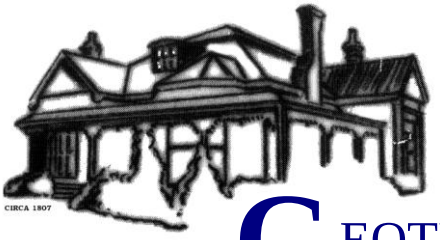

GEOTECHNIQUE® PTY LTD

ABN 64 002 841 063

STAGE 2 DETAILED SITE INVESTIGATION

PROPOSED MULTI STOREY RESIDENTIAL FLAT BUILDING

LOTS 22 & 23 IN DP35110
4-6 BIGGE STREET, WARWICK FARM

REPORT NO 14570/1-AA 25 NOVEMBER 2019

Lemko Place, Penrith NSW 2750 PO Box 880, Penrith NSW 2751
Telephone (02) 4722 2700
e-mail: info@geotech.com.au www.geotech.com.au

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ABN 64 002 841 063

Job No: 14570/1
Our Ref: 14570/1-AA
25 November 2019

Hutchinson Builders
23 Dunning Avenue
ROSEBERY NSW 2018
Email: Vu.Do@hutchinsonbuilders.com.au

Attention: Mr V Do

Dear Sir

re: **Proposed Multi Storey Residential Flat Building**
Lots 22 & 23 in DP35110, 4-6 Bigge Street, Warwick Farm
Stage 2 Detailed Site Investigation

Further to the preliminary site investigation (PSI) report (Project No 22475/1899D-E; Report No 19/1201 dated May 2019), prepared by STS Geoenvironmental Pty Ltd (STS) for the property currently registered as Lots 22 and 23 in DP35110, located at 4-6 Bigge Street, Warwick Farm (hereafter referred to as the site) and as requested, we have completed a Stage 2 detailed site investigation (DSI) for the site.

A brief of the outcome of the assessment was summarised in the Executive Summary.

If you have any questions, please do not hesitate to contact the undersigned.

Yours faithfully
GEOTECHNIQUE PTY LTD

ANWAR BARBHUYIA
Senior Associate
B.E (Civil), MEngSc (Enviro), MIEAust

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ABN 64 002 841 063

EXECUTIVE SUMMARY

Further to the preliminary site investigation (PSI) report (Project No 22475/1899D-E; Report No 19/1201 dated May 2019), prepared by STS Geoenvironmental Pty Ltd (STS) for the property currently registered as Lots 22 and 23 in DP35110, located at 4-6 Bigge Street, Warwick Farm (hereafter referred to as the site), in the local government area of Liverpool City Council, this executive summary presents a synopsis of a Stage 2 detailed site investigation (DSI) for the site.

We understand that the proposed development consists of construction of an eleven-storey residential flat building with one level basement car park.

The objective of the Stage 2 DSI is to conduct sampling and testing at three extra test pit locations to satisfy the EPA Sampling Guidelines in order to address Liverpool Council request for additional information (Ref: DA-639/1019 dated 18 October 2019) and to ascertain whether the site is likely to present a risk of harm to human health and the environment for the proposed use.

In order to achieve the objective of this assessment, the scope of work included review of the PSI report, site reconnaissance, additional test pit excavation, soil sampling and testing, and preparation of this report.

The findings of this Stage 2 DSI contamination assessment are summarised as follows:

- The site is proposed for a residential development.
- The site is vacant land with no specific usage.
- The general soil profile in the site comprised of fill materials overlying natural clayey soil. Topsoil overlying natural clayey soil was encountered in the south eastern portion of the site. The test pits and boreholes did not reveal any visual evidence of asbestos or other indicators of significant contamination, such as staining, odours or significant foreign matter.
- All the laboratory test results satisfied the criteria for stating that the analytes selected are either not present i.e. concentrations less than laboratory limits of reporting, or present in the sampled soil at concentrations that do not pose a risk of hazard to human health or the environment under a “residential with minimal opportunities for soil access” form of development.
- The data quality objectives outlined in the report have been satisfied.

Based on this assessment, the site does not present a risk of harm to human health and environment, and in our opinion, the site is considered suitable for the proposed residential development.

If any suspect materials (identified by unusual staining, odour, discolouration or inclusions such as building rubble, asbestos sheets/pieces/pipes, ash material, etc.) between the sampling locations are encountered during any stage of future earthworks/site preparation, Unexpected Finds Management Protocol (Appendix D) should be implemented. In the event of contamination, detailed assessment, remediation and validation will be necessary.

For any materials to be excavated and removed from the site, it is recommended that waste classification of the materials, in accordance with the "Waste Classification Guidelines Part 1: Classifying Waste"(NSW EPA 2014), NSW EPA resource recovery exemptions and orders under the Protection of the Environment Operations (Waste) Regulation 2014, or NSW EPA Certification: Virgin excavated natural material is undertaken prior to disposal at an appropriately licensed landfill or potential re-use at other sites.

Any imported soil (fill) must be assessed by a qualified environmental consultant, prior to importation, to ensure suitability for the proposed use. In addition, the imported fill must not contain asbestos and ash, be free of unusual odour, not be discoloured and not acid sulphate soil or potential acid sulphate soil. The imported fill should either be virgin excavated natural material (VENM) or excavated natural material (ENM).

Reference should be made to Section 15.0 of the report and Appendix E, which set out details of the limitations of the assessment.

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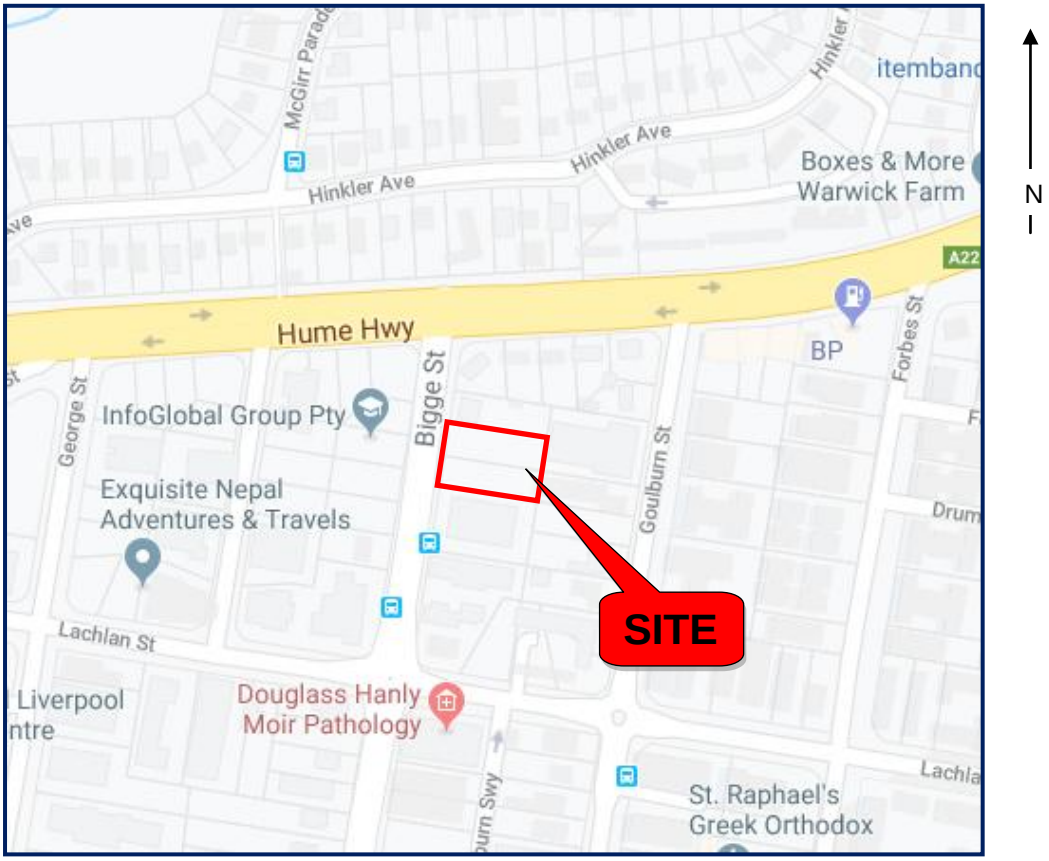
APPENDICES

1.0 INTRODUCTION

Further to the preliminary site investigation (PSI) report (Project No 22475/1899D-E; Report No 19/1201 dated May 2019), prepared by STS Geoenvironmental Pty Ltd (STS) for the property currently registered as Lots 22 and 23 in DP35110, located at 4-6 Bigge Street, Warwick Farm (hereafter referred to as the site) and as requested, we have completed a Stage 2 detailed site investigation (DSI) for the site. The location of the site is indicated on Figure 1 below:

FIGURE 1



Map Data ©2019 Google

We understand that the proposed development consists of construction of an eleven-storey residential flat building with one level basement car park. Proposed development plans are included in Appendix A.

The objective of the Stage 2 DSI is to conduct sampling and testing at three extra test pit locations to satisfy the EPA Sampling Guidelines in order to address Liverpool Council request for additional information (Ref: DA-639/1019 dated 18 October 2019), as included in Appendix A and to ascertain whether the site is likely to present a risk of harm to human health and the environment for the proposed use.

This report was prepared generally in accordance with the NSW Environment Protection Authority (EPA), "Guidelines for Consultants Reporting on Contaminated Sites" – 2011, and to satisfy Managing Land Contamination: Planning Guidelines, State Environmental Planning Policy No. 55 – Remediation of Land.

2.0 SCOPE OF WORK

In order to achieve the objective of this assessment, the following scope of work was conducted in accordance with our email fee proposal dated 31 October 2019:

- Review of the previous PSI report dated May 2019.
- Obtaining underground services plans from "Dial Before You Dig" and you/owner (if available).
- Scanning of sample locations by a services locator.
- An inspection by an Environmental Engineer for current site conditions and identification of any environmental concerns based on visual and olfactory indicators of potential contamination.
- Recovery of soil samples from three systematic test pit locations using an excavator.
- Forwarding the soil and quality assurance (QA) / quality control (QC) samples to National Association of Testing Authorities (NATA) accredited laboratories for testing.
- Assessment of the laboratory analytical results.
- Assessment of the field and laboratory QA/QC.
- Assessment of the contamination status of the soil in the site.

3.0 SITE INFORMATION

The site is located at 4-6 Bigge Street, Warwick Farm, in the local government area of Liverpool City Council and is registered as Lots 22 and 23 in DP35110. The site and lot layout is shown on Drawing No 14570/1-AA1.

As detailed in the survey plan (dated 1 May 2019, prepared by Dennis Smith Survey) in Appendix A, the site is rectangular in shape, covering an area of approximately 1,758m^2.

At the time of inspection and field sampling on 6 November 2019 by an Environmental Engineer from Geotechnique as a part of Stage 2 DSI, the site conditions, as shown on Drawing No 14570/1-AA1, remained almost the same as observed in May 2019 by STS as a part of PSI.

The site was grass covered with scattered trees, with the exception of gravel on the surface, located approximately at the middle of the site and concrete in a small area towards the northern boundary. There were areas of long grass towards the northern and southern sections of the site.

There was minor littering and a stockpile towards the southern boundary of the site. This stockpile was assessed during the previous PSI.

The surrounding properties consisted of residential apartments in all the cardinal directions; however, immediately to the west was Biggie Street.

4.0 TOPOGRAPHY, GEOLOGY & HYDROGEOLOGY

In general, ground within the site is flat.

The Geological Map of Sydney (Geological Series Sheet 9130, Scale 1:100,000, 1983), published by the Department of Mineral Resources indicates the residual soils within the site to be underlain by Triassic Age Shale of the Wianamatta Group, comprising black to dark grey shale and laminite.

The Soil Landscape Map of Sydney (soil Landscape Series Sheet 9130, Scale 1:100,000, 2002), prepared by the Soil Conservation Service of NSW, indicates that the site is located within the Blacktown soil landscape area and typically consists of highly plastic and relatively impermeable residual soil.

Reference should be made to Table 1 in Appendix B for descriptions of the soils encountered during sampling for this assessment. Based on information from the PSI and DSI, the sub-surface profile across the site is generalised as follows:

Fill	The following 3 types of fill were encountered; Type 1: 500mm to 600mm thick silty gravelly clay, low plasticity, brown. Type 1 fill in all boreholes (BH1 to BH4) was underlain by natural clayey soil. Type 2: 300mm thick silty sand, fine to medium grained, brown, with recycled road base gravel. Type 2 fill in TP101 was underlain by natural clayey soil. Type 3: 400mm thick silty clay, medium plasticity, brown, with gravel with inclusion of root fibres. Type 3 fill in TP102 was underlain by natural clayey soil.
Topsoil	Silty Clay, low to medium plasticity, brown. 300mm thick topsoil was encountered in TP103 underlain by natural clayey soil.
Natural Soil	Silty Clay, medium to high plasticity, red, grey with orange brown or mottled red, grey or red mottled grey, was encountered beneath the fill and topsoil.

No groundwater or perched water was encountered during sampling to a maximum depth of approximately 3.0m below the existing ground level (EGL).

The closest water body is Brickmackers Creek which is situated approximately 280m to the north-west of the site.

A site-specific groundwater analysis is outside the scope of this assessment. However, a search was carried out during the PSI through the website of Department of Primary Industries Office of Water for any registered groundwater bore data within a radius of 500m of the site. The search revealed no bores within a radius of 500m of the site on the search date (1 May 2019). The nearest registered borehole is located at about 1.5km northeast of the site.

5.0 SITE HISTORY INFORMATION

STS carried out a review of site history information as part of their PSI in May 2019. The review included historical aerial photographs, historical land titles, NSW EPA records regarding notices for contaminated land, council records and Section 10.7 Planning Certificate. For details, reference should be made to the PSI report (Project No 22475/1899D-E; Report No 19/1201 dated May 2019).

Historical aerial photographs revealed that the site had been under residential land use since at least the 1950s and residences had been built on the western half of the site since the 1950s. Aerial photographs from 1961 indicated the presence of smaller site structures to the east of the existing residences. All structures on the site were removed most probably in 2007. The 2014 aerial photograph captured ground disturbance on the northern portion of the site, and no significant change on the site after 2014.

NSW Department of Lands records indicate that private proprietors owned the site from 1906 to 1945. From 1945 until the present day the site was owned by the Housing Commission of New South Wales (HCNSW).

A search of the NSW EPA records revealed no EPA Notices issued for the site. A search of the Protection of the Environment Operations (POEO) Public Register found no records for the site.

The Section 10.7 Planning Certificates revealed no matters arising under the Contaminated Land Management (CLM) Act 1997. It indicates that the site is zoned R4 – Hight Density Residential.

Given site history, it is not likely that any substantial storage or use of chemicals or disposal of wastes, any history of product spill or loss, any discharges to land, air or water, has occurred.

6.0 SUMMARY OF THE PRELIMINARY SITE INVESTIGATION (PSI)

A PSI was carried out by STS for the site currently registered as Lots 22 and 23 in DP35110 located at 4-6 Bigge Street, Warwick Farm, in the local government area of Liverpool City Council. The results are presented in the PSI report (Project No 22475/1899D-E; Report No 19/1201 dated May 2019).

It was understood that the proposed development consisted of construction of a ten-storey residential building over one (1) level of basement.

The objectives of the assessment were to identify any areas of potential contamination and to assess if the site potentially presents a risk of harm to human health and the environment under the conditions of the proposed residential use.

In order to achieve the objectives of the assessment, the scope of work included the review of historical aerial photographs, historical land titles, NSW EPA records regarding notices for contaminated land, council records and Section 10.7 Planning Certificate.

A walkover of the site was carried out by STS on 2 May 2019 to verify and/or confirm some of the information gathered from the historical documents reviewed. During the inspection it was observed that; the site was vacant and fenced, most of the site was covered with grass except for a small area located approximately near the centre of the site, scattered trees were located within the southern half of the site, and minor littering along the southern boundary of the site.

Based on the information obtained in preparation of this report, it was considered that the site has potential for contamination due to past site activities.

Under the scope of the PSI, STS carried out an intrusive investigation on the site by way of four (4) boreholes across the site and two (2) test pits in stockpiled materials (identified on the southern portion of the site). Fill was encountered in all 4 boreholes which consisted of silty gravelly clay. Stockpiled material (approximately 3m^3) identified on the site comprised sandy gravel/gravelly sand. In total, twelve (12) soil samples were recovered from the site: six (6) fill, four (4) native soil and two (2) stockpiled materials and were subjected to laboratory testing.

Laboratory test results indicate detection of elevated zinc concentration in one location which exceeded ecological investigation level (EIL), but was marginally above the upper bound background concentration. Hence STS consider the EIL exceedance is unlikely to impact ecological receptors within the proposed land use setting. PAH concentration were detected but were below the relevant carcinogenic PAH criteria for Health Investigation Levels (HIL) for residential with minimal opportunities for soil access (HIL B) and ecological screening level (ESL).

Due to detection of PAH concentrations in the site, STS recommends to carry out additional investigation to appropriately characterise the PAH contamination due to proposal for deep soil area as a part of residential development.

7.0 DATA QUALITY OBJECTIVES

The data qualitative objectives (DQO) are qualitative and quantitative statements that specify the quality of the data required for the assessment. DQO must ensure that the data obtained is sufficient to characterise the contamination of a site and enable appropriate assessment of health and environmental risks for the current or proposed use. The DQO were developed for this assessment in accordance with accordance with National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 1999 (April 2013), as well as in accordance with the Australian Standard "*Guide to the Sampling and Investigation of Potentially Contaminated Soil Part 1: Non-volatile and semi-volatile compounds*" (AS4482.1-2005) and "*Guide to the Sampling and Investigation of Potentially Contaminated Soil Part 2: Volatile substances*" (AS4482.2-1999). The DQO process adopted is outlined below:

State the Problem

The site was a vacant land without any specific usage. The site contains fill materials. As a result the potential exists for contamination to have occurred within the site in the past and presently.

The proposed development of the site consists of construction of an eleven-storey residential flat building with one level basement car park.

The following key professional personnel were involved in the assessment:

Mr Anwar Barbhuyia	Associate
Mr Saurabh Sapkota	Environmental Engineer

Identify the Decisions

The decisions to be made in completing the assessment are as follows;

- Does the site, or is the site, likely to present a risk of harm to human health or the environment?
- Is the site currently suitable for the proposed end use?
- Is there any potential for groundwater contamination?
- Are there any off-site migration issues to be considered?
- Is further investigation required to adequately address the abovementioned decisions?
- Is further investigation required to delineate the extent of contamination identified?
- Does the site require remediation to ensure suitability for the proposed end use?

Identify Inputs to the Decisions
The inputs into the decision process are as follows;

- Historical information (presented in Section 5.0).
- Site operations and observation details (presented in Section 3.0).
- Additional systematic soil sampling at a density required to meet the NSW EPA "*Sampling Design Guidelines*" using an excavator.
- Soil profile information obtained through the sampling phase.
- Chemical and/or physical test data on analysed samples.
- Assessment of test data / data sets against applicable soil investigation levels in the NEPM 1999 (April 2013). For asbestos assessment, the assessed soil must not contain asbestos containing material (ACM) in excess of 0.04%w/w and surface soil within the site is free of visible ACM, and asbestos fines (AF) and fibrous asbestos (FA) in the soil is <0.001% w/w.

Define the Study Boundaries
The study boundary for this assessment is defined by the boundaries of the subject site, as shown on Drawing No 14570/1-AA1 and summarised in Section 3.0 of this report.

Develop a Decision Rule
The information obtained through this assessment will be used to characterise the site in terms of contamination issues and risk to human health and the environment. The decision rule in characterising the site will be as follows;

- Laboratory test results will be assessed individually.
- The assessment criteria are the NSW EPA produced and/or endorsed criteria, as specified in Section 12.0 of this report. For asbestos assessment, the assessed soil must not ACM in excess of 0.01%w/w and surface soil within the site is free of visible ACM, and AF and FA in the soil is <0.001% w/w.
- The site will be deemed to potentially contain contamination “hot spots” if any of the individual concentrations exceed the assessment criteria adopted or any presence of asbestos-cement pieces on the surface soil or presence of ACM in excess of 0.04%w/w in the assessed soil and/or detection of AF and FA in excess of 0.001%w/w in the assessed soil.
- Further investigation, remediation and/or management will be recommended if the site is found to be contaminated or containing contamination “hot spots”.

Laboratory test results will only be accepted and considered useable for this assessment under the following conditions:

- All laboratories used are accredited by NATA for the analyses undertaken.
- All detection limits set by the laboratories fall below the assessment criteria adopted.
- The recovery of spike concentrations in the trip spike sample is sufficient so as not to impact on the reported concentrations of the soil samples when the same recovery is applied (BTEX only).
- The differences between the reported concentrations of analytes in the field duplicate samples and the corresponding original samples are within accepted limits (refer to Section 9.4).

- The differences between the reported concentrations of analytes in the inter-laboratory duplicate (split) samples and the corresponding original samples are within accepted limits (refer to Section 9.5).
- The QA/QC protocols and results reported by the laboratories comply with the requirements of the NEPM 1999 (April 2013) "*Guideline on Laboratory Analysis of Potentially Contaminated Soils*".

Specify Limits on Decision Errors

The limits on decision errors for this assessment are as follows;

- Additional systematic sample numbers support to comply with those recommended in the NSW EPA sampling design guidelines, which have risk probabilities already incorporated. Sample numbers are therefore considered adequate for site characterisation.
- Analyte selection in the site is based on site history, site activities, and the presence of fill materials. The possibility of any other potential contaminants that would be detected through field observation (through odours, staining, and colouring) might need to be included.
- The assessment criteria adopted from the guidelines stated in Section 12.0 have risk probabilities already incorporated.
- The acceptable limits for field and inter-laboratory duplicate (split) comparisons are outlined in Sections 9.4 and 9.5 of this report.
- The acceptance limits for laboratory QA/QC parameters are based on the laboratory reported acceptance limits and those stated in the NEPM 1999 (April 2013) "*Guideline on Laboratory Analysis of Potentially Contaminated Soils*".

Optimise the Design for Obtaining Data

- The procedures adopted for location and collection of environmental samples were developed prior to implementation, in accordance with NSW EPA guidelines and current industry practice. The sampling program was designed to ensure integrity of data collection during the assessment, including decontamination techniques, sample labelling, storage and chain of custody protocols.
- The analytical program was developed in theory prior to undertaking the sampling (based on site history and site activities) and refined on the basis of field observations (both surface and sub-surface) during the sampling phase. All potential contaminants have been covered within rear portion of the site.
- Only laboratories accredited by NATA for the analyses undertaken were used for this assessment. The laboratory performance is assessed through review of statistics calculated for QA samples such as blanks, spikes, duplicates and surrogates.
- The field QA/QC protocols adopted are outlined in Section 9.0 of this report. The QA/QC program incorporates preparation of traceable documentation of procedures used in the sampling and analytical program and in data validation procedures.

