Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Preliminary Site (Contamination) Investigation

Proposed Hotel Development
28-32 Somerset Street, Kingswood

Prepared for
Boston Global

Project 99851.00
November 2020

Douglas Partners
Geotechnics / Environment / Groundwater

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	Signature	Date
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1. Introduction

This report presents the results of a Preliminary Site (Contamination) Investigation undertaken by Douglas Partners Pty Ltd (DP) in 2015[1] for a previous residential development at 28-32 Somerset Street, Kingswood (as shown on Drawing 1, Appendix A (referred to herein as the 'site'). The property has since changed ownership and the new owners are proposing a hotel development. A walkover of the site was undertaken to confirm that the results of the 2015 site investigation remain generally valid. This report represents an update of the 2015 report in the context of the new development proposal. This current investigation was commissioned by Boston Global and was prepared in accordance with DP's proposal SYD201126 dated 9 October 2020.

It is understood that the proposed development of the site includes the construction of a new hotel that will have six above ground floor levels, rooftop facilities and two basement levels. Excavation to depths of approximately 6 m to 7 m will be required.

The objectives of the PSI were to:

- Review current and historical information to gain an understanding of likely current and past land uses and hence site activities which may be potentially contaminating;
- Develop a conceptual site model (CSM) based on the available desktop information, site walkover and limited soil analysis program. This involved assessing potential contamination source - pathway - receptor linkages; and
- Provide an opinion on the suitability of the site for the proposed development.

The PSI was conducted and reported in general accordance with the National Environment Protection Council (NEPC) *National Environment Protection (Assessment of Site Contamination) Measure 1999* (amended 2013) (NEPC, 2013) and included a review of desktop information, a site walkover, development of a CSM, drilling of six test bores, collection of soil samples and analysis of selected samples for various contaminants of concern.

A geotechnical investigation was also conducted in 2015 and is currently being updated for the new development proposal. The results are presented separately (refer DP report Ref: 99851.00.R.001.Rev0 dated 10 November 2020).

[1] Douglas Partners *Report of Preliminary Site (Contamination) Investigation, 28-32 Somerset Street, Kingswood,* dated October 2015 (DP Project 85085.01.R.001.Rev0) (DP 2015).

2. Background

The 2015 development proposal was for a residential apartment building that included five above ground floor levels and two basement floor levels. The develop footprint was similar in nature to the currently proposed hotel, with the current proposed land use (commercial) being less sensitive compared to the previous proposed residential use. Similar to the 2015 proposal, the proposed hotel will occupy most of the site area and will require a similar depth of excavation to accommodate the two basement levels. In the current proposal, the lowest basement floor level is proposed at reduced level (RL) 41.6 m AHD.

Original investigations undertaken in 2015 included six boreholes that were drilled to depths of between 9.9 m and 11.6 m with the bottom of the boreholes extended to between 6.5 m and 8.3 m into rock, equating to borehole termination depths of between RL 38.7 and RL 36.1, approximately 3.5 m to 5 m below the proposed depth of bulk excavation. Site conditions have remained generally unchanged since the 2015 investigation (demolition of Number 30). Accordingly, the data obtained in 2015 is considered suitable to use for the purpose of assessing the suitability of the site (from a contamination perspective) for the new proposed use.

3. Scope of Works

The scope of works for the PSI comprised:

- Review the previous DP (2015) PSI;
- Undertake a site walkover to observe any changes in site conditions which may have occurred since 2015;
- Search of the NSW EPA Register for notices issued under the *Contaminated Land Management Act* 1997 and the *Protection of the Environment Operations Act* 1997 to see if any have been reported since DP (2015).

The scope of works carried out under DP (2015) comprised:

- Review of current and historical land titles;
- Review of historical aerial photographs;
- Search of the NSW WorkCover dangerous goods register (now known as the SafeWork NSW Schedule 11 hazardous chemicals stored on the premise);
- Search of Council records accessible under an informal Government Information (Public Access) (GIPA);
- Review of Section 149 Planning Certificates provided by the Client (now known as the Section 10.7 Planning Certificates);
- Search of the NSW EPA Register for notices issued under the *Contaminated Land Management Act* 1997 and the *Protection of the Environment Operations Act* 1997;
- Search of the NSW Department of Primary Industries Water groundwater database for registered groundwater bores in the vicinity of the site;
- Review of published geological, soil landscape and acid sulphate soil maps;

- A site walkover to observe current and recent land use and assess the potential for contamination;
- Development of a preliminary CSM;
- Service clearance of test bore locations;
- Auguring of six test bores using a drill rig and hand tools for contamination and geotechnical purposes;
- Soil samples were generally collected at the near surface and then at regular depth intervals to 0.5 m into natural soils and where signs of potential contamination were observed;
- Screening of all soil samples for volatile organic compounds using a photo-ionisation detector (PID);
- Analysis at a National Association of Testing Authorities (NATA) accredited laboratory of nine selected soil samples (plus QA / QC) and one material sample for the following potential contaminants and properties:
  - Metals (total arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc);
  - Total recoverable hydrocarbons (TRH) as a screening test for total petroleum hydrocarbons (TPH);
  - Benzene, toluene, ethylbenzene and total xylenes (BTEX);
  - Polycyclic aromatic hydrocarbons (PAH);
  - Total phenols;
  - Organochlorine pesticides (OCP);
  - Organophosphorus pesticides (OPP);
  - Polychlorinated biphenyls (PCB);
  - Asbestos (40 g soil samples for screening purposes and a potential asbestos containing material fragment);
  - Cation exchange capacity (CEC) and pH to assist calculation of site specific ecological investigation levels; and
  - Quality control / quality assurance sampling and analysis, comprising one intra-laboratory replicate.
- Preparation of an updated CSM; and
- Preparation of this report outlining the methodology and results of the PSI, discussion of the requirements for remediation and an assessment of the suitability of the site for the proposed development. A preliminary waste classification assessment has also been included.

4. Site Identification and Description

4.1 Site Identification

The site is located at 28-32 Somerset Street, Kingswood, on the corner with Hargrave Street. It comprises three lots, two of which are currently occupied by single-storey weatherboard houses and a third which is vacant. These are identified as Lot 59, Deposited Plan 36728 for Number 28, Lot 58, Deposited Plan 36278 for Number 30 and Lot 57, Deposited Plan 215146 for Number 32.

The site is understood to cover an area of approximately 1,700 m^2. Drawing 1, Appendix A, shows the location of the site.

4.2 Site Description

A site walkover was also undertaken by a DP environmental scientist on 21 September 2015 as part of DP (2015). It is noted that Number 28 and 30 were occupied at the time of the inspection. Site photographs from the site walkover are included in Appendix B. The following site features were observed:

- The site is bound by residential properties to the north and east, Hargrave Street to the south and Somerset Street and Nepean Hospital to the west;
- Number 28 was predominantly covered by a weatherboard house with concrete slabs and grass covering the backyard. Concrete pieces and gravel were observed in various locations across the property whilst the front yard comprised a grassed area with garden beds. A piece of fibrous material was observed adjacent to the rear fence (and was collected for analysis) (refer to Photographs 1 - 5, Appendix B);
- Number 30 was also occupied by a weatherboard house, with the front and rear areas grassed (refer to Photographs 6 - 8, Appendix B);
- Number 32 was a vacant lot with temporary fencing. Small pieces of building/demolition waste (e.g., concrete) were observed to be spread sporadically across the lot (refer to Photographs 8 - 10, Appendix B);
- The site generally sloped towards the east/north-east; and
- There was no evidence of gross contamination at the site.

A second site walkover was undertaken by a DP environmental engineer on 4 November 2020. Site photographs form the site walkover are also included in Appendix B. The following general site features and changes since DP (2015) were noted:

- Number 28 was still occupied by the house observed in 2015, however, the house appears to be vacant and the vegetation is not overgrown, particularly in the back yard (refer to Photographs 11 and 12, Appendix B);
- The house at number 30 had been removed and the site was now a vacant lot with temporary fencing. The lot was mostly overgrown with grass and small pieces of building/demolition waste (e.g., concrete, brick and tile) were observed to be spread sporadically across the lot (refer to Photographs 13 and 14, Appendix B); and
- Number 32 was still a vacant lot with signs of building rubble spread across the lot and no significant changes to the site were observed (refer to Photograph 15, Appendix B).

It is noted that existing structures and a grass coverage across the majority of the site precluding detailed visual inspection of the surface. Additionally, the walkover did not include a hazardous materials (HAZMAT) survey, although the existing structures on the site (and adjacent sites) appeared to include potential bonded asbestos containing material (ACM) / fibre cement sheeting.

4.3 Proposed Development

The proposed development is understood to be a seven-storey hotel with two basement levels. The building will have the reception and bar on the ground floor, with hotel rooms from ground floor up to level 5 and a rooftop bar and dining. Selected architectural plans have been included in Appendix A, showing the proposed cross sections and elevations of the proposed hotel.

5. Regional Topography, Geology and Hydrogeology

The majority of the site has been generally levelled, with a slight slope to the north-east, consistent with the local topography. It is expected that groundwater migrates towards local waterways approximately 4 km to the east of the site which ultimately are expected to source the Nepean River. Review of the NSW Department of Primary Industries Water groundwater bore database indicated that there were no registered water bores present within 500 m of the site.

Reference to the Penrith 1:100 000 Series Geological Sheet indicates the site is underlain by Bringelly Shale which typically comprises shale, carbonaceous claystone, laminite and fine to medium grained lithic sandstone. The results of the investigation (refer to Section 9) were consistent with this geological mapping which identified residual soils overlying shale. The geological setting is shown in Figure 1.

According to NSW Acid Sulphate Soil Risk mapping (1994-1998) the site is not located within or close to an area with a risk for acid sulphate soils.

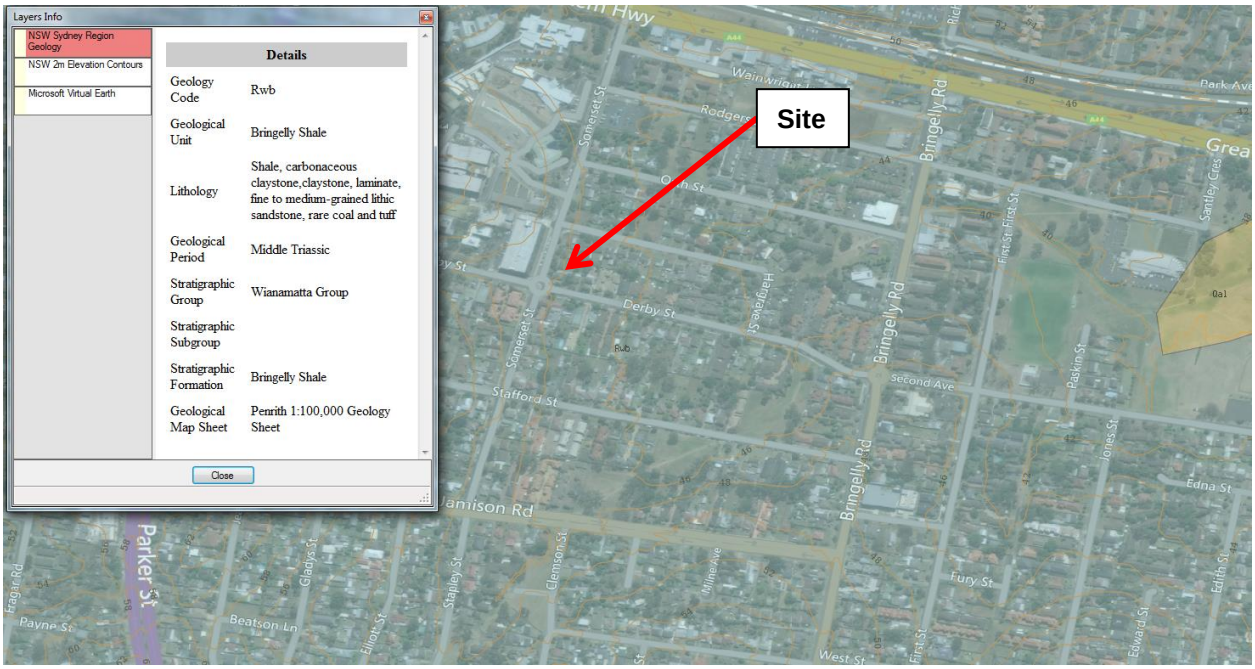


Figure 1: Showing the Geological Setting of the Site

6. Desktop Review- Historical Information

6.1 Aerial Photographs

Historical aerial photographs were obtained from databases held by the NSW Land & Property Information Division for the years 1947, 1956, 1970, 1986, 1994 and 2005 with Nearmap the source of the 2015 photograph. Extracts of the photographs are provided in Appendix C.

1947 - The photograph shows the site and general area to be undeveloped. Some tree clearing may have occurred and the general area typically comprises rural/semi-rural properties. Somerset Street is now present.

1956 - There appears to have been little change to the site since the 1947 photograph, although the area is becoming more populated with residential buildings and associated infrastructure (e.g., local roads). The first buildings for the Nepean Hospital had been built on the property to the west.

1970 - The site is occupied by three residential buildings along with additional sheds. Hargrave Road is now present and properties to the north, east and south have been developed for residential purposes. Further development of Nepean Hospital was evident.

1986, 1994 and 2005 - There appeared to be no significant change to the site or local area which is still dominated by residential properties. Development of Nepean Hospital has been ongoing.

2015 - There has been minimal change to Numbers 28 and 30, whilst the building on Number 32 is no longer present. Further development of Nepean Hospital, including a multistorey carpark that abuts Somerset Street is now present. Note: Nearmap photographs indicate that the building on Number 32 was removed between February and April 2013.

2020 - Reflective of current site conditions, observed and discussed in Section 3.2, the only building remaining is at Number 28 and the remaining two lots are vacant. Further development of Nepean Hospital is still being undertaken north-east of the site.

6.2 Historical Land Titles

A historical title deeds search was used to obtain ownership and occupancy information including company names and the occupations of individuals. The title information can assist in the identification of previous land uses by the company names or the site owners and can, therefore, assist in establishing whether there were potentially contaminating activities occurring at the site. A summary of the title deeds and possible land uses (with reference to the aerial photographs) is presented in the tables below for the three lots which cover the site. A full copy of the search, including the cadastre map, is provided in Appendix C.

Table 1: Part of Lot 59, Deposited Plan 36278 - 28 Somerset Street

Date of Acquisition and term held	Registered Proprietor(s) & Occupations where available	Potential Land Use
01.03.1909 (1909 to 1922)	Permanent Trustee Company of New South Wales Limited	Open space / possibly grazing
13.05.1922 (1922 to 1939)	Frederick Charles Jones (Tanner)	Open space / possibly grazing
22.09.1939 (1939 to 1942)	Amy Amelia Jones (Widow) Frederick Nepean Jones (Master Tanner) Reginald Neale (Store Keeper)	Open space / possibly grazing
27.03.1942 (1942 to 1958)	Commonwealth of Australia (Acquired for Postal & Telegraphic Services)	Open space / vacant
28.08.1958 (1958 to 1974)	Housing Commission of New South Wales	Residential
04.11.1974 (1974 to 2000)	George Albert French (Managing Director)	Residential
05.10.2000 (2000 to 2001)	Jennifer Beth Taylor Mervyn Reginald Taylor Elizabeth Mary Taylor	Residential
22.11.2001 (2001 to 2006)	Jennifer Beth Taylor	Residential
06.06.2006 (2006 to 2007)	Dural Holdings Australia Pty Ltd	Residential
08.01.2007 (2007 to date)	# Zeftco Pty Ltd	Residential

# Denotes current registered proprietor

Table 2: Lot 58, Deposited Plan 36278 - 30 Somerset Street

Date of Acquisition and term held	Registered Proprietor(s) & Occupations where available	Potential Land Use
01.03.1909 (1909 to 1922)	Permanent Trustee Company of New South Wales Limited	Open space / possibly grazing
13.05.1922 (1922 to 1939)	Frederick Charles Jones (Tanner)	Open space / possibly grazing
22.09.1939 (1939 to 1942)	Amy Amelia Jones (Widow) Frederick Nepean Jones (Master Tanner) Reginald Neale (Store Keeper)	Open space / possibly grazing
27.03.1942 (1942 to 1958)	Commonwealth of Australia (Acquired for Postal & Telegraphic Services)	Open space / vacant
28.08.1958 (1958 to 1990)	Housing Commission of New South Wales	Residential
21.03.1990 (1990 to 2004)	Robert William Bunt (Driver) Margaret Elizabeth Bunt (Married Woman)	Residential

Date of Acquisition and term held	Registered Proprietor(s) & Occupations where available	Potential Land Use
19.03.2004 (2004 to 2004)	Somerset Bed and Breakfast Pty Limited	Residential / B&B
19.03.2004 (2004 to 2006)	Jennifer Beth Taylor	Residential
06.06.2006 (2006 to 2007)	Dural Holdings Australia Pty Ltd	Residential
08.01.2007 (2007 to date)	# Zeftco Pty Ltd	Residential

# Denotes current registered proprietor

Table 3: Lot 57, Deposited Plan 215146 - 32 Somerset Street

Date of Acquisition and term held	Registered Proprietor(s) & Occupations where available	Potential Land Use
01.03.1909 (1909 to 1922)	Permanent Trustee Company of New South Wales Limited	Open space / possibly grazing
13.05.1922 (1922 to 1939)	Frederick Charles Jones (Tanner)	Open space / possibly grazing
22.09.1939 (1939 to 1942)	Amy Amelia Jones (Widow) Frederick Nepean Jones (Master Tanner) Reginald Neale (Store Keeper) (Transmission Application not investigated)	Open space / possibly grazing
27.03.1942 (1942 to 1958)	Commonwealth of Australia (Acquired for Postal & Telegraphic Services)	Open space / vacant
28.08.1958 (1958 to 1989)	Housing Commission of New South Wales	Residential
25.01.1989 (1989 to 1993)	Peter Reginald Walker (Factory Supervisor) Jacoba Walker (Married Woman)	Residential
08.09.1993 (1993 to 2001)	Jacoba Walker (Widow)	Residential
28.06.2001 (2001 to 2004)	Raphael Rahme John Rahme Joseph Rahme	Residential
29.03.2004 (2004 to 2014)	Angelo Peter Preketes	Residential
03.12.2014 (2014 to date)	# Zeftco Pty Ltd	Vacant

# Denotes current registered proprietor

6.3 WorkCover Dangerous Goods Search

A search of records held by WorkCover NSW (now SafeWork NSW) was requested by DP. WorkCover advised that they had not located from their records any information on licences for keeping dangerous goods within the site boundary. A copy of the search result is provided in Appendix C.

