTAL PAH (mg/kg)	HEPTACHLOR	ALDRIN	DIELDRIN	DDD	DDE	DDT	CHLORDANE (trans & cis)	
TP15	0-0.1	-	-	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2	-
TP23	0-0.1	-	-	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2	-
TP42	0-0.15	-	-	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2	-
TP52	0-0.2	<0.10	<1.8	-	-	-	-	-	-	-	<0.9
TP55	0.5-0.7	-	-	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2	-
SP1	0-0.5	-	-	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2	-
SP2	0-0.5	<0.10	<1.8	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2	<0.9
Limits of Reporting (LOR)		0.05	NA	0.1	0.1	0.05	0.2	0.2	0.2	0.2	0.9
NATIONAL ENVIRONMENT PROTECTION MEASURE (1999)											
Health Investigation Levels (HIL) [a] (HIL 'A')		1	20	10	10 [b]	10 [b]	200 [c]			50	10

Notes
a: Residential with gardens and accessible soil including children's day-care centres, preschools, primary schools, townhouses and villas.
b: Aldrin + Dieldrin
c: Total of DDD + DDE + DDT
NA: Not Applicable

TABLE J
ORGANOCHLORINE PESTICIDES (OCP) TEST RESULTS
COMPOSITED SAMPLES
(Ref No: 12467/2-AA)

Analyte / Composite Number	Organochlorine Pesticides (mg/kg)						
	HEPTACHLOR	ALDRIN	DIELDRIN	DDD	DDE	DDT	CHLORDANE (trans & cis)
Composite C1	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C2	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C3	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C4	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C5	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C6	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C7	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C8	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C9	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C10	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C11	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C12	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C13	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C14	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C15	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C16	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C17	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C18	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C19	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C20	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C21	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C22	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C23	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C24	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C25	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C26	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C27	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C28	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C29	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C30	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C31	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Composite C32	<0.1	<0.1	<0.05	<0.2	<0.2	<0.2	<0.2
Limits of Reporting (LOR)	0.1	0.1	0.05	0.2	0.2	0.2	0.2
NATIONAL ENVIRONMENT PROTECTION MEASURE (1999)							
Health Investigation Levels [a] (HIL 'A')	10	10 [c]	10 [c]		200 [d]		50
Adjusted HIL 'A' [b]	3.3	3.3 [c]	3.3 [c]		67 [d]		17

Notes
a: Residential with gardens and accessible soil including children's day-care centres, preschools, primary schools, townhouses and villas.
b: Adjusted HIL 'A' = HIL 'A'/3
c: Aldrin + Dieldrin
d: Total of DDD + DDE + DDT

TABLE K
ASBESTOS TEST RESULTS
DISCRETE SAMPLES
(Ref No: 12467/2-AA)

Analyte / Sample Location	Depth (m)	Result
Fibro-cement Pieces		
TP74	-	**Chrysotile asbestos detected**
Soil		
TP9	0.15-0.4	No asbestos detected
TP74	0.2-0.5	No asbestos detected
SP2	0-.5	No asbestos detected

Appendix 6: SGS Environmental Services Analytical Reports and Envirolab Services Certificate of Analysis

ANALYTICAL REPORT

16 May 2011

Geotechnique
P.O. Box 880
PENRITH
NSW 2751

Attention: **Anwar Barbhuyia**

Your Reference: 12467-2 - Claymore

Our Reference: SE87477

Samples: 187 Soils, 4 Waters, 1 Material
Received: 10/05/2011

Preliminary Report Sent: 13/05/11

These samples were analysed in accordance with your written instructions.

For and on Behalf of:
SGS ENVIRONMENTAL SERVICES

Sample Receipt:	Angela Mamalicos	AU.SampleReceipt.Sydney@sgs.com
Production Manager:	Huong Crawford	Huong.Crawford@sgs.com

Results Approved and/or Authorised by:

Ravee Sivasubramaniam
Asbestos Signatory

Ly Kim Ha
Organics Signatory
Organics Signatory

Huong Crawford
Metals Signatory

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Environmental Services Unit 16/33 Maddox Street Alexandria NSW 2015 Australia
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MBTEX in Soil		
Our Reference:	UNITS	SE87477-118
Your Reference	----------	TP52
Composite Reference	----------	-
Depth		0-0.2
Sample Matrix		Soil
Date Sampled		5/05/2011
Date Extracted (MBTEX)		12/05/2011
Date Analysed (MBTEX)		12/05/2011
Methyl-tert-butyl ether (MtBE)	mg/kg	<0.1
Benzene	mg/kg	<0.1
Toluene	mg/kg	<0.1
Ethylbenzene	mg/kg	<0.1
Total Xylenes	mg/kg	<0.3
BTEX Surrogate (%)	%	71

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Environmental Services Unit 16/33 Maddox Street Alexandria NSW 2015 Australia
t +61 (0)2 8594 0400 f + 61 (0)2 8594 0499 www.au.sgs.com

Total Recoverable Hydrocarbons in Soi		
Our Reference:	UNITS	SE87477-1 18
Your Reference	----------	TP52
Composite Reference	----------	-
Depth		0-0.2
Sample Matrix		Soil
Date Sampled		5/05/2011
Date Extracted (TRH C6-C9 PT)		12/05/2011
Date Analysed (TRH C6-C9 PT)		12/05/2011
TRH C_6 - C_9 P&T	mg/kg	<20
Date Extracted (TRH C10-C40)		12/05/2011
Date Analysed (TRH C10-C40)		12/05/2011
TRH C_{10} - C_{14}	mg/kg	<20
TRH C_{15} - C_{28}	mg/kg	<50
TRH C_{29} - C_{40}	mg/kg	<150

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