Data Quality Indicators

The performance of the assessment in achieving the DQO will be 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 is representative of each media present on the site;
Completeness	A measure of the amount of useable data from a data collection activity;
Comparability	The confidence (expressed qualitatively) that data can be considered equivalent for each sampling and analytical event.

Assessment of the data quality indicators is presented in Section 8.0 (sampling) and Section 11.0 (analysis) of this report.

8.0 SAMPLING & ANALYSIS PLAN AND SAMPLING METHODOLOGY

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

1. Nature, location and likely distribution of soil contaminants beneath the site.
2. The risks that the contaminants (if present) pose to human health or the environment under the conditions of the proposed development.

The risk of harm to human health and the environment was determined through comparison of test results with EPA produced or endorsed criteria available at the time, as discussed in Section 12.0 of this report.

Soil sampling was carried out on 6 November 2019 by an Environmental Engineer from Geotechnique who was responsible for visually assessing the site, locating the nominated sample locations, supervision of excavation of test pits, recovery of soil samples, preparation of samples for delivery to NATA accredited laboratories and logging the sub-surface profile encountered at each sample locations.

Based on the "Sampling Design Guidelines for Contaminated Sites" 1995 EPA, there (3) additional systematic sampling locations (TP101 to TP103) were adopted in the site to supplement four systematic sampling points adopted during the PSI. All three additional locations were excavated by an excavator. The test pit locations are shown on Drawing No 14570/1-AA1.

Prior to excavation all locations were scanned to avoid any underground services.

The sampling procedures adopted were as follows:

- The test pits were excavated to the depth interval nominated by the Environmental Engineer. The representative soil sample was recovered from the excavator bulk sample using disposable gloves.

- To minimise the potential loss of volatiles, the laboratory soil sample was immediately transferred to a labelled, laboratory supplied, 250ml glass jar and sealed with an airtight, Teflon screw top lid. The fully filled jar was then placed in a chilled container.
- Recovered soil samples were also transferred into laboratory supplied separate small plastic zip-lock bags, which were placed inside a larger plastic bag.

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

No rinsate water sample was collected, as each sample was recovered using separate disposable gloves. Duplicate sample and split sample were also recovered using separate disposable gloves.

At completion of field sampling, the chilled containers and large plastic bags were transported to our Penrith office. The chilled containers were then transferred to a refrigerator where the temperature was maintained below 4°C.

The chilled containers with the trip spike sample and large plastic bag were forwarded to the primary laboratory of SGS Environmental Services (SGS) and the secondary laboratory, Envirolab Service Pty Ltd (Envirolab), both NATA accredited. Chains of Custody (COC) were then forwarded to the laboratories.

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

The soil profiles encountered and described in Section 4.0 of this report did reveal visual (staining, dying) indicators of potential contaminants. As a result and generally based on the potential for contamination identified in the *Preliminary Site Investigation* report, discrete fill samples were analysed for Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc), Total Recoverable Hydrocarbons (TRH), BTEX (Benzene, Toluene, Ethyl Benzene and Xylenes), Polycyclic Aromatic Hydrocarbons (PAH), Organochlorine Pesticides (OCP), Polychlorinated Biphenyls (PCB) and asbestos. The samples were also analysed for Phenols for screening purposes. Discrete topsoil sample was analysed for Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc), TRH, BTEX, PAH, OCP, PCB, Phenols and asbestos for screening purposes.

Natural soil samples immediately below the fill materials or topsoil were analysed for Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc), TRH, BTEX and PAH for screening purposes. Few selected deeper natural soil samples were analysed for Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc) for screening purposes

Site was not used for activities which can generate potential PFAS. So this was not included in the laboratory analysis.

No salinity testing was included in the chemical analysis as no input to adjust some groundwater criteria was required, as groundwater contamination assessment was not required in the DSI.

The following table provides a list of the data quality indicators (refer to Section 7.0) for the soil sampling phase of the assessment and the methods adopted in ensuring that the data quality indicators were met.

DATA QUALITY INDICATOR	METHOD(S) OF ACHIEVEMENT
Completeness	Good sampling coverage of site; additional sample numbers support to comply with NSW EPA sampling design guidelines. Representative coverage of potential contaminants in the site based on site history, site activities, and the presence of fill materials. On site visual assessment of soils uncovered. Use of trained and qualified field staff (Section 9.1). Preparation of sample location plan. Preparation of soil profile logs. Preparation of chain of custody records.
Comparability	Using appropriate techniques for sample recovery. Experienced samplers used. Using appropriate sample storage and transportation methods.
Representativeness	Good sampling coverage of site; additional sample numbers support to comply with NSW EPA sampling design guidelines. Representative coverage of potential contaminants in the site based on site history, site activities, and the presence of fill materials.
Precision and Accuracy	Trip spike, field duplicate, and inter-laboratory duplicate / split samples recovered or prepared (Section 9.3 to 9.5).

9.0 FIELD QUALITY ASSURANCE AND QUALITY CONTROL

9.1 Sampling Personnel

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

Mr Sapkota has a Bachelor of Civil Engineering degree and has been employed by Geotechnique as an Environmental Engineer since 2014. At commencement of employment, Mr Sapkota underwent supervised training in Geotechnique procedures for sampling and logging.

9.2 Decontamination Procedures

As stated in Section 8.0 of this report, each soil sample was transferred directly to the laboratory supplied, glass jar and plastic bag using separate disposable gloves from the excavator bulk sample. As stated in Sections 9.4 and 9.5, separate disposable gloves were used to divide the soil sample into two portions to prepare duplicate/split samples.

Therefore, no decontamination is required for sampling. Hence no rinsate water sample was collected.

9.3 Trip Spike

Trip spike samples are obtained from the laboratory on a regular basis, prior to conducting field sampling where volatile substances are suspected. The samples are held in the Penrith Office of Geotechnique, at less than 4°C, for a period of not more than seven days. During the field work, the trip spike samples are kept in the chilled container with soil samples recovered from the site. The trip spike sample is then forwarded to the primary laboratory together with the soil samples recovered from the site.

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

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

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

As indicated in Table A, the results show a good recovery of the spike concentrations. Furthermore, all BTEX results were less than laboratory detection limits and there were no visible or olfactory indications of hydrocarbon contamination.

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

9.4 Duplicate Sample

A field duplicate sample was prepared in the field through the following processes:

- A larger than normal quantity of soil was recovered from the sample location selected for duplication.
- The sample was placed in a decontaminated stainless bowl and divided into two portions, using disposable gloves.
- One portion of the sub-sample was immediately transferred, using the decontaminated trowel, into a labelled, laboratory supplied, 250ml glass jar and sealed with an airtight, Teflon screw top lid. The fully filled jar was labelled as the duplicate sample and immediately placed in a chilled container.
- The remaining portion was stored in the same way and labelled as the original sample.

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

Metals:	13 samples analysed;	1 duplicate;	7.7% frequency
TRH:	6 samples analysed;	1 duplicate;	17% frequency
BTEX:	6 samples analysed;	1 duplicate;	17% frequency
PAH:	6 samples analysed;	1 duplicate;	17% frequency
OCP	3 samples analysed	1 duplicate;	33% frequency
PCB:	3 samples analysed	1 duplicate;	33% frequency
Phenols:	3 samples analysed	1 duplicate;	33% frequency

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

The laboratory test results are summarised in Table B. The laboratory test results certificates are included in Appendix C.

A comparison was made of the laboratory test results for the duplicate samples with the original samples and the Relative Percentage Differences (RPD) was computed to assess the accuracy of the laboratory test procedures. RPD within 30% are generally considered acceptable. However, this variation can be higher for organic analysis than for inorganics and for low concentrations of analytes.

As shown in Table B, the comparisons between the duplicate and corresponding original sample indicated generally acceptable RPD, with the exception of marginally higher RPD of two metals due to the heterogeneity of samples.

All the concentrations with RPD in excess of 30% in the duplicate pairs were both less than the relevant assessment criteria.

Therefore, the variations are not considered critical and the laboratory test data provided by SGS are of adequate accuracy and reliability for this assessment.

9.5 Inter-laboratory Duplicate (Split) Sample

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

The split sample was prepared in the same manner as the duplicate sample. Reference should be made to Section 9.4.

Split sample was forwarded to the secondary laboratory of Envirolab.

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

Metals:	13 samples analysed;	1 split;	7.7% frequency
TRH:	6 samples analysed;	1 split;	17% frequency
BTEX:	6 samples analysed;	1 split;	17% frequency
PAH:	6 samples analysed;	1 split;	17% frequency
OCP	3 samples analysed	1 split;	33% frequency
PCB:	3 samples analysed	1 split;	33% frequency
Phenols:	3 samples analysed	1 split;	33% frequency

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

The results are also summarised in Table C. The laboratory test results certificates are included in Appendix C.

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

As shown in Tables C, the comparisons between the split and corresponding original sample indicated generally acceptable RPD, with the exception of higher RPD for three Metals and Total PAH, mainly due to the heterogeneity of samples.

All the concentrations with RPD in excess of 30% in the splits pairs were both less than the relevant assessment criteria.

Therefore, the variations are not considered critical and the test results provided by the primary laboratory are deemed reliable for this assessment.

10.0 LABORATORY QUALITY ASSESSMENT AND QUALITY CONTROL

Geotechnique uses only laboratories accredited by the NATA for chemical analyses. The laboratories also incorporate quality laboratory management systems to ensure that trained analysts using validated methods and suitably calibrated equipment produce reliable results.

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

SGS and Envirolab are accredited by NATA and operate a Quality System designed to comply with ISO / IEC 17025.

The discrete soil samples were analysed within the allowable holding times detailed in Schedule B(3) of The *NEPM 1999 (April 2013)*. It should be noted that there is no specific holding time for asbestos analysis.

The test methods adopted by the laboratories are indicated with the laboratory test results certificates. As part of the analytical run for the project, the laboratories included laboratory blanks, duplicate samples, laboratory control samples, matrix spikes, matrix spike duplicates and/or surrogate spikes.

We have checked the QA/QC procedures and results adopted by the laboratories against the appropriate guidelines. The QC sample numbers adopted by SGS and Envirolab are considered adequate for the analyses undertaken.

The methods used by SGS and Envirolab have been validated and endorsed by NATA.

The samples analysed for TPH (C_6–C_9) and/or BTEX were extracted by the purge and trap method recommended by the NSW EPA.

All reported laboratory LOR / Practical Quantitation Limit (PQL) were less than the assessment criteria adopted for each analyte.

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

11.0 QA/QC DATA EVALUATION

The following table provides a list of the data quality indicators for the analytical phase of the assessment and the methods adopted in ensuring that the data quality indicators were met.

DATA QUALITY INDICATOR	METHOD(S) OF ACHIEVEMENT
Data Completeness	Laboratory sample receipt information received confirming receipt of samples intact and appropriate chain of custody. Analysis for all potential contaminants of concern in the site. NATA registered laboratory analytical reports / certificates of analysis provided.
Data Comparability	Use of NATA registered laboratories. Test methods consistent for each sample. Test methods comparable between primary and secondary laboratory. Acceptable Relative Percentage Differences between original samples and field duplicates and inter-laboratory duplicate / split samples.
Data Representativeness	Representative coverage of potential contaminants in site based on site history, site activities, and the presence of fill materials. Adequate duplicate, split and trip spike sample numbers. Adequate laboratory internal quality control and quality assurance methods, complying with the NEPM.
Data Precision and Accuracy	Acceptable recoveries of spike concentrations in trip spike sample. Acceptable RPD for duplicate comparison overall. Acceptable RPD for inter-laboratory duplicate / split sample comparison overall. Appropriate and validated laboratory test methods used. Adequate laboratory performance based on results of the blank samples, duplicates, surrogate spike samples, control samples and/or matrix spike samples.

Based on the above, it is considered that both laboratories complied with the quality assurance and quality control data quality indicators. As such, it is concluded that the laboratory test data obtained are reliable and useable for this assessment.

12.0 ASSESSMENT CRITERIA

Investigation levels and screening levels developed in the NEPM 1999 (April 2013) were used in this assessment, as follows:

- Risk-based Health Investigation Levels (HIL) for a broad range of metals and organic substances. The HIL are applicable for assessing human health risk via all relevant pathways of exposure. The HIL as listed in Table 1A(1) of Schedule B1 "*Guideline on Investigation Levels for Soil and Groundwater*" are provided for different land uses and applicable to the top 3m of soil for residential use.

  The site is proposed for construction of an eleven-storey residential flat building with one level basement car park. Therefore, with regard to human health, analytical results were assessed against risk based HIL for *residential with minimal opportunities for soil access* (HIL B).

- Health Screening Levels (HSL) for selected petroleum compounds, fractions and Naphthalene are applicable for assessing human health risk via inhalation and direct contact pathways. The HSL depend on specific soil physicochemical properties, land use scenarios and the characteristics of building structures. The HSL listed in Table 1A(3) of Schedule B1 "*Guideline on Investigation Levels for Soil and Groundwater*" apply to different soil types and depths below surface to >4 m.

  For this assessment the analytical results were assessed against the available HSL for *high density residential* (HSL B) for sand to depth of 0m to <1m and clay to depth of 0m to <1m.

- Ecological Screening Levels (ESL) for selected petroleum hydrocarbon compounds, TPH fractions and Benzo(a)Pyrene are applicable for assessing the risk to terrestrial ecosystems. ESL listed in Table 1B(6) of Schedule B1 "*Guideline on Investigation Levels for Soil and Groundwater*" broadly apply to coarse and fine-grained soils and various land uses and are generally applicable to the top 2m of soil.

  The analytical results were assessed against the available ESL for *urban residential* for coarse-grained soil (sand) and fine-grained soil (clay).

- Ecological Investigation Levels (EIL), a specific type of Soil Quality Guidelines (SQG) for selected metals, is applicable for assessing the risk to terrestrial ecosystems. EIL listed in Table 1B(1-5) of Schedule B1 "*Guideline on Investigation Levels for Soil and Groundwater*" depend on specific soil physicochemical properties and land use scenarios and generally apply to the top 2m of soil. For arsenic and lead, generic EIL are adopted, for *urban residential* land use for aged contamination. For other metals, where available, EIL are calculated using the EIL calculator developed by CSIRO for NEPC.

  For this assessment the analytical results were assessed against the available SQG / EIL for *urban residential* land use for aged contamination in soil for low traffic volume.

  For DDT and Naphthalene, generic EIL are adopted, for *urban residential* land use for fresh contaminants.

For discrete soil samples, the individual concentrations of analytes were assessed against the HIL B / HSL B / ESL / EIL.

For asbestos, the assessed soil must not contain ACM in excess of 0.04%w/w and surface soil within the site is free of visible ACM, and asbestos fines (AF) and fibrous asbestos (FA) in the soil is <0.001% w/w.

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

The adopted assessment criteria for the soil samples are detailed in Tables D to H.

13.0 FIELD & LABORATORY TEST RESULTS, ASSESSMENT & DISCUSSION

13.1 Field Results

Details of the sub-surface conditions encountered during field work for this assessment are presented in Appendix A of this report. As discussed in Section 4.0 the general soil profile in site comprised imported fill overlying natural clayey soil. Topsoil overlying natural clayey soil was encountered in the south eastern portion of the site.

The test pits and boreholes did not reveal any visual evidence of asbestos or other indicators of significant contamination, such as staining, odours or significant foreign matter.

13.2 Analytical Results

Reference may be made to Appendix C for the actual laboratory test results certificates from SGS. The test results are also presented in D to H together with the assessment criteria adopted. A discussion of the test data is presented in the following sub-sections.

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

As indicated in Table D, the concentrations of metals in the soil samples analysed were below the relevant HIL B and/or EIL adopted.

As indicated in PSI report, elevated zinc concentration (329mg/kg) exceeding relevant EIL was encountered in the duplicate sample S7 which corresponds with the surface sample at borehole BH2. As BH2 is located within the proposed basement excavation area, elevated zinc concentration may have limited environmental values requiring consideration. Therefore, EIL may not be applicable for the proposed basement car park area, which covers most of the site and elevated zinc concentration in the fill sample at BH2 was no longer an issue for the site.

13.2.2 TRH and BTEX

The TRH and BTEX test results for discrete fill and topsoil samples and selected discrete deeper natural soil samples are presented in Table E. As shown in Table E, the concentrations of F1 (TRH C6-C10 less BTEX), F2 (TRH >C10-C16 less Naphthalene), F3 (TRH >C16-C34), F4 (TRH >C34-C40) and BTEX were below the relevant Health Screening Levels B (HSL B) and / or Ecological Screening Levels (ESL) adopted.

13.2.3 Polycyclic Aromatic Hydrocarbons (PAH)

The PAH test results for discrete fill and topsoil samples and selected discrete deeper natural soil samples are presented in Table F and as shown, the concentrations of Benzo(a)pyrene, Benzo(a)pyrene TEQ, Naphthalene and Total PAH were below the relevant HIL B or ESL or HSL B or EIL adopted, which the exception of the Benzo(a)pyrene concentration of surface fill sample at TP101. The Benzo(a)pyrene concentration exceeded the ESL.

As TP101 is located within the proposed basement excavation area, elevated Benzo(a)pyrene concentration may have limited environmental values requiring consideration. Therefore, ESL may not applicable for the site. Hence elevated Benzo(a)pyrene concentration in the surface fill sample at TP101 was no longer an issue for the site.

All PAH results in TP102 and TP103, which are located in in deep soil zone area, were below the relevant HIL B or ESL or HSL B or EIL adopted. Hence, PAH is not a concern for soil in the deep soil zone area.

13.2.4 Organochlorine Pesticides (OCP)

The OCP test results for the discrete fill and topsoil samples are presented in Table G and as indicated, all concentrations of OCP were well below the relevant HIL B. Concentrations of DDT were also below the EIL. Moreover, all test results were below the laboratory limits of reporting (LOR).

13.2.5 Polychlorinated Biphenyls (PCB)

The PCB test results for the discrete fill and topsoil samples are presented in Table G and as indicated the concentrations of PCB were below the relevant HIL B adopted as well as below the laboratory LOR.

13.2.6 Phenols

The Phenols test results for the discrete fill and topsoil samples are presented in Table G and as indicated, the concentrations of Phenols were well below the relevant HIL B adopted, as well as below the laboratory LOR.

13.2.7 Asbestos

The asbestos test results for the discrete fill and topsoil samples are presented in Table H and as indicated, no AF and FA in excess of 0.001%w/w were found. Moreover, ACM in excess of 0.01% was not detected in the analysed soil samples.

14.0 CONCLUSION AND RECOMMENDATIONS

The data quality objectives outlined in the report have been satisfied. The findings of this Stage 2 detailed site investigation are summarised as follows:

- The site is proposed for a residential development.
- The site is vacant land with no specific usage.
- The general soil profile in the e site comprised of fill materials overlying natural clayey soil. Topsoil overlying natural clayey soil was encountered in the south eastern portion of the site. The test pits and boreholes did not reveal any visual evidence of asbestos or other indicators of significant contamination, such as staining, odours or significant foreign matter.
- As presented in summary tables (Tables D to H) and discussed in Section 13.2, all the laboratory test results satisfied the criteria for stating that the analytes selected are either not present i.e. concentrations less than laboratory limits of reporting, or present in the sampled soil at concentrations that do not pose a risk of hazard to human health or the environment under a “residential with minimal opportunities for soil access” form of development.

Based on this assessment, the site does not present a risk of harm to human health and environment, and in our opinion, the site is considered suitable for the proposed residential development.

If any suspect materials (identified by unusual staining, odour, discolouration or inclusions such as building rubble, asbestos sheets/pieces/pipes, ash material, etc.) between the sampling locations are encountered during any stage of future earthworks/site preparation, Unexpected Finds Management Protocol (Appendix D) should be implemented. In the event of contamination, detailed assessment, remediation and validation will be necessary.

For any materials to be excavated and removed from the site, it is recommended that waste classification of the materials, in accordance with the "Waste Classification Guidelines Part 1: Classifying Waste"(NSW EPA 2014), NSW EPA resource recovery exemptions and orders under the Protection of the Environment Operations (Waste) Regulation 2014, or NSW EPA Certification: Virgin excavated natural material is undertaken prior to disposal at an appropriately licensed landfill or potential re-use at other sites.

Any imported soil (fill) must be assessed by a qualified environmental consultant, prior to importation, to ensure suitability for the proposed use. In addition, the imported fill must not contain asbestos and ash, be free of unusual odour, not be discoloured and not acid sulphate soil or potential acid sulphate soil. The imported fill should either be virgin excavated natural material (VENM) or excavated natural material (ENM).

15.0 LIMITATIONS

Within the scope of work outlined in the email fee proposal dated 31 October 2019, the services performed by Geotechnique were conducted in a manner consistent with the level of quality and skill generally exercised by members of the profession and consulting practice.

This report has been prepared for Hutchinson Builders for the purposes stated within. Liverpool City Council may rely upon the report for development and/or construction application determinations. Reliance on this report by other parties shall be at such parties' sole risk as the report might not contain sufficient information for other purposes.

This report shall only be presented in full and may not be used to support any objective other than those set out in the report, except where written approval is provided by Geotechnique Pty Ltd.

The information in this report is considered accurate at completion of field sampling for this assessment (6 November 2019) in accordance with current site conditions. Any variations to the site form or use beyond the sampling date could nullify the conclusions stated.

Whilst investigations conducted at the site were carried out in accordance with current NSW guidelines the potential always exists for contaminated soils to be present between sampled locations.

Presented in Appendix E is a document entitled "Environmental Notes", which should be read in conjunction with this report.