6.4 Council Section 149 Planning Certificates

Section 149 Planning certificates (now known as Section 10.7 Planning Certificates) provided to DP by the client were reviewed. The review indicated that:

- The residential properties 28, 30 and 32 Somerset Street are zoned RB4 Mixed Use;
- The land has not been identified as significantly contaminated land within the meaning of the *Contaminated Land Management Act 1997* (CLM Act);
- The land is not subject to a management order within the meaning of the CLM Act;
- The land is not the subject of an approved voluntary management proposal or maintenance order within the meaning of the CLM Act; and
- Council has not been provided with a site audit statement for this land.

Copies of the provided Section 149 Planning certificates are attached in Appendix C.

6.5 Council Records

An informal request to review available Council records associated with the site under the *Government Information (Public Access) Act 2009* was completed. Penrith City Council advised that there were no records for the site with respect to *inter alia*:

- Information indicating previous land use and site activities;
- Previous contamination assessments;
- Pollution notifications or other breaches of Council's environmental policies; and
- Use of asbestos or other hazardous materials on the site.

It is noted that the lack of records is not unexpected given the extended period of use as residential properties and the lack of notable development on the site since the 1950s / 1960s (as indicated by the aerial photographs (Section 5.1)).

6.6 Regulatory Notice Search

The EPA publishes records of contaminated sites under Section 58 of the *Contaminated Land Management Act* 1997 (CLM Act) on a public database accessed via the internet. The notices relate to investigation and / or remediation of site contamination considered to be significantly contaminated under the definition in the CLM Act. More specifically the notices cover the following:

- Actions taken by the EPA under sections 15, 17, 19, 21, 23, 26 or 28 of the CLM Act;

- Actions taken by the EPA under sections 35 or 36 of the Environmentally Hazardous Chemicals Act 1985; and
- Site audit statements provided to the EPA under section 52 of the CLM Act on sites subject to an in-force remediation order.

A search of the public database on 17 September 2015 and on 9 November 2020 indicated that neither the site nor any other properties within a 1 km radius were listed.

It should be noted that the EPA record of Notices for contaminated land does not provide a record of all contaminated land in NSW.

The NSW EPA also issues environmental protection licenses under Section 308 of the *Protection of the Environment Operations Act* 1997 (POEO Act). The register contains:

- Environmental protection licenses;
- Applications for new licenses and to transfer or vary existing licenses;
- Environment protection and noise control licenses;
- Convictions in prosecutions under the POEO Act;
- The result of civil proceedings;
- License review information;
- Exemptions from provisions of the POEO Act or Regulations;
- Approvals granted under Clause 9 of the POEO (Control of Burning) Regulation; and
- Approvals granted under Clause 7a of the POEO (Clean Air) Regulation.

A search of the public register on 17 September 2015 indicated that no licenses were listed for the site or properties within 1 km. A search of the public register on 9 November 2020 indicated that there were no licenses listed for the site or properties within 1 km. DP notes that at the Nepean Hospital, 'Healthscope Limited' located approximately 3575 m north west of the site held a licenced for hazardous, Industrial or Group A waste Generation or Storage (>10 - 100 tonnes) which is no longer in force as of 19 February 2009.

7. Preliminary Conceptual Site Model

A CSM is a representation of site-related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM provides the framework for identifying how the site became contaminated and how potential receptors may be exposed to contamination either in the present or the future i.e., it enables an assessment of the potential source - pathway - receptor linkages.-

7.1 Potential Contamination Sources

Potential sources of contamination are listed in Table 4, and are based on the site walkover and review of desktop information (Section 5).

Table 4: Potential Contamination Sources and Contaminants of Concern

Potential Source	Description of Potential Contaminating Activity	Contaminants of Concern
Site buildings and structures	Hazardous building materials within buildings or structures.	Asbestos, possibly lead paint and / or other hazardous building materials.
Impacted filling / topsoil from general site activities over time	The use of pesticides to protect site structures, demolition and deterioration of buildings or structures and small areas levelled using site won or imported filling.	Asbestos, heavy metals, TRH, BTEX, PAH, OCP, OPP, PCB and phenols

For the purpose of developing a CSM, the potential sources of contamination can be defined as:

- S1 - Hazardous building materials within buildings or structures; and
- S2 - Impacted filling / topsoil.

7.2 Potential Contamination Migration Pathways

The pathways by which the potential sources of contamination could reach potential receptors are described below:

- P1 - Dermal contact and ingestion;
- P2 - Inhalation of dust;
- P3 - Inhalation of vapours;
- P4 - Leaching and vertical migration into groundwater; and
- P5 - Direct contact with in-ground structures and terrestrial ecology.

7.3 Potential Receptors of Concern

The potential receptors of potential contamination sourced from the site are considered to be:

- R1 - Site users (current and future- commercial (hotel) land use);
- R2 - Adjacent site users (current and future- commercial/industrial land use);
- R3 - Construction and maintenance workers;
- R4 - Groundwater;

- R5- Terrestrial ecology (current and future); and
- R6 - Property (current and future).

There were no surface water bodies in the near vicinity of the site (refer Section 4) and hence were not considered to be of concern.

7.4 Conceptual Site Model

A 'source - pathway - receptor' approach has been used to assess the potential risks of harm being caused to human or environmental receptors from contamination sources on or in the vicinity of the site, via exposure pathways (potential complete pathways). The possible pathways between the above sources (S1 and S2) and receptors (R1 to R6) are provided in Table 5 below.

Table 5: Preliminary Conceptual Site Model

Potential Source	Pathway	Receptor
S1 - Hazardous building materials within buildings or structures	P1 - Dermal contact and ingestion	R1 - Site users R3 - Construction & maintenance workers
	P2 - Inhalation of dust	R1 - Site users R2 - Adjacent site users R3 - Construction & maintenance workers
S2 - Impacted filling / topsoil	P1 - Dermal contact and ingestion	R1 - Site users R3 - Construction & maintenance workers
	P2 - Inhalation of dust P3 - Inhalation of vapours	R1 - Site users R2 - Adjacent site users R3 - Construction & maintenance workers
	P4 - Leaching and vertical migration to groundwater	R4 - Groundwater
	P5 - Direct Contact with in-ground structures and terrestrial ecology	R5 - Terrestrial ecology R6 - Property

8. Fieldwork and Analysis

8.1 Data Quality Objectives and Project Quality Procedures

The PSI has been devised broadly in accordance with the seven step data quality objective (DQO) process which is provided in Appendix D, Schedule B2 of NEPC (2013). The DQO process is outlined as follows:

- Stating the Problem;
- Identifying the Decision;
- Identifying Inputs to the Decision;
- Defining the Boundary of the Assessment;
- Developing a Decision Rule;
- Specifying Acceptable Limits on Decision Errors; and
- Optimising the Design for Obtaining Data.

Referenced sections for the respective DQOs listed above are presented in Table D1, Appendix D.

8.2 Data Quality Indicators

The performance of the assessment in achieving the DQO was assessed through the application of Data Quality Indicators (DQI), defined as follows:

Precision: A quantitative measure of the variability (or reproducibility) of data;

Accuracy: A quantitative measure of the closeness of reported data to the "true" value;

Representativeness: The confidence (expressed qualitatively) that data are representative of each media present on the site;

Completeness: A measure of the amount of useable data from a data collection activity; and

Comparability: The confidence (expressed qualitatively) that data can be considered equivalent for each sampling and analytical event.

Further comments on the DQIs are presented in Appendix D.

8.3 Field Quality Assurance and Quality Control

The field QC procedures for sampling were as prescribed in Douglas Partners' *Field Procedures Manual*, and are outlined later in this section.

Given the limited soil sampling and analysis undertaken for the investigation, field QA / QC was limited to one replicate recovered and analysed for a limited suite of contaminants by means of intra- laboratory analysis. This is in general accordance with standard industry practice and guidelines.

8.4 Laboratory QA / QC

The analytical laboratory, accredited by NATA, is required to conduct in-house QA/QC procedures. These are normally incorporated into every analytical run and include reagent blanks, spike recovery, surrogate recovery and duplicate samples.

The results of the DP assessment of laboratory QA / QC are shown in Appendix D with the full laboratory certificates of analysis included in Appendix F.

8.5 Sample Location and Rationale

The recommended minimum sampling density as stipulated in the NSW EPA's *Contaminated Sites: Sampling Design Guideline, 199*5 for a 1,700 m^2 site is between six and seven sampling points. Given the sites current and prolonged use as residential properties, buildings covering significant areas of the site and to undertake the works in conjunction with the geotechnical investigation, six sample locations were considered suitable for the investigation. Sampling locations were selected to provide general site coverage in conjunction with the geotechnical investigation requirements.

The test bore locations are shown on Drawing 1, Appendix A.

8.6 Fieldwork Methods

The auguring of six test bores was undertaken using a drill rig and hand tools. All test bores were augured to refusal on rock and then cored using NMLC-coring drilling techniques for geotechnical purposes. Additionally, it is noted that BH4 was converted for groundwater well installation to a depth of 10 m bgl, to allow groundwater level monitoring for geotechnical purposes at a later date (if required).

The depths of each test bore and drilling methods are shown on the test bore logs provided in Appendix E. The work was undertaken between 17 and 23 September 2015.

8.7 Soil Sampling Procedure

All sample locations were cleared for services and underground pipes by a services locator and by review of dial-before-you-dig (DBYD) plans.

All sampling data was recorded on DP's test bore logs with essential information included in the chain-of-custody sheets. The general sampling procedure adopted for the collection of environmental samples is summarised below:

- Collection of disturbed soil samples directly from the auger using disposable sampling equipment;
- Transfer of samples into laboratory-prepared glass jars, filled to the top to minimise the headspace within the sample jar and capping immediately to minimise loss of volatiles. Replicate samples were placed into snap lock plastic bags for asbestos analysis;
- Labelling of sample containers with individual and unique identification, including project number, sample location and sample depth; and

- Placement of the glass jars, with Teflon lined lid, into an ice cooled, insulated and sealed container for transport to the laboratory.

8.8 Analytical Rationale

The analytical scheme was designed to obtain an indication of the potential presence and possible distribution of contaminants that may be attributable to past and present activities, or features within the site, as discussed in Section 6. It is noted that as the soil results indicated low risk from chemical contaminants (discussed in Sections 9 and 10), groundwater analysis was not considered warranted for this investigation.

Envirolab Services Pty Ltd (Envirolab) was used for the analysis of soil samples (including intra-laboratory analysis of the replicate sample). The laboratory is required to carry out routine in-house QC procedures.

Laboratory analytical methods as stated by Envirolab are provided in the laboratory certificates of analysis in Appendix F and are summarised in the QA / QC section in Appendix D.

9. Site Assessment Criteria

It is understood that a development application is to be made to redevelop the site into a seven storey hotel building with a two level basement.

The site assessment criteria (SAC) applied in the current investigation is informed by the CSM which identified human and environmental receptors to be exposed to potential contamination on the site. Analytical results were assessed (as a Tier 1 assessment) against the SAC comprising the investigation and screening levels of Schedule B1, NEPC (2013). The NEPC guidelines are endorsed by the NSW EPA under the CLM Act 1997.

The investigation and screening levels are applicable to generic land use settings and include consideration of, where relevant, the soil type and the depth of contamination. The investigation and screening levels are not intended to be used as clean up levels. Rather, they establish concentrations above which further appropriate investigation (e.g., Tier 2 assessment) should be undertaken. They are intentionally conservative and are based on a reasonable worst-case scenario.

The investigation and screening levels for soils applied in the current investigation comprise levels adopted for a commercial/industrial land use scenario.

9.1 Health Investigation and Screening Levels

The Health Investigation Levels (HIL) and Health Screening Levels (HSL) are scientifically-based, generic assessment criteria designed to be used in the first stage (Tier 1) of an assessment of potential human health risk from chronic exposure to contaminants.

HILs are applicable to assessing health risk arising *via* all relevant pathways of exposure for a range of metals and organic substances. The HIL are generic to all soil types and apply generally to a depth of 3 m below the surface for commercial / industrial use. Site-specific conditions may determine the depth to which HILs apply for other land uses.

HSLs are applicable to selected petroleum compounds and fractions to assess the risk to human health via inhalation and direct contact pathways. HSL have been developed for different land uses, soil types and depths to contamination. Petroleum based Health Screening Levels for direct contact have been adopted from the Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) *Technical Report no.10 Health screening levels for petroleum hydrocarbons in soil and groundwater* (2011) as referenced by NEPC (2013).

The generic HIL and HSL are considered to be appropriate for the assessment of contamination at the site. Given the proposed land use the adopted HIL and HSL are:

- **HIL-D** - Commercial / Industrial;
- **HSL-D (vapour intrusion)** - Commercial / Industrial; and
- **HSL-D (direct contact)** - Commercial / Industrial.

Given that the HIL B and HSL B values apply to a relatively sensitive land use, it is considered that the values are also protective of construction and maintenance workers at the site.

In addition, the HSL adopted are predicated on the inputs summarised in Table 6.

Table 6: Inputs to the Derivation of HSLs

Variable	Input	Rationale
Potential exposure pathway	Soil vapour intrusion (inhalation) / Direct contact *	With the potential for vapour intrusion into new buildings, and direct contact with soils after construction, both pathways are considered viable.
Soil Type	Sand	In the absence of laboratory particle analysis sand HSLs have been adopted as an initial conservative screen. It is noted that the majority of the material is predominantly clay.
Depth to contamination	0 m to <1 m	0 to <1 m for soil HSLs (fill / topsoil - impacted soil recovered between 0 m and 0.7 m).

**Developed by CRC CARE (2011)*

The adopted HILs and HSLs for the analytes included in the PSI are listed in the following Table 7.

Table 7: Health Investigation and Screening Levels (mg/kg)

Contaminants		HIL-D & HSL-D Direct Contact	HSL-D Vapour Intrusion
Metals	Arsenic	3000	-
	Cadmium	900	-
	Chromium (VI)	3600	-
	Copper	240 000	-
	Lead	1500	-
	Mercury (inorganic)	730	-
	Nickel	6000	-
	Zinc	400 000	-
PAH	Benzo(a)pyrene TEQ[1]	40	-
	Naphthalene	11 000 (HSL)	NL
	Total PAH	4000	-
TRH	C6 – C10 (less BTEX) [F1]	26 000 (HSL)	260
	>C10-C16 (less Naphthalene) [F2]	20 000 (HSL)	NL
	>C16-C34 [F3]	27 000 (HSL)	-
	>C34-C40 [F4]	38 000 (HSL)	-
BTEX	Benzene	430 (HSL)	3
	Toluene	99 000 (HSL)	NL
	Ethylbenzene	27 000 (HSL)	NL
	Xylenes	81 000 (HSL)	230
Phenol	Pentachlorophenol (used as an initial screen)	660	-
OCP	Aldrin + Dieldrin	45	-
	Chlordane	530	-
	DDT+DDE+DDD	3600	-
	Endosulfan	2000	-
	Endrin	100	-
	Heptachlor	50	-
	HCB	80	-
	Methoxychlor	2500	-
OPP	Chlorpyrifos	2000	
PCB [2]		7	-

Notes to Table 7:

1. sum of carcinogenic PAH
2. non dioxin-like PCBs only
3. NL – not limiting.

9.2 Ecological Investigation Levels

Ecological Investigation Levels (EIL) have been derived for selected metals and organic compounds and are applicable for assessing risk to terrestrial ecosystems (NEPC, 2013). EIL depend on specific soil physiochemical properties and land use scenarios and generally apply to the top 2 m of soil, which corresponds to the root zone and habitation zone of many species. The EIL is determined for a contaminant based on the sum of the ambient background concentration (ABC) and an added contaminant limit (ACL). The ABC of a contaminant is the soil concentration in a specific locality that is the sum of naturally occurring background levels and the contaminants levels that have been introduced from diffuse or non-point sources (e.g., motor vehicle emissions). The ACL is the added concentration (above the ABC) of a contaminant above which further appropriate investigation and evaluation of the impact on ecological values is required.

The EIL is calculated using the following formula:

EIL = ABC + ACL,

The ABC is determined through direct measurement at an appropriate reference site (preferred) or through the use of methods defined by Olszowy et al *Trace element concentrations in soils from rural and urban areas of Australia*, Contaminated Sites monograph no. 4, South Australian Health Commission, Adelaide, Australia 1995 (Olszowy, 1995) or Hamon et al, *Geochemical indices allow estimation of heavy metal background concentrations in soils*, Global Biogeochemical Cycles, vol. 18, GB1014, (Hamon, 2004). ACL is based on the soil characteristics of pH, CEC and clay content.

EILs (and ACLs where appropriate) have been derived in NEPC (2013) for only a short list of contaminants comprising As, Cu, Cr (III), DDT, naphthalene, Ni, Pb and Zn. An *Interactive (Excel) Calculation Spreadsheet* may be used for calculating site-specific EIL for these contaminants, and has been provided in the ASC NEPM Toolbox available on the SCEW (Standing Council on Environment and Water) website (http://www.scew.gov.au/node/941).