LIST OF REFERENCES

Australian Standard "Guide to the Sampling and Investigation of Potentially Contaminated Soil Part 1: Non-volatile and semi-volatile compounds" (AS4482.1-2005)

Australian Standard "Guide to the Sampling and Investigation of Potentially Contaminated Soil Part 2: Volatile substances" (AS4482.2-1999)

Contaminated Land Management Act 1997

Contaminated Land Management Regulation 1998

Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites – NSW Environment Protection Authority 2011

Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (3rd Edition) –NSW EPA 2017

Contaminated Sites: Sampling Design Guidelines - NSW Environment Protection Authority 1995

Geology of the Sydney 1:100,000 Sheet (9130) – Geological Survey of New South Wales, Department of Minerals and Energy 1983

Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land – Department of Urban Affairs and Planning / NSW Environment Protection Authority 1998

National Environment Protection (Assessment of Site Contamination) Measure – National Environmental Protection Council (NEPM) 1999 (April 2013)

Protection of the Environment Operations (Waste) Regulation 2005 – General Exemption Under Part 6, Clause 51 and 51A – The Excavated Natural Material Exemption & Order 2014

Soil Landscape of the Sydney 1:100,000 Sheet (9130) – Soil Conservation Service Survey of NSW 1983

Waste Classification Guidelines Part 1: Classifying Waste - NSW DECC (November 2014)

DRAWING

Drawing No 14570/1-AA1	*Lot Layout, Site Features, Test Pit and Borehole Locations*

Imagery ©2019 NearMap.com

LEGEND

- Test Pit
- Previous Test Pit (STS)
- Previous Borehole (STS)

0 5 10 15 20 25m

Scale 1:500

GEOTECHNIQUE® PTY LTD

PO Box 880
Penrith NSW 2750
Tel: 02 4722 2700
Fax: 02 4722 2777
e-mail:info@geotech.com.au
www.geotech.com.au

NOTES

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

Hutchinson Builders
Lots 22 & 23 in DP35110
4-6 Bigge Street
Warwick Farm

Lot Layout, Site Features, Test Pit and Borehole Locations

Drawing No: 14570/1-AA1
Job No: 14570/1
Drawn By: MH
Date: 25 November 2019
Checked By: SS/AB

File No: 14570-1
Layers: 0, AA1

TABLES

TABLES

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TABLE A
TRIP SPIKE
(Ref No: 14570/1-AA)

Sample	Sampling Date	BTEX			
		Benzene	Toluene	Ethylbenzene	Xylenes
TS1	6/11/2019	75%	80%	81%	82%

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

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TABLE B
DUPLICATE SAMPLE
(Ref No: 14570/1-AA)

ANALYTE	TP101 0.0-0.15 (m) mg/kg	DDS1 mg/kg	RELATIVE PERCENTAGE DIFFERENCES (RPD) %
Arsenic	3	3	0
Cadmium	<0.3	<0.3	-
Chromium	11	13	17
Copper	23	27	16
Lead	23	32	33
Mercury	0.06	0.06	0
Nickel	7.9	11	33
Zinc	57	73	25
TOTAL RECOVERABLE HYDROCARBONS (TRH)			
F1 (C6-C10 less BTEX)	<25	<25	-
F2 (>C10-C16)	<25	<25	-
F3 (>C16-C34)	140	<90	-
F4 (>C34-C40)	<120	<120	-
BTEX			
Benzene	<0.1	<0.1	-
Toluene	<0.1	<0.1	-
Ethyl Benzene	<0.1	<0.1	-
Xylenes	<0.3	<0.3	-
POLYCYCLIC AROMATIC HYDROCARBONS			
Benzo(a)Pyrene TEQ	1.4	1.3	7
Total PAH	8.9	9	1
Naphthalene	<0.1	<0.1	-
Benzo(a)Pyrene	1	0.9	11
ORGANOCHLORINE PESTICIDES (OCP)			
Hexachlorobenzene (HCB)	<0.1	<0.1	-
Heptachlor	<0.1	<0.1	-
Aldrin+Dieldrin	<0.15	<0.15	-
Endrin	<0.2	<0.2	-
Methoxychlor	<0.1	<0.1	-
Mirex	<0.1	<0.1	-
Endosulfan (alpha, beta & sulphate)	<0.5	<0.5	-
DDD+DDE+DDT	<0.6	<0.6	-
Chlordane (alpha & gamma)	<0.2	<0.2	-
POLYCHLORINATED BIPHENYLS (PCB)			
Total PCB	<1	<1	-
Phenols	<5	<5	-

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TABLE C
SPLIT SAMPLE
(Ref No: 14570/1-AA)

ANALYTE	TP102 0.0-0.15 (m) mg/kg (SGS)	DSS1 mg/kg (ENVIROLAB)	RELATIVE PERCENTAGE DIFFERENCES (RPD) %
Arsenic	6	10	50
Cadmium	0.3	0.6	67
Chromium	12	16	29
Copper	21	20	5
Lead	110	120	9
Mercury	0.07	0.1	35
Nickel	3.2	3	6
Zinc	130	240	59
TOTAL RECOVERABLE HYDROCARBONS (TRH)			
F1 (C6-C10 less BTEX)	<25	<25	-
F2 (>C10-C16)	<25	<50	-
F3 (>C16-C34)	<90	<100	-
F4 (>C34-C40)	<120	<100	-
BTEX			
Benzene	<0.1	<0.2	-
Toluene	<0.1	<0.5	-
Ethyl Benzene	<0.1	<1	-
Xylenes	<0.3	<3	-
POLYCYCLIC AROMATIC HYDROCARBONS (PAH)			
Benzo(a)Pyrene TEQ	<0.3	<0.5	-
Total PAH	1.3	0.83	44
Naphthalene	<0.1	<1	-
Benzo(a)Pyrene	0.1	<0.05	-
ORGANOCHLORINE PESTICIDES (OCP)			
Hexachlorobenzene (HCB)	<0.1	<0.1	-
Heptachlor	<0.1	<0.1	-
Aldrin+Dieldrin	<0.15	<0.2	-
Endrin	<0.2	<0.1	-
Methoxychlor	<0.1	<0.1	-
Endosulfan (alpha (I), beta (II) & sulphate)	<0.5	<0.3	-
DDD+DDE+DDT	<0.6	<0.3	-
Chlordane (alpha & gamma)	<0.2	<0.2	-
POLYCHLORINATED BIPHENYLS (PCB)			
Total PCB	<1	<0.1	-
Phenols	<5	<5	-

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TABLE D
METAL, CATION EXCHANGE CAPACITY (CEC) & pH TEST RESULTS
DISCRETE SAMPLES
(Ref No: 14570/1-AA)

Sample Location	Depth (m)	METAL (mg/kg)								CEC ($cmol_c/kg$)	pH
		ARSENIC	CADMIUM	CHROMIUM (Total)	COPPER	LEAD	MERCURY	NICKEL	ZINC		
TP101	0.0-0.15	3	<0.3	11	23	23	0.06	7.9	57	45	8.7
TP101	0.35-0.45	3	<0.3	11	8.1	12	<0.05	0.7	6	7.9	4.8
TP101	0.5-0.6	3	<0.3	12	11	15	<0.05	0.6	8	12	4.9
TP101	2.9-3.0	8	<0.3	4.3	44	11	<0.05	0.6	9	14	5.3
TP102	0.0-0.15	6	0.3	12	21	110	0.07	3.2	130	21	7.6
TP102	0.45-0.55	5	<0.3	8	8.4	11	<0.05	<0.5	9	11	5.2
TP102	0.6-0.7	<1	<0.3	1.5	7.5	7	<0.05	<0.5	4	12	5.0
TP102	2.7-2.8	1	<0.3	4.8	22	16	<0.05	2	20	14	5.6
TP102	2.9-3.0	1	<0.3	2.7	57	8	<0.05	0.7	6	16	5.3
TP103	0.0-0.15	5	<0.3	9.5	13	46	<0.05	2.7	53	17	5.2
TP103	0.4-0.7	4	<0.3	4.1	11	7	<0.05	0.5	7	14	4.8
TP103	1.7-1.8	2	<0.3	3.9	23	10	<0.05	0.9	9	12	4.9
TP103	2.9-3.0	3	<0.3	4.8	24	10	<0.05	3.2	25	10	5.0
Limit of Reporting (LOR)		1	0.3	0.5	0.5	1	0.05	0.5	2	0.02	0.1
NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013)											
Health-based Investigation Levels (HIL) B - [a] Residential B		500	150	500 [c]	30000	1200	30 [d]	1200	60000		
Ecological Investigation Levels (EIL) - [b] Urban residential		100 [e]	-	190 [f]	150	1100 [g]	-	230	350		

Notes:
a: Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.
b: EIL of aged chromium (III), copper, nickel & zinc were derived from calculation spreadsheet developed by CSIRO for NEPC; Old Suburb with Low Traffic; the average CEC=15.8 cmolc/kg & pH=5.5; the assumed clay content=1 % were selected for derivation of EIL; a conservative approach.
c: Chromium (VI)
d: Methyl Mercury
e: Generic EIL for aged arsenic
f: Chromium (III)
g: Generic added contaminant limit for aged lead.

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TABLE E
TOTAL RECOVERABLE HYDROCARBONS (TRH) AND BTEX TEST RESULTS
DISCRETE SAMPLES
(Ref No: 14570/1-AA)

												NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013)																	
			TRH (mg/kg)					BTEX (mg/kg)				Health Screening Levels (HSL) B High density residential						Ecological Screening Levels for fine-grained soil Urban residential								Ecological Screening Levels for coarse-grained soil Urban residential							
Sample Location	Depth (m)	Soil type	F1	F2*	F2**	F3	F4	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES	F1	F2*	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES	F1	F2**	F3	F4	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES	F1	F2**	F3	F4	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES
TP101	0.0-0.15	Sand	<25	<25	<25	140	<120	<0.1	<0.1	<0.1	<0.3	45	110	0.5	160	55	40	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
TP101	0.35-0.45	Clay	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	50	280	0.7	480	NL	110	180	120	1300	5600	65	105	125	45	-	-	-	-	-	-	-	-
TP102	0.0-0.15	Clay	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	50	280	0.7	480	NL	110	180	120	1300	5600	65	105	125	45	-	-	-	-	-	-	-	-
TP102	0.45-0.55	Clay	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	50	280	0.7	480	NL	110	180	120	1300	5600	65	105	125	45	-	-	-	-	-	-	-	-
TP103	0.0-0.15	Clay	<25	<25	<25	150	<120	<0.1	<0.1	<0.1	<0.3	50	280	0.7	480	NL	110	180	120	1300	5600	65	105	125	45	-	-	-	-	-	-	-	-
TP103	0.4-0.7	Clay	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	50	280	0.7	480	NL	110	180	120	1300	5600	65	105	125	45	-	-	-	-	-	-	-	-
Limit of Reporting (LOR)			25	25	25	90	120	0.1	0.1	0.1	0.3																				

Notes:
F1: C6-C10 less BTEX
F2*: >C10-C16 less Naphthalene
F2**: >C10-C16
F3: >C16-C34
F4: >C34-C40
NL: Not Limiting

GEOTECHNIQUE
PTY LTD

TABLE F
POLYCYCLIC AROMATIC HYDROCARBONS (PAH) TEST RESULTS
DISCRETE SAMPLES
(Ref No: 14570/1-AA)

			PAH (mg/kg)				NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013)				
							Health-based Investigation Levels (HIL) B - Residential B		Health Screening Level (HSL) B - High density residential	Generic Ecological Investigation Level (EIL) - Urban residential	Ecological Screening Level (ESL) - Urban residential
Sample Location	Depth (m)	Soil type	BaP TEQ	TOTAL PAHs	NAPHTHALENE	BENZO(a)PYRENE (BaP)	BaP TEQ	TOTAL PAHs	NAPHTHALENE	NAPHTHALENE	BENZO(a)PYRENE (BaP)
TP101	0.0-0.15	Sand	1.4	8.9	<0.1	1.0	4	400	3	170	0.7
TP101	0.35-0.45	Clay	<0.3	<0.8	<0.1	<0.1	4	400	5	170	0.7
TP102	0.0-0.15	Clay	<0.3	1.3	<0.1	0.1	4	400	5	170	0.7
TP102	0.45-0.55	Clay	<0.3	<0.8	<0.1	<0.1	4	400	5	170	0.7
TP103	0.0-0.15	Clay	<0.3	<0.8	<0.1	<0.1	4	400	5	170	0.7
TP103	0.4-0.7	Clay	<0.3	<0.8	<0.1	<0.1	4	400	5	170	0.7
Limit of Reporting (LOR)			0.3	0.8	0.1	0.1					

Notes: a: Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.

NL: Not Limiting

GEOTECHNIQUE PTY LTD

TABLE G
ORGANOCHLORINE PESTICIDES (OCP), POLYCHLORINATED BIPHENYLS (PCB) & PHENOLS TEST RESULTS
DISCRETE SAMPLES
(Ref No: 14570/1-AA)

Sample Location	Depth (m)	OCP (mg/kg)										PCB (mg/kg)	Phenols (mg/kg)
		HEXACHLOROBENZENE (HCB)	HEPTACHLOR	ALDRIN+DIELDRIN	ENDRIN	METHOXYCHLOR	MIREX	ENDOSULFAN (alpha, beta & sulphate)	DDD+DDE+DDT	DDT	CHLORDANE (alpha & gamma)		
TP101	0.0-0.15	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	<5
TP102	0.0-0.15	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	<5
TP103	0.0-0.15	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	<5
Limit of Reporting (LOR)		0.1	0.1	0.15	0.2	0.1	0.1	0.5	0.6	0.2	0.2	1	5
NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013)													
Health-based Investigation Levels (HIL) B - Residential B[a]		15	10	10	20	500	20	400	600		90	1	45000
Ecological Investigation Levels (EIL) - Urban residential										180[b]			

Notes: a: Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.

b: Generic EIL for DDT

GEOTECHNIQUE PTY LTD

TABLE H
ASBESTOS TEST RESULTS
DISCRETE SAMPLES
(Ref No: 14570/1-AA)

Sample Location	Depth (m)	ASBESTOS (% w/w)	
Soil Sample		ACM (>7mm)	AF/FA (<7mm)
TP101	0.0-0.15	<0.01	<0.001
TP102	0.0-0.15	<0.01	<0.001
TP103	0.0-0.15	<0.01	<0.001
Limits of Reporting (LOR)		0.01	0.001
NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013) Health Screening Levels - Residential B[a]		0.04	0.001
Fibro-cement Piece			

Notes: ACM: Asbestos Containing Material

AF: Asbestos Fines

FA: Fibrous Asbestos

a: Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.

APPENDIX A

PROPOSED DEVELOPMENT PLANS, COUNCIL REQUEST FOR ADDITIONAL INFORMATION, AND DETAILED SURVEY PLAN

NOTES

DLCS Quality Endorsed Company ISO 9001:2008, Registration Number 20476
Nominated Architect: Nicholas Turner 6695, ABN 86 064 084 911

CLIENT

Hutchinson Builders
23 Dunning Avenue, Rosebery NSW 2018

LEGEND

CPE	Car Park Exhaust	FFL	Finished Floor Level	LR	Lobby Relief	B	Bedroom	LDY	Laundry
CW	Cold Water	FIP EWIS	Fire Indicator Panel Emergency Warning and Intercom System	OH	Horizontal Shading Device	BY	Balcony	TCE	Terrace
C	Comms			SP	Stair Press	BT	Bathroom Type	S	Storage
EL	Electrical	FS	Fire Stair			D	Dining		
EX RL	Existing Relative Level	H	Hydraulic Riser			E	Entry		
FEX	Fire Extinguisher	L	Lift			KT	Kitchen Type		

Rev	Date	Approved by	Issue Name
A	20.05.19	VS	Development Application
B	08.07.19	VS	Development Application
C	20.09.19	VS	Development Application

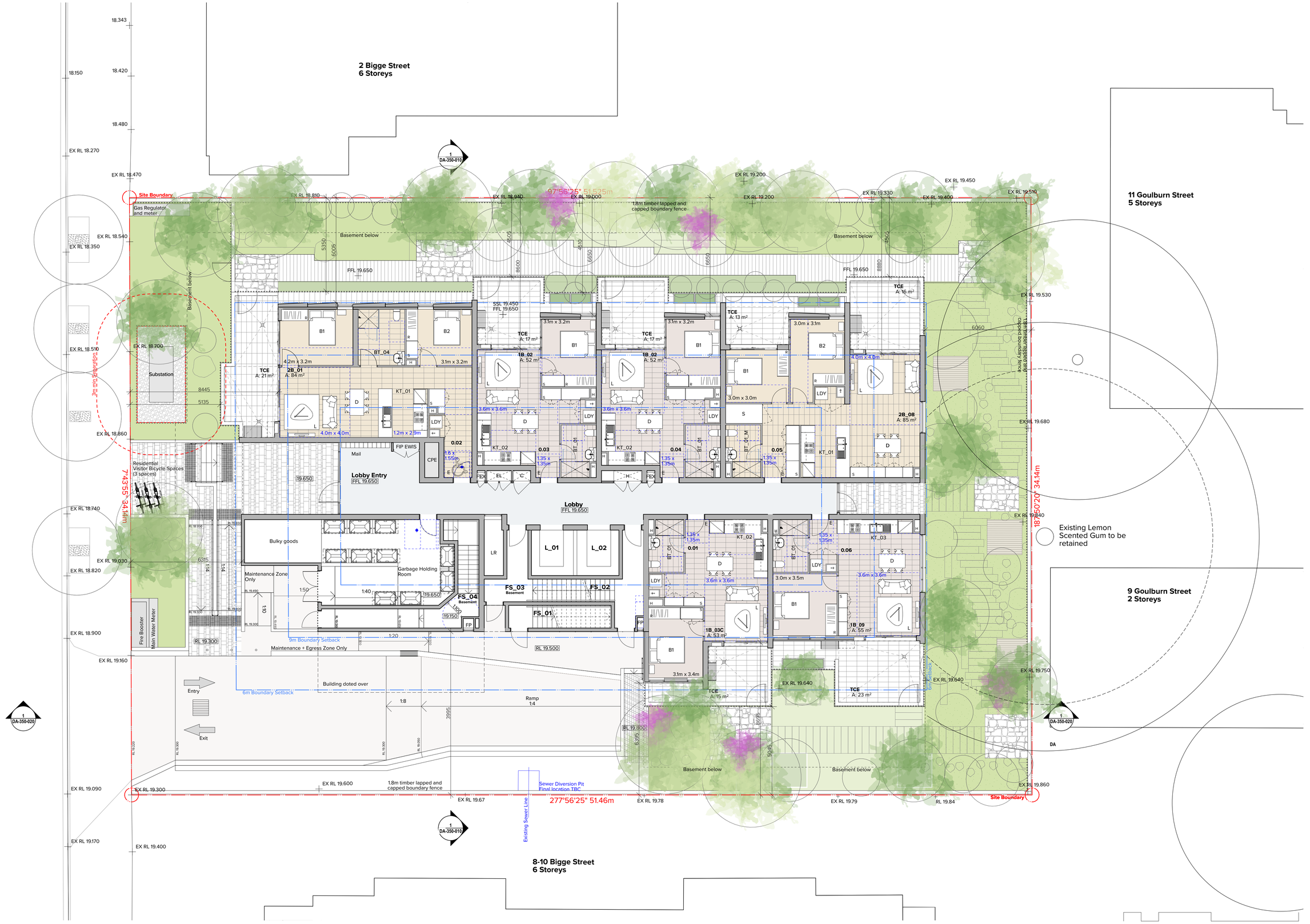
0 1 2 5 10m

Project Title
Bigge Street Warwick Farm
4-6 Bigge Street Warwick Farm NSW 2170 Australia

Drawing Title
GA Plans
Basement Plan

Scale: 1:100 @A1, 50%@A3
Project No.: 18013
Drawn by: DF,MM,YX
North
Status: For Development Application
Dwg No.: DA-110-007
Rev: C

TURNER
Level 7 ONE Oxford Street
Darlinghurst NSW 2010
AUSTRALIA
T +61 2 8668 0000
F +61 2 8668 0088
turnerstudio.com.au



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CLIENT

Hutchinson Builders
23 Dunning Avenue, Rosebery NSW 2018

LEGEND

CPE	Car Park Exhaust	FFL	Finished Floor Level	LR	Lobby Relief	B	Bedroom	LDY	Laundry
CW	Cold Water	FIP EWIS	Fire Indicator Panel Emergency Warning and Intercom System	OH	Horizontal Shading Device	BY	Balcony	TCE	Terrace
C	Comms			SP	Stair Press	BT	Bathroom Type	S	Storage
EL	Electrical	FS	Fire Stair			D	Dining		
EX RL	Existing Relative Level	H	Hydraulic Riser			E	Entry		
FEX	Fire Extinguisher	L	Lift			KT	Kitchen Type		

Rev	Date	Approved by	Issue Name
A	15.05.19	VS	Development Application
B	08.07.19	VS	Development Application
C	20.09.19	VS	Development Application

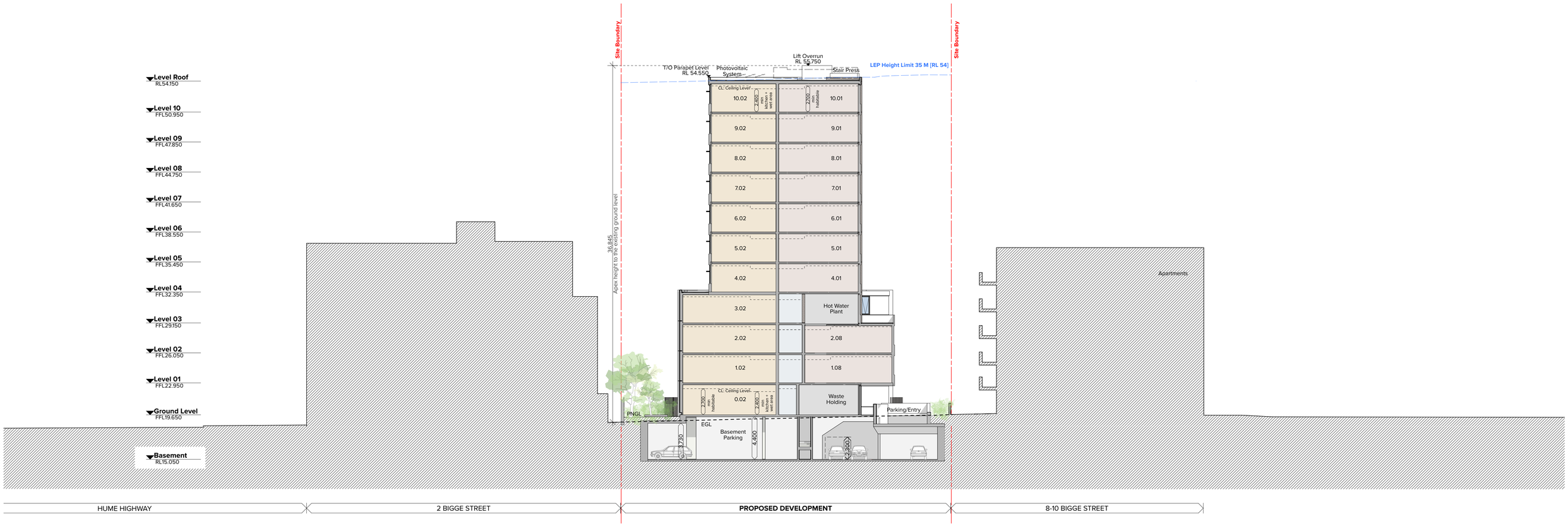
Project Title
Bigge Street Warwick Farm
4-6 Bigge Street Warwick Farm NSW 2170 Australia

Drawing Title
GA Plans
Ground Level Plan

0 1 2 5 10m

Scale: 1:100 @A1, 50%@A3
Project No.: 18013
Drawn by: DF,MM,YX
Status: For Development Application
Dwg No.: DA-110-008
Rev: C
North

TURNER
Level 7 ONE Oxford Street
Darlinghurst NSW 2010
AUSTRALIA
T +61 2 8668 0000
F +61 2 8668 0088
turnerstudio.com.au



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CLIENT

Hutchinson Builders
23 Dunning Avenue, Rosebery NSW 2018

Rev	Date	Approved by	Issue Name
A	28.05.19	VS	Development Application
B	08.07.19	VS	Development Application
C	20.09.19	VS	Development Application

Project Title
Bigge Street Warwick Farm
4-6 Bigge Street Warwick Farm NSW 2170 Australia

Drawing Title
GA Sections
Section AA

0 1 2 5 10 20m

Scale **1:200 @A1, 50%@A3**
Project No. **18013**
Drawn by **DF**
Status **For Development Application**
Dwg No. **DA-350-010**
Rev **C**
North

TURNER
Level 7 ONE Oxford Street
Darlinghurst NSW 2010
AUSTRALIA
T +61 2 8668 0000
F +61 2 8668 0088
turnerstudio.com.au

CLIENT
Hutchinson Builders
23 Dunning Avenue, Rosebery NSW 2018

Rev	Date	Approved by	Issue Name
A	28.05.19	VS	Development Application
B	08.07.19	VS	Development Application
C	20.09.19	VS	Development Application

Project Title
Bigge Street Warwick Farm
4-6 Bigge Street Warwick Farm NSW 2170 Australia

Drawing Title
GA Sections
Section BB

0 1 2 5 10 20m

Scale: **1:200 @A1, 50%@A3**
Project No.: **18013**
Drawn by: **DF**
North
Status: **For Development Application**
Dwg No.: **DA-350-020**
Rev: **C**

TURNER
Level 7 **ONE** Oxford Street
Darlinghurst NSW 2010
AUSTRALIA
T +61 2 8668 0000
F +61 2 8668 0088
turnerstudio.com.au

LIVERPOOL CITY COUNCIL

Our Ref:	DA-639/2019
Contact:	Nelson Mu
Ph:	(02) 8711 7556
Date:	18 October 2019

LAND AND HOUSING CORPORATION
C/- HUTCHINSON BUILDERS
23 DUNNING AVE
ROSEBERRY NSW 2018

REQUEST FOR ADDITIONAL INFORMATION

(in accordance with the Stop the Clock provisions under Clause 54 and 109 of the *EP&A Regulations 2000*)

ADDRESS: **LOT 23 DP 35110, LOT 22 DP 35110**
4 – 6 BIGGE STREET, WARWICK FARM NSW 2170

DESCRIPTION: **CONSTRUCTION OF AN 11-STOREY RESIDENTIAL FLAT BUILDING CONTAINING 52 APARTMENTS (COMPRISING A MIX OF ONE AND TWO BEDROOM UNITS) ABOVE 1 LEVEL OF BASEMENT PARKING AND THE REMOVAL OF ALL VEGETATION ON SITE AND ASSOCIATED LANDSCAPING AND CIVIL WORKS.**

Thank you for your application for the above proposed development. Council has conducted a preliminary assessment and requires more information to enable us to appropriately assess the application.