The adopted EIL, derived from Tables 1B (1) to 1B(5), Schedule B1 of NEPC (2013) are shown in the following Table 8. The following site specific data and assumptions have been used to determine the EILs:

- A protection level for commercial / industrial;
- The EILs will apply to the top 2 m;
- Given the likely primary source of soil contaminants (i.e., historical filling) the contamination is considered as “aged” (>2 years);
- ABCs have been taken as the approximate average EPA background concentrations for NSW as published in Olszowy (1995); and
- Site specific pH and CEC have been tested whilst a conservative clay content has been assumed and as such these values have been used in the determination of EILs, where appropriate.

The adopted EILs are listed in the following Table 8.

Table 8: Ecological Investigation Levels (EIL) in mg/kg

Analyte		EIL[2]	Comments
Metals	Arsenic	160	Adopted parameters: pH of 6.87 (average tested); CEC of 14.67 meq/100g (average tested); Conservative clay content composition of 1% used Iron not tested as EIL aged criteria was adopted.
	Copper	320	
	Nickel	380	
	Chromium III	320	
	Lead	1800	
	Zinc	970	
OCP	DDT	640	
PAH	Naphthalene	370	

9.3 Ecological Screening Levels - Petroleum Hydrocarbons

Ecological Screening Levels (ESL) are used to assess the risk of selected petroleum hydrocarbon compounds, BTEX and benzo(a)pyrene to terrestrial ecosystems. ESL applies to the top 2 m of the soil profile as for EIL.

ESL has been derived in NEPC (2013) for petroleum fractions F1 to F4 as well as BTEX and Benzo(a)pyrene. Site specific data and assumptions as summarised in Table 9 have been used to determine the ESL. The adopted ESL, from Table 1B (6), Schedule B1 of NEPC (2013) are shown in Table 9.

Table 9: Inputs to the derivation of ESL

Variable	Input	Rationale
Depth of ESL application	Top 2 m of the soil profile	The top 2 m depth below ground level corresponds to the root zone and habitation zone of many species.
Land use	Commercial/Industrial	Proposed future land use.
Soil Texture	Coarse	The most conservative values (soil profile sand, sand encountered in some of the filling, however, predominately the filling was clay).

Table 10: Ecological Screening Levels (ESL) in mg/kg

Analyte		ESL	Comments
TRH	C6 - C10 (less BTEX) [F1]	215*	All ESLs are low reliability apart from those marked with * which are moderate reliability
	>C10-C16 (less Naphthalene) [F2]	170*	
	>C16-C34 [F3]	1700	
	>C34-C40 [F4]	3300	
BTEX	Benzene	75	
	Toluene	135	
	Ethylbenzene	165	
	Xylenes	180	
PAH	Benzo(a)pyrene	1.4	

9.4 Management Limits - Petroleum Hydrocarbons

In addition to appropriate consideration and application of the HSL and ESL, there are additional considerations which reflect the nature and properties of petroleum hydrocarbons, including:

- Formation of observable light non-aqueous phase liquids (LNAPL);
- Fire and explosion hazards; and
- Effects on buried infrastructure e.g., penetration of, or damage to, in-ground services.

Management Limits to avoid or minimise these potential effects have been adopted in NEPC (2013) as interim Tier 1 guidance. Management Limits have been derived in NEPC (2013) for the same four petroleum fractions as the HSL (F1 to F4). The adopted Management Limits, from Table 1B (7), Schedule B1 of NEPC (2013) are shown in the following Table 11. The following site specific data and assumptions have been used to determine the Management Limits:

- The Management Limits will apply to any depth within the soil profile;
- The Management Limits for commercial/industrial land use apply; and
- A “coarse” soil texture has been adopted to take a conservative approach.

Table 11: Management Limits in mg/kg

Analyte		Management Limit
TRH	$C_6 – C_{10}$ (F1) #	700
	$>C_{10}-C_{16}$ (F2) #	1,000
	$>C_{16}-C_{34}$ (F3)	3,500
	$>C_{34}-C_{40}$ (F4)	10,000

Separate management limits for BTEX and naphthalene are not available hence these have not been subtracted from the relevant fractions to obtain F1 and F2

9.5 Asbestos in Soil

Bonded asbestos-containing material (ACM) is the most common form of asbestos contamination across Australia, generally arising from:

- Inadequate removal and disposal practices during demolition of buildings containing asbestos products;
- Widespread dumping of asbestos products and asbestos containing fill on vacant land and development sites; and
- Commonly occurring in historical fill containing unsorted demolition materials.

Mining, manufacturing or distribution of asbestos products may result in sites being contaminated by friable asbestos including free fibres. Severe weathering or damage to bonded ACM may also result in the formation of friable asbestos comprising fibrous asbestos (FA) and / or asbestos fines (AF).

Asbestos only poses a risk to human health when asbestos fibres are made airborne and inhaled. If asbestos is bound in a matrix such as cement or resin, it is not readily made airborne except through substantial physical damage. Bonded ACM in sound condition represents a low human health risk, whilst both FA and AF materials have the potential to generate, or be associated with, free asbestos fibres. Consequently, FA and AF must be carefully managed to prevent the release of asbestos fibres into the air.

A detailed asbestos assessment as outlined in NEPC (2013) was not undertaken as part of the PSI. As such, asbestos was screened from replicate bag samples taken with each jar sample. Therefore, the presence or absence of asbestos at a limit of reporting of 0.1 g/kg has been adopted for this assessment as an initial screen.

Where bonded materials were identified to be potentially ACM, these materials were analysed to confirm their ACM classification.

9.6 Waste Classification Criteria

To assess the waste classification of the material for off-site disposal purposes a preliminary waste classification assessment was undertaken in accordance with the six step process outlined in the NSW EPA *Waste Classification Guidelines 2014* (EPA, 2014). To soil results are assessed against the general solid waste (GSW) criteria outlined in Tables 1 and 2 of the guidelines.

With respect to the natural materials at the site, these are also assessed for their potential classification as Virgin Excavated Natural Material (VENM). In this regard EPA (2014) defines VENM as:

- *"natural material (such as clay, gravel, sand, soil or rock fines):*
- *that has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or process residues, as a result of industrial, commercial, mining or agricultural activities; and*
- *that does not contain any sulfidic ores or soils or any other waste; and*
- *includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved from time to time by a notice published in the NSW Government Gazette."*

No further NSW EPA guidelines or Gazettal notices have been published/issued that provide additional criteria for assessing VENM. Given this DP have compared the results of the natural soils to published background concentrations in NEPC (1999) *National Environment Protection Measure (Assessment of Site Contamination)* Schedule B1, Table 5-A, Background Ranges and ANZECC/NHMRC (1992) *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites, Environmental Soil Quality Guidelines* Background A [ANZECC A] as a screening criteria. In the case of organics where no reference values exist the laboratory PQL have been adopted as the screening level.

10. Fieldwork Results

10.1 Field Observations

Details of the subsurface conditions encountered in the investigation are given in the test bore logs in Appendix E, together with notes defining classification methods and descriptive terms.

The sequence of subsurface materials encountered within the boreholes, in increasing depth order, may be summarised as follows:

Filling / Topsoil:	Generally brown silty clay filling with some gravel and some sand filling (BH4 only) to depths of between 0.2 m and 0.7 m;
Clay / Silty Clay:	Red, brown and grey firm to very stiff clays/silty clays to depths of between 2.7 m and 4.3 m; and
Shale:	Extremely low to very low strength shale to depths of between 4.5 m and 6.0 m overlying low and then medium strength shale to termination depths of between 9.92 m and 11.6 m.

No free groundwater was observed during augering of the boreholes to maximum depths of 2.5 m. The use of water during rotary drilling and coring precluded further groundwater measurements during drilling. The water level recorded in the monitoring well installed in BH4 was 2.5 m depth (RL 45.2) on 9 October 2015.

There were no signs of gross chemical contamination during the drilling.

10.2 Field Testing Results

Replicate soil samples collected in plastic bags were allowed to equilibrate under ambient temperatures before screening for Total Photo-ionisable Compounds (TOPIC) using a calibrated photo-ionisation detector (PID). The PID readings were all <5 ppm, consistent with the field observations noted above.

10.3 Laboratory Results

The results of the laboratory analysis undertaken are summarised and presented in Table F1: Summary of Soil Laboratory Results in Appendix F.

The full laboratory certificates together with the chain of custody and sample receipt information are also presented in Appendix F.

11. Discussion of Results

11.1 Contaminants in Soil

The soil samples were generally free of significant signs of chemical contamination concern (e.g., strong odours, staining, etc). Filling / topsoil was generally minimal across the site with thickness ranging between 0.2 m and 0.7 m depth.

Soil samples were analysed for a variety of common contaminants including heavy metals, TRH, BTEX, PAH, OCP, OPP, PCB, phenols and asbestos. The concentrations of BTEX, TRH, PCB, OCP, OPP, phenol and asbestos were all below the laboratory detection limits in all samples analysed. There was a very low detection of PAH in sample BH6/.01 from the filling, with a total positive PAH concentration of 0.2 mg/kg. Heavy metals were detected at all locations with concentrations generally low.

The fragment of fibrous material (possibly ACM) observed near the rear fence of 28 Somerset Street was tested for asbestos and was confirmed to not contain asbestos.

All results were within the health and ecological SAC.

11.2 Provisional Waste Classification

Chemical results for the filling were generally within the General Solid Waste (GSW) criteria without TCLP (CT1 criteria). There were minor exceedances for lead in BH4/0-0.1 and for nickel in BH2/0-0.1. TCLP analysis confirmed low leaching characteristics for both analytes in the respective samples and hence were within the GSW criteria with TCLP (TCLP1/SCC1 criteria). Therefore, based on the field and laboratory results the filling is provisionally classified as General Solid Waste (non-putrescible).

The natural clays, silty clays and bedrock similarly did not show any signs of gross contamination and the results were generally consistent with background ranges. On this basis and in conjunction with the filling not being mixed with the natural material, the natural clays and silty clays and bedrock at the site has a provisional classification of Virgin Excavated Natural Material (VENM).

12. Updated Conceptual Site Model

An updated CSM is presented in Table 12. It is a representation of site information regarding the potential contamination sources and associated exposure pathways and potential receptors identified from this investigation.

Table 12: Conceptual Site Model

Potential Source	Pathway	Receptor
S1 - Hazardous building materials within buildings or structures	P1 - Dermal contact and ingestion	R1 - Site users R3 - Construction & maintenance workers
	P2 - Inhalation of dust	R1 - Site users R2 - Adjacent site users R3 - Construction & maintenance workers

The following summarises the inputs from the current investigation which have informed the above CSM.

The recorded concentrations of chemical contaminants in soil during the current investigation were all within the relevant health and ecological criteria.

The site inspection did observe the presence of some building rubble on the vacant lot (Number 32 Somerset Street) which is likely due to the demolition of the former residential building in 2013. Given the age of that building (which is thought to be consistent with the existing structures, i.e., 1950's/1960's as indicated by the aerial photographs) and site observations, it is likely that the demolished building and existing buildings contained / contain hazardous materials. In light of this and the grass coverage across large sections of the site (in particular Number 32), an appropriately licensed occupational hygienist should complete a HAZMAT survey prior to any demolition works of the existing buildings and provide clearance of the site post removal of the buildings and grass / vegetation coverage.

13. Conclusion and Recommendations

Based on the field and analytical results presented in this report it is considered the site can be made suitable for the proposed hotel (commercial) development, subject to the following being undertaken:

- A hazmat survey of existing buildings / structures prior to demolition and the site being cleared by an occupational hygienist post demolition works;
- Confirmation of the contamination status (and waste classification) of the soils under the existing buildings; and
- Development of an unexpected finds protocol for implementation during construction works.

Additionally, it is recommended that the vacant lots (Number 30 and 32) be cleared for asbestos during stripping of the grass coverage and / or the demolition and clearance documentation completed for the removal of the former house are obtained and reviewed.

Additionally, regarding the provisional *General Solid Waste (non-putrescible)* classification for the filling and the VENM classification for the underlying natural material, should material be identified during works which does not reflect those described herein or shows signs of contamination (e.g., results of testing under the existing buildings, odours, staining, asbestos) this material is to be segregated and an appropriately qualified environmental consultant engaged to confirm the classification of the material.

14. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for this project at 29 - 32 Somerset Street, Kingswood in accordance with DP's proposal SYD201126.P.001.Rev0 dated 9 October 2020 and acceptance received from Boston Global dated 12 October 2020. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Boston Global for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

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

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

The assessment of atypical safety hazards arising from this advice is restricted to the environmental components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

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

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

The scope for work for this investigation/report did not include the assessment of surface or sub-surface materials or groundwater for contaminants, within or adjacent to the site. Should evidence of filling of unknown origin be noted in the report, and in particular the presence of building demolition materials, it should be recognised that there may be some risk that such filling may contain contaminants and hazardous building materials.

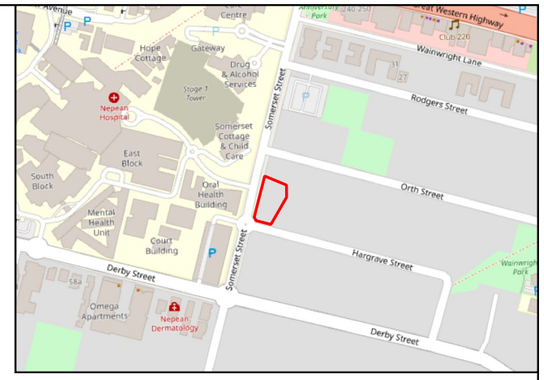
Asbestos has not been detected by observation or by laboratory analysis, either on the surface of the site, or in filling materials at the test locations sampled and analysed. Building demolition materials, such as concrete, brick and tile were, however, observed on the surface and these are considered as indicative of the possible presence of hazardous building materials (HBM), including asbestos.

Although the sampling plan adopted for this investigation is considered appropriate to achieve the stated project objectives, there are necessarily parts of the site that have not been sampled and analysed. This is either due to undetected variations in ground conditions or to budget constraints (as discussed above), or to parts of the site being inaccessible and not available for inspection/sampling, or to vegetation preventing visual inspection and reasonable access. It is therefore considered possible that HBM, including asbestos, may be present in unobserved or untested parts of the site, between and beyond sampling locations, and hence no warranty can be given that asbestos is not present.

Douglas Partners Pty Ltd

Appendix A

Drawing 1



LOCALITY MAP

Notes:
1. Basemap from nearmap.com (dated 01/10/2020)
2. Test locations shown are approximate only

Legend

- Approximate Site Boundary
- DP 2015 Borehole Location
- DP 2015 Monitoring Well Location

0 20 40 60 m

Douglas Partners
Geotechnics / Environment / Groundwater

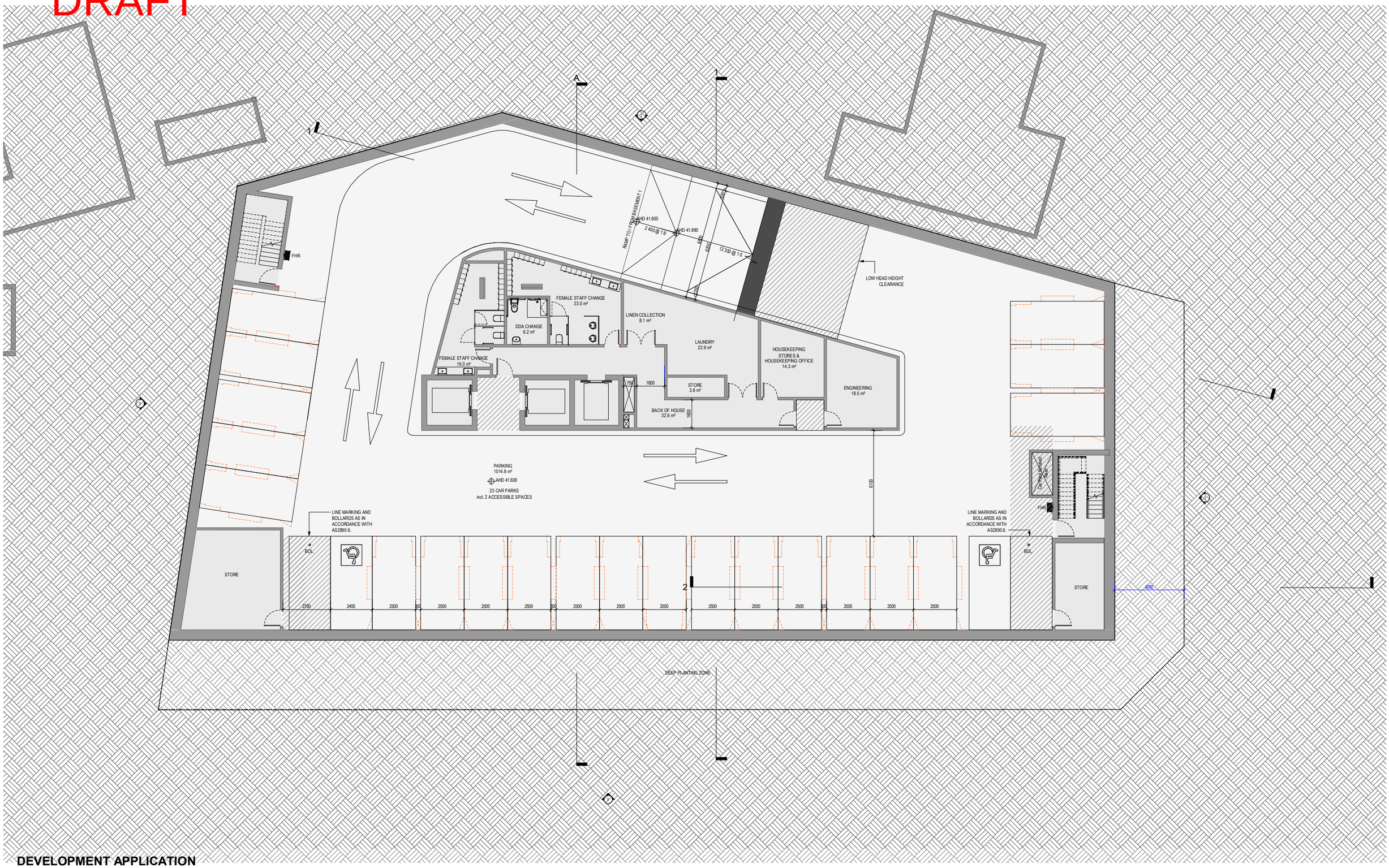
CLIENT:	Boston Global		
OFFICE:	Sydney	DRAWN BY:	LT
SCALE:	1:750 @ A3	DATE:	06.11.2020