Issues identified/additional information required:

1. The applicant shall submit a plan showing the consolidation of the two existing lots into one lot for assessment purposes.

2. As per the pre-DA advice, dated 27 March 2019, the applicant shall provide a Tenancy Management Plan for consideration and assessment.

Contamination

3. The preliminary contamination assessment titled Preliminary Site Investigation (Ref: 22475/1899D-E) Prepared by STS dated May 2019 submitted with the application has identified that further investigation is required. The relevant assessment is to be undertaken by a suitably qualified and experienced contaminated land consultant with regard to the potential effects of any contaminants on public health, the environment and building structures and shall meet the sampling density outlined in the NSW EPA Contaminated Sites Sampling Design Guidelines (1995).

   Where the Stage 2 - Detailed Site Investigation indicates that the site poses unacceptable risks to human health or the environment, a Remedial Action Plan (RAP) shall be prepared by a suitably qualified and experienced Contaminated Land Consultant in accordance with applicable guidelines made or approved by the NSW EPA under the Contaminated Land Management Act 1997. In these circumstances, the Remedial Action Plan shall be referred to Liverpool City Council for review.

Please submit all the requested information to Councils Customer Centre on a USB or CD as send by email to lcc@liverpool.nsw.gov.au.

It is important to label the documents in line with Councils electronic filing naming convention. You can find details about this on Council's Development Application Form. *i.e DA Number – Additional Information – Site Plan – XXX Address.pdf*

The assessment is now on hold to give you time to gather the additional information. The assessment period will re-commence once Council receives the information. To enable us to assess the application as efficiently as possible, please submit the information by **4 November 2019.**

If the requested information is not received by the due date (or an alternative due date if agreed), Council will assume the information will not be provided and the application will be determined, which may result in refusal of the application (Clause 54(6) *EP&A Regulations 2000*).

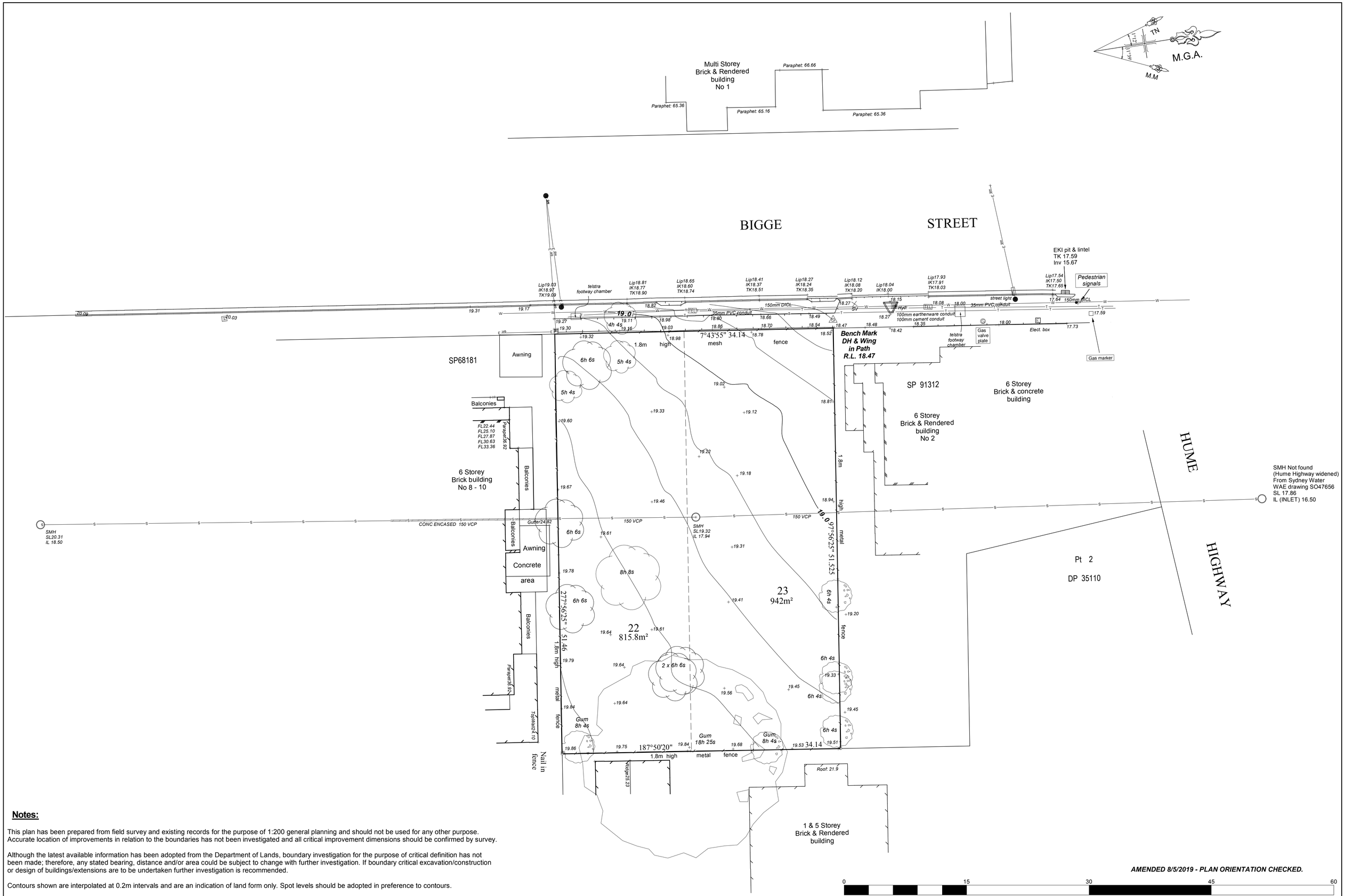
If amended plans are submitted for assessment, an additional processing fee will apply. Please see Council's adopted fees and charges schedule for details.

To track the progress of your application, please visit eplanning.liverpool.nsw.gov.au and click on "Track an Application". The ePlanning portal also contains other relevant information including an online mapping system and access to frequently requested planning information.

If you have questions please call Nelson Mu on (02) 8711 7556.

Yours faithfully

Nelson Mu
Acting Coordinator
DEVELOPMENT ASSESSMENT



Notes:

This plan has been prepared from field survey and existing records for the purpose of 1:200 general planning and should not be used for any other purpose. Accurate location of improvements in relation to the boundaries has not been investigated and all critical improvement dimensions should be confirmed by survey.

Although the latest available information has been adopted from the Department of Lands, boundary investigation for the purpose of critical definition has not been made; therefore, any stated bearing, distance and/or area could be subject to change with further investigation. If boundary critical excavation/construction or design of buildings/extensions are to be undertaken further investigation is recommended.

Contours shown are interpolated at 0.2m intervals and are an indication of land form only. Spot levels should be adopted in preference to contours.

Services have been located where possible, underground services are interpreted from the records of the relevant authority unless stated as 'located'. The relevant authority should be contacted and all services accurately located prior to any excavation/construction works or design of buildings/extensions. Please call 1100 or visit www.1100.com.au for 'Dial Before You Dig' service location plans.

Roof profile and tree details are approximate only.

AMENDED 8/5/2019 - PLAN ORIENTATION CHECKED.

0 15 30 45 60

DENNIS SMITH SURVEYS
8 Railway Street Bulli NSW 2516
Ph: 02 4284 9402 Fax: 02 4285 7042
E-mail: info@dssurvey.com.au
Web: www.dssurvey.com.au

PLAN: DETAIL SURVEY
ADDRESS: 4 - 6 BIGGE STREET, WARWICK FARM.
TITLE: 22/35110, 23/35110.
CLIENT: HUTCHINSON BUILDERS

ORIENTATION: Map Grid of Australia
Origin: DP1204506
DATUM: A.H.D.
Origin: PM52194

P.R.: 9834/3
SCALE 1: 200
DATE: 1/05/2019
SHEET 1 of 1 (A1)
Drawn: M.S.

APPENDIX B

TABLE 1 – TEST PIT LOGS

GEOTECHNIQUE PTY LTD

Project	**Proposed Multi Storey Residential Flat Building**	**Job No**	**14570/1**
Location	**Lots 22 & 23 in DP35110**	**Refer to Drawing No**	**14570/1-AA1**
	4-6 Biggie Street, Warwick Farm	**Logged & Sampled by**	**SS**

TABLE 1

Test Pit	Depth (m)	Sample Depth (m)	Date	Material Description	Remarks*
TP101	0-0.3	0-0.15	06/11/19	FILL: Silty Sand, fine to medium grained, brown with recycled road base gravel and trace of fabric	
	0.3-0.5	0.35-0.45		(CH) Silty Clay, high plasticity, red	
	0.5-2.8	0.5-0.6		(CH) Silty Clay, high plasticity, grey mottled red, with ironstone gravel	
		1.5-1.6			
		2.5-2.6			
	2.8-3.0	2.9-3.0		(CH) Shaley Clay, high plasticity, grey, with ironstone gravel	
TP102	0-0.4	0-0.15	06/11/19	FILL: Silty Clay, medium plasticity, brown with gravel, with inclusion of root fibres	
	0.4-0.6	0.45-0.55		(CH) Silty Clay, high plasticity, red mottled grey	
	0.6-1.9	0.6-0.7		(CH) Silty Clay, high plasticity, grey mottled red, with ironstone gravel	
		1.6-1.7			
	1.9-2.8	2.7-2.8		(CH) Shaley Clay, high plasticity, grey	
	2.8-3.0	2.9-3.0		BEDROCK: Shale	
TP103	0-0.3	0-0.15	06/11/19	TOPSOIL: Silty Clay, low to medium plasticity, brown	
	0.3-2.8	0.4-0.7		(CH) Silty Clay, high plasticity, grey mottled red, with ironstone gravel	
		0.7-0.8			
		1.7-1.8			
		2.7-2.8			
	2.8-3.0	2.9-3.0		(CH) Shaley Clay, high plasticity, grey, with ironstone gravel	

NS = No Sample
*Odour (O), Discolouration (D), Petroleum Hydrocarbon Staining (PHS), Asbestos Containing Material (ACM), Ash Material (ASHM), Demolition Waste (DW), Groundwater (GW), Perched Water (PW) PID reading etc.

APPENDIX C

LABORATORY TEST RESULTS REPORTS/CERTIFICATES

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Anwar Barbhuyia
Client	Geotechnique
Address	P.O. Box 880 PENRITH NSW 2751
Telephone	02 4722 2700
Facsimile	02 4722 6161
Email	anwar@geotech.com.au
Project	**14570/1 Warwick Farm**
Order Number	(Not specified)
Samples	15

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE199787 R1**
Date Received	7/11/2019
Date Reported	19/11/2019

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(4354).

No respirable fibres detected in all soil samples using trace analysis technique.

Asbestos analysed by Approved Identifier Yusuf Kuthpudin.

This report cancels and supersedes the report No.SE199787 R0 dated 13th November 2019 issued by SGS Environment, Health and Safety due to amendment if client id #14 as per client request.

SIGNATORIES

Dong LIANG
Metals/Inorganics Team Leader

Ly Kim HA
Organic Section Head

Ravee SIVASUBRAMANIAM
Hygiene Team Leader

VOC's in Soil [AN433] Tested: 8/11/2019

PARAMETER	UOM	LOR	TP101 SAND 0.0-0.15 6/11/2019 SE199787.001	TP101 CLAY 0.35-0.45 6/11/2019 SE199787.002	TP102 CLAY 0.0-0.15 6/11/2019 SE199787.005	TP102 CLAY 0.45-0.55 6/11/2019 SE199787.006	TP103 CLAY 0.0-0.15 6/11/2019 SE199787.010
Benzene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ethylbenzene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
m/p-xylene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-xylene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Xylenes	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Total BTEX	mg/kg	0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Naphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1

PARAMETER	UOM	LOR	TP103 CLAY 0.4-0.7 6/11/2019 SE199787.011	DDS1 SAND - 6/11/2019 SE199787.014	TS1 SAND - 6/11/2019 SE199787.015
Benzene	mg/kg	0.1	<0.1	<0.1	[75%]
Toluene	mg/kg	0.1	<0.1	<0.1	[80%]
Ethylbenzene	mg/kg	0.1	<0.1	<0.1	[81%]
m/p-xylene	mg/kg	0.2	<0.2	<0.2	[83%]
o-xylene	mg/kg	0.1	<0.1	<0.1	[82%]
Total Xylenes	mg/kg	0.3	<0.3	<0.3	-
Total BTEX	mg/kg	0.6	<0.6	<0.6	-
Naphthalene	mg/kg	0.1	<0.1	<0.1	-

Volatile Petroleum Hydrocarbons in Soil [AN433] Tested: 8/11/2019

PARAMETER	UOM	LOR	TP101 SAND 0.0-0.15 6/11/2019 SE199787.001	TP101 CLAY 0.35-0.45 6/11/2019 SE199787.002	TP102 CLAY 0.0-0.15 6/11/2019 SE199787.005	TP102 CLAY 0.45-0.55 6/11/2019 SE199787.006	TP103 CLAY 0.0-0.15 6/11/2019 SE199787.010
TRH C6-C9	mg/kg	20	<20	<20	<20	<20	<20
Benzene (F0)	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
TRH C6-C10	mg/kg	25	<25	<25	<25	<25	<25
TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	<25	<25	<25	<25

PARAMETER	UOM	LOR	TP103 CLAY 0.4-0.7 6/11/2019 SE199787.011	DDS1 SAND - 6/11/2019 SE199787.014
TRH C6-C9	mg/kg	20	<20	<20
Benzene (F0)	mg/kg	0.1	<0.1	<0.1
TRH C6-C10	mg/kg	25	<25	<25
TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	<25

TRH (Total Recoverable Hydrocarbons) in Soil [AN403] Tested: 8/11/2019

PARAMETER	UOM	LOR	TP101 SAND 0.0-0.15 6/11/2019 SE199787.001	TP101 CLAY 0.35-0.45 6/11/2019 SE199787.002	TP102 CLAY 0.0-0.15 6/11/2019 SE199787.005	TP102 CLAY 0.45-0.55 6/11/2019 SE199787.006	TP103 CLAY 0.0-0.15 6/11/2019 SE199787.010
TRH C10-C14	mg/kg	20	<20	<20	<20	<20	<20
TRH C15-C28	mg/kg	45	**63**	<45	<45	<45	**93**
TRH C29-C36	mg/kg	45	**130**	<45	<45	<45	**96**
TRH C37-C40	mg/kg	100	<100	<100	<100	<100	<100
TRH >C10-C16	mg/kg	25	<25	<25	<25	<25	<25
TRH >C10-C16 - Naphthalene (F2)	mg/kg	25	<25	<25	<25	<25	<25
TRH >C16-C34 (F3)	mg/kg	90	**140**	<90	<90	<90	**150**
TRH >C34-C40 (F4)	mg/kg	120	<120	<120	<120	<120	<120
TRH C10-C36 Total	mg/kg	110	**190**	<110	<110	<110	**190**
TRH >C10-C40 Total (F bands)	mg/kg	210	<210	<210	<210	<210	<210

PARAMETER	UOM	LOR	TP103 CLAY 0.4-0.7 6/11/2019 SE199787.011	DDS1 SAND - 6/11/2019 SE199787.014
TRH C10-C14	mg/kg	20	<20	<20
TRH C15-C28	mg/kg	45	<45	<45
TRH C29-C36	mg/kg	45	<45	**51**
TRH C37-C40	mg/kg	100	<100	<100
TRH >C10-C16	mg/kg	25	<25	<25
TRH >C10-C16 - Naphthalene (F2)	mg/kg	25	<25	<25
TRH >C16-C34 (F3)	mg/kg	90	<90	<90
TRH >C34-C40 (F4)	mg/kg	120	<120	<120
TRH C10-C36 Total	mg/kg	110	<110	<110
TRH >C10-C40 Total (F bands)	mg/kg	210	<210	<210

PAH (Polynuclear Aromatic Hydrocarbons) in Soil [AN420] Tested: 8/11/2019

PARAMETER	UOM	LOR	TP101 SAND 0.0-0.15 6/11/2019 SE199787.001	TP101 CLAY 0.35-0.45 6/11/2019 SE199787.002	TP102 CLAY 0.0-0.15 6/11/2019 SE199787.005	TP102 CLAY 0.45-0.55 6/11/2019 SE199787.006	TP103 CLAY 0.0-0.15 6/11/2019 SE199787.010
Naphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.1	**0.2**	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.1	**0.4**	<0.1	**0.1**	<0.1	<0.1
Anthracene	mg/kg	0.1	**0.2**	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.1	**1.3**	<0.1	**0.3**	<0.1	**0.1**
Pyrene	mg/kg	0.1	**1.4**	<0.1	**0.3**	<0.1	**0.2**
Benzo(a)anthracene	mg/kg	0.1	**0.9**	<0.1	**0.1**	<0.1	<0.1
Chrysene	mg/kg	0.1	**0.6**	<0.1	**0.1**	<0.1	<0.1
Benzo(b&j)fluoranthene	mg/kg	0.1	**1.0**	<0.1	**0.1**	<0.1	<0.1
Benzo(k)fluoranthene	mg/kg	0.1	**0.4**	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	mg/kg	0.1	**1.0**	<0.1	**0.1**	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	**0.7**	<0.1	<0.1	<0.1	<0.1
Dibenzo(ah)anthracene	mg/kg	0.1	**0.1**	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	mg/kg	0.1	**0.7**	<0.1	<0.1	<0.1	<0.1
Carcinogenic PAHs, BaP TEQ <LOR=0	TEQ (mg/kg)	0.2	**1.4**	<0.2	<0.2	<0.2	<0.2
Carcinogenic PAHs, BaP TEQ <LOR=LOR	TEQ (mg/kg)	0.3	**1.4**	<0.3	<0.3	<0.3	<0.3
Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	TEQ (mg/kg)	0.2	**1.4**	<0.2	**0.2**	<0.2	<0.2
Total PAH (18)	mg/kg	0.8	**8.9**	<0.8	**1.3**	<0.8	<0.8
Total PAH (NEPM/WHO 16)	mg/kg	0.8	**8.9**	<0.8	**1.3**	<0.8	<0.8

PARAMETER	UOM	LOR	TP103 CLAY 0.4-0.7 6/11/2019 SE199787.011	DDS1 SAND - 6/11/2019 SE199787.014
Naphthalene	mg/kg	0.1	<0.1	<0.1
2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1
1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.1	<0.1	**0.3**
Acenaphthene	mg/kg	0.1	<0.1	<0.1
Fluorene	mg/kg	0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.1	<0.1	**0.5**
Anthracene	mg/kg	0.1	<0.1	**0.4**
Fluoranthene	mg/kg	0.1	<0.1	**1.3**
Pyrene	mg/kg	0.1	<0.1	**1.4**
Benzo(a)anthracene	mg/kg	0.1	<0.1	**0.8**
Chrysene	mg/kg	0.1	<0.1	**0.6**
Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	**1.0**
Benzo(k)fluoranthene	mg/kg	0.1	<0.1	**0.4**
Benzo(a)pyrene	mg/kg	0.1	<0.1	**0.9**
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	**0.6**
Dibenzo(ah)anthracene	mg/kg	0.1	<0.1	**0.1**
Benzo(ghi)perylene	mg/kg	0.1	<0.1	**0.6**
Carcinogenic PAHs, BaP TEQ <LOR=0	TEQ (mg/kg)	0.2	<0.2	**1.3**
Carcinogenic PAHs, BaP TEQ <LOR=LOR	TEQ (mg/kg)	0.3	<0.3	**1.3**
Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	TEQ (mg/kg)	0.2	<0.2	**1.3**
Total PAH (18)	mg/kg	0.8	<0.8	**9.0**
Total PAH (NEPM/WHO 16)	mg/kg	0.8	<0.8	**9.0**

OC Pesticides in Soil [AN420] Tested: 8/11/2019

PARAMETER	UOM	LOR	TP101 SAND 0.0-0.15 6/11/2019 SE199787.001	TP102 CLAY 0.0-0.15 6/11/2019 SE199787.005	TP103 CLAY 0.0-0.15 6/11/2019 SE199787.010	DDS1 SAND - 6/11/2019 SE199787.014
Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Alpha BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Lindane	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Beta BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Delta BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor epoxide	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDE	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Alpha Endosulfan	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Gamma Chlordane	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Alpha Chlordane	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
trans-Nonachlor	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDE	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
Endrin	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
o,p'-DDD	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDT	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Beta Endosulfan	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
p,p'-DDD	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDT	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan sulphate	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Endrin Ketone	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Isodrin	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1

PCBs in Soil [AN420] Tested: 8/11/2019

PARAMETER	UOM	LOR	TP101 SAND 0.0-0.15 6/11/2019 SE199787.001	TP102 CLAY 0.0-0.15 6/11/2019 SE199787.005	TP103 CLAY 0.0-0.15 6/11/2019 SE199787.010	DDS1 SAND - 6/11/2019 SE199787.014
Arochlor 1016	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1221	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1232	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1242	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1248	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1254	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1260	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1262	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1268	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Total PCBs (Arochlors)	mg/kg	1	<1	<1	<1	<1

Total Phenolics in Soil [AN289] Tested: 12/11/2019

PARAMETER	UOM	LOR	TP101 SAND 0.0-0.15 6/11/2019 SE199787.001	TP102 CLAY 0.0-0.15 6/11/2019 SE199787.005	TP103 CLAY 0.0-0.15 6/11/2019 SE199787.010	DDS1 SAND - 6/11/2019 SE199787.014
Total Phenols	mg/kg	5	<5	<5	<5	<5

pH in soil (1:5) [AN101] Tested: 13/11/2019

PARAMETER	UOM	LOR	TP101 SAND 0.0-0.15 6/11/2019 SE199787.001	TP101 CLAY 0.35-0.45 6/11/2019 SE199787.002	TP101 CLAY 0.5-0.6 6/11/2019 SE199787.003	TP101 CLAY 2.9-3.0 6/11/2019 SE199787.004	TP102 CLAY 0.0-0.15 6/11/2019 SE199787.005
pH	pH Units	0.1	8.7	4.8	4.9	5.3	7.6

PARAMETER	UOM	LOR	TP102 CLAY 0.45-0.55 6/11/2019 SE199787.006	TP102 CLAY 0.6-0.7 6/11/2019 SE199787.007	TP102 CLAY 2.7-2.8 6/11/2019 SE199787.008	TP102 CLAY 2.9-3.0 6/11/2019 SE199787.009	TP103 CLAY 0.0-0.15 6/11/2019 SE199787.010
pH	pH Units	0.1	5.2	5.0	5.6	5.3	5.2

PARAMETER	UOM	LOR	TP103 CLAY 0.4-0.7 6/11/2019 SE199787.011	TP103 CLAY 1.7-1.8 6/11/2019 SE199787.012	TP103 CLAY 2.9-3.0 6/11/2019 SE199787.013
pH	pH Units	0.1	4.8	4.9	5.0

Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) [AN122] Tested: 11/11/2019

PARAMETER	UOM	LOR	TP101 SAND 0.0-0.15 6/11/2019 SE199787.001	TP101 CLAY 0.35-0.45 6/11/2019 SE199787.002	TP101 CLAY 0.5-0.6 6/11/2019 SE199787.003	TP101 CLAY 2.9-3.0 6/11/2019 SE199787.004	TP102 CLAY 0.0-0.15 6/11/2019 SE199787.005
Exchangeable Sodium, Na	mg/kg	2	220	330	580	1300	85
Exchangeable Sodium, Na	meq/100g	0.01	0.94	1.4	2.5	5.6	0.37
Exchangeable Sodium Percentage*	%	0.1	2.1	17.9	21.5	39.1	1.8
Exchangeable Potassium, K	mg/kg	2	630	100	160	240	170
Exchangeable Potassium, K	meq/100g	0.01	1.6	0.27	0.40	0.63	0.42
Exchangeable Potassium Percentage*	%	0.1	3.6	3.4	3.4	4.4	2.1
Exchangeable Calcium, Ca	mg/kg	2	8400	340	120	66	3400
Exchangeable Calcium, Ca	meq/100g	0.01	42	1.7	0.61	0.33	17
Exchangeable Calcium Percentage*	%	0.1	93.0	21.7	5.2	2.3	83.3
Exchangeable Magnesium, Mg	mg/kg	2	72	550	1000	940	320
Exchangeable Magnesium, Mg	meq/100g	0.02	0.59	4.5	8.2	7.7	2.7
Exchangeable Magnesium Percentage*	%	0.1	1.3	57.0	70.0	54.2	12.9
Cation Exchange Capacity	meq/100g	0.02	45	7.9	12	14	21

PARAMETER	UOM	LOR	TP102 CLAY 0.45-0.55 6/11/2019 SE199787.006	TP102 CLAY 0.6-0.7 6/11/2019 SE199787.007	TP102 CLAY 2.7-2.8 6/11/2019 SE199787.008	TP102 CLAY 2.9-3.0 6/11/2019 SE199787.009	TP103 CLAY 0.0-0.15 6/11/2019 SE199787.010
Exchangeable Sodium, Na	mg/kg	2	370	840	1100	1400	240
Exchangeable Sodium, Na	meq/100g	0.01	1.6	3.7	4.6	6.0	1.0
Exchangeable Sodium Percentage*	%	0.1	15.0	30.1	32.3	37.7	6.2
Exchangeable Potassium, K	mg/kg	2	140	160	220	330	370
Exchangeable Potassium, K	meq/100g	0.01	0.35	0.41	0.55	0.83	0.95
Exchangeable Potassium Percentage*	%	0.1	3.2	3.4	3.8	5.2	5.6
Exchangeable Calcium, Ca	mg/kg	2	490	58	370	24	2000
Exchangeable Calcium, Ca	meq/100g	0.01	2.5	0.29	1.9	0.12	9.9
Exchangeable Calcium Percentage*	%	0.1	22.7	2.4	13.0	0.7	58.8
Exchangeable Magnesium, Mg	mg/kg	2	780	950	890	1100	600
Exchangeable Magnesium, Mg	meq/100g	0.02	6.4	7.8	7.3	9.0	5.0
Exchangeable Magnesium Percentage*	%	0.1	59.0	64.1	50.9	56.3	29.4
Cation Exchange Capacity	meq/100g	0.02	11	12	14	16	17

PARAMETER	UOM	LOR	TP103 CLAY 0.4-0.7 6/11/2019 SE199787.011	TP103 CLAY 1.7-1.8 6/11/2019 SE199787.012	TP103 CLAY 2.9-3.0 6/11/2019 SE199787.013
Exchangeable Sodium, Na	mg/kg	2	590	1100	830
Exchangeable Sodium, Na	meq/100g	0.01	2.5	4.6	3.6
Exchangeable Sodium Percentage*	%	0.1	18.8	39.0	35.1
Exchangeable Potassium, K	mg/kg	2	310	180	190
Exchangeable Potassium, K	meq/100g	0.01	0.80	0.47	0.48
Exchangeable Potassium Percentage*	%	0.1	5.9	4.0	4.6
Exchangeable Calcium, Ca	mg/kg	2	300	17	150
Exchangeable Calcium, Ca	meq/100g	0.01	1.5	0.08	0.73
Exchangeable Calcium Percentage*	%	0.1	11.2	0.7	7.1
Exchangeable Magnesium, Mg	mg/kg	2	1100	810	670
Exchangeable Magnesium, Mg	meq/100g	0.02	8.7	6.7	5.5
Exchangeable Magnesium Percentage*	%	0.1	64.0	56.3	53.1
Cation Exchange Capacity	meq/100g	0.02	14	12	10

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES [AN040/AN320] Tested: 11/11/2019

PARAMETER	UOM	LOR	TP101 SAND 0.0-0.15 6/11/2019 SE199787.001	TP101 CLAY 0.35-0.45 6/11/2019 SE199787.002	TP101 CLAY 0.5-0.6 6/11/2019 SE199787.003	TP101 CLAY 2.9-3.0 6/11/2019 SE199787.004	TP102 CLAY 0.0-0.15 6/11/2019 SE199787.005
Arsenic, As	mg/kg	1	3	3	3	8	6
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3	0.3
Chromium, Cr	mg/kg	0.5	11	11	12	4.3	12
Copper, Cu	mg/kg	0.5	23	8.1	11	44	21
Lead, Pb	mg/kg	1	23	12	15	11	110
Nickel, Ni	mg/kg	0.5	7.9	0.7	0.6	0.6	3.2
Zinc, Zn	mg/kg	2	57	6	8	9	130

PARAMETER	UOM	LOR	TP102 CLAY 0.45-0.55 6/11/2019 SE199787.006	TP102 CLAY 0.6-0.7 6/11/2019 SE199787.007	TP102 CLAY 2.7-2.8 6/11/2019 SE199787.008	TP102 CLAY 2.9-3.0 6/11/2019 SE199787.009	TP103 CLAY 0.0-0.15 6/11/2019 SE199787.010
Arsenic, As	mg/kg	1	5	<1	1	1	5
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	8.0	1.5	4.8	2.7	9.5
Copper, Cu	mg/kg	0.5	8.4	7.5	22	57	13
Lead, Pb	mg/kg	1	11	7	16	8	46
Nickel, Ni	mg/kg	0.5	<0.5	<0.5	2.0	0.7	2.7
Zinc, Zn	mg/kg	2	9	4	20	6	53

PARAMETER	UOM	LOR	TP103 CLAY 0.4-0.7 6/11/2019 SE199787.011	TP103 CLAY 1.7-1.8 6/11/2019 SE199787.012	TP103 CLAY 2.9-3.0 6/11/2019 SE199787.013	DDS1 SAND - 6/11/2019 SE199787.014
Arsenic, As	mg/kg	1	4	2	3	3
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	4.1	3.9	4.8	13
Copper, Cu	mg/kg	0.5	11	23	24	27
Lead, Pb	mg/kg	1	7	10	10	32
Nickel, Ni	mg/kg	0.5	0.5	0.9	3.2	11
Zinc, Zn	mg/kg	2	7	9	25	73

Mercury in Soil [AN312] Tested: 11/11/2019

PARAMETER	UOM	LOR	TP101 SAND 0.0-0.15 6/11/2019 SE199787.001	TP101 CLAY 0.35-0.45 6/11/2019 SE199787.002	TP101 CLAY 0.5-0.6 6/11/2019 SE199787.003	TP101 CLAY 2.9-3.0 6/11/2019 SE199787.004	TP102 CLAY 0.0-0.15 6/11/2019 SE199787.005
Mercury	mg/kg	0.05	**0.06**	<0.05	<0.05	<0.05	**0.07**

PARAMETER	UOM	LOR	TP102 CLAY 0.45-0.55 6/11/2019 SE199787.006	TP102 CLAY 0.6-0.7 6/11/2019 SE199787.007	TP102 CLAY 2.7-2.8 6/11/2019 SE199787.008	TP102 CLAY 2.9-3.0 6/11/2019 SE199787.009	TP103 CLAY 0.0-0.15 6/11/2019 SE199787.010
Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05	<0.05

PARAMETER	UOM	LOR	TP103 CLAY 0.4-0.7 6/11/2019 SE199787.011	TP103 CLAY 1.7-1.8 6/11/2019 SE199787.012	TP103 CLAY 2.9-3.0 6/11/2019 SE199787.013	DDS1 SAND - 6/11/2019 SE199787.014
Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	**0.06**

Moisture Content [AN002] Tested: 8/11/2019

PARAMETER	UOM	LOR	TP101 SAND 0.0-0.15 6/11/2019 SE199787.001	TP101 CLAY 0.35-0.45 6/11/2019 SE199787.002	TP101 CLAY 0.5-0.6 6/11/2019 SE199787.003	TP101 CLAY 2.9-3.0 6/11/2019 SE199787.004	TP102 CLAY 0.0-0.15 6/11/2019 SE199787.005
% Moisture	%w/w	1	7.7	15.7	15.2	15.1	12.3

PARAMETER	UOM	LOR	TP102 CLAY 0.45-0.55 6/11/2019 SE199787.006	TP102 CLAY 0.6-0.7 6/11/2019 SE199787.007	TP102 CLAY 2.7-2.8 6/11/2019 SE199787.008	TP102 CLAY 2.9-3.0 6/11/2019 SE199787.009	TP103 CLAY 0.0-0.15 6/11/2019 SE199787.010
% Moisture	%w/w	1	13.8	12.8	15.0	13.4	12.0

PARAMETER	UOM	LOR	TP103 CLAY 0.4-0.7 6/11/2019 SE199787.011	TP103 CLAY 1.7-1.8 6/11/2019 SE199787.012	TP103 CLAY 2.9-3.0 6/11/2019 SE199787.013	DDS1 SAND - 6/11/2019 SE199787.014
% Moisture	%w/w	1	15.6	13.3	13.0	8.2

Fibre Identification in soil [AN602] Tested: 12/11/2019

PARAMETER	UOM	LOR	TP101 SAND 0.0-0.15 6/11/2019 SE199787.001	TP102 CLAY 0.0-0.15 6/11/2019 SE199787.005	TP103 CLAY 0.0-0.15 6/11/2019 SE199787.010
Asbestos Detected	No unit	-	No	No	No
Estimated Fibres*	%w/w	0.01	<0.01	<0.01	<0.01

Gravimetric Determination of Asbestos in Soil [AN605] Tested: 12/11/2019

PARAMETER	UOM	LOR	TP101 SAND 0.0-0.15 6/11/2019 SE199787.001	TP102 CLAY 0.0-0.15 6/11/2019 SE199787.005	TP103 CLAY 0.0-0.15 6/11/2019 SE199787.010
Total Sample Weight*	g	1	**936**	**651**	**614**
ACM in >7mm Sample*	g	0.01	<0.01	<0.01	<0.01
AF/FA in >2mm to <7mm Sample*	g	0.0001	<0.0001	<0.0001	<0.0001
AF/FA in <2mm Sample*	g	0.0001	<0.0001	<0.0001	<0.0001
Asbestos in soil (>7mm ACM)*	%w/w	0.01	<0.01	<0.01	<0.01
Asbestos in soil (>2mm to <7mm AF/FA)*	%w/w	0.001	<0.001	<0.001	<0.001
Asbestos in soil (<2mm AF/FA)*	%w/w	0.001	<0.001	<0.001	<0.001
Asbestos in soil (<7mm AF/FA)*	%w/w	0.001	<0.001	<0.001	<0.001
Fibre Type*	No unit	-	-	-	-

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN040/AN320	A portion of sample is digested with nitric acid to decompose organic matter and hydrochloric acid to complete the digestion of metals. The digest is then analysed by ICP OES with metals results reported on the dried sample basis. Based on USEPA method 200.8 and 6010C.
AN040	A portion of sample is digested with Nitric acid to decompose organic matter and Hydrochloric acid to complete the digestion of metals and then filtered for analysis by ASS or ICP as per USEPA Method 200.8.
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode and is calibrated against 3 buffers purchased commercially. For soils, sediments and sludges, an extract with water (or 0.01M CaCl2) is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN122	Exchangeable Cations, CEC and ESP: Soil sample is extracted in 1M Ammonium Acetate at pH=7 (or 1M Ammonium Chloride at pH=7) with cations (Na, K, Ca & Mg) then determined by ICP OES/ICP MS and reported as Exchangeable Cations. For saline soils, these results can be corrected for water soluble cations and reported as Exchangeable cations in meq/100g or soil can be pre-treated (aqueous ethanol/aqueous glycerol) prior to extraction. Cation Exchange Capacity (CEC) is the sum of the exchangeable cations in meq/100g.
AN122	The Exchangeable Sodium Percentage (ESP) is calculated as the exchangeable sodium divided by the CEC (all in meq/100g) times 100. ESP can be used to categorise the sodicity of the soil as below: ESP < 6% non-sodic ESP 6-15% sodic ESP >15% strongly sodic Method is referenced to Rayment and Lyons, 2011, sections 15D3 and 15N1.-
AN289	Analysis of Total Phenols in Soil Sediment and Water: Steam distillable phenols react with 4-aminoantipyrine at pH 7.9±0.1 in the presence of potassium ferricyanide to form a coloured antipyrine dye analysed by Discrete Analyser. Reference APHA 5530 B/D.
AN312	Mercury by Cold Vapour AAS in Soils: After digestion with nitric acid, hydrogen peroxide and hydrochloric acid, mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36 and in recognition of the NEPM 1999 (2013), >C10-C16 (F2), >C16-C34 (F3) and >C34-C40 (F4). F2 is reported directly and also corrected by subtracting Naphthalene (from VOC method AN433) where available.
AN403	Additionally, the volatile C6-C9 fraction may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Recoverable Hydrocarbons - Silica (TRH-Si) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with differential polarity of the eluent solvents .
AN403	The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependent on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.
AN420	(SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols (etc) in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).
AN420	SVOC Compounds: Semi-Volatile Organic Compounds (SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).
AN433	VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC`s are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.

AN602	Qualitative identification of chrysotile, amosite and crocidolite in bulk samples by polarised light microscopy (PLM) in conjunction with dispersion staining (DS). AS4964 provides the basis for this document. Unequivocal identification of the asbestos minerals present is made by obtaining sufficient diagnostic `clues`, which provide a reasonable degree of certainty, dispersion staining is a mandatory `clue` for positive identification. If sufficient `clues` are absent, then positive identification of asbestos is not possible. This procedure requires removal of suspect fibres/bundles from the sample which cannot be returned.
AN602	Fibres/material that cannot be unequivocably identified as one of the three asbestos forms, will be reported as unknown mineral fibres (umf) The fibres detected may or may not be asbestos fibres.
AN602	AS4964.2004 Method for the Qualitative Identification of Asbestos in Bulk Samples, Section 8.4, Trace Analysis Criteria, Note 4 states:"Depending upon sample condition and fibre type, the detection limit of this technique has been found to lie generally in the range of 1 in 1,000 to 1 in 10,000 parts by weight, equivalent to 1 to 0.1 g/kg."
AN602	The sample can be reported “no asbestos found at the reporting limit of 0.1 g/kg” (<0.01%w/w) where AN602 section 4.5 of this method has been followed, and if- (a) no trace asbestos fibres have been detected (i.e. no ‘respirable’ fibres): (b) the estimated weight of non-respirable asbestos fibre bundles and/or the estimated weight of asbestos in asbestos-containing materials are found to be less than 0.1g/kg: and (c) these non-respirable asbestos fibre bundles and/or the asbestos containing materials are only visible under stereo-microscope viewing conditions.
AN605	This technique gravimetrically determines the mass of Asbestos Containing Material retained on a 7mm Sieve and assumes that 15% of this ACM is asbestos. This calculated asbestos weight is then calculated as a percentage of the total sample weight.
AN605	This technique also gravimetrically determines the mass of Fibrous Asbestos (FA) and Asbestos Fines (AF) Containing Material retained on and passing a 2mm sieve post 7mm sieving. Assumes that FA and AF are 100% asbestos containing. This calculated asbestos weight is then calculated as a percentage of the total sample weight. This does not include free fibres which are only observed by standard trace analysis as per AN 602.
AN605	Insofar as is technically feasible, this report is consistent with the analytical reporting recommendations in the Western Australian Department of Health Guidelines for the Assessment Remediation and Management of Asbestos - Contaminated Sites in Western Australia - May 2009.

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
		NVL	Not validated.	LOR	Limit of Reporting.
**	Indicative data, theoretical holding time exceeded.	IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au.pv.sgsvr/en-gb/environment.

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ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Anwar Barbhuyia
Client	Geotechnique
Address	P.O. Box 880 PENRITH NSW 2751
Telephone	02 4722 2700
Facsimile	02 4722 6161
Email	anwar@geotech.com.au
Project	**14570/1 Warwick Farm**
Order Number	(Not specified)
Samples	3

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE199787 R1**
Date Received	07 Nov 2019
Date Reported	19 Nov 2019

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(4354).

No respirable fibres detected in all soil samples using trace analysis technique.

Asbestos analysed by Approved Identifier Yusuf Kuthpudin.

This report cancels and supersedes the report No.SE199787 R0 dated 13th November 2019 issued by SGS Environment, Health and Safety due to amendment if client id #14 as per client request.

SIGNATORIES

Dong LIANG
Metals/Inorganics Team Leader

Ly Kim HA
Organic Section Head

Ravee SIVASUBRAMANIAM
Hygiene Team Leader

RESULTS

Fibre Identification in soil — Method AN602

Laboratory Reference	Client Reference	Matrix	Sample Description	Date Sampled	Fibre Identification	Est.%w/w*
SE199787.001	TP101	Other	936g Clay,Sand,Soil, Rocks	06 Nov 2019	No Asbestos Found Organic Fibres Detected	<0.01
SE199787.005	TP102	Other	651g Clay,Soil,Rocks	06 Nov 2019	No Asbestos Found Organic Fibres Detected	<0.01
SE199787.010	TP103	Other	614g Clay,Soil,Rocks	06 Nov 2019	No Asbestos Found Organic Fibres Detected	<0.01

Gravimetric Determination of Asbestos in Soil [AN605] Tested: 12/11/2019

PARAMETER	UOM	LOR	TP101 SAND 0.0-0.15 6/11/2019 SE199787.001	TP102 CLAY 0.0-0.15 6/11/2019 SE199787.005	TP103 CLAY 0.0-0.15 6/11/2019 SE199787.010
Total Sample Weight*	g	1	**936**	**651**	**614**
ACM in >7mm Sample*	g	0.01	<0.01	<0.01	<0.01
AF/FA in >2mm to <7mm Sample*	g	0.0001	<0.0001	<0.0001	<0.0001
AF/FA in <2mm Sample*	g	0.0001	<0.0001	<0.0001	<0.0001
Asbestos in soil (>7mm ACM)*	%w/w	0.01	<0.01	<0.01	<0.01
Asbestos in soil (>2mm to <7mm AF/FA)*	%w/w	0.001	<0.001	<0.001	<0.001
Asbestos in soil (<2mm AF/FA)*	%w/w	0.001	<0.001	<0.001	<0.001
Asbestos in soil (<7mm AF/FA)*	%w/w	0.001	<0.001	<0.001	<0.001
Fibre Type*	No unit	-	-	-	-

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN602	Qualitative identification of chrysotile, amosite and crocidolite in bulk samples by polarised light microscopy (PLM) in conjunction with dispersion staining (DS). AS4964 provides the basis for this document. Unequivocal identification of the asbestos minerals present is made by obtaining sufficient diagnostic `clues`, which provide a reasonable degree of certainty, dispersion staining is a mandatory `clue` for positive identification. If sufficient `clues` are absent, then positive identification of asbestos is not possible. This procedure requires removal of suspect fibres/bundles from the sample which cannot be returned.
AN602	Fibres/material that cannot be unequivocably identified as one of the three asbestos forms, will be reported as unknown mineral fibres (umf) The fibres detected may or may not be asbestos fibres.
AN602	AS4964.2004 Method for the Qualitative Identification of Asbestos in Bulk Samples , Section 8.4, Trace Analysis Criteria, Note 4 states:"Depending upon sample condition and fibre type, the detection limit of this technique has been found to lie generally in the range of 1 in 1,000 to 1 in 10,000 parts by weight, equivalent to 1 to 0.1 g/kg."
AN602	The sample can be reported “no asbestos found at the reporting limit of 0.1 g/kg” (<0.01%w/w) where AN602 section 4.5 of this method has been followed, and if- (a) no trace asbestos fibres have been detected (i.e. no ‘respirable’ fibres): (b) the estimated weight of non-respirable asbestos fibre bundles and/or the estimated weight of asbestos in asbestos-containing materials are found to be less than 0.1g/kg: and (c) these non-respirable asbestos fibre bundles and/or the asbestos containing materials are only visible under stereo-microscope viewing conditions.
AN605	This technique gravimetrically determines the mass of Asbestos Containing Material retained on a 7mm Sieve and assumes that 15% of this ACM is asbestos. This calculated asbestos weight is then calculated as a percentage of the total sample weight.
AN605	This technique also gravimetrically determines the mass of Fibrous Asbestos (FA) and Asbestos Fines (AF) Containing Material retained on and passing a 2mm sieve post 7mm sieving. Assumes that FA and AF are 100% asbestos containing. This calculated asbestos weight is then calculated as a percentage of the total sample weight. This does not include free fibres which are only observed by standard trace analysis as per AN 602.
AN605	Insofar as is technically feasible, this report is consistent with the analytical reporting recommendations in the Western Australian Department of Health Guidelines for the Assessment Remediation and Management of Asbestos - Contaminated Sites in Western Australia - May 2009.