TITLE: **Site and Previous Test Location Plan**
Proposed Hotel Development
28 - 32 Somerset Street, Kingswood

N

PROJECT No:	99851.01
DRAWING No:	1
REVISION:	0

DRAFT



DEVELOPMENT APPLICATION

Revisions				
	P5	08.07.20	For Client Review	KD
	P6	10.07.20	For Review	GT
	P7	14.10.20	WIP FOR INFORMATION	HB
	P8	26.10.20	For Information	MT
	P9	09.11.20	Development Application - Draft	MT

9/11/2020 10:23:13 AM

Project: **28-32 SOMERSET STREET, KINGSWOOD**
28-32 SOMERSET STREET, KINGSWOOD

Drawing: **Basement 2**

Project No.: **220027**

Date: **03.04.20**

Author: **GT**

Scale: @ A1: **1 : 100**

Drawing No.: **TP01.01** **P9**

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DRAFT

SINGLE STOREY WEATHER BOARD RESIDENCE 40 ORTHO STREET

GARAGE

SHED

SINGLE STOREY WEATHERBOARD RESIDENCE 26 SOMMERSET STREET

VERANDAH

SINGLE STOREY FIBIROUS CEMENT RESIDENCE 1 HARGRAVE STREET

EXISTING STREET PARKING

EXISTING STREET PARKING

TITLE BOUNDARY 284° 25' 18" (80.505 m)

TITLE BOUNDARY 356° 20' 35" (15.864 m)

TITLE BOUNDARY 21° 26' 05" (15.852 m)

TITLE BOUNDARY 95° 52' 38" (19.812 m)

TITLE BOUNDARY 185° 51' 03" (55.475 m)

TITLE BOUNDARY 140° 51' 27" (6.171 m)

STAIR FROM BASEMENT

Basement Ammenities Riser

Car Park Make Up Air Riser

5000L RWT

5000L RWT

5000L RWT

Hydraulic Stack

23.6 m²

23.6 m²

24.7 m²

24.7 m²

27.1 m²

24.0 m²

39.6 m²

34.1 m²

Luggage Store 6.8 m²

Nurses Room 3.3 m²

Hydraulic Stack

Outside Air Riser

Toilet Exhaust Riser

BAR BOH 9.3 m²

Toilet Exhaust Riser

Toilet Exhaust Riser

Hydraulic Stack

OFFICE

ADMIN 32.8 m²

MEETING ROOM

EMPLOYEE BREAK ROOM 34.0 m²

BOH 100.4 m²

Car Park Exhaust Riser

Staff Entry

2. No Visitor Bikes.

Grease Arrester Below

Water Quality Chamber

Car Park Make Up Air Riser

BAR 72.7 m²

FOYER / ENTRY 78.6 m²

LOUNGE 167.4 m²

4600

4000 DCP SETBACK

4000 DCP SETBACK

Hydrant Booster Assembly To be exposed and painted

8. No Visitor Bikes. Opportunity for future rental initiative for the local community and hotel users

PRAM XO

PRAM XO

PRAM XO

2. No Visitor Bikes.

Kiosk Substation

2000

DEEP PLANTING ZONE

DEEP PLANTING ZONE

16.666 @ 1:6.5

16.666 @ 1:6.5

AHD 47.497

400.0 @ 1:12

AHD 47.830

6400 @ 1:20

AHD 48.150

RAMP TO / FROM BASEMENT 1

Sightline triangle. To be kept clear of obstructions to ensure pedestrian safety.

2000

Proposed Crossover

HARGRAVE STREET

TEL

TEL

TEL

SIGN

SIGN

SIGN

SIGN

PP

PP

TAXI ZONE

EXISTING STREET PARKING

PROPOSED STREET PARKING

EXISTING STREET PARKING

PROPOSED STREET PARKING

SOMERSET STREET

DEVELOPMENT APPLICATION

Revisions				
	P8	22.10.20	For Information	MT
	P9	26.10.20	For Information	MT
	P10	29.10.20	For Information	MT
	P11	30.10.20	For Information	MT
	P12	09.11.20	Development Application - Draft	MT

Project: **28-32 SOMERSET STREET, KINGSWOOD**
28-32 SOMERSET STREET, KINGSWOOD

Drawing: **Ground**

Project No: **220027** Date: **03.04.20** Author: **GT** Scale: @ A1 **1 : 100** Drawing No.: **TP01.03** **P12**

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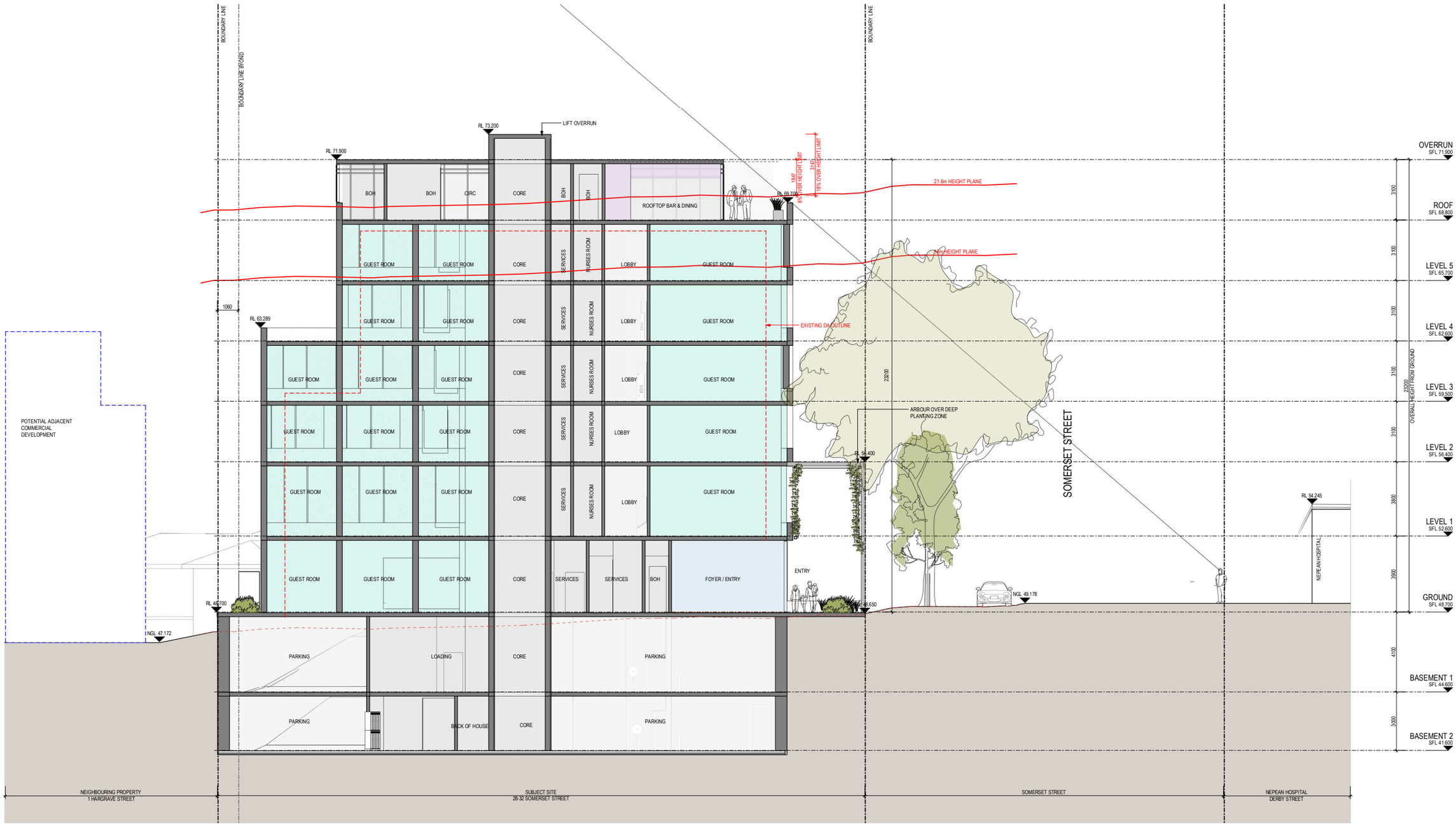
DRAFT



DEVELOPMENT APPLICATION

Revisions			
P8	14.10.20	WIP FOR INFORMATION	HB
P9	26.10.20	For Information	MT
P10	26.10.20	For Information	MT
P11	30.10.20	For Information	MT
P12	09.11.20	Development Application - Draft	MT

Project: **28-32 SOMERSET STREET, KINGSWOOD**
28-32 SOMERSET STREET, KINGSWOOD

Drawing: **Section A**

Project No: **220027**

Date: **06/03/13**

Author: **GT**

Scale: @ A1 **1 : 100**

Drawing No.: **TP03.01** **P12**

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Appendix B

Site Photographs

Photo 1 - Looking South at Front Yard of Number 28 (DP 2015)

Photo 2 - Concrete Pieces Found in Front Yard of Number 28 (DP 2015)

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT	99851
	Proposed Hotel Development	PLATE No	1
	Somerset Street, Kingswood	REV	A
	CLIENT: Boston Global Pty Ltd	DATE	9-Nov-20

Photo 3 - Asebstos Warning in Electrical Box of Number 28 (DP 2015)

Photo 4 - Pieces of Fibrous Materials Near Back Fence of Number 28 (DP 2015)

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT	99851
	Proposed Hotel Development	PLATE No	2
	Somerset Street, Kingswood	REV	A
	CLIENT: Boston Global Pty Ltd	DATE	9-Nov-20

Photo 5 - North at Back Yard of Number 28 (DP 2015)

Photo 6 - Looking South at Front Yard of Number 30 (DP 2015)

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT 99851
	Proposed Hotel Development	PLATE No 3
	Somerset Street, Kingswood	REV A
	CLIENT: Boston Global Pty Ltd	DATE 9-Nov-20

Photo 7 - Looking South at Back Yard of Number 30 (DP 2015)

Photo 8 - Looking North-East at Vacant Lot, Number 32 (DP 2015)

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT	99851
	Proposed Hotel Development	PLATE No	4
	Somerset Street, Kingswood	REV	A
	CLIENT: Boston Global Pty Ltd	DATE	9-Nov-20

Photo 9 - Building/Demolition Waste (concrete and tiles) on Number 32 (DP 2015)

Photo 10 - Building/Demolition Waste (concrete) in the Grass on Number 32 (DP 2015)

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT	99851
	Proposed Hotel Development	PLATE No	5
	Somerset Street, Kingswood	REV	A
	CLIENT: Boston Global Pty Ltd	DATE	9-Nov-20

Photo 11 - Building at Number 32 is the same as in 2015, garden overgrown (DP 2020)

Photo 12 - Backyard of Number 32 with some waste and concrete slabs visible (DP 2020)

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT	99851
	Proposed Hotel Development	PLATE No	6
	Somerset Street, Kingswood	REV	A
	CLIENT: Boston Global Pty Ltd	DATE	9-Nov-20

Photo 13 - Vacant Lot at Number 30 (DP 2020)

Photo 14 - Building/Demolition Waste (concrete) in the Grass on Number 30 (DP 2020)

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Proposed Hotel Development** **Somerset Street, Kingswood**	PROJECT	99851
		PLATE No	7
		REV	A
	CLIENT: Boston Global Pty Ltd	DATE	9-Nov-20

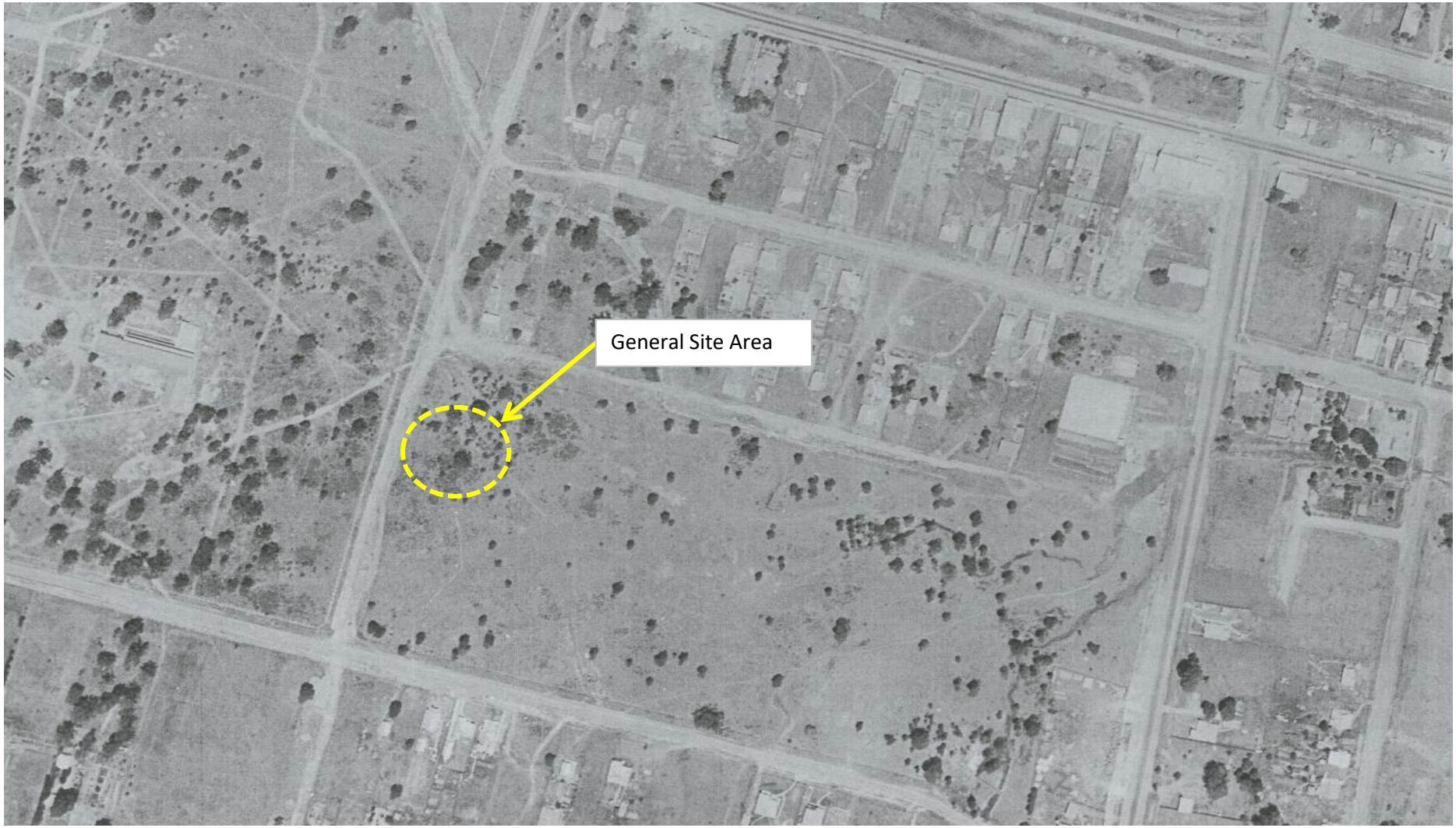
Photo 15 - Building/Demolition Waste (concrete and tiles) on Number 32, no significant change since 2015 (DP 2020)

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Proposed Hotel Development** **Somerset Street, Kingswood**	PROJECT	99851
		PLATE No	8
		REV	A
	CLIENT: Boston Global Pty Ltd	DATE	9-Nov-20

Appendix C

Historical Information

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Boston Global	**Aerial Photogaph 1947**	PROJECT No: 99851.00
	OFFICE: Sydney	**Proposed Hotel Development**	DWG No: C1
	DATE: 9 Nov 2020	**28-32 Somerset Street, Kingswood**	REVISION: A



Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Boston Global	**Aerial Photogaph 1956**	PROJECT No: 99851.00
	OFFICE: Sydney	**Proposed Hotel Development**	DWG No: C2
	DATE: 9 Nov 2020	**28-32 Somerset Street, Kingswood**	REVISION: A

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Boston Global	**Aerial Photogaph 1970**	PROJECT No: 99851.00
	OFFICE: Sydney	**Proposed Hotel Development**	DWG No: C3
	DATE: 9 Nov 2020	**28-32 Somerset Street, Kingswood**	REVISION: A

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Boston Global	**Aerial Photogaph 1986**	PROJECT No: 99851.00
	OFFICE: Sydney	**Proposed Hotel Development**	DWG No: C4
	DATE: 9 Nov 2020	**28-32 Somerset Street, Kingswood**	REVISION: A

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Boston Global	**Aerial Photogaph 1994**	PROJECT No: 99851.00
	OFFICE: Sydney	**Proposed Hotel Development**	DWG No: C5
	DATE: 9 Nov 2020	**28-32 Somerset Street, Kingswood**	REVISION: A

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Boston Global	**Aerial Photogaph 2005**	PROJECT No: 99851.00
	OFFICE: Sydney	**Proposed Hotel Development**	DWG No: C6
	DATE: 9 Nov 2020	**28-32 Somerset Street, Kingswood**	REVISION: A

Source: Nearmap

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Boston Global	**Aerial Photogaph 2015**	PROJECT No: 99851.00
	OFFICE: Sydney	**Proposed Hotel Development**	DWG No: C7
	DATE: 9 Nov 2020	**28-32 Somerset Street, Kingswood**	REVISION: A

Source: Nearmap

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Boston Global	**Aerial Photogaph 2015**	PROJECT No: 99851.00
	OFFICE: Sydney	**Proposed Hotel Development**	DWG No: C8
	DATE: 9 Nov 2020	**28-32 Somerset Street, Kingswood**	REVISION: A

Appendix D

QA / QC Procedures and Results

QA / QC PROCEDURES AND RESULTS

D1. Data Quality Objectives

The Detailed Site Investigation (DSI) was prepared with reference to the seven step data quality objective (DQO) process which is provided in Appendix B, Schedule B2 of the *National Environment Protection (Assessment of Site Contamination) Measure* 1999 as amended 2013 (NEPC, 2013). The DQO process is outlined as follows:

- Stating the Problem;
- Identifying the Decision;
- Identifying Inputs to the Decision;
- Defining the Boundary of the Assessment;
- Developing a Decision Rule;
- Specifying Acceptable Limits on Decision Errors; and
- Optimising the Design for Obtaining Data.