FOOTNOTES

Amosite	-	Brown Asbestos	NA	-	Not Analysed
Chrysotile	-	White Asbestos	LNR	-	Listed, Not Required
Crocidolite	-	Blue Asbestos	*	-	NATA accreditation does not cover the performance of this service.
Amphiboles	-	Amosite and/or Crocidolite	**	-	Indicative data, theoretical holding time exceeded.

(In reference to soil samples only) This report does not comply with the analytical reporting recommendations in the Western Australian Department of Health Guidelines for the Assessment and Remediation and Management of Asbestos Contaminated sites in Western Australia - May 2009.

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.

Where reported: 'Asbestos Detected': Asbestos detected by polarised light microscopy, including dispersion staining.
Where reported: 'No Asbestos Found': No Asbestos Found by polarised light microscopy, including dispersion staining.
Where reported: 'UMF Detected': Mineral fibres of unknown type detected by polarised light microscopy, including dispersion staining. Confirmation by another independent analytical technique may be necessary.

Even after disintegration it can be very difficult, or impossible, to detect the presence of asbestos in some asbestos-containing bulk materials using polarised light microscopy. This is due to the low grade or small length or diameter of asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au.pv.sgsvr/en-gb/environment.

STATEMENT OF QA/QC PERFORMANCE

SE199787 R1

CLIENT DETAILS

Contact	Anwar Barbhuyia
Client	Geotechnique
Address	P.O. Box 880 PENRITH NSW 2751
Telephone	02 4722 2700
Facsimile	02 4722 6161
Email	anwar@geotech.com.au
Project	**14570/1 Warwick Farm**
Order Number	(Not specified)
Samples	15

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE199787 R1**
Date Received	07 Nov 2019
Date Reported	19 Nov 2019

COMMENTS

All the laboratory data for each environmental matrix was compared to SGS' stated Data Quality Objectives (DQO). Comments arising from the comparison were made and are reported below.

The data relating to sampling was taken from the Chain of Custody document.
This QA/QC Statement must be read in conjunction with the referenced Analytical Report.
The Statement and the Analytical Report must not be reproduced except in full.

All Data Quality Objectives were met with the exception of the following:

Matrix Spike	Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES	1 item
	VOC's in Soil	1 item
	Volatile Petroleum Hydrocarbons in Soil	1 item

SAMPLE SUMMARY

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	Ice Bricks
Samples received in correct containers	Yes	Sample counts by matrix	12 Sand, 3 Clay
Date documentation received	7/11/2019@2:02pm	Type of documentation received	COC
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	8.2°C	Sufficient sample for analysis	Yes
Turnaround time requested	Standard		

HOLDING TIME SUMMARY

SE199787 R1

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS “Field Sampling Guide for Containers and Holding Time” (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR)

Method: ME-(AU)-[ENV]AN122

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TP101	SE199787.001	LB187395	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP101	SE199787.002	LB187395	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP101	SE199787.003	LB187395	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP101	SE199787.004	LB187395	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP102	SE199787.005	LB187395	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP102	SE199787.006	LB187395	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP102	SE199787.007	LB187395	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP102	SE199787.008	LB187395	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP102	SE199787.009	LB187395	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP103	SE199787.010	LB187395	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP103	SE199787.011	LB187395	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP103	SE199787.012	LB187395	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP103	SE199787.013	LB187395	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019

Fibre Identification in soil

Method: ME-(AU)-[ENV]AN602

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TP101	SE199787.001	LB187496	06 Nov 2019	07 Nov 2019	05 Nov 2020	12 Nov 2019	05 Nov 2020	13 Nov 2019
TP102	SE199787.005	LB187496	06 Nov 2019	07 Nov 2019	05 Nov 2020	12 Nov 2019	05 Nov 2020	13 Nov 2019
TP103	SE199787.010	LB187496	06 Nov 2019	07 Nov 2019	05 Nov 2020	12 Nov 2019	05 Nov 2020	13 Nov 2019

Gravimetric Determination of Asbestos in Soil

Method: ME-(AU)-[ENV]AN605

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TP101	SE199787.001	LB187496	06 Nov 2019	07 Nov 2019	04 May 2020	12 Nov 2019	04 May 2020	13 Nov 2019
TP102	SE199787.005	LB187496	06 Nov 2019	07 Nov 2019	04 May 2020	12 Nov 2019	04 May 2020	13 Nov 2019
TP103	SE199787.010	LB187496	06 Nov 2019	07 Nov 2019	04 May 2020	12 Nov 2019	04 May 2020	13 Nov 2019

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TP101	SE199787.001	LB187379	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP101	SE199787.002	LB187379	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP101	SE199787.003	LB187379	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP101	SE199787.004	LB187379	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP102	SE199787.005	LB187379	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP102	SE199787.006	LB187379	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP102	SE199787.007	LB187379	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP102	SE199787.008	LB187379	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP102	SE199787.009	LB187379	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP103	SE199787.010	LB187379	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP103	SE199787.011	LB187379	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP103	SE199787.012	LB187379	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
TP103	SE199787.013	LB187379	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019
DDS1	SE199787.014	LB187379	06 Nov 2019	07 Nov 2019	04 Dec 2019	11 Nov 2019	04 Dec 2019	13 Nov 2019

Moisture Content

Method: ME-(AU)-[ENV]AN002

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TP101	SE199787.001	LB187283	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	13 Nov 2019	09 Nov 2019
TP101	SE199787.002	LB187283	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	13 Nov 2019	09 Nov 2019
TP101	SE199787.003	LB187283	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	13 Nov 2019	09 Nov 2019
TP101	SE199787.004	LB187283	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	13 Nov 2019	09 Nov 2019
TP102	SE199787.005	LB187283	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	13 Nov 2019	09 Nov 2019
TP102	SE199787.006	LB187283	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	13 Nov 2019	09 Nov 2019
TP102	SE199787.007	LB187283	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	13 Nov 2019	09 Nov 2019
TP102	SE199787.008	LB187283	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	13 Nov 2019	09 Nov 2019
TP102	SE199787.009	LB187283	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	13 Nov 2019	09 Nov 2019
TP103	SE199787.010	LB187283	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	13 Nov 2019	09 Nov 2019
TP103	SE199787.011	LB187283	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	13 Nov 2019	09 Nov 2019
TP103	SE199787.012	LB187283	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	13 Nov 2019	09 Nov 2019
TP103	SE199787.013	LB187283	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	13 Nov 2019	09 Nov 2019
DDS1	SE199787.014	LB187283	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	13 Nov 2019	09 Nov 2019

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

Sample Name	Sample No.	QC Ref

HOLDING TIME SUMMARY

SE199787 R1

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS “Field Sampling Guide for Containers and Holding Time” (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

OC Pesticides in Soil (continued)

Method: ME-(AU)-[ENV]AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TP101	SE199787.001	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	13 Nov 2019
TP101	SE199787.002	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	13 Nov 2019
TP102	SE199787.005	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	13 Nov 2019
TP102	SE199787.006	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	13 Nov 2019
TP103	SE199787.010	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	13 Nov 2019
TP103	SE199787.011	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	13 Nov 2019
DDS1	SE199787.014	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	13 Nov 2019

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TP101	SE199787.001	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	12 Nov 2019
TP101	SE199787.002	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	12 Nov 2019
TP102	SE199787.005	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	12 Nov 2019
TP102	SE199787.006	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	12 Nov 2019
TP103	SE199787.010	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	12 Nov 2019
TP103	SE199787.011	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	12 Nov 2019
DDS1	SE199787.014	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	12 Nov 2019

PCBs in Soil

Method: ME-(AU)-[ENV]AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TP101	SE199787.001	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	13 Nov 2019
TP101	SE199787.002	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	13 Nov 2019
TP102	SE199787.005	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	13 Nov 2019
TP102	SE199787.006	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	13 Nov 2019
TP103	SE199787.010	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	13 Nov 2019
TP103	SE199787.011	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	13 Nov 2019
DDS1	SE199787.014	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	13 Nov 2019

pH in soil (1:5)

Method: ME-(AU)-[ENV]AN101

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TP101	SE199787.001	LB187542	06 Nov 2019	07 Nov 2019	13 Nov 2019	13 Nov 2019	14 Nov 2019	13 Nov 2019
TP101	SE199787.002	LB187542	06 Nov 2019	07 Nov 2019	13 Nov 2019	13 Nov 2019	14 Nov 2019	13 Nov 2019
TP101	SE199787.003	LB187542	06 Nov 2019	07 Nov 2019	13 Nov 2019	13 Nov 2019	14 Nov 2019	13 Nov 2019
TP101	SE199787.004	LB187542	06 Nov 2019	07 Nov 2019	13 Nov 2019	13 Nov 2019	14 Nov 2019	13 Nov 2019
TP102	SE199787.005	LB187542	06 Nov 2019	07 Nov 2019	13 Nov 2019	13 Nov 2019	14 Nov 2019	13 Nov 2019
TP102	SE199787.006	LB187542	06 Nov 2019	07 Nov 2019	13 Nov 2019	13 Nov 2019	14 Nov 2019	13 Nov 2019
TP102	SE199787.007	LB187542	06 Nov 2019	07 Nov 2019	13 Nov 2019	13 Nov 2019	14 Nov 2019	13 Nov 2019
TP102	SE199787.008	LB187542	06 Nov 2019	07 Nov 2019	13 Nov 2019	13 Nov 2019	14 Nov 2019	13 Nov 2019
TP102	SE199787.009	LB187542	06 Nov 2019	07 Nov 2019	13 Nov 2019	13 Nov 2019	14 Nov 2019	13 Nov 2019
TP103	SE199787.010	LB187542	06 Nov 2019	07 Nov 2019	13 Nov 2019	13 Nov 2019	14 Nov 2019	13 Nov 2019
TP103	SE199787.011	LB187542	06 Nov 2019	07 Nov 2019	13 Nov 2019	13 Nov 2019	14 Nov 2019	13 Nov 2019
TP103	SE199787.012	LB187542	06 Nov 2019	07 Nov 2019	13 Nov 2019	13 Nov 2019	14 Nov 2019	13 Nov 2019
TP103	SE199787.013	LB187542	06 Nov 2019	07 Nov 2019	13 Nov 2019	13 Nov 2019	14 Nov 2019	13 Nov 2019

Total Phenolics in Soil

Method: ME-(AU)-[ENV]AN289

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TP101	SE199787.001	LB187442	06 Nov 2019	07 Nov 2019	20 Nov 2019	12 Nov 2019	20 Nov 2019	12 Nov 2019
TP102	SE199787.005	LB187442	06 Nov 2019	07 Nov 2019	20 Nov 2019	12 Nov 2019	20 Nov 2019	12 Nov 2019
TP103	SE199787.010	LB187442	06 Nov 2019	07 Nov 2019	20 Nov 2019	12 Nov 2019	20 Nov 2019	12 Nov 2019
DDS1	SE199787.014	LB187442	06 Nov 2019	07 Nov 2019	20 Nov 2019	12 Nov 2019	20 Nov 2019	12 Nov 2019

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TP101	SE199787.001	LB187370	06 Nov 2019	07 Nov 2019	04 May 2020	11 Nov 2019	04 May 2020	13 Nov 2019
TP101	SE199787.002	LB187370	06 Nov 2019	07 Nov 2019	04 May 2020	11 Nov 2019	04 May 2020	13 Nov 2019
TP101	SE199787.003	LB187370	06 Nov 2019	07 Nov 2019	04 May 2020	11 Nov 2019	04 May 2020	13 Nov 2019
TP101	SE199787.004	LB187370	06 Nov 2019	07 Nov 2019	04 May 2020	11 Nov 2019	04 May 2020	13 Nov 2019
TP102	SE199787.005	LB187370	06 Nov 2019	07 Nov 2019	04 May 2020	11 Nov 2019	04 May 2020	13 Nov 2019
TP102	SE199787.006	LB187370	06 Nov 2019	07 Nov 2019	04 May 2020	11 Nov 2019	04 May 2020	13 Nov 2019
TP102	SE199787.007	LB187370	06 Nov 2019	07 Nov 2019	04 May 2020	11 Nov 2019	04 May 2020	13 Nov 2019
TP102	SE199787.008	LB187370	06 Nov 2019	07 Nov 2019	04 May 2020	11 Nov 2019	04 May 2020	13 Nov 2019
TP102	SE199787.009	LB187370	06 Nov 2019	07 Nov 2019	04 May 2020	11 Nov 2019	04 May 2020	13 Nov 2019

HOLDING TIME SUMMARY

SE199787 R1

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS “Field Sampling Guide for Containers and Holding Time” (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES (continued)

Method: ME-(AU)-[ENV]AN040/AN320

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TP103	SE199787.010	LB187370	06 Nov 2019	07 Nov 2019	04 May 2020	11 Nov 2019	04 May 2020	13 Nov 2019
TP103	SE199787.011	LB187370	06 Nov 2019	07 Nov 2019	04 May 2020	11 Nov 2019	04 May 2020	13 Nov 2019
TP103	SE199787.012	LB187370	06 Nov 2019	07 Nov 2019	04 May 2020	11 Nov 2019	04 May 2020	13 Nov 2019
TP103	SE199787.013	LB187370	06 Nov 2019	07 Nov 2019	04 May 2020	11 Nov 2019	04 May 2020	13 Nov 2019
DDS1	SE199787.014	LB187370	06 Nov 2019	07 Nov 2019	04 May 2020	11 Nov 2019	04 May 2020	13 Nov 2019

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TP101	SE199787.001	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	12 Nov 2019
TP101	SE199787.002	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	12 Nov 2019
TP102	SE199787.005	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	12 Nov 2019
TP102	SE199787.006	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	12 Nov 2019
TP103	SE199787.010	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	12 Nov 2019
TP103	SE199787.011	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	12 Nov 2019
DDS1	SE199787.014	LB187272	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	12 Nov 2019

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TP101	SE199787.001	LB187267	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	11 Nov 2019
TP101	SE199787.002	LB187267	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	11 Nov 2019
TP102	SE199787.005	LB187267	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	11 Nov 2019
TP102	SE199787.006	LB187267	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	11 Nov 2019
TP103	SE199787.010	LB187267	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	11 Nov 2019
TP103	SE199787.011	LB187267	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	11 Nov 2019
DDS1	SE199787.014	LB187267	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	11 Nov 2019
TS1	SE199787.015	LB187267	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	11 Nov 2019

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TP101	SE199787.001	LB187267	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	11 Nov 2019
TP101	SE199787.002	LB187267	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	11 Nov 2019
TP102	SE199787.005	LB187267	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	11 Nov 2019
TP102	SE199787.006	LB187267	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	11 Nov 2019
TP103	SE199787.010	LB187267	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	11 Nov 2019
TP103	SE199787.011	LB187267	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	11 Nov 2019
DDS1	SE199787.014	LB187267	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	11 Nov 2019
TS1	SE199787.015	LB187267	06 Nov 2019	07 Nov 2019	20 Nov 2019	08 Nov 2019	18 Dec 2019	11 Nov 2019

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Tetrachloro-m-xylene (TCMX) (Surrogate)	TP101	SE199787.001	%	60 - 130%	83
	TP102	SE199787.005	%	60 - 130%	85
	TP103	SE199787.010	%	60 - 130%	93
	DDS1	SE199787.014	%	60 - 130%	80

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
2-fluorobiphenyl (Surrogate)	TP101	SE199787.001	%	70 - 130%	98
	TP101	SE199787.002	%	70 - 130%	98
	TP102	SE199787.005	%	70 - 130%	92
	TP102	SE199787.006	%	70 - 130%	96
	TP103	SE199787.010	%	70 - 130%	100
	TP103	SE199787.011	%	70 - 130%	98
	DDS1	SE199787.014	%	70 - 130%	94
d14-p-terphenyl (Surrogate)	TP101	SE199787.001	%	70 - 130%	106
	TP101	SE199787.002	%	70 - 130%	106
	TP102	SE199787.005	%	70 - 130%	100
	TP102	SE199787.006	%	70 - 130%	104
	TP103	SE199787.010	%	70 - 130%	104
	TP103	SE199787.011	%	70 - 130%	104
	DDS1	SE199787.014	%	70 - 130%	102
d5-nitrobenzene (Surrogate)	TP101	SE199787.001	%	70 - 130%	98
	TP101	SE199787.002	%	70 - 130%	100
	TP102	SE199787.005	%	70 - 130%	94
	TP102	SE199787.006	%	70 - 130%	98
	TP103	SE199787.010	%	70 - 130%	100
	TP103	SE199787.011	%	70 - 130%	98
	DDS1	SE199787.014	%	70 - 130%	96

PCBs in Soil

Method: ME-(AU)-[ENV]AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Tetrachloro-m-xylene (TCMX) (Surrogate)	TP101	SE199787.001	%	60 - 130%	83
	TP102	SE199787.005	%	60 - 130%	85
	TP103	SE199787.010	%	60 - 130%	93
	DDS1	SE199787.014	%	60 - 130%	80

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	TP101	SE199787.001	%	60 - 130%	73
	TP101	SE199787.002	%	60 - 130%	86
	TP102	SE199787.005	%	60 - 130%	74
	TP102	SE199787.006	%	60 - 130%	70
	TP103	SE199787.010	%	60 - 130%	89
	TP103	SE199787.011	%	60 - 130%	71
	DDS1	SE199787.014	%	60 - 130%	70
	TS1	SE199787.015	%	60 - 130%	98
d4-1,2-dichloroethane (Surrogate)	TP101	SE199787.001	%	60 - 130%	90
	TP101	SE199787.002	%	60 - 130%	109
	TP102	SE199787.005	%	60 - 130%	116
	TP102	SE199787.006	%	60 - 130%	86
	TP103	SE199787.010	%	60 - 130%	102
	TP103	SE199787.011	%	60 - 130%	87
	DDS1	SE199787.014	%	60 - 130%	86
	TS1	SE199787.015	%	60 - 130%	81
d8-toluene (Surrogate)	TP101	SE199787.001	%	60 - 130%	87
	TP101	SE199787.002	%	60 - 130%	108
	TP102	SE199787.005	%	60 - 130%	83
	TP102	SE199787.006	%	60 - 130%	84
	TP103	SE199787.010	%	60 - 130%	78
	TP103	SE199787.011	%	60 - 130%	86
	DDS1	SE199787.014	%	60 - 130%	85
	TS1	SE199787.015	%	60 - 130%	84

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Volatile Petroleum Hydrocarbons in Soil — **Method: ME-(AU)-[ENV]AN433**

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	TP101	SE199787.001	%	60 - 130%	73
	TP101	SE199787.002	%	60 - 130%	86
	TP102	SE199787.005	%	60 - 130%	74
	TP102	SE199787.006	%	60 - 130%	70
	TP103	SE199787.010	%	60 - 130%	89
	TP103	SE199787.011	%	60 - 130%	71
	DDS1	SE199787.014	%	60 - 130%	70
d4-1,2-dichloroethane (Surrogate)	TP101	SE199787.001	%	60 - 130%	90
	TP101	SE199787.002	%	60 - 130%	109
	TP102	SE199787.005	%	60 - 130%	116
	TP102	SE199787.006	%	60 - 130%	86
	TP103	SE199787.010	%	60 - 130%	102
	TP103	SE199787.011	%	60 - 130%	87
	DDS1	SE199787.014	%	60 - 130%	86
d8-toluene (Surrogate)	TP101	SE199787.001	%	60 - 130%	87
	TP101	SE199787.002	%	60 - 130%	108
	TP102	SE199787.005	%	60 - 130%	83
	TP102	SE199787.006	%	60 - 130%	84
	TP103	SE199787.010	%	60 - 130%	78
	TP103	SE199787.011	%	60 - 130%	86
	DDS1	SE199787.014	%	60 - 130%	85

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR)

Method: ME-(AU)-[ENV]AN122

Sample Number	Parameter	Units	LOR	Result
LB187395.001	Exchangeable Sodium, Na	mg/kg	2	0
	Exchangeable Potassium, K	mg/kg	2	0
	Exchangeable Calcium, Ca	mg/kg	2	0
	Exchangeable Magnesium, Mg	mg/kg	2	0

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Sample Number	Parameter	Units	LOR	Result
LB187379.001	Mercury	mg/kg	0.05	<0.05

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number		Parameter	Units	LOR	Result
LB187272.001		Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1
		Alpha BHC	mg/kg	0.1	<0.1
		Lindane	mg/kg	0.1	<0.1
		Heptachlor	mg/kg	0.1	<0.1
		Aldrin	mg/kg	0.1	<0.1
		Beta BHC	mg/kg	0.1	<0.1
		Delta BHC	mg/kg	0.1	<0.1
		Heptachlor epoxide	mg/kg	0.1	<0.1
		Alpha Endosulfan	mg/kg	0.2	<0.2
		Gamma Chlordane	mg/kg	0.1	<0.1
		Alpha Chlordane	mg/kg	0.1	<0.1
		p,p'-DDE	mg/kg	0.1	<0.1
		Dieldrin	mg/kg	0.05	<0.05
		Endrin	mg/kg	0.2	<0.2
		Beta Endosulfan	mg/kg	0.2	<0.2
		p,p'-DDD	mg/kg	0.1	<0.1
		p,p'-DDT	mg/kg	0.1	<0.1
		Endosulfan sulphate	mg/kg	0.1	<0.1
		Endrin Aldehyde	mg/kg	0.1	<0.1
		Methoxychlor	mg/kg	0.1	<0.1
		Endrin Ketone	mg/kg	0.1	<0.1
		Isodrin	mg/kg	0.1	<0.1
		Mirex	mg/kg	0.1	<0.1
	Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	%	-	86

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number		Parameter	Units	LOR	Result
LB187272.001		Naphthalene	mg/kg	0.1	<0.1
		2-methylnaphthalene	mg/kg	0.1	<0.1
		1-methylnaphthalene	mg/kg	0.1	<0.1
		Acenaphthylene	mg/kg	0.1	<0.1
		Acenaphthene	mg/kg	0.1	<0.1
		Fluorene	mg/kg	0.1	<0.1
		Phenanthrene	mg/kg	0.1	<0.1
		Anthracene	mg/kg	0.1	<0.1
		Fluoranthene	mg/kg	0.1	<0.1
		Pyrene	mg/kg	0.1	<0.1
		Benzo(a)anthracene	mg/kg	0.1	<0.1
		Chrysene	mg/kg	0.1	<0.1
		Benzo(a)pyrene	mg/kg	0.1	<0.1
		Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1
		Dibenzo(ah)anthracene	mg/kg	0.1	<0.1
		Benzo(ghi)perylene	mg/kg	0.1	<0.1
		Total PAH (18)	mg/kg	0.8	<0.8
	Surrogates	d5-nitrobenzene (Surrogate)	%	-	86
		2-fluorobiphenyl (Surrogate)	%	-	86
		d14-p-terphenyl (Surrogate)	%	-	80

PCBs in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number	Parameter	Units	LOR

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

PCBs in Soil (continued)

Method: ME-(AU)-[ENV]AN420

Sample Number		Parameter	Units	LOR	Result
LB187272.001		Arochlor 1016	mg/kg	0.2	<0.2
		Arochlor 1221	mg/kg	0.2	<0.2
		Arochlor 1232	mg/kg	0.2	<0.2
		Arochlor 1242	mg/kg	0.2	<0.2
		Arochlor 1248	mg/kg	0.2	<0.2
		Arochlor 1254	mg/kg	0.2	<0.2
		Arochlor 1260	mg/kg	0.2	<0.2
		Arochlor 1262	mg/kg	0.2	<0.2
		Arochlor 1268	mg/kg	0.2	<0.2
		Total PCBs (Arochlors)	mg/kg	1	<1
	Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	%	-	86

Total Phenolics in Soil

Method: ME-(AU)-[ENV]AN289

Sample Number	Parameter	Units	LOR	Result
LB187442.001	Total Phenols	mg/kg	5	<5

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Sample Number	Parameter	Units	LOR	Result
LB187370.001	Arsenic, As	mg/kg	1	<1
	Cadmium, Cd	mg/kg	0.3	<0.3
	Chromium, Cr	mg/kg	0.5	<0.5
	Copper, Cu	mg/kg	0.5	<0.5
	Nickel, Ni	mg/kg	0.5	<0.5
	Lead, Pb	mg/kg	1	<1
	Zinc, Zn	mg/kg	2	<2

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Sample Number	Parameter	Units	LOR	Result
LB187272.001	TRH C10-C14	mg/kg	20	<20
	TRH C15-C28	mg/kg	45	<45
	TRH C29-C36	mg/kg	45	<45
	TRH C37-C40	mg/kg	100	<100
	TRH C10-C36 Total	mg/kg	110	<110

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result
LB187267.001	Monocyclic Aromatic	Benzene	mg/kg	0.1	<0.1
	Hydrocarbons	Toluene	mg/kg	0.1	<0.1
		Ethylbenzene	mg/kg	0.1	<0.1
		m/p-xylene	mg/kg	0.2	<0.2
		o-xylene	mg/kg	0.1	<0.1
	Polycyclic VOCs	Naphthalene	mg/kg	0.1	<0.1
	Surrogates	d4-1,2-dichloroethane (Surrogate)	%	-	96
		d8-toluene (Surrogate)	%	-	97
		Bromofluorobenzene (Surrogate)	%	-	77
	Totals	Total BTEX	mg/kg	0.6	<0.6

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result
LB187267.001		TRH C6-C9	mg/kg	20	<20
	Surrogates	d4-1,2-dichloroethane (Surrogate)	%	-	96

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE199722.001	LB187379.024	Mercury	mg/kg	0.05	0.14	0.17	62	21
SE199787.010	LB187379.014	Mercury	mg/kg	0.05	<0.05	<0.05	169	0

Moisture Content

Method: ME-(AU)-[ENV]AN002

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE199787.002	LB187283.011	% Moisture	%w/w	1	15.7	15.4	36	2
SE199787.014	LB187283.025	% Moisture	%w/w	1	8.2	9.2	41	11

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE199787.002	LB187272.021		Naphthalene	mg/kg	0.1	<0.1	0	200	0
			2-methylnaphthalene	mg/kg	0.1	<0.1	0	200	0
			1-methylnaphthalene	mg/kg	0.1	<0.1	0	200	0
			Acenaphthylene	mg/kg	0.1	<0.1	0	200	0
			Acenaphthene	mg/kg	0.1	<0.1	0	200	0
			Fluorene	mg/kg	0.1	<0.1	0	200	0
			Phenanthrene	mg/kg	0.1	<0.1	0	200	0
			Anthracene	mg/kg	0.1	<0.1	0	200	0
			Fluoranthene	mg/kg	0.1	<0.1	0.01	200	0
			Pyrene	mg/kg	0.1	<0.1	0.01	200	0
			Benzo(a)anthracene	mg/kg	0.1	<0.1	0.01	200	0
			Chrysene	mg/kg	0.1	<0.1	0.01	200	0
			Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	0	200	0
			Benzo(k)fluoranthene	mg/kg	0.1	<0.1	0	200	0
			Benzo(a)pyrene	mg/kg	0.1	<0.1	0	200	0
			Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	0	200	0
			Dibenzo(ah)anthracene	mg/kg	0.1	<0.1	0	200	0
			Benzo(ghi)perylene	mg/kg	0.1	<0.1	0	200	0
			Carcinogenic PAHs, BaP TEQ <LOR=0	mg/kg	0.2	<0.2	0	200	0
			Carcinogenic PAHs, BaP TEQ <LOR=LOR	mg/kg	0.3	<0.3	0.242	134	0
			Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	mg/kg	0.2	<0.2	0.121	175	0
			Total PAH (18)	mg/kg	0.8	<0.8	0	200	0
		Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.5	0.48	30	4
			2-fluorobiphenyl (Surrogate)	mg/kg	-	0.5	0.49	30	0
			d14-p-terphenyl (Surrogate)	mg/kg	-	0.5	0.53	30	0

pH in soil (1:5)

Method: ME-(AU)-[ENV]AN101

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE199787.010	LB187542.014	pH	pH Units	0.1	5.2	5.7	32	8
SE199787.013	LB187542.026	pH	pH Units	0.1	5.0	5.017	32	1

Total Phenolics in Soil

Method: ME-(AU)-[ENV]AN289

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE199658.019	LB187442.014	Total Phenols	mg/kg	5	<0.1	0.3	98	90

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE199722.001	LB187370.024	Arsenic, As	mg/kg	1	6	5	48	7
		Cadmium, Cd	mg/kg	0.3	<0.3	0.4	130	16
		Chromium, Cr	mg/kg	0.5	13	11	34	19
		Copper, Cu	mg/kg	0.5	53	42	31	25
		Nickel, Ni	mg/kg	0.5	14	19	33	30
		Lead, Pb	mg/kg	1	190	150	31	23
		Zinc, Zn	mg/kg	2	290	220	31	27
SE199787.010	LB187370.014	Arsenic, As	mg/kg	1	5	5	50	1
		Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	200	0
		Chromium, Cr	mg/kg	0.5	9.5	9.9	35	5

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES (continued)

Method: ME-(AU)-[ENV]AN040/AN320

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE199787.010	LB187370.014		Copper, Cu	mg/kg	0.5	13	14	34	4
			Nickel, Ni	mg/kg	0.5	2.7	2.9	48	4
			Lead, Pb	mg/kg	1	46	39	32	15
			Zinc, Zn	mg/kg	2	53	52	34	2

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE199787.002	LB187272.014		TRH C10-C14	mg/kg	20	<20	<20	200	0
			TRH C15-C28	mg/kg	45	<45	<45	200	0
			TRH C29-C36	mg/kg	45	<45	<45	200	0
			TRH C37-C40	mg/kg	100	<100	<100	200	0
			TRH C10-C36 Total	mg/kg	110	<110	<110	200	0
			TRH >C10-C40 Total (F bands)	mg/kg	210	<210	<210	200	0
		TRH F Bands	TRH >C10-C16	mg/kg	25	<25	<25	200	0
			TRH >C10-C16 - Naphthalene (F2)	mg/kg	25	<25	<25	200	0
			TRH >C16-C34 (F3)	mg/kg	90	<90	<90	200	0
			TRH >C34-C40 (F4)	mg/kg	120	<120	<120	200	0

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE199787.002	LB187267.014	Monocyclic	Benzene	mg/kg	0.1	<0.1	<0.1	200	0
		Aromatic	Toluene	mg/kg	0.1	<0.1	<0.1	200	0
			Ethylbenzene	mg/kg	0.1	<0.1	<0.1	200	0
			m/p-xylene	mg/kg	0.2	<0.2	<0.2	200	0
			o-xylene	mg/kg	0.1	<0.1	<0.1	200	0
		Polycyclic	Naphthalene	mg/kg	0.1	<0.1	<0.1	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	mg/kg	-	10.9	11.7	50	7
			d8-toluene (Surrogate)	mg/kg	-	10.8	9.0	50	18
			Bromofluorobenzene (Surrogate)	mg/kg	-	8.6	7.5	50	14
		Totals	Total Xylenes	mg/kg	0.3	<0.3	<0.3	200	0
			Total BTEX	mg/kg	0.6	<0.6	<0.6	200	0

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE199787.002	LB187267.014		TRH C6-C10	mg/kg	25	<25	<25	200	0
			TRH C6-C9	mg/kg	20	<20	<20	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	mg/kg	-	10.9	11.7	30	7
			d8-toluene (Surrogate)	mg/kg	-	10.8	9.0	30	18
			Bromofluorobenzene (Surrogate)	mg/kg	-	8.6	7.5	30	14
		VPH F Bands	Benzene (F0)	mg/kg	0.1	<0.1	<0.1	200	0
			TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	<25	200	0

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB187379.002	Mercury	mg/kg	0.05	0.24	0.2	70 - 130	121

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB187272.002		Heptachlor	mg/kg	0.1	0.2	0.2	60 - 140	80
		Aldrin	mg/kg	0.1	0.2	0.2	60 - 140	86
		Delta BHC	mg/kg	0.1	0.2	0.2	60 - 140	82
		Dieldrin	mg/kg	0.05	0.17	0.2	60 - 140	84
		Endrin	mg/kg	0.2	<0.2	0.2	60 - 140	77
		p,p'-DDT	mg/kg	0.1	0.2	0.2	60 - 140	80
	Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0.12	0.15	40 - 130	81

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB187272.002		Naphthalene	mg/kg	0.1	4.4	4	60 - 140	110
		Acenaphthylene	mg/kg	0.1	4.4	4	60 - 140	109
		Acenaphthene	mg/kg	0.1	4.2	4	60 - 140	106
		Phenanthrene	mg/kg	0.1	5.0	4	60 - 140	125
		Anthracene	mg/kg	0.1	5.1	4	60 - 140	126
		Fluoranthene	mg/kg	0.1	5.1	4	60 - 140	127
		Pyrene	mg/kg	0.1	4.9	4	60 - 140	124
		Benzo(a)pyrene	mg/kg	0.1	5.0	4	60 - 140	125
	Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.5	0.5	40 - 130	92
		2-fluorobiphenyl (Surrogate)	mg/kg	-	0.5	0.5	40 - 130	92
		d14-p-terphenyl (Surrogate)	mg/kg	-	0.5	0.5	40 - 130	104

PCBs in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB187272.002	Arochlor 1260	mg/kg	0.2	0.3	0.4	60 - 140	85

pH in soil (1:5)

Method: ME-(AU)-[ENV]AN101

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB187542.003	pH	pH Units	0.1	7.4	7.415	98 - 102	100

Total Phenolics in Soil

Method: ME-(AU)-[ENV]AN289

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB187442.002	Total Phenols	mg/kg	5	<5	2.5	70 - 130	96

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB187370.002	Arsenic, As	mg/kg	1	310	318.22	80 - 120	98
	Cadmium, Cd	mg/kg	0.3	4.3	4.62	80 - 120	94
	Chromium, Cr	mg/kg	0.5	33	38.31	80 - 120	85
	Copper, Cu	mg/kg	0.5	280	290	80 - 120	98
	Nickel, Ni	mg/kg	0.5	180	187	80 - 120	96
	Lead, Pb	mg/kg	1	91	89.9	80 - 120	102
	Zinc, Zn	mg/kg	2	260	273	80 - 120	97

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB187272.002		TRH C10-C14	mg/kg	20	40	40	60 - 140	100
		TRH C15-C28	mg/kg	45	<45	40	60 - 140	103
		TRH C29-C36	mg/kg	45	<45	40	60 - 140	95
	TRH F Bands	TRH >C10-C16	mg/kg	25	41	40	60 - 140	103
		TRH >C16-C34 (F3)	mg/kg	90	<90	40	60 - 140	108
		TRH >C34-C40 (F4)	mg/kg	120	<120	20	60 - 140	85

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB187267.002	Monocyclic	Benzene	mg/kg	0.1	4.2	5	60 - 140	84
	Aromatic	Toluene	mg/kg	0.1	4.5	5	60 - 140	90
		Ethylbenzene	mg/kg	0.1	4.7	5	60 - 140	93
		m/p-xylene	mg/kg	0.2	9.5	10	60 - 140	95
		o-xylene	mg/kg	0.1	4.7	5	60 - 140	95
	Surrogates	d4-1,2-dichloroethane (Surrogate)	mg/kg	-	9.1	10	70 - 130	91
		d8-toluene (Surrogate)	mg/kg	-	10.1	10	70 - 130	101
		Bromofluorobenzene (Surrogate)	mg/kg	-	10.8	10	70 - 130	108

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB187267.002		TRH C6-C10	mg/kg	25	80	92.5	60 - 140	86
		TRH C6-C9	mg/kg	20	70	80	60 - 140	87
	Surrogates	d4-1,2-dichloroethane (Surrogate)	mg/kg	-	9.1	10	70 - 130	91
		Bromofluorobenzene (Surrogate)	mg/kg	-	10.8	10	70 - 130	108
	VPH F Bands	TRH C6-C10 minus BTEX (F1)	mg/kg	25	52	62.5	60 - 140	83

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub -sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE199787.001	LB187379.004	Mercury	mg/kg	0.05	0.30	0.06	0.2	121

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

QC Sample	Sample Number		Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE199793.001	LB187272.004		Naphthalene	mg/kg	0.1	4.2	<0.1	4	106
			2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	-	-
			1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	-	-
			Acenaphthylene	mg/kg	0.1	4.3	<0.1	4	109
			Acenaphthene	mg/kg	0.1	4.0	<0.1	4	100
			Fluorene	mg/kg	0.1	<0.1	<0.1	-	-
			Phenanthrene	mg/kg	0.1	4.4	<0.1	4	109
			Anthracene	mg/kg	0.1	4.2	<0.1	4	104
			Fluoranthene	mg/kg	0.1	4.1	<0.1	4	103
			Pyrene	mg/kg	0.1	4.4	<0.1	4	110
			Benzo(a)anthracene	mg/kg	0.1	<0.1	<0.1	-	-
			Chrysene	mg/kg	0.1	<0.1	<0.1	-	-
			Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	<0.1	-	-
			Benzo(k)fluoranthene	mg/kg	0.1	<0.1	<0.1	-	-
			Benzo(a)pyrene	mg/kg	0.1	3.1	<0.1	4	77
			Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	<0.1	-	-
			Dibenzo(ah)anthracene	mg/kg	0.1	<0.1	<0.1	-	-
			Benzo(ghi)perylene	mg/kg	0.1	<0.1	<0.1	-	-
			Carcinogenic PAHs, BaP TEQ <LOR=0	TEQ (mg/kg)	0.2	3.1	<0.2	-	-
			Carcinogenic PAHs, BaP TEQ <LOR=LOR	TEQ (mg/kg)	0.3	3.2	<0.3	-	-
			Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	TEQ (mg/kg)	0.2	3.1	<0.2	-	-
			Total PAH (18)	mg/kg	0.8	33	<0.8	-	-
		Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.5	0.5	-	96
			2-fluorobiphenyl (Surrogate)	mg/kg	-	0.5	0.5	-	94
			d14-p-terphenyl (Surrogate)	mg/kg	-	0.4	0.5	-	88

Total Phenolics in Soil

Method: ME-(AU)-[ENV]AN289

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE199787.014	LB187442.013	Total Phenols	mg/kg	5	<5	<5	2.5	80

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE199787.001	LB187370.004	Arsenic, As	mg/kg	1	42	3	50	78
		Cadmium, Cd	mg/kg	0.3	36	<0.3	50	71
		Chromium, Cr	mg/kg	0.5	48	11	50	74
		Copper, Cu	mg/kg	0.5	56	23	50	66 ④
		Nickel, Ni	mg/kg	0.5	45	7.9	50	75
		Lead, Pb	mg/kg	1	60	23	50	74
		Zinc, Zn	mg/kg	2	94	57	50	73

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

QC Sample	Sample Number		Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE199793.001	LB187272.021		TRH C10-C14	mg/kg	20	43	<20	40	108
			TRH C15-C28	mg/kg	45	48	<45	40	120
			TRH C29-C36	mg/kg	45	<45	<45	40	100
			TRH C37-C40	mg/kg	100	<100	<100	-	-
			TRH C10-C36 Total	mg/kg	110	<110	<110	-	-
			TRH >C10-C40 Total (F bands)	mg/kg	210	<210	<210	-	-
		TRH F Bands	TRH >C10-C16	mg/kg	25	42	<25	40	105
			TRH >C10-C16 - Naphthalene (F2)	mg/kg	25	42	<25	-	-
			TRH >C16-C34 (F3)	mg/kg	90	<90	<90	40	123
			TRH >C34-C40 (F4)	mg/kg	120	<120	<120	-	-

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

QC Sample	Sample Number	Parameter	Units	LOR

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub -sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

VOC's in Soil (continued)

Method: ME-(AU)-[ENV]AN433

QC Sample	Sample Number		Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE199793.001	LB187267.004	Monocyclic	Benzene	mg/kg	0.1	3.6	<0.1	5	72
		Aromatic	Toluene	mg/kg	0.1	3.9	<0.1	5	78
			Ethylbenzene	mg/kg	0.1	4.1	<0.1	5	83
			m/p-xylene	mg/kg	0.2	8.4	<0.2	10	84
			o-xylene	mg/kg	0.1	4.3	<0.1	5	85
		Polycyclic	Naphthalene	mg/kg	0.1	4.2	<0.1	-	-
		Surrogates	d4-1,2-dichloroethane (Surrogate)	mg/kg	-	6.4	9.4	10	64 ①
			d8-toluene (Surrogate)	mg/kg	-	7.1	9.4	10	71
			Bromofluorobenzene (Surrogate)	mg/kg	-	8.1	7.7	10	81
		Totals	Total Xylenes	mg/kg	0.3	13	<0.3	-	-
			Total BTEX	mg/kg	0.6	24	<0.6	-	-

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

QC Sample	Sample Number		Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE199793.001	LB187267.004		TRH C6-C10	mg/kg	25	73	<25	92.5	78
			TRH C6-C9	mg/kg	20	54	<20	80	68
		Surrogates	d4-1,2-dichloroethane (Surrogate)	mg/kg	-	6.4	9.4	10	64 ①
			d8-toluene (Surrogate)	mg/kg	-	7.1	9.4	10	71
			Bromofluorobenzene (Surrogate)	mg/kg	-	8.1	7.7	-	81
		VPH F	Benzene (F0)	mg/kg	0.1	3.6	<0.1	-	-
		Bands	TRH C6-C10 minus BTEX (F1)	mg/kg	25	48	<25	62.5	77

MATRIX SPIKE DUPLICATES

SE199787 R1

Matrix spike duplicates are calculated as Relative Percent Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The original result is the analyte concentration of the matrix spike. The Duplicate result is the analyte concentration of the matrix spike duplicate.

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No matrix spike duplicates were required for this job.

Samples analysed as received.

Solid samples expressed on a dry weight basis.

QC criteria are subject to internal review according to the SGS QA/QC plan and may be provided on request or alternatively can be found here: https://www.sgs.com.au/~/media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022 QA QC Plan.pdf

*	NATA accreditation does not cover the performance of this service.
**	Indicative data, theoretical holding time exceeded.
-	Sample not analysed for this analyte.
IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
LOR	Limit of reporting.
QFH	QC result is above the upper tolerance.
QFL	QC result is below the lower tolerance.

①	At least 2 of 3 surrogates are within acceptance criteria.
②	RPD failed acceptance criteria due to sample heterogeneity.
③	Results less than 5 times LOR preclude acceptance criteria for RPD.
④	Recovery failed acceptance criteria due to matrix interference.
⑤	Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
⑥	LOR was raised due to sample matrix interference.
⑦	LOR was raised due to dilution of significantly high concentration of analyte in sample.
⑧	Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
⑨	Recovery failed acceptance criteria due to sample heterogeneity.
⑩	LOR was raised due to high conductivity of the sample (required dilution).
†	Refer to Analytical Report comments for further information.

SAMPLE RECEIPT ADVICE

SE199787

CLIENT DETAILS

Contact	Anwar Barbhuyia
Client	Geotechnique
Address	P.O. Box 880 PENRITH NSW 2751
Telephone	02 4722 2700
Facsimile	02 4722 6161
Email	anwar@geotech.com.au
Project	**14570/1 Warwick Farm**
Order Number	(Not specified)
Samples	15

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
Samples Received	Thu 7/11/2019
Report Due	Wed 13/11/2019
SGS Reference	**SE199787**

SUBMISSION DETAILS

This is to confirm that 15 samples were received on Thursday 7/11/2019. Results are expected to be ready by COB Wednesday 13/11/2019.
Please quote SGS reference SE199787 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	Ice Bricks
Samples received in correct containers	Yes	Sample counts by matrix	12 Sand, 3 Clay
Date documentation received	7/11/2019@2:02pm	Type of documentation received	COC
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	8.2°C	Sufficient sample for analysis	Yes
Turnaround time requested	Standard		

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

5 Soil samples have been placed on hold as no tests have been assigned for them by the client. These samples will not be processed.