The DQOs have been addressed within the report as shown in Table D1.

Table D1: Data Quality Objectives

Data Quality Objective	Report Section where Addressed
State the Problem	S1 Introduction
Identify the Decision	S10 10 Discussion of Results S11 Updated Conceptual Site Model S12 Conclusion and Recommendations
Identify Inputs to the Decision	S1 Introduction S3 Site Information S4 Regional Topography, Geology and Hydrogeology S5 Desktop Review S8 Site Assessment Criteria S9 Fieldwork Results
Define the Boundary of the Assessment	S3 Site Identification and Description Site Drawings 1 - Appendix A
Develop a Decision Rule	S8 Site Assessment Criteria
Specify Acceptable Limits on Decision Errors	S7 Fieldwork and Analysis QA/QC Procedures and Results - Appendix D

Data Quality Objective	Report Section where Addressed
Optimise the Design for Obtaining Data	S2 Scope of Works S7.5 Sample Location and Rationale QA/QC Procedures and Results - Appendix D

D2. FIELD AND LABORATORY QUALITY CONTROL

The field and laboratory quality control (QC) procedures and results are summarised in the following Table D2. Reference should be made to the fieldwork and analysis procedures in Section 7 and the laboratory results certificates in Appendix F for further details.

Table D2: Field and Laboratory QC

Item	Evaluation / Acceptance Criteria	Achievement
Analytical laboratories used	NATA accreditation	yes
Holding times	Various based on type of analysis	yes
Intra-laboratory replicates	5% of primary samples; <50% RPD (>5 x PQL)	yes[1]
Laboratory / Reagent Blanks	1 per batch; <PQL	yes
Matrix Spikes	1 per lab batch; 70-130% recovery (inorganics); 60-140% recovery (organics)	yes
Surrogate Spikes	All organics analysis; 70-130% recovery (inorganics); 60-140% recovery (organics)	yes
Control Samples	1 per lab batch; 70-130% recovery (inorganics); 60-140% recovery (organics)	yes

Note: 1 Qualitative assessment of RPD results overall; refer Section D2.1

In summary, the QC data is determined to be of sufficient quality to be considered acceptable for the assessment.

D2.1 Intra-Laboratory Replicates

Intra-laboratory replicates were analysed as an internal check of the reproducibility within the primary laboratory Envirolab and as a measure of consistency of sampling techniques. The comparative results of analysis between original and intra-laboratory replicate sample are summarised in Table D3.

Table D3: Intra-laboratory Results – Soils (mg/kg)

Analyte	Primary Sample ID- BH6/0.5	Replicate Sample ID – BD1/210915	Difference	RPD
Benzo(a)pyrene	<0.2	<0.2	0	0%
Total PAH	<1.55	<1.55	0	0%
Arsenic	5	4	1	25%
Cadmium	<0.4	<0.4	0	0%
Chromium	10	9	1	11%
Copper	14	12	2	15%
Lead	8	7	1	13%
Mercury	<0.1	<0.1	0	0%
Nickel	3	2	1	**40%**
Zinc	11	10	1	10%

The calculated RPD values were all within the acceptable range except for nickel. However, the actual concentrations for nickel were < 5 times the PQL and therefore not considered significant. Given this and the other results, the intra-laboratory replicate comparisons indicate that the sampling techniques were generally consistent and repeatable.

D3. Data Quality Indicators

The reliability of field procedures and analytical results was assessed against the following data quality indicators (DQIs):

- Completeness – a measure of the amount of usable data from a data collection activity;
- Comparability – the confidence (qualitative) that data may be considered to be equivalent for each sampling and analytical event;
- Representativeness – the confidence (qualitative) of data representativeness of media present on-site;
- Precision – a measure of variability or reproducibility of data; and
- Accuracy – a measure of closeness of the data to the 'true' value.

The DQIs were assessed as outlined in the following Table D4.

Table D4: Data Quality Indicators

Data Quality Indicator	Method(s) of Achievement
Completeness	Systematic and selected target locations sampled within site constraints; Works undertaken by appropriately experienced DP environmental scientists and engineers with 3-8 years' experience; Preparation of borehole logs, sample location plan and chain of custody (COC) records; Preparation of field groundwater sampling sheets; Laboratory sample receipt information received confirming receipt of samples intact and appropriateness of the chain of custody; Samples analysed for contaminants of potential concern (COPC) identified in the Conceptual Site Model (CSM); Completion of COC documentation; NATA accredited laboratory results certificates provided by the laboratory; Satisfactory frequency and results for field and laboratory QC samples as discussed in Section D2.
Comparability	Using appropriate techniques for sample recovery, storage and transportation, which were the same for the duration of the project; Works undertaken by appropriately experienced DP environmental scientists and engineers with 3-8 years' experience; Use of NATA registered laboratory, with test methods the same or similar between laboratories; Satisfactory results for field and laboratory QC samples.
Representativeness	Target media sampled; Sample numbers recovered and analysed are considered to be representative of the target media and complying with DQOs; Samples were extracted and analysed within holding times; Samples were analysed in accordance with the COC.
Precision	Field staff followed standard operating procedures; Acceptable RPD between original samples and replicates; Satisfactory results for all other field and laboratory QC samples.
Accuracy	Field staff followed standard operating procedures; Satisfactory results for all field and laboratory QC samples.

Based on the above, it is considered that the DQIs have been complied with. As such, it is concluded that the field and laboratory test data obtained are reliable and useable for this assessment.

Appendix E

Test Bore Log Results

Notes About this Report

BOREHOLE LOG

CLIENT: Zeftco Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 28-32 Somerset Street, Kingswood

SURFACE LEVEL: 48.4 AHD
EASTING: 288449
NORTHING: 6262070
DIP/AZIMUTH: 90°/--

BORE No: 1
PROJECT No: 85085
DATE: 21 - 23/9/2015
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
48	0.15	FILLING - brown, silty clay (topsoil) filling with some rootlets, humid							E			
	0.4	SILTY CLAY - stiff, brown mottled red-brown and grey, silty clay, MC<PL, apparently moderate to high plasticity							E			
47	1	SILTY CLAY - stiff to very stiff, brown mottled red-brown, silty clay with a trace of ironstone gravel and rootlets, MC<PL, apparently moderate to high plasticity							E			
									S			2,4,6 N = 10
46	2							Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°				
	2.65	SHALE - extremely low strength, light grey-brown shale							S			10,25/90mm refusal
	2.9	SHALE - extremely low then very low strength, extremely then highly weathered, slightly fractured, light grey and red-brown, shale with some medium strength ironstone bands						3.2m: J70°, un, ro, fe 3.5m: J50° & 70°, st, ro, cly 3.7m: B0°, fe	C	100	0	pp >600
45	3											
	4							4.28 & 4.5m: B (x2) 0°, cly				PL(A) = 0.2
44	4.5	SHALE - low strength, highly then slightly weathered, slightly fractured, grey-brown shale										
	5											
	5.3	SHALE - medium strength, slightly weathered and fresh, slightly fractured and unbroken, grey shale						5.2 & 5.26m: B (x2) 0°, cly, 5mm 5.26m: J80°, ti 5.46m: B0°, fe, cly, 5mm 5.61m: B5°, fe, cly 5.77m: J50°, pl, sm, cln	C	94	78	PL(A) = 0.4
43	6											PL(A) = 0.4
42	6.62							6.4-6.45m: Cs 6.45m: CORE LOSS: 170mm				
	7											PL(A) = 0.4
41								7.4-7.46m: Cs				
	8											PL(A) = 0.6
40								8.62m: J80°, ti	C	100	92	
	9											PL(A) = 0.4
39								9.45m: J85°, un, ro, cly 9.55m: J45°, pl, sm, cly				
	10.0	Bore discontinued at 10.0m										

RIG: Hand tools/DT100 **DRILLER:** SM/JS **LOGGED:** JS/SI **CASING:** HW to 2.5m

TYPE OF BORING: Hand auger to 0.6m; Solid flight auger to 2.5m; Rotary to 2.9m; NMLC-Coring to 10.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Water loss from 4.0m to 5.0m

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Zeftco Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 28-32 Somerset Street, Kingswood

SURFACE LEVEL: 47.7 AHD
EASTING: 288470
NORTHING: 6262064
DIP/AZIMUTH: 90°/--

BORE No: 2
PROJECT No: 85085
DATE: 17 - 21/9/2015
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
47	0.1	FILLING - dark brown and grey, sandy clay topsoil filling with some rootlets and some fine gravel, moist							D/E			
	0.7	FILLING - dark brown, silty clay filling with some fine to medium gravel and a trace of rootlets, moist							D/E			
46	1	From 0.4m: wet with slight odour CLAY - firm, grey and brown, clay with a trace of rootlets, wet							D/E S			1,2,3 N = 5
45	2	2.0m: stiff to very stiff							S			4,9,14 N = 23
44	3											
43	4							Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°	S			6,17,25/120mm refusal
	4.3	SHALE - extremely low strength, light grey-brown shale										
	4.9	SHALE - very low strength, highly weathered, slightly fractured, light brown shale						5.13-5.35m: J (x3) 40°-45°, un, ro, cly 5.8-5.85m: Cz 5.92m: B0°, fe	C	100	10	
42	5											
	6											
	6.1	SHALE - medium strength, slightly weathered and fresh, slightly fractured, grey shale with some clay bands										PL(A) = 0.5
41	7	7.0-7.52m: low strength						6.95m: B0°, cly vn 7.45 & 7.55m: B (x2) 0°, cly, 10mm	C	100	97	PL(A) = 0.2
40	8											PL(A) = 0.9
	8.46							8.46m: CORE LOSS: 260mm				
39	8.72											
	9							9.06m: B0°, cly co 9.18m: CORE LOSS: 160mm	C	80	65	
	9.34											PL(A) = 0.8
38								9.78m: J45°, pl, sm, cln				

RIG: Hand tools/DT100 **DRILLER:** SM/JS **LOGGED:** AL/SI **CASING:** HW to 2.5m

TYPE OF BORING: Hand auger to 1.0m; Solid flight auger to 2.5m; Rotary to 4.9m; NMLC-Coring to 11.6m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Zeftco Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 28-32 Somerset Street, Kingswood

SURFACE LEVEL: 47.7 AHD
EASTING: 288470
NORTHING: 6262064
DIP/AZIMUTH: 90°/--

BORE No: 2
PROJECT No: 85085
DATE: 17 - 21/9/2015
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
37	11	SHALE - medium strength, slightly weathered and fresh, slightly fractured, grey shale with some clay bands *(continued)*						10.1m: B0°, cly co 10.3-10.34m: Cs 10.43-10.83m: B (x4) 0°, cly, 5-10mm 11.05-11.33m: B (x3) 0°, cly, 10mm				PL(A) = 0.4 PL(A) = 1.4 PL(A) = 0.5
36	11.6	Bore discontinued at 11.6m										
35	12											
34	13											
33	14											
32	15											
31	16											
30	17											
29	18											
28	19											

RIG: Hand tools/DT100 **DRILLER:** SM/JS **LOGGED:** AL/SI **CASING:** HW to 2.5m

TYPE OF BORING: Hand auger to 1.0m; Solid flight auger to 2.5m; Rotary to 4.9m; NMLC-Coring to 11.6m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Zeftco Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 28-32 Somerset Street, Kingswood

SURFACE LEVEL: 48.6 AHD
EASTING: 288443
NORTHING: 6262058
DIP/AZIMUTH: 90°/--

BORE No: 3
PROJECT No: 85085
DATE: 22/9/2015
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
48	0.2	FILLING - brown, silty clay (topsoil) filling with some rootlets and a trace of gravel, humid							E			
		SILTY CLAY - stiff to very stiff, brown mottled red-brown and grey, silty clay, MC<PL, apparently moderate to high plasticity							E			
47	1								S			2,4,7 N = 11
								Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°				
46	2											
	2.7	SHALE - extremely low to very low strength, extremely to highly weathered, fractured and slightly fractured, light grey-brown and red-brown, shale with some medium strength ironstone bands							S			13,22,15/30mm refusal
	3							3.07-3.21m: B (x3) 0°, cly, 10mm 3.29m: B0°, cly vn 3.45m: J45°, un, ro, fe 3.5-3.55m: Cs	C	100	0	PL(A) = 0.5
45	4								C	100	0	
	4.65	SHALE - low strength, highly and slightly weathered, slightly fractured, grey-brown shale						4.68m: B5°, fe, cly 5.15m: B0°, cly, 5mm				PL(A) = 0.2 PL(A) = 0.5
44	5											
	5.8	SHALE - medium strength, fresh, slightly fractured and unbroken, grey shale						5.66-5.7m: Cs 5.70-5.72m: Cs 6m: J85°, pl, ro, cln	C	100	92	PL(A) = 0.4
43	6											
								6.84m: B0°, cly, 10mm 7.13m: J, sv (85°- 90°) pl, ro, cln	C	100	100	PL(A) = 0.4
42	7							7.75m: J60°, un, ro, cln				
	8											
41									C	100	99	PL(A) = 0.5 PL(A) = 0.4
	9	9.6-9.7m: carbonaceous shale band						9.69m: J35°, un, ro, cln 9.73m: B5°, cly, 10mm				PL(A) = 0.5
40	9.92	Bore discontinued at 9.92m										
39												

RIG: Hand tools/DT100 **DRILLER:** SM/JS **LOGGED:** JS/SI **CASING:** HW to 2.5m

TYPE OF BORING: Hand auger to 0.5m; Solid flight auger to 2.5m; Rotary to 3.0m; NMLC-Coring to 10.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Zeftco Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 28-32 Somerset Street, Kingswood

SURFACE LEVEL: 47.7 AHD
EASTING: 288467
NORTHING: 6262048
DIP/AZIMUTH: 90°/--

BORE No: 4
PROJECT No: 85085
DATE: 17/9/2015
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
47	0.1	FILLING - dark brown, fine sand topsoil filling with some rootlets, damp							D/E			
	0.25	FILLING - dark brown, fine sand filling with some medium gravel, damp							A			
	1	CLAY - firm, brown clay, damp From 0.75m: brown-grey							D/E			
									A			
									D			
									A			2,2,3 N = 5
									S			
46	2											
	2.2	CLAY - very stiff, grey clay with some ironstone bands, damp										
45	3								S			6,8,9 N = 17
	3.5	SHALE - extremely low to very low strength, grey and brown shale						Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°				
44	4								S			10,18,25/130mm refusal
	4.45	SHALE - very low strength, highly weathered, slightly fractured, grey-brown shale										
43	5							4.64m: B0°, fe, cly, 10mm	C	100	0	
								5.35m: B0°, cly co, 5mm	C	100	0	
42	6							5.7-5.72m: Cs 5.8m: B0°, fe, cly co 5.93m: B0°, fe, cly 6.12 & 6.19m: B (x2) 0°, fe, cly 6.5 & 6.89m: B0°, cly vn	C	100	90	PL(A) = 0.3
	6.12	SHALE - low to medium strength, slightly weathered and fresh, fractured and slightly fractured, light grey to grey shale										
41	7							7.0-7.1m: cly 7.4m: B0°, cly, 5mm 7.52-7.57m: cly 7.66m: B0°, cly, 10mm				PL(A) = 0.3
40	8											PL(A) = 0.4
	7.95	SHALE - medium strength, fresh then slightly weathered, slightly fractured, grey shale							C	100	80	
39	9							8.8m: J30°, ti 8.92-8.95m: Cz 9m: B0°, cly co 9.85-9.95m: B (x2) 0°, cly, 5mm				PL(A) = 0.5
38	9.85	9.7-10.0m: low strength band						9.65m: CORE LOSS: 200mm	C	41	0	
	10 10.0											

Bore discontinued at 10.0m

RIG: DT100 **DRILLER:** SM **LOGGED:** AL/SI **CASING:** HW to 2.6m

TYPE OF BORING: Solid flight auger to 2.5m; Rotary to 4.45m; NMLC-Coring to 10.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Standpipe installed to 10.0m (screen 3.0-10.0m; gravel 2.5-10.0m; bentonite 2.0-2.5m; backfill to GL with gatic cover)

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Zeftco Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 28-32 Somerset Street, Kingswood