SAMPLE RECEIPT ADVICE

SE199787

CLIENT DETAILS

Client Geotechnique

Project 14570/1 Warwick Farm

SUMMARY OF ANALYSIS

No.	Sample ID	OC Pesticides in Soil	PAH (Polynuclear Aromatic Hydrocarbons) in Soil	PCBs in Soil	pH in soil (1:5)	Total Phenolics in Soil	TRH (Total Recoverable Hydrocarbons) in Soil	VOC's in Soil	Volatile Petroleum Hydrocarbons in Soil
001	TP101 0.0-0.15	28	26	11	1	1	10	11	7
002	TP101 0.35-0.45	-	26	-	1	-	10	11	7
003	TP101 0.5-0.6	-	-	-	1	-	-	-	-
004	TP101 2.9-3.0	-	-	-	1	-	-	-	-
005	TP102 0.0-0.15	28	26	11	1	1	10	11	7
006	TP102 0.45-0.55	-	26	-	1	-	10	11	7
007	TP102 0.6-0.7	-	-	-	1	-	-	-	-
008	TP102 2.7-2.8	-	-	-	1	-	-	-	-
009	TP102 2.9-3.0	-	-	-	1	-	-	-	-
010	TP103 0.0-0.15	28	26	11	1	1	10	11	7
011	TP103 0.4-0.7	-	26	-	1	-	10	11	7
012	TP103 1.7-1.8	-	-	-	1	-	-	-	-
013	TP103 2.9-3.0	-	-	-	1	-	-	-	-
014	DDS1	28	26	11	-	1	10	11	7
015	TS1	-	-	-	-	-	-	8	-

CONTINUED OVERLEAF

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SAMPLE RECEIPT ADVICE

SE199787

CLIENT DETAILS

Client Geotechnique

Project 14570/1 Warwick Farm

SUMMARY OF ANALYSIS

No.	Sample ID	Exchangeable Cations and Cation Exchange Capacity	Fibre Identification in soil	Gravimetric Determination of Asbestos in Soil	Mercury in Soil	Moisture Content	Total Recoverable Elements in Soil/Waste
001	TP101 0.0-0.15	13	2	8	1	1	7
002	TP101 0.35-0.45	13	-	-	1	1	7
003	TP101 0.5-0.6	13	-	-	1	1	7
004	TP101 2.9-3.0	13	-	-	1	1	7
005	TP102 0.0-0.15	13	2	8	1	1	7
006	TP102 0.45-0.55	13	-	-	1	1	7
007	TP102 0.6-0.7	13	-	-	1	1	7
008	TP102 2.7-2.8	13	-	-	1	1	7
009	TP102 2.9-3.0	13	-	-	1	1	7
010	TP103 0.0-0.15	13	2	8	1	1	7
011	TP103 0.4-0.7	13	-	-	1	1	7
012	TP103 1.7-1.8	13	-	-	1	1	7
013	TP103 2.9-3.0	13	-	-	1	1	7
014	DDS1	-	-	-	1	1	7

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

GEOTECHNIQUE PTY LTD

1 LEMKO PLACE PENRITH NSW 2750 Tel: (02) 4722 2700

E-MAILED
7/11/19 @ 2.02pm

CHAIN OF CUSTODY

Results Required By: Normal Turnaround 4 days **Date: Wednesday, 13 November 2019**

Except pH Results Required By - **Date:**

Your Reference No.: SB199787

TO: SGS
UNIT 16, 33 MADDOX STREET
ALEXANDRIA NSW 2015 Tel: 02 8594 0400

Sampled By: SS Ref No: 14570/1 Project Manager: ANWAR BARBHUYIA

Location: Warwick Farm

	Location	Depth (m)	Date	Soil	Water	Material	Metals As Cd Cr Cu Pb Hg Ni Zn	pH	CEC	CL8 TRH BTEX PAH	CL10 Metals* TRH BTEX PAH	CL16 Metals* TRH BTEX PAH OC PCB	Be B Co Mn Se	Mn	Asbestos 0.001% w/w	Asbestos	BTEX	TRH & BTEX	PAH	OCP	OCP & PCB	Phenol	Cyanide	VOC	OCP OPP & PCB
1	TP101	0.0-0.15	6/11/19	GP		Sand		✓	✓			✓			✓							✓			
2	TP101	0.35-0.45	06/11/19	G		Clay		✓	✓		✓														
3	TP101	0.5-0.6	06/11/19	G		Clay	✓	✓	✓																
	TP101	1.5-1.6	06/11/19	G		Clay																			
	TP101	2.5-2.6	06/11/19	G		Clay																			
4	TP101	2.9-3.0	06/11/19	G		Clay	✓	✓	✓																
5	TP102	0.0-0.15	06/11/19	GP		Clay		✓	✓			✓			✓							✓			
6	TP102	0.45-0.55	06/11/19	G		Clay		✓	✓		✓														
7	TP102	0.6-0.7	06/11/19	G		Clay	✓	✓	✓																
	TP102	1.6-1.7	06/11/19	G		Clay																			
8	TP102	2.7-2.8	06/11/19	G		Clay	✓	✓	✓																
9	TP102	2.9-3.0	06/11/19	G		Clay	✓	✓	✓																
10	TP103	0.0-0.15	06/11/19	GP		Clay		✓	✓			✓			✓							✓			
11	TP103	0.4-0.7	06/11/19	G		Clay		✓	✓		✓														
	TP103	0.7-0.8	06/11/19	G		Clay																			
12	TP103	1.7-1.8	06/11/19	G		Clay	✓	✓	✓																
	TP103	2.7-2.8	06/11/19	G		Clay																			
13	TP103	2.9-3.0	06/11/19	G		Clay	✓	✓	✓																

GEOTECHNIQUE PTY LTD

1 LEMKO PLACE PENRITH NSW 2750 Tel: (02) 4722 2700

CHAIN OF CUSTODY

Results Required By: Normal Turnaround 4 days **Date: Wednesday, 13 November 2019**

Except pH Results Required By - **Date:**

Your Reference No.:

TO: SGS
UNIT 16, 33 MADDOX STREET
ALEXANDRIA NSW 2015 Tel: 02 8594 0400

Sampled By: **SS** Ref No: **14570/1** Project Manager: **ANWAR BARBHUYIA**

Location: **Warwick Farm**

	Location	Depth (m)	Date	Soil	Water	Material	Metals As Cd Cr Cu Pb Hg Ni Zn	pH	CEC	CL8 TRH BTEX PAH	CL10 Metals* TRH BTEX PAH	CL16 Metals* TRH BTEX PAH OC PCB	Be B Co Mn Se	Mn	Asbestos 0.001% w/w	Asbestos	BTEX	TRH & BTEX	PAH	OCP	OCP & PCB	Phenol	Cyanide	VOC	OCP OPP & PCB
14	DDS1		06/11/19	G		Sand						✓										✓				
15	TS1					Sand											✓									

Relinquished by			Received by		
Name	Signature	Date	Name	Signature	Date
ANWAR BARBHUYIA	AB	07/11/19			

WG: Water sample (glass bottle) G Soil sample (glass jar) FCP Fibro Cement Piece (plastic bag) *: As,Cd,Cr,Cu,Pb,Hg,Ni & Zn (8 metals)

WP: Water sample (plastic bottle) P Soil sample (plastic bag) ✓ Test required

E-MAILED
19/11/19 @ 11:04am

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

CERTIFICATE OF ANALYSIS 230329

Client Details

Client	Geotechnique Pty Ltd
Attention	Anwar Barbhuyia
Address	PO Box 880, Penrith, NSW, 2751

Sample Details

Your Reference	**14570/1, Warwick Farm**
Number of Samples	1 Soil
Date samples received	07/11/2019
Date completed instructions received	07/11/2019

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.

Report Details

Date results requested by	14/11/2019
Date of Issue	13/11/2019

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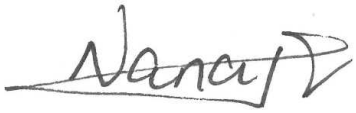
Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Diego Bigolin, Team Leader, Inorganics
Josh Williams, Senior Chemist
Loren Bardwell, Senior Chemist
Steven Luong, Organics Supervisor

Authorised By



Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil		
Our Reference		230329-1
Your Reference	UNITS	DSS1
Date Sampled		06/11/2019
Type of sample		Soil
Date extracted	-	08/11/2019
Date analysed	-	11/11/2019
TRH C_6 - C_9	mg/kg	<25
TRH C_6 - C_{10}	mg/kg	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-Xylene	mg/kg	<1
naphthalene	mg/kg	<1
Total +ve Xylenes	mg/kg	<3
Surrogate aaa-Trifluorotoluene	%	107

svTRH (C10-C40) in Soil		
Our Reference		230329-1
Your Reference	UNITS	DSS1
Date Sampled		06/11/2019
Type of sample		Soil
Date extracted	-	08/11/2019
Date analysed	-	09/11/2019
TRH C_{10} - C_{14}	mg/kg	<50
TRH C_{15} - C_{28}	mg/kg	<100
TRH C_{29} - C_{36}	mg/kg	<100
TRH >C_{10} -C_{16}	mg/kg	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50
TRH >C_{16} -C_{34}	mg/kg	<100
TRH >C_{34} -C_{40}	mg/kg	<100
Total +ve TRH (>C10-C40)	mg/kg	<50
Surrogate o-Terphenyl	%	106

PAHs in Soil		
Our Reference		230329-1
Your Reference	UNITS	DSS1
Date Sampled		06/11/2019
Type of sample		Soil
Date extracted	-	08/11/2019
Date analysed	-	08/11/2019
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	<0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	0.3
Pyrene	mg/kg	0.2
Benzo(a)anthracene	mg/kg	0.1
Chrysene	mg/kg	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	0.2
Benzo(a)pyrene	mg/kg	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
Total +ve PAH's	mg/kg	0.83
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5
Surrogate p-Terphenyl-d14	%	79

Organochlorine Pesticides in soil		
Our Reference		230329-1
Your Reference	UNITS	DSS1
Date Sampled		06/11/2019
Type of sample		Soil
Date extracted	-	08/11/2019
Date analysed	-	08/11/2019
alpha-BHC	mg/kg	<0.1
HCB	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	<0.1
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1
Surrogate TCMX	%	80

PCBs in Soil		
Our Reference		230329-1
Your Reference	UNITS	DSS1
Date Sampled		06/11/2019
Type of sample		Soil
Date extracted	-	08/11/2019
Date analysed	-	08/11/2019
Aroclor 1016	mg/kg	<0.1
Aroclor 1221	mg/kg	<0.1
Aroclor 1232	mg/kg	<0.1
Aroclor 1242	mg/kg	<0.1
Aroclor 1248	mg/kg	<0.1
Aroclor 1254	mg/kg	<0.1
Aroclor 1260	mg/kg	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1
Surrogate TCMX	%	80

Acid Extractable metals in soil		
Our Reference	UNITS	230329-1
Your Reference		DSS1
Date Sampled		06/11/2019
Type of sample		Soil
Date prepared	-	08/11/2019
Date analysed	-	08/11/2019
Arsenic	mg/kg	10
Cadmium	mg/kg	0.6
Chromium	mg/kg	16
Copper	mg/kg	20
Lead	mg/kg	120
Mercury	mg/kg	0.1
Nickel	mg/kg	3
Zinc	mg/kg	240

Misc Soil - Inorg		
Our Reference		230329-1
Your Reference	UNITS	DSS1
Date Sampled		06/11/2019
Type of sample		Soil
Date prepared	-	08/11/2019
Date analysed	-	08/11/2019
Total Phenolics (as Phenol)	mg/kg	<5

Moisture		
Our Reference		230329-1
Your Reference	UNITS	DSS1
Date Sampled		06/11/2019
Type of sample		Soil
Date prepared	-	08/11/2019
Date analysed	-	11/11/2019
Moisture	%	11

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
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	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
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-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. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-012/017	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS.
Org-012/017	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS and/or GC-MS/MS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.

Method ID	Methodology Summary
Org-012/017	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ 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. 'EQ 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. 'EQ 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-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
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-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. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			08/11/2019	[NT]	[NT]	[NT]	[NT]	08/11/2019	[NT]
Date analysed	-			11/11/2019	[NT]	[NT]	[NT]	[NT]	11/11/2019	[NT]
TRH C_6 - C_9	mg/kg	25	Org-016	<25	[NT]	[NT]	[NT]	[NT]	102	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	[NT]	[NT]	[NT]	[NT]	102	[NT]
Benzene	mg/kg	0.2	Org-016	<0.2	[NT]	[NT]	[NT]	[NT]	75	[NT]
Toluene	mg/kg	0.5	Org-016	<0.5	[NT]	[NT]	[NT]	[NT]	97	[NT]
Ethylbenzene	mg/kg	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]
m+p-xylene	mg/kg	2	Org-016	<2	[NT]	[NT]	[NT]	[NT]	115	[NT]
o-Xylene	mg/kg	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	113	[NT]
naphthalene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	119	[NT]	[NT]	[NT]	[NT]	120	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			08/11/2019	[NT]	[NT]	[NT]	[NT]	08/11/2019	[NT]
Date analysed	-			09/11/2019	[NT]	[NT]	[NT]	[NT]	09/11/2019	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	108	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	82	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	108	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	108	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	92	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	108	[NT]
Surrogate o-Terphenyl	%		Org-003	100	[NT]	[NT]	[NT]	[NT]	88	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			08/11/2019	[NT]	[NT]	[NT]	[NT]	08/11/2019	[NT]
Date analysed	-			08/11/2019	[NT]	[NT]	[NT]	[NT]	08/11/2019	[NT]
Naphthalene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Acenaphthylene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	120	[NT]
Phenanthrene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	92	[NT]
Anthracene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Pyrene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	114	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012/017	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012/017	<0.05	[NT]	[NT]	[NT]	[NT]	112	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012/017	78	[NT]	[NT]	[NT]	[NT]	86	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			08/11/2019	[NT]	[NT]	[NT]	[NT]	08/11/2019	[NT]
Date analysed	-			08/11/2019	[NT]	[NT]	[NT]	[NT]	08/11/2019	[NT]
alpha-BHC	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	64	[NT]
HCB	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	88	[NT]
gamma-BHC	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	80	[NT]
delta-BHC	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
gamma-Chlordane	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Dieldrin	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Endrin	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Endosulfan II	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	88	[NT]
Methoxychlor	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-012/017	76	[NT]	[NT]	[NT]	[NT]	93	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			08/11/2019	[NT]	[NT]	[NT]	[NT]	08/11/2019	[NT]
Date analysed	-			08/11/2019	[NT]	[NT]	[NT]	[NT]	08/11/2019	[NT]
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	118	[NT]
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-006	76	[NT]	[NT]	[NT]	[NT]	93	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date prepared	-			08/11/2019	[NT]	[NT]	[NT]	[NT]	08/11/2019	[NT]
Date analysed	-			08/11/2019	[NT]	[NT]	[NT]	[NT]	08/11/2019	[NT]
Arsenic	mg/kg	4	Metals-020	<4	[NT]	[NT]	[NT]	[NT]	107	[NT]
Cadmium	mg/kg	0.4	Metals-020	<0.4	[NT]	[NT]	[NT]	[NT]	101	[NT]
Chromium	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	110	[NT]
Copper	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	109	[NT]
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	110	[NT]
Mercury	mg/kg	0.1	Metals-021	<0.1	[NT]	[NT]	[NT]	[NT]	88	[NT]
Nickel	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	101	[NT]
Zinc	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	109	[NT]

QUALITY CONTROL: Misc Soil - Inorg						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date prepared	-			08/11/2019	[NT]	[NT]	[NT]	[NT]	08/11/2019	[NT]
Date analysed	-			08/11/2019	[NT]	[NT]	[NT]	[NT]	08/11/2019	[NT]
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	[NT]	[NT]	[NT]	[NT]	97	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

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.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

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: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-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 sam

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.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

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

Job No: 230329
Date Received: 7/11/19
Time Received: 1652
Received by: CM
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

GEOTECHNIQUE PTY LTD

Laboratory Test Request / Chain of Custody Record

Lemko Place
PENRITH NSW 2750
Tel: (02) 4722 2700

TO: ENVIROLAB SERVICES PTY LD
12 ASHLEY STREET
CHATSWOOD NSW 2067

PH: 02 9910 6200

ATTN: MS AILEEN HIE

Sampling By: SS
Ref No: 14570/1
Project:
Project Manager: AB
Location: Warwick Farm

Results required by: NORMAL TURNAROUND TIME

Sampling details				Sample type												
Location	Depth (m)	Date	Time	Soil		METALS As, Cd, Cr, Cu, Pb, Hg, Ni and Zn	TRH & BTEX	PAH	OCP	PCB	PHENOL	CYANIDE	COMBO NO		
(1) DSS1		6/11/2019	-	G		✓	✓	✓	✓	✓	✓		7		

Relinquished by			Received by			
Name	Signature	Date	Name	Signature	Date	
ANWAR BARBHUYIA	AB	7/11/2019	Claire McKenzie	Claire McKenzie	7/11/19	1652.

Legend:
G Soil sample (glass jar)
P Soil sample (plastic bag)
✓ Test required

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

SAMPLE RECEIPT ADVICE

Client Details

Client	Geotechnique Pty Ltd
Attention	Anwar Barbhuyia

Sample Login Details

Your reference	14570/1, Warwick Farm
Envirolab Reference	230329
Date Sample Received	07/11/2019
Date Instructions Received	07/11/2019
Date Results Expected to be Reported	14/11/2019

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	1 Soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	17.5
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

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@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the 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
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	PCBsin Soil	Acid Extractable metalsin soil	Misc Soil - Inorg
DSS1	✓	✓	✓	✓	✓	✓	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

APPENDIX D

UNEXPECTED FINDS MANAGEMENT PROTOCOL

GEOTECHNIQUE® PTY LTD

ABN 64 002 841 063

UNEXPECTED FINDS MANAGEMENT PROTOCOL

LOTS 22 & 23 IN DP35110
4-6 BIGGE Street, WARWICK FARM

In the event that unexpected finds and/or suspect materials (identified by unusual staining, odour, discolouration or inclusions such as building rubble, asbestos sheeting/pieces/pipes, ash material, imported fill, etc.) are encountered during future earthworks or in between sampling locations, the following actions are to be undertaken.

Management of unexpected finds and/or suspect materials
If unexpected finds and/or suspect materials are encountered:

- Works are to be ceased.
- An Environmental consultant is to be engaged to take appropriate action.
- If contamination is identified, the contaminated materials must be disposed of at an EPA licensed landfill facility with an appropriate waste classification.

Management of bonded asbestos containing material (ACM)
If ACM is encountered, the following measures are implemented:

- Engage a Class B Licence for bonded asbestos contractor.
- Removal of the asbestos waste must be carried out in accordance with the requirements of the regulators, such as SafeWork NSW and NSW EPA.
- A competent personnel or a SafeWork NSW Licensed Asbestos Assessor or a Professional Hygienist should be engaged to provide a clearance certificate.

Management of friable asbestos within the soil
It is recommended that the following measures are implemented if friable asbestos is encountered:

- Engage a Class A licensed contractor for friable asbestos
- Removal of the asbestos waste must be carried out in accordance with the requirements of the regulators, such as SafeWork NSW and NSW EPA
- A SafeWork NSW Licensed Asbestos Assessor or a Professional Hygienist must be engaged to provide a clearance certificate

APPENDIX E

ENVIRONMENTAL NOTES

IMPORTANT INFORMATION REGARDING YOUR ENVIRONMENTAL SITE ASSESSMENT

These notes have been prepared by Geotechnique Pty Ltd, using guidelines prepared by the ASFE (Associated Soil and Foundation Engineers). The notes are offered to assist in the interpretation of your environmental site assessment report.

REASONS FOR AN ENVIRONMENTAL ASSESSMENT

Environmental site assessments are typically, though not exclusively, performed in the following circumstances:

- As a pre-acquisition assessment on behalf of either a purchaser or a vendor, when a property is to be sold
- As a pre-development assessment, when a property or area of land is to be redeveloped, or the land use has changed e.g. from a factory to a residential subdivision
- As a pre-development assessment of greenfield sites, to establish baseline conditions and assess environmental, geological and hydrological constraints to the development of e.g. a landfill
- As an audit of the environmental effects of previous and present site usage

Each circumstance requires a specific approach to the assessment of soil and groundwater contamination. In all cases the objective is to identify and if possible quantify the risks that unrecognised contamination poses to the ongoing proposed activity. Such risks may be both financial (clean-up costs or limitations in site use) and physical (health risks to site users or the public).

ENVIRONMENTAL SITE ASSESSMENT LIMITATIONS

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

AN ENVIRONMENTAL SITE ASSESSMENT REPORT IS BASED ON A UNIQUE SET OF PROJECT SPECIFIC FACTORS

In the following events and in order to avoid cost problems, you should ask your consultant to assess any changes in the conclusion and recommendations made in the assessment:

- When the nature of the proposed development is changed e.g. if a residential development is proposed, rather than a commercial development
- When the size or configuration of the proposed development is altered e.g. if a basement is added
- When the location or orientation of the proposed structure is modified
- When there is a change of land ownership, or
- For application to an adjacent site

ENVIRONMENTAL SITE ASSESSMENT FINDINGS ARE PROFESSIONAL ESTIMATES

Site assessment identifies actual sub-surface conditions only at those points where samples are taken, when they are taken. Data obtained from the sampling and subsequent laboratory analyses are interpreted by geologists, engineers or scientists and opinions are drawn about the overall sub-surface conditions, the nature and extent of contamination, the likely impact on any proposed development and appropriate remediation measures. Actual conditions may differ from those inferred, because no professional, no matter how qualified and no sub-surface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, however, steps can be taken to help minimise the impact. For this reason site owners should retain the services of their consultants throughout the development stages of the project in order to identify variances, conduct additional tests that may be necessary and to recommend solutions to problems encountered on site.

Soil and groundwater contamination is a field in which legislation and interpretation of legislation by government departments is changing rapidly. Whilst every attempt is made by Geotechnique Pty Ltd to be familiar with current policy, our interpretation of the investigation findings should not be taken to be that of the relevant authority. When approval from a statutory authority is required for a project, approval should be directly sought.

STABILITY OF SUB-SURFACE CONDITIONS

Sub-surface conditions can change by natural processes and site activities. As an environmental site assessment is based on conditions existing at the time of the investigation, project decisions should not be based on environmental site assessment data that may have been affected by time. The consultant should be requested to advise if additional tests are required.

ENVIRONMENTAL SITE ASSESSMENTS ARE PERFORMED FOR SPECIFIC PURPOSES AND CLIENTS

Environmental site assessments are prepared in response to a specific scope of work required to meet the specific needs of specific individuals e.g. an assessment prepared for a consulting civil engineer may not be adequate to a construction contractor or another consulting civil engineer.

An assessment should not be used by other persons for any purpose or by the client for a different purpose. No individual, other than the client, should apply an assessment, even for its intended purpose, without first conferring with the consultant. No person should apply an assessment for any purpose other than that originally contemplated, without first conferring with the consultant.

MISINTERPRETATION OF ENVIRONMENTAL SITE ASSESSMENTS

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

LOGS SHOULD NOT BE SEPARATED FROM THE REPORT

Borehole and test pit logs are prepared by environmental scientists, engineers or geologists, based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these would not be redrawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problem, however, contractors can still misinterpret the logs during bid preparation if separated from the text of the assessment. Should this occur, delays and disputes, or unanticipated costs may result.

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

READ RESPONSIBILITY CLAUSES CLOSELY

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