SURFACE LEVEL: 48.8 AHD
EASTING: 288438
NORTHING: 6262032
DIP/AZIMUTH: 90°/--

BORE No: 5
PROJECT No: 85085
DATE: 17/9/2015
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
48	0.25	FILLING - brown, silty, fine sand filling with some rootlets and some fine gravel, humid							D/E			
		CLAY - stiff, red-grey clay, humid							D/E			
48	1	0.9m: stiff to very stiff							S			3,6,8 N = 14
47	2							Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°	S			6,20,25/100mm refusal
46	3	3.0 CLAY - hard, light grey and red-brown, clay with ironstone gravel, moist							C	100	0	pp = 550
		3.48 SHALE - extremely low to very low strength, extremely to highly weathered, slightly fractured, grey-brown shale						3.63 & 3.78m: B (x2) 5°, cly co				
45	4							4.45m: B0°, cly	C	100	10	
44	5							5.22m: J40°, pl, ro, fe 5.5m: B0°, cly				
43	6	6.0 SHALE - medium then medium to high strength, slightly weathered and fresh, slightly fractured and unbroken, grey shale						6.18m: B0°, fe	C	100	100	PL(A) = 0.4
42	7							7.1m: B0°, cly co 7.46-7.56m: fg 7.6-7.63m: Cs				PL(A) = 0.4
41	8							8.38m: J85°, un, ro, cln	C	100	95	PL(A) = 0.4
40	9							9.12m: B0°, cly, 10mm				
39		9.5-10.2m: interbedded shale/siltstone										PL(A) = 0.6

RIG: Hand tools/DT100 **DRILLER:** AL/SM **LOGGED:** AL/SI **CASING:** HW to 2.5m

TYPE OF BORING: Hand auger to 0.5m; Solid flight auger to 2.5m; Rotary to 3.0m; NMLC-Coring to 10.2m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Zeftco Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 28-32 Somerset Street, Kingswood

SURFACE LEVEL: 48.8 AHD
EASTING: 288438
NORTHING: 6262032
DIP/AZIMUTH: 90°/--

BORE No: 5
PROJECT No: 85085
DATE: 17/9/2015
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	10.2	Bore discontinued at 10.2m							C	100	95	PL(A) = 1

RIG: Hand tools/DT100 **DRILLER:** AL/SM **LOGGED:** AL/SI **CASING:** HW to 2.5m

TYPE OF BORING: Hand auger to 0.5m; Solid flight auger to 2.5m; Rotary to 3.0m; NMLC-Coring to 10.2m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Zeftco Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 28-32 Somerset Street, Kingswood

SURFACE LEVEL: 48.1 AHD
EASTING: 288455
NORTHING: 6262030
DIP/AZIMUTH: 90°/--

BORE No: 6
PROJECT No: 85085
DATE: 22/9/2015
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
48	0.2	FILLING - brown, silty clay (topsoil) filling with some rootlets							E			
		SILTY CLAY - firm to stiff, grey mottled brown, silty clay with a trace of ironstone gravel, MC~PL, apparently moderate to high plasticity							E			
47	1								S			2,2,3 N = 5
	1.5	SILTY CLAY - stiff to very stiff, grey mottled red-brown, silty clay with some ironstone gravel bands, MC<PL, apparently moderate to high plasticity						Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°				
46	2											
									S			7,10,17 N = 27
45	3											
	3.2	SHALE - extremely low then extremely low to very low strength, extremely then extremely to highly weathered, light grey-brown shale							C	100	0	
44	4											
									C	100	0	
43	5							5.07-5.09m: Cs				
								5.7-6.2m: B (x8) 0°- 5°, cly co				
42	6								C	100	65	PL(A) = 0.4
	6.2	SHALE - medium strength, slightly weathered and fresh, slightly fractured then unbroken, grey shale with some siltstone laminations						6.7m: B0°, fe				
41	7											PL(A) = 0.4
		7.4-7.68m: very low to low strength						7.4-7.68m: B's 0°, cly co				
								7.68m: J35°, pl, sm, cly				
40	8								C	100	93	PL(A) = 0.5
39	9											PL(A) = 0.4
	10.0	Bore discontinued at 10.0m										

RIG: DT100 **DRILLER:** SM **LOGGED:** JS/SI **CASING:** HW to 2.5m

TYPE OF BORING: Solid flight auger (TC-bit) to 2.5m; Rotary to 3.2m; NMLC-Coring to 10.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

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Sampling Methods

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Sampling

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

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

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

Test Pits

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

Large Diameter Augers

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

Continuous Spiral Flight Augers

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

Non-core Rotary Drilling

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

Continuous Core Drilling

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

Standard Penetration Tests

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

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

The test results are reported in the following form.

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

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

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

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

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

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

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are generally based on Australian Standard AS1726:2017, Geotechnical Site Investigations. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

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

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

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

Type	Particle size (mm)
Coarse gravel	19 - 63
Medium gravel	6.7 - 19
Fine gravel	2.36 – 6.7
Coarse sand	0.6 - 2.36
Medium sand	0.21 - 0.6
Fine sand	0.075 - 0.21

Definitions of grading terms used are:

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

The proportions of secondary constituents of soils are described as follows:

In fine grained soils (>35% fines)

Term	Proportion of sand or gravel	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	>30%	Sandy Clay
With	15 – 30%	Clay with sand
Trace	0 - 15%	Clay with trace sand

In coarse grained soils (>65% coarse)
- with clays or silts

Term	Proportion of fines	Example
And	Specify	Sand (70%) and Clay (30%)
Adjective	>12%	Clayey Sand
With	5 - 12%	Sand with clay
Trace	0 - 5%	Sand with trace clay

In coarse grained soils (>65% coarse)
- with coarser fraction

Term	Proportion of coarser fraction	Example
And	Specify	Sand (60%) and Gravel (40%)
Adjective	>30%	Gravelly Sand
With	15 - 30%	Sand with gravel
Trace	0 - 15%	Sand with trace gravel

The presence of cobbles and boulders shall be specifically noted by beginning the description with ‘Mix of Soil and Cobbles/Boulders’ with the word order indicating the dominant first and the proportion of cobbles and boulders described together.

Soil Descriptions

Cohesive Soils

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

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	VS	<12
Soft	S	12 - 25
Firm	F	25 - 50
Stiff	St	50 - 100
Very stiff	VSt	100 - 200
Hard	H	>200
Friable	Fr	-

Cohesionless Soils

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

Relative Density	Abbreviation	Density Index (%)
Very loose	VL	<15
Loose	L	15-35
Medium dense	MD	35-65
Dense	D	65-85
Very dense	VD	>85

Soil Origin

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

- Residual soil - derived from in-situ weathering of the underlying rock;
- Extremely weathered material – formed from in-situ weathering of geological formations. Has soil strength but retains the structure or fabric of the parent rock;
- Alluvial soil – deposited by streams and rivers;
- Estuarine soil – deposited in coastal estuaries;
- Marine soil – deposited in a marine environment;
- Lacustrine soil – deposited in freshwater lakes;
- Aeolian soil – carried and deposited by wind;
- Colluvial soil – soil and rock debris transported down slopes by gravity;
- Topsoil – mantle of surface soil, often with high levels of organic material.
- Fill – any material which has been moved by man.

Moisture Condition – Coarse Grained Soils

For coarse grained soils the moisture condition should be described by appearance and feel using the following terms:

- Dry (D) Non-cohesive and free-running.
- Moist (M) Soil feels cool, darkened in colour.
  Soil tends to stick together.
  Sand forms weak ball but breaks easily.
- Wet (W) Soil feels cool, darkened in colour.
  Soil tends to stick together, free water forms when handling.

Moisture Condition – Fine Grained Soils

For fine grained soils the assessment of moisture content is relative to their plastic limit or liquid limit, as follows:

- ‘Moist, dry of plastic limit’ or ‘w <PL’ (i.e. hard and friable or powdery).
- ‘Moist, near plastic limit’ or ‘w ≈ PL (i.e. soil can be moulded at moisture content approximately equal to the plastic limit).
- ‘Moist, wet of plastic limit’ or ‘w >PL’ (i.e. soils usually weakened and free water forms on the hands when handling).
- ‘Wet’ or ‘w ≈LL’ (i.e. near the liquid limit).
- ‘Wet’ or ‘w >LL’ (i.e. wet of the liquid limit).

Rock Strength

Rock strength is defined by the Unconfined Compressive Strength and it refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects.

The Point Load Strength Index $Is_{(50)}$ is commonly used to provide an estimate of the rock strength and site specific correlations should be developed to allow UCS values to be determined. The point load strength test procedure is described by Australian Standard AS4133.4.1-2007. The terms used to describe rock strength are as follows:

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

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$. It should be noted that the UCS to $Is_{(50)}$ ratio varies significantly for different rock types and specific ratios should be determined for each site.

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Residual Soil	RS	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.
Extremely weathered	XW	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible
Highly weathered	HW	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Moderately weathered	MW	The whole of the rock material is discoloured , usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable, but shows little or no change of strength from fresh rock.
Slightly weathered	SW	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
Fresh	FR	No signs of decomposition or staining.
Note: If HW and MW cannot be differentiated use DW (see below)		
Distinctly weathered	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching or may be decreased due to deposition of weathered products in pores.

Rock Descriptions

Degree of Fracturing

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

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with occasional fragments
Fractured	Core lengths of 30-100 mm with occasional shorter and longer sections
Slightly Fractured	Core lengths of 300 mm or longer with occasional sections of 100-300 mm
Unbroken	Core contains very few fractures

Rock Quality Designation

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

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

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

Stratification Spacing

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

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

Symbols & Abbreviations

Introduction

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

Drilling or Excavation Methods

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

Water

▷	Water seep
▽	Water level

Sampling and Testing

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

Description of Defects in Rock

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

Defect Type

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

Orientation

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

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

Coating or Infilling Term

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

Coating Descriptor

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

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

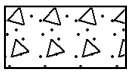
Symbols & Abbreviations

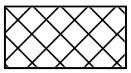
Graphic Symbols for Soil and Rock

General

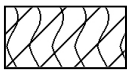

Asphalt

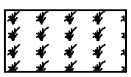

Road base

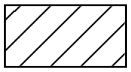

Concrete

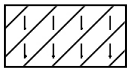

Filling

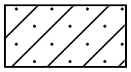
Soils


Topsoil

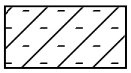

Peat

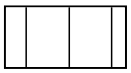

Clay

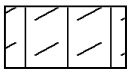

Silty clay

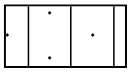

Sandy clay

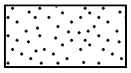

Gravelly clay

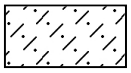

Shaly clay

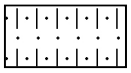

Silt


Clayey silt


Sandy silt


Sand

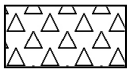

Clayey sand


Silty sand


Gravel

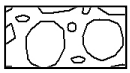

Sandy gravel


Cobbles, boulders

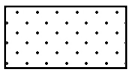

Talus

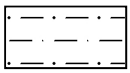
Sedimentary Rocks

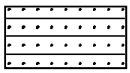

Boulder conglomerate

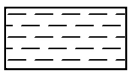

Conglomerate


Conglomeratic sandstone

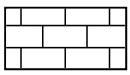

Sandstone


Siltstone

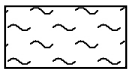

Laminite

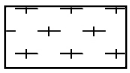

Mudstone, claystone, shale

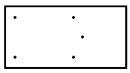

Coal


Limestone

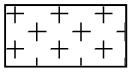
Metamorphic Rocks

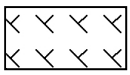

Slate, phyllite, schist

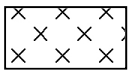

Gneiss

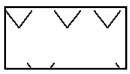

Quartzite

Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

About this Report

Douglas Partners

Introduction

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

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

Copyright

Borehole and Test Pit Logs

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

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

Groundwater

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

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

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

Reports

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

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

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

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

About this Report

Site Anomalies

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

Information for Contractual Purposes

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

Site Inspection

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

Appendix F

Laboratory Summary Results Table

Laboratory Certificates of Analysis

and Chain of Custody Documentation

Table F1: Summary of Soil Laboratory Results

					BTEX								Lead		Metals							Organochlorine Pesticides							
				B(a)P Total Potency Equivalent	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Xylene Total [#4]	C6-C10 less BTEX (F1)	pH (aqueous extract)	Cation Exchange Capacity	Lead	Lead (TCLP)	Arsenic	Cadmium	Chromium (III+VI)	Copper	Mercury	Nickel	Nickel (TCLP)	Zinc	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin [#4]	b-BHC	Chlordane (cis)	Chlordane (trans)	d-BHC
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	pH_Units	meq/100g	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL				0.5	0.2	1	0.5	2	1		25			1	0.03	4	0.4	1	1	0.1	1	0.02	1	0.1	0.1	0.1		0.1	0.1	0.1	0.1
NEPM 2013 HILs/HSLs D Commercial/Industrial Soil				40	430	27,000	99,000			81,000	26,000			1500		3000	900		240,000	730	6000		400,000				45		530		
NEPM 2013 Comm/Ind D Soil HSL for Vapour Intrusion, Sand 0-1m					3	NL	NL			230	260																				
NEPM 2013 EILs/ESLs for Commercial/Industrial, Coarse/Sand 0-2m					75	165	135			180				1100		160		320	320		380		970								
NEPM 2013 Management Limits in Commercial/Industrial, Coarse Soil																															
NSW 2014 General Solid Waste (CT1)					10	600	288			1000				100		100	20	100		4	40										
NSW 2014 General Solid Waste (SCC1 and TCLP1)														1500	5						1050	2									
NEPC (1999)- For Natural Material														2-200		1-50	1	5-1,000	2-100	0.03	5-500		10-300								
ANZECC (1992) - For Natural Material					0.05-1		0.1-1							<2-200		0.2-30	0.04-2	0.5-110	1-190	0.001-0.1	2-400		2-180								
Location	**Sample Depth**	**Sample Date**	**Srtata**																												
BH1	0.1	21/09/2015	Filling	<0.5	<0.2	<1	<0.5	<2	<1	<3	<25	6.3	12	26	-	4	<0.4	12	22	<0.1	8	-	66	-	-	-	-	-	-	-	-
BH2	0-0.1	17/09/2015	Filling	<0.5	<0.2	<1	<0.5	<2	<1	<3	<25	8.2	22	13	-	<4	<0.4	93	31	<0.1	78	0.03	68	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1
BH2	0.4-0.5	17/09/2015	Filling	<0.5	<0.2	<1	<0.5	<2	<1	<3	<25	-	-	25	-	11	4	29	21	<0.1	11	-	130	-	-	-	-	-	-	-	-
BH3	0.1	21/09/2015	Filling	<0.5	<0.2	<1	<0.5	<2	<1	<3	<25	-	-	66	-	6	0.4	24	18	<0.1	8	-	64	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1
BH4	0-0.1	17/09/2015	Filling	<0.5	<0.2	<1	<0.5	<2	<1	<3	<25	-	-	110	<0.03	<4	0.7	18	38	<0.1	10	-	310	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1
BH4	0.4-0.5	17/09/2015	Natural	<0.5	<0.2	<1	<0.5	<2	<1	<3	<25	6.1	10	15	-	8	<0.4	18	18	<0.1	4	-	36	-	-	-	-	-	-	-	-
BH5	0-0.1	17/09/2015	Filling	<0.5	<0.2	<1	<0.5	<2	<1	<3	<25	-	-	26	-	<4	<0.4	11	16	<0.1	12	-	160	-	-	-	-	-	-	-	-
BH6	0.1	21/09/2015	Filling	<0.5	<0.2	<1	<0.5	<2	<1	<3	<25	-	-	22	-	9	<0.4	27	16	<0.1	6	-	37	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1
BH6	0.5	21/09/2015	Natural	<0.5	<0.2	<1	<0.5	<2	<1	<3	<25	-	-	8	-	5	<0.4	10	14	<0.1	3	-	11	-	-	-	-	-	-	-	-
BD1 (intra)	-	21/09/2015	Natural	<0.5	-	-	-	-	-	-	-	-	-	7	-	4	<0.4	9	12	<0.1	2	-	10	-	-	-	-	-	-	-	-
MS1	-	21/09/2015	Material	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Data Comments

#1 ESDAT Combined with Non-Detect Multiplier of 0.5. Some Analytes are missing from this Combined Compound.
#2 ESDAT Combined. Some Analytes are missing from this Combined Compound.
#3 ESDAT Combined with Non-Detect Multiplier of 0.5.
#4 ESDAT Combined.
#5 NIL (+)VE

Table F1: Summary of Soil Laboratory Results

																Organophosphorous Pesticides								PAH/Phenols							
				DDD	DDT	DDT+DDE+DDD #2	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor	Bromophos-ethyl	Chlorpyrifos	Chlorpyrifos-methyl	Diazinon	Dimethoate	Ethion	Fenitrothion	Ronnel	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL				0.1	0.1		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.05	0.2	0.1	0.1
NEPM 2013 HILs/HSLs D Commercial/Industrial Soil						3600		2000			100			50		2500		2000														
NEPM 2013 Comm/Ind D Soil HSL for Vapour Intrusion, Sand 0-1m																																
NEPM 2013 EILs/ESLs for Commercial/Industrial, Coarse/Sand 0-2m					640																								1.4			
NEPM 2013 Management Limits in Commercial/Industrial, Coarse Soil																																
NSW 2014 General Solid Waste (CT1)																		4											0.8			
NSW 2014 General Solid Waste (SCC1 and TCLP1)																													10			
NEPC (1999)- For Natural Material																																
ANZECC (1992) - For Natural Material																																
Location	**Sample Depth**	**Sample Date**	**Srtata**																													
BH1	0.1	21/09/2015	Filling	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1
BH2	0-0.1	17/09/2015	Filling	<0.1	<0.1	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1
BH2	0.4-0.5	17/09/2015	Filling	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1
BH3	0.1	21/09/2015	Filling	<0.1	<0.1	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1
BH4	0-0.1	17/09/2015	Filling	<0.1	<0.1	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1
BH4	0.4-0.5	17/09/2015	Natural	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1
BH5	0-0.1	17/09/2015	Filling	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1
BH6	0.1	21/09/2015	Filling	<0.1	<0.1	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.07	<0.2	<0.1	<0.1
BH6	0.5	21/09/2015	Natural	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1
BD1 (intra)	-	21/09/2015	Natural	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1
MS1	-	21/09/2015	Material	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Data Comments

#1 ESDAT Combined with Non-Detect Multiplier of 0.5. Some Analytes are missing f
#2 ESDAT Combined. Some Analytes are missing from this Combined Compound.
#3 ESDAT Combined with Non-Detect Multiplier of 0.5.
#4 ESDAT Combined.
#5 NIL (+)VE

Table F1: Summary of Soil Laboratory Results

											Polychlorinated Biphenyls							TPH										
				Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Phenolics Total	Pyrene	Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arochlor 1260	C10-C16	C16-C34	C34-C40	F2-NAPHTHALENE	C6 - C9	C10 - C14	C15 - C28	C29-C36	+C10 - C36 (Sum of total)	C6-C10	Asbestos
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	g/kg
EQL				0.1	0.1	0.1	0.1	0.1		0.1	5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	50	100	100	50	25	50	100	100		25	0.1
NEPM 2013 HILs/HSLs D Commercial/Industrial Soil								11,000	4000												27,000	38,000	20,000							
NEPM 2013 Comm/Ind D Soil HSL for Vapour Intrusion, Sand 0-1m								NL															NL							
NEPM 2013 EILs/ESLs for Commercial/Industrial, Coarse/Sand 0-2m								370												120	300	2800							180	
NEPM 2013 Management Limits in Commercial/Industrial, Coarse Soil																				1000	3500	10,000							700	
NSW 2014 General Solid Waste (CT1)																								650				10,000		
NSW 2014 General Solid Waste (SCC1 and TCLP1)																														
NEPC (1999)- For Natural Material																														
ANZECC (1992) - For Natural Material									0.95-5		0.03-0.5																			
Location	**Sample Depth**	**Sample Date**	**Srtata**																											
BH1	0.1	21/09/2015	Filling	<0.1	<0.1	<0.1	<0.1	<0.1	0[#5]	<0.1	-	<0.1	-	-	-	-	-	-	-	<50	<100	<100	<50	<25	<50	<100	<100	<250[#4]	<25	<0.1
BH2	0-0.1	17/09/2015	Filling	<0.1	<0.1	<0.1	<0.1	<0.1	0[#5]	<0.1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<50	<100	<100	<50	<25	<50	<100	<100	<250[#4]	<25	<0.1
BH2	0.4-0.5	17/09/2015	Filling	<0.1	<0.1	<0.1	<0.1	<0.1	0[#5]	<0.1	-	<0.1	-	-	-	-	-	-	-	<50	<100	<100	<50	<25	<50	<100	<100	<250[#4]	<25	<0.1
BH3	0.1	21/09/2015	Filling	<0.1	<0.1	<0.1	<0.1	<0.1	0[#5]	<0.1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<50	<100	<100	<50	<25	<50	<100	<100	<250[#4]	<25	<0.1
BH4	0-0.1	17/09/2015	Filling	<0.1	<0.1	<0.1	<0.1	<0.1	0[#5]	<0.1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<50	<100	<100	<50	<25	<50	<100	<100	<250[#4]	<25	<0.1
BH4	0.4-0.5	17/09/2015	Natural	<0.1	<0.1	<0.1	<0.1	<0.1	0[#5]	<0.1	-	<0.1	-	-	-	-	-	-	-	<50	<100	<100	<50	<25	<50	<100	<100	<250[#4]	<25	-
BH5	0-0.1	17/09/2015	Filling	<0.1	<0.1	<0.1	<0.1	<0.1	0[#5]	<0.1	-	<0.1	-	-	-	-	-	-	-	78	<100	<100	78	<25	<50	<100	<100	<250[#4]	<25	<0.1
BH6	0.1	21/09/2015	Filling	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<5	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<50	<100	<100	<50	<25	<50	<100	<100	<250[#4]	<25	<0.1
BH6	0.5	21/09/2015	Natural	<0.1	<0.1	<0.1	<0.1	<0.1	0[#5]	<0.1	-	<0.1	-	-	-	-	-	-	-	<50	<100	<100	<50	<25	<50	<100	<100	<250[#4]	<25	-
BD1 (intra)	-	21/09/2015	Natural	<0.1	<0.1	<0.1	<0.1	<0.1	0[#5]	<0.1	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MS1	-	21/09/2015	Material	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD

Data Comments

#1 ESDAT Combined with Non-Detect Multiplier of 0.5. Some Analytes are missing f
#2 ESDAT Combined. Some Analytes are missing from this Combined Compound.
#3 ESDAT Combined with Non-Detect Multiplier of 0.5.
#4 ESDAT Combined.
#5 NIL (+)VE

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CERTIFICATE OF ANALYSIS 134843

Client:
Douglas Partners Pty Ltd
96 Hermitage Rd
West Ryde
NSW 2114

Attention: David Holden

Sample log in details:

Your Reference:	**85085.01, Kingswood - Somerset Street**
No. of samples:	12 Soils
Date samples received / completed instructions received	23/09/2015 / 23/9/2015

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	30/09/15 / 29/09/15
Date of Preliminary Report:	Not Issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

ACCREDITED FOR TECHNICAL COMPETENCE

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	134843-1	134843-2	134843-3	134843-4	134843-5
Your Reference	----------	BH1	BH2	BH2	BH3	BH4
Depth	----------	0.1	0-0.1	0.4-0.5	0.1	0-0.1
Date Sampled		21/09/2015	17/09/2015	17/09/2015	21/09/2015	17/09/2015
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015	24/09/2015
Date analysed	-	26/09/2015	26/09/2015	26/09/2015	26/09/2015	26/09/2015
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	88	92	89	86	74

vTRH(C6-C10)/BTEXN in Soil					
Our Reference:	UNITS	134843-6	134843-7	134843-8	134843-9
Your Reference	----------	BH4	BH5	BH6	BH6
Depth	----------	0.4-0.5	0-0.1	0.1	0.5
Date Sampled		17/09/2015	17/09/2015	21/09/2015	21/09/2015
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015
Date analysed	-	26/09/2015	26/09/2015	26/09/2015	26/09/2015
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	83	80	89	89

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	134843-1	134843-2	134843-3	134843-4	134843-5
Your Reference	----------	BH1	BH2	BH2	BH3	BH4
Depth	----------	0.1	0-0.1	0.4-0.5	0.1	0-0.1
Date Sampled		21/09/2015	17/09/2015	17/09/2015	21/09/2015	17/09/2015
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015	24/09/2015
Date analysed	-	26/09/2015	26/09/2015	26/09/2015	26/09/2015	26/09/2015
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100	<100	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	<100	<100	<100	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	<100	<100	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	87	86	86	89	90

svTRH (C10-C40) in Soil					
Our Reference:	UNITS	134843-6	134843-7	134843-8	134843-9
Your Reference	----------	BH4	BH5	BH6	BH6
Depth	----------	0.4-0.5	0-0.1	0.1	0.5
Date Sampled		17/09/2015	17/09/2015	21/09/2015	21/09/2015
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015
Date analysed	-	26/09/2015	26/09/2015	26/09/2015	26/09/2015
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	<100	<100	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	78	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	78	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	<100	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	<100	<100	<100
Surrogate o-Terphenyl	%	86	93	87	87

PAHs in Soil						
Our Reference:	UNITS	134843-1	134843-2	134843-3	134843-4	134843-5
Your Reference	----------	BH1	BH2	BH2	BH3	BH4
Depth	----------	0.1	0-0.1	0.4-0.5	0.1	0-0.1
Date Sampled		21/09/2015	17/09/2015	17/09/2015	21/09/2015	17/09/2015
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015	24/09/2015
Date analysed	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015	24/09/2015
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Total Positive PAHs	mg/kg	NIL (+)VE	NIL (+)VE	NIL (+)VE	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	89	88	87	89	94

PAHs in Soil						
Our Reference:	UNITS	134843-6	134843-7	134843-8	134843-9	134843-10
Your Reference	----------	BH4	BH5	BH6	BH6	BD1/210915
Depth	----------	0.4-0.5	0-0.1	0.1	0.5	0.1-0.2
Date Sampled		17/09/2015	17/09/2015	21/09/2015	21/09/2015	21/09/2015
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015	24/09/2015
Date analysed	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015	24/09/2015
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	0.07	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Total Positive PAHs	mg/kg	NIL (+)VE	NIL (+)VE	0.20	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	92	83	94	87	95

Organochlorine Pesticides in soil					
Our Reference:	UNITS	134843-2	134843-4	134843-5	134843-8
Your Reference	----------	BH2	BH3	BH4	BH6
Depth	----------	0-0.1	0.1	0-0.1	0.1
Date Sampled		17/09/2015	21/09/2015	17/09/2015	21/09/2015
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015
Date analysed	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	85	85	88	83

Organophosphorus Pesticides					
Our Reference:	UNITS	134843-2	134843-4	134843-5	134843-8
Your Reference	----------	BH2	BH3	BH4	BH6
Depth	----------	0-0.1	0.1	0-0.1	0.1
Date Sampled		17/09/2015	21/09/2015	17/09/2015	21/09/2015
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015
Date analysed	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	0.2	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	85	85	88	83

PCBs in Soil					
Our Reference:	UNITS	134843-2	134843-4	134843-5	134843-8
Your Reference	----------	BH2	BH3	BH4	BH6
Depth	----------	0-0.1	0.1	0-0.1	0.1
Date Sampled		17/09/2015	21/09/2015	17/09/2015	21/09/2015
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015
Date analysed	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015
Aroclor 1016	mg/kg	<0.1	<0.1	<0.2	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.2	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.2	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.2	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.2	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.2	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.2	<0.1
Surrogate TCLMX	%	85	85	88	83

Misc Soil - Inorg					
Our Reference:	UNITS	134843-2	134843-4	134843-5	134843-8
Your Reference	----------	BH2	BH3	BH4	BH6
Depth	----------	0-0.1	0.1	0-0.1	0.1
Date Sampled		17/09/2015	21/09/2015	17/09/2015	21/09/2015
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015
Date analysed	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5

Acid Extractable metals in soil						
Our Reference:	UNITS	134843-1	134843-2	134843-3	134843-4	134843-5
Your Reference	----------	BH1	BH2	BH2	BH3	BH4
Depth	----------	0.1	0-0.1	0.4-0.5	0.1	0-0.1
Date Sampled		21/09/2015	17/09/2015	17/09/2015	21/09/2015	17/09/2015
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015	24/09/2015
Date analysed	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015	24/09/2015
Arsenic	mg/kg	4	<4	11	6	<4
Cadmium	mg/kg	<0.4	<0.4	4	0.4	0.7
Chromium	mg/kg	12	93	29	24	18
Copper	mg/kg	22	31	21	18	38
Lead	mg/kg	26	13	25	66	110
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	8	78	11	8	10
Zinc	mg/kg	66	68	130	64	310

Acid Extractable metals in soil						
Our Reference:	UNITS	134843-6	134843-7	134843-8	134843-9	134843-10
Your Reference	----------	BH4	BH5	BH6	BH6	BD1/210915
Depth	----------	0.4-0.5	0-0.1	0.1	0.5	0.1-0.2
Date Sampled		17/09/2015	17/09/2015	21/09/2015	21/09/2015	21/09/2015
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015	24/09/2015
Date analysed	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015	24/09/2015
Arsenic	mg/kg	8	<4	9	5	4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	18	11	27	10	9
Copper	mg/kg	18	16	16	14	12
Lead	mg/kg	15	26	22	8	7
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	4	12	6	3	2
Zinc	mg/kg	36	160	37	11	10

Acid Extractable metals in soil		
Our Reference:	UNITS	134843-13
Your Reference	----------	BH2 - TRIPLICATE
Depth	----------	0.1
Date Sampled		17/09/2015
Type of sample		Soil
Date prepared	-	24/09/2015
Date analysed	-	24/09/2015
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.4
Chromium	mg/kg	62
Copper	mg/kg	27
Lead	mg/kg	24
Mercury	mg/kg	<0.1
Nickel	mg/kg	51

Acid Extractable metals in soil		
Our Reference:	UNITS	134843-13
Your Reference	----------	BH2 - TRIPLICATE
Depth	----------	0.1
Date Sampled		17/09/2015
Type of sample		Soil
Zinc	mg/kg	94

Moisture						
Our Reference:	UNITS	134843-1	134843-2	134843-3	134843-4	134843-5
Your Reference	----------	BH1	BH2	BH2	BH3	BH4
Depth	----------	0.1	0-0.1	0.4-0.5	0.1	0-0.1
Date Sampled		21/09/2015	17/09/2015	17/09/2015	21/09/2015	17/09/2015
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015	24/09/2015
Date analysed	-	25/09/2015	25/09/2015	25/09/2015	25/09/2015	25/09/2015
Moisture	%	9.2	9.3	26	9.4	17

Moisture						
Our Reference:	UNITS	134843-6	134843-7	134843-8	134843-9	134843-10
Your Reference	----------	BH4	BH5	BH6	BH6	BD1/210915
Depth	----------	0.4-0.5	0-0.1	0.1	0.5	0.1-0.2
Date Sampled		17/09/2015	17/09/2015	21/09/2015	21/09/2015	21/09/2015
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	24/09/2015	24/09/2015	24/09/2015	24/09/2015	24/09/2015
Date analysed	-	25/09/2015	25/09/2015	25/09/2015	25/09/2015	25/09/2015
Moisture	%	18	7.8	12	18	19

Asbestos ID - soils						
Our Reference:	UNITS	134843-1	134843-2	134843-3	134843-4	134843-5
Your Reference	----------	BH1	BH2	BH2	BH3	BH4
Depth	----------	0.1	0-0.1	0.4-0.5	0.1	0-0.1
Date Sampled		21/09/2015	17/09/2015	17/09/2015	21/09/2015	17/09/2015
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	29/09/2015	29/09/2015	29/09/2015	29/09/2015	29/09/2015
Sample mass tested	g	Approx. 35g	Approx. 45g	Approx. 55g	Approx. 35g	Approx. 25g
Sample Description	-	Brown course grain soil & rocks	Brown course grain soil & rocks	Brown course grain soil & rocks	Brown course grain soil & rocks	Brown course grain soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils			
Our Reference:	UNITS	134843-7	134843-8
Your Reference	----------	BH5	BH6
Depth	----------	0-0.1	0.1
Date Sampled		17/09/2015	21/09/2015
Type of sample		Soil	Soil
Date analysed	-	29/09/2015	29/09/2015
Sample mass tested	g	Approx. 40g	Approx. 30g
Sample Description	-	Brown course grain soil & rocks	Brown course grain soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected

Misc Inorg - Soil				
Our Reference:	UNITS	134843-2	134843-6	134843-11
Your Reference	----------	BH2	BH4	BH1
Depth	----------	0-0.1	0.4-0.5	0.5
Date Sampled		17/09/2015	17/09/2015	21/09/2015
Type of sample		Soil	Soil	Soil
Date prepared	-	25/09/2015	25/09/2015	25/09/2015
Date analysed	-	25/09/2015	25/09/2015	25/09/2015
pH 1:5 soil:water	pH Units	8.2	6.1	6.3

CEC Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- ----------	134843-2 BH2 0-0.1 17/09/2015 Soil	134843-6 BH4 0.4-0.5 17/09/2015 Soil	134843-11 BH1 0.5 21/09/2015 Soil
Date prepared	-	28/09/2015	28/09/2015	28/09/2015
Date analysed	-	28/09/2015	28/09/2015	28/09/2015
Exchangeable Ca	meq/100g	19	4.8	9.3
Exchangeable K	meq/100g	0.2	0.1	0.2
Exchangeable Mg	meq/100g	1.8	4.9	2.5
Exchangeable Na	meq/100g	0.12	0.55	<0.1
Cation Exchange Capacity	meq/100g	22	10	12

Asbestos ID - materials		
Our Reference:	UNITS	134843-12
Your Reference	----------	MS1
Depth	----------	-
Date Sampled		21/09/2015
Type of sample		Material
Date analysed	-	29/09/2015
Mass / Dimension of Sample	-	115x45x5mm
Sample Description	-	Brown compressed fibre cement material
Asbestos ID in materials	-	No asbestos detected Organic Fibre Detected

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-012 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'TEQ PQL' values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'TEQ zero' values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'TEQ half PQL' values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-008	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Inorg-008	Moisture content determined by heating at 105+/-5 deg C for a minimum of 12 hours.
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Metals-009	Determination of exchangeable cations and cation exchange capacity in soil based on Rayment and Lyons 2011.

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			24/09/2015	134843-2	24/09/2015 || 24/09/2015	LCS-4	24/09/2015
Date analysed	-			26/09/2015	134843-2	26/09/2015 || 26/09/2015	LCS-4	26/09/2015
TRHC6 - C9	mg/kg	25	Org-016	<25	134843-2	<25 || <25	LCS-4	102%
TRHC6 - C10	mg/kg	25	Org-016	<25	134843-2	<25 || <25	LCS-4	102%
Benzene	mg/kg	0.2	Org-016	<0.2	134843-2	<0.2 || <0.2	LCS-4	103%
Toluene	mg/kg	0.5	Org-016	<0.5	134843-2	<0.5 || <0.5	LCS-4	81%
Ethylbenzene	mg/kg	1	Org-016	<1	134843-2	<1 || <1	LCS-4	106%
m+p-xylene	mg/kg	2	Org-016	<2	134843-2	<2 || <2	LCS-4	110%
o-Xylene	mg/kg	1	Org-016	<1	134843-2	<1 || <1	LCS-4	108%
naphthalene	mg/kg	1	Org-014	<1	134843-2	<1 || <1	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	87	134843-2	92 || 89 || RPD: 3	LCS-4	98%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			24/09/2015	134843-2	24/09/2015 || 24/09/2015	LCS-4	24/09/2015
Date analysed	-			25/09/2015	134843-2	26/09/2015 || 26/09/2015	LCS-4	25/09/2015
TRHC10 - C14	mg/kg	50	Org-003	[NT]	134843-2	<50 || <50	LCS-4	99%
TRHC15 - C28	mg/kg	100	Org-003	[NT]	134843-2	<100 || <100	LCS-4	77%
TRHC29 - C36	mg/kg	100	Org-003	[NT]	134843-2	<100 || <100	LCS-4	94%
TRH>C10-C16	mg/kg	50	Org-003	[NT]	134843-2	<50 || <50	LCS-4	99%
TRH>C16-C34	mg/kg	100	Org-003	[NT]	134843-2	<100 || <100	LCS-4	77%
TRH>C34-C40	mg/kg	100	Org-003	[NT]	134843-2	<100 || <100	LCS-4	94%
Surrogate o-Terphenyl	%		Org-003	87	134843-2	86 || 86 || RPD: 0	LCS-4	115%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			24/09/2015	134843-2	24/09/2015 || 24/09/2015	LCS-4	24/09/2015
Date analysed	-			24/09/2015	134843-2	24/09/2015 || 24/09/2015	LCS-4	24/09/2015
Naphthalene	mg/kg	0.1	Org-012 subset	<0.1	134843-2	<0.1 || <0.1	LCS-4	99%
Acenaphthylene	mg/kg	0.1	Org-012 subset	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012 subset	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012 subset	<0.1	134843-2	<0.1 || <0.1	LCS-4	106%
Phenanthrene	mg/kg	0.1	Org-012 subset	<0.1	134843-2	<0.1 || <0.1	LCS-4	105%
Anthracene	mg/kg	0.1	Org-012 subset	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012 subset	<0.1	134843-2	<0.1 || <0.1	LCS-4	105%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Pyrene	mg/kg	0.1	Org-012 subset	<0.1	134843-2	<0.1 || <0.1	LCS-4	114%
Benzo(a)anthracene	mg/kg	0.1	Org-012 subset	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012 subset	<0.1	134843-2	<0.1 || <0.1	LCS-4	99%
Benzo(b,j+k) fluoranthene	mg/kg	0.2	Org-012 subset	<0.2	134843-2	<0.2 || <0.2	[NR]	[NR]
Benzo(a)pyrene	mg/kg	0.05	Org-012 subset	<0.05	134843-2	<0.05 || <0.05	LCS-4	117%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012 subset	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012 subset	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012 subset	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012 subset	92	134843-2	88 || 89 || RPD: 1	LCS-4	116%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			24/09/2015	134843-2	24/09/2015 || 24/09/2015	LCS-4	24/09/2015
Date analysed	-			24/09/2015	134843-2	24/09/2015 || 24/09/2015	LCS-4	24/09/2015
HCB	mg/kg	0.1	Org-005	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	134843-2	<0.1 || <0.1	LCS-4	96%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	134843-2	<0.1 || <0.1	LCS-4	88%
Heptachlor	mg/kg	0.1	Org-005	<0.1	134843-2	<0.1 || <0.1	LCS-4	73%
delta-BHC	mg/kg	0.1	Org-005	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	134843-2	<0.1 || <0.1	LCS-4	93%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	134843-2	<0.1 || <0.1	LCS-4	92%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	134843-2	<0.1 || <0.1	LCS-4	94%
Dieldrin	mg/kg	0.1	Org-005	<0.1	134843-2	<0.1 || <0.1	LCS-4	127%
Endrin	mg/kg	0.1	Org-005	<0.1	134843-2	<0.1 || <0.1	LCS-4	103%
pp-DDD	mg/kg	0.1	Org-005	<0.1	134843-2	<0.1 || <0.1	LCS-4	101%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	134843-2	<0.1 || <0.1	LCS-4	103%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Surrogate TCMX	%		Org-005	93	134843-2	85 || 84 || RPD: 1	LCS-4	108%

QUALITY CONTROL Organophosphorus Pesticides	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			24/09/2015	134843-2	24/09/2015 || 24/09/2015	LCS-4	24/09/2015
Date analysed	-			24/09/2015	134843-2	24/09/2015 || 24/09/2015	LCS-4	24/09/2015
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	<0.1	134843-2	<0.1 || <0.1	LCS-4	70%
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	134843-2	<0.1 || <0.1	LCS-4	92%
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Diazinon	mg/kg	0.1	Org-008	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Dichlorvos	mg/kg	0.1	Org-008	<0.1	134843-2	<0.1 || <0.1	LCS-4	71%
Dimethoate	mg/kg	0.1	Org-008	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Ethion	mg/kg	0.1	Org-008	<0.1	134843-2	<0.1 || <0.1	LCS-4	105%
Fenitrothion	mg/kg	0.1	Org-008	<0.1	134843-2	<0.1 || <0.1	LCS-4	102%
Malathion	mg/kg	0.1	Org-008	<0.1	134843-2	<0.1 || <0.1	LCS-4	76%
Parathion	mg/kg	0.1	Org-008	<0.1	134843-2	<0.1 || <0.1	LCS-4	87%
Ronnel	mg/kg	0.1	Org-008	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Surrogate TCMX	%		Org-008	93	134843-2	85 || 84 || RPD: 1	LCS-4	108%

QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			24/09/2015	134843-2	24/09/2015 || 24/09/2015	LCS-4	24/09/2015
Date analysed	-			24/09/2015	134843-2	24/09/2015 || 24/09/2015	LCS-4	24/09/2015
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	134843-2	<0.1 || <0.1	LCS-4	110%
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	134843-2	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		Org-006	93	134843-2	85 || 84 || RPD: 1	LCS-4	108%

QUALITY CONTROL Misc Soil - Inorg	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			24/09/2015	134843-2	24/09/2015 || 24/09/2015	LCS-1	24/09/2015
Date analysed	-			24/09/2015	134843-2	24/09/2015 || 24/09/2015	LCS-1	24/09/2015
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	134843-2	<5 || <5	LCS-1	102%
QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			24/09/2015	134843-2	24/09/2015 || 24/09/2015	LCS-4	24/09/2015
Date analysed	-			24/09/2015	134843-2	24/09/2015 || 24/09/2015	LCS-4	24/09/2015
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	134843-2	<4 || <4	LCS-4	111%
Cadmium	mg/kg	0.4	Metals-020 ICP-AES	<0.4	134843-2	<0.4 || <0.4	LCS-4	103%
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	134843-2	93 || 44 || RPD: 72	LCS-4	107%
Copper	mg/kg	1	Metals-020 ICP-AES	<1	134843-2	31 || 27 || RPD: 14	LCS-4	113%
Lead	mg/kg	1	Metals-020 ICP-AES	<1	134843-2	13 || 32 || RPD: 84	LCS-4	103%
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	134843-2	<0.1 || <0.1	LCS-4	97%
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	134843-2	78 || 37 || RPD: 71	LCS-4	101%
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	134843-2	68 || 110 || RPD: 47	LCS-4	102%

QUALITY CONTROL Misc Inorg - Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			25/09/2015	[NT]	[NT]	LCS-1	25/09/2015
Date analysed	-			25/09/2015	[NT]	[NT]	LCS-1	25/09/2015
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	LCS-1	102%
QUALITY CONTROL CEC	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			28/09/2015	134843-11	28/09/2015 || 28/09/2015	LCS-2	28/09/2015
Date analysed	-			28/09/2015	134843-11	28/09/2015 || 28/09/2015	LCS-2	28/09/2015
Exchangeable Ca	meq/100g	0.1	Metals-009	<0.1	134843-11	9.3 || 9.5 || RPD: 2	LCS-2	98%
Exchangeable K	meq/100g	0.1	Metals-009	<0.1	134843-11	0.2 || 0.2 || RPD: 0	LCS-2	112%
Exchangeable Mg	meq/100g	0.1	Metals-009	<0.1	134843-11	2.5 || 2.5 || RPD: 0	LCS-2	99%
Exchangeable Na	meq/100g	0.1	Metals-009	<0.1	134843-11	<0.1 || <0.1	LCS-2	93%
Cation Exchange Capacity	meq/100g	1	Metals-009	[NT]	134843-11	12 || 12 || RPD: 0	[NR]	[NR]

QUALITY CONTROL Misc Soil - Inorg	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	134843-4	24/09/2015
Date analysed	-	[NT]	[NT]	134843-4	24/09/2015
Total Phenolics (as Phenol)	mg/kg	[NT]	[NT]	134843-4	101%

Report Comments:

Acid Extractable Metals in Soil: The laboratory RPD acceptance criteria has been exceeded for 134843-2 for Cr, Pb, Ni. Therefore a triplicate result has been issued as laboratory sample number 134843-13.

Asbestos: Excessive sample volume was provided for asbestos analysis. A portion of the supplied sample was sub-sampled according to Envirolab procedures. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g (50mL) of sample in its own container as per AS4964-2004.
Note: Samples 134843-1,2,3,4,5,7,8 were sub-sampled from bags provided by the client.

Asbestos ID was analysed by Approved Identifier: Lulu Scott
Asbestos ID was authorised by Approved Signatory: Lulu Scott

INS: Insufficient sample for this test
NA: Test not required
<: Less than

PQL: Practical Quantitation Limit
RPD: Relative Percent Difference
>: Greater than

NT: Not tested
NA: Test not required
LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

CHAIN OF CUSTODY

Douglas Partners
Geotechnics | Environment | Groundwater

Client: Douglas Partners	Project Number 85085.01	To:	Envirolab Services
Contact Person: David Holden	Project Name: Kingswood - Somerset Street	Contact Person:	Aileen Hie
Project Mgr: David Holden	PO No.:	Address:	12 Ashley Street
	lab Quote No. :		Chatswood NSW 2068
Address: 96 Hermitage Road	Date results required: Standard	Phone:	02 9910 6200
West Ryde NSW 2114	Or choose: standard	Fax:	02 9910 6201
	Note: Inform lab in advance if urgent turnaround is required - surcharges apply	Email:	ahie@envirolab.com.au
Phone: 9809 0666 Mob: 0401 907 492	Report format: esdat / PDF / Excel	Laboratory Report No:	
Email: david.holdsen @douglaspartners.com.au	Comments: Samples already held by Envirolab	Lab Comments:	

Sample information						Tests Required												Comments
Lab Sample ID	Field Sample ID	Depth	Date sampled	Container Type	Type of sample	Combo 8a	Combo 3a	Combo 3	pH & CEC	PAH	HM	asbestos					Combo	Provide as much information about the sample as you can
1	BH1	0.1	21/09/2015	G	S		X											
2	BH2	0-0.1	17/09/2015	G	S	X			X									
3	BH2	0.4-0.5	17/09/2015	G	S		X											
4	BH3	0.1	21/09/2015	G	S	X												
5	BH4	0-0.1	17/09/2015	G	S	X												
6	BH4	0.4-0.5	17/09/2015	G	S			X	X									
7	BH5	0-0.1	17/09/2015	G	S		X											
8	BH6	0.1	21/09/2015	G	S	X												
9	BH6	0.5	21/09/2015	G	S			X										
10	BD1/210915	0.1 - 0.2	21/09/2015	G	S					X	X							
11	BH1	0.5	21/09/2015	B	S				X									
12	MS1	-	21/09/2015									X						

ENVIROLAB

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 134843
Date Received: 23/9/15
Time Received: 18:00
Received by: D.F
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/~~Broken/None~~

Relinquished by: Douglas Partners	Sample Receipt	*Lab use only:*
Hand delivered / Courier (by whom) HUNTER	Received by (Company): Envirolab Services	Samples Received: Cool or Ambient (circle one)
Condition of Sample at dispatch Cool or Ambient (circle)	Print Name: Dennell Ford	Temperature Received at: (if applicable)
Temperature (if Applicable):	Date & Time: 23/9/15 18:00	Transported by: Hand delivered / courier
Print Name: D HOLDEN	Signature:	
Date & Time: 23/9/15		
Signature:		

Page_____of_____

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

SAMPLE RECEIPT ADVICE

Client Details	
Client	Douglas Partners Pty Ltd
Attention	David Holden

Sample Login Details	
Your Reference	85085.01, Kingswood - Somerset Street
Envirolab Reference	134843
Date Sample Received	23/09/2015
Date Instructions Received	23/09/2015
Date Results Expected to be Reported	30/09/2015

Sample Condition	
Samples received in appropriate condition for analysis	YES
No. of Samples Provided	12 Soils
Turnaround Time Requested	Standard
Temperature on receipt (°C)	13.4
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments
Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	Phone: 02 9910 6200
Fax: 02 9910 6201	Fax: 02 9910 6201
Email: ahie@envirolabservices.com.au	Email: jhurst@envirolabservices.com.au

Sample and Testing Details on following page

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

Sample Id	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides	PCBs in Soil	Misc Soil - Inorg	Acid Extractable metals in soil	Asbestos ID - soils	pH 1:5 soil:water	CEC	Asbestos ID - materials
BH1-0.1	✓	✓	✓					✓	✓			
BH2-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
BH2-0.4-0.5	✓	✓	✓					✓	✓			
BH3-0.1	✓	✓	✓	✓	✓	✓	✓	✓	✓			
BH4-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓	✓			
BH4-0.4-0.5	✓	✓	✓					✓		✓	✓	
BH5-0-0.1	✓	✓	✓					✓	✓			
BH6-0.1	✓	✓	✓	✓	✓	✓	✓	✓	✓			
BH6-0.5	✓	✓	✓					✓				
BD1/210915-0.1-0.2			✓					✓				
BH1-0.5										✓	✓	
MS1												✓

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 134843-A

Client:
Douglas Partners Pty Ltd
96 Hermitage Rd
West Ryde
NSW 2114

Attention: David Holden

Sample log in details:

Your Reference:	**85085.01, Kingswood - Somerset Street**
No. of samples:	Additional testing on 2 soils
Date samples received / completed instructions received	23/09/2015 / 29/09/15

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	6/10/15 / 1/10/15
Date of Preliminary Report:	Not Issued

NATA accreditation number 2901. This document shall not be reproduced except in full.
Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

ACCREDITED FOR TECHNICAL COMPETENCE

Metals in TCLP USEPA1311			
Our Reference:	UNITS	134843-A-2	134843-A-5
Your Reference	----------	BH2	BH4
Depth	----------	0-0.1	0-0.1
Date Sampled		17/09/2015	17/09/2015
Type of sample		Soil	Soil
Date extracted	-	30/09/2015	30/09/2015
Date analysed	-	30/09/2015	30/09/2015
pH of soil for fluid# determ.	pH units	6.8	6.4
pH of soil for fluid # determ. (acid)	pH units	1.5	1.6
Extraction fluid used	-	1	1
pH of final Leachate	pH units	5.3	5.0
Lead in TCLP	mg/L	[NA]	<0.03
Nickel in TCLP	mg/L	0.03	[NA]

Method ID	Methodology Summary
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) based upon AS 4439 and USEPA 1311. Additional information as required in AS4439.3 section 11 can be provided on request.
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP).
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.

QUALITY CONTROL Metals in TCLP USEPA1311	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			30/09/2015	[NT]	[NT]	LCS-W1	30/09/2015
Date analysed	-			30/09/2015	[NT]	[NT]	LCS-W1	30/09/2015
Lead in TCLP	mg/L	0.03	Metals-020 ICP-AES	<0.03	[NT]	[NT]	LCS-W1	97%
Nickel in TCLP	mg/L	0.02	Metals-020 ICP-AES	<0.02	[NT]	[NT]	LCS-W1	97%

Report Comments:

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

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Aileen Hie

From: David Holden <David.Holden@douglaspartners.com.au>
Sent: Tuesday, 29 September 2015 5:15 PM
To: Aileen Hie
Subject: 134843 85085.01, Kingswood - Somerset Street- Addtional TCLP testing

Hi Aileen,

Could you please undertake additional TCLP testing for 134843 85085.01, Kingswood - Somerset Street

Sample 134843-2 (BH2/0-0.1) – TCLP analysis for nickel
Sample 134843-4 (BH4/0-0.1) – TCLP analysis for lead

Thanks

Dave

134843 A
std TAT
due 7/10

David Holden | Environmental Scientist
Douglas Partners Pty Ltd | ABN 75 053 980 117 | www.douglaspartners.com.au
96 Hermitage Road West Ryde NSW 2114 | PO Box 472 West Ryde NSW 1685
P: 02 8878 0652 | F: 02 9809 4095 | M: 0414 768 997 | E: David.Holden@douglaspartners.com.au

From: Nancy Zhang [mailto:NZhang@envirolab.com.au]
Sent: Tuesday, 29 September 2015 4:44 PM
To: David Holden
Subject: Results for Registration 134843 85085.01, Kingswood - Somerset Street

Please refer to attached for:
a copy of the Certificate of Analysis
a copy of the Invoice
a copy of the COC
an excel file containing the results

Please note that a hard copy will not be posted.

Enquiries should be made directly to:
Jacinta Hurst on jhurst@envirolabservices.com.au
or
David Springer on dspringer@envirolabservices.com.au
or
Tania Notaras on tnotaras@envirolabservices.com.au

Regards