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Report on
Preliminary Contamination Assessment

Proposed Contractor's Car Park
Corner of Fitzroy Street and Mount Street, Goulburn

Prepared for
Hansen Yuncken Pty Ltd

Project 94054.08
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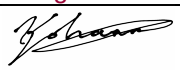
Author			15 April 2020
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1. Introduction

Douglas Partners Pty Ltd (DP) has been engaged by Hansen Yuncken Pty Ltd to complete this preliminary contamination assessment (PCA) undertaken for a proposed contractor's car park on the corner of Fitzroy Street and Mount Street, Goulburn (the site). The site is shown on Drawing CCP1, Appendix A.

The investigation was undertaken in accordance with DP's proposal CAN200051 dated 21 February 2020.

The objective of the PCA is to assess the potential for contamination at the site based on past and present land uses and to comment on the need for further investigation and/or management with regard to the proposed development.

This report must be read in conjunction with all appendices including the notes provided in Appendix A.

2. Scope of Works

The scope of work undertaken for this PCA was as follows:

- A review of readily available site information, comprising geological and topographical maps;
- A review of readily available site history information, comprising;
  - Historical and current aerial photographs;
  - Public databases held under the Contaminated Land Management Act 1997 and the Protection of the Environment Operations Act 1997; and
  - Readily accessible Council Records
- A site walkover to identify conditions that may indicate a potential for contamination, and to determine associated environmental receptors;
- Excavation of nine test pits to refusal depths of between 0.8 m and 1.2 m below ground level (bgl) using a 1.5 tonne tracked excavator;
- Collection of soil samples from each test pit. Samples were collected at regular intervals, change in strata or indicators of potential contamination. Each sample included one jar and one 500 mL plastic bag for asbestos analysis (friable asbestos (FA), asbestos fines (AF) and asbestos identification (ID);

- Laboratory analysis of nine samples for a range of the following contaminants:
  - Metals / metalloids (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc);
  - Polycyclic aromatic hydrocarbons (PAH);
  - Total recoverable hydrocarbons (TRH);
  - Benzene, toluene, ethylbenzene and xylene (BTEX);
  - Phenols;
  - Organochlorine pesticides (OCP) and organophosphorus pesticides (OPP);
  - Polychlorinated biphenyls (PCB); and
  - Asbestos (identification, FA and AF)
- Laboratory analysis of one sample for pH and CEC for the purposes of determining site specific ecological investigation levels (EILs);
- Field sampling and laboratory analysis included a Quality Assurance/Quality Control (QA/QC) plan consisting of approximately 10% inter-laboratory replicates, appropriate Chain of Custody procedures and in-house laboratory QA/QC testing; and
- Provision of this report, detailing the methodology and results of the investigation and providing comment on identified contamination issues at the site, compatibility of the site for the proposed development, recommendations for further works if considered necessary and provide comment on waste classification.

3. Site Information

Site Address	5 Fitzroy Street, Goulburn
Legal Description	Lot 1 Deposited Plan 813219
Area	2600 m^2
Zoning	Zone R1 General Residential
Local Council Area	Goulburn Mulwaree Council
Current Use	Vacant open space
Surrounding Uses	North – Public School East – Residential South – Commercial and residential West – Preschool

4. Environmental Setting

Regional Topography	The surrounding land has a gradual slope from south west to north east. Most of the surrounding land has been developed for a mix of residential and commercial development.
Site Topography	The site is lightly grassed and is sloped gently to the north-east with the highpoint of the site in the south-west. The elevation of the site ranges from approximately 664 m Australian Height Datum (AHD) to 658 m AHD. The maximum north-south, east-west dimensions of the site were approximately 75 m and 35 m, respectively
Geology	Reference to Goulburn 1:100,000 indicates the site is close to a boundary between Quaternary-aged alluvium and the Rhyanna Formation which comprises volcanoclastic sandstone, siltstones and mudstones, volcanic mudstones and quartz-lithic sandstone of Siluro-Devonian age
Acid Sulfate Soils	Online acid sulfate soils risk mapping indicates that the site is in an area of no known acid sulfate occurrences.
Surface Water	Based on online mapping, the nearest surface watercourse to the site was an unnamed creek approximately 600 m north of the site. The unnamed creek is a tributary of, and flows in a general northerly direction into, the Wollondilly River approximately 880 m north of the site.
Groundwater	Based on topography and the nearest surface watercourse, local groundwater is considered to follow the regional groundwater, flowing in a north easterly direction towards the Wollondilly River.

5. Site History

5.1 Historical Aerial Photography

Several historical aerial photographs were obtained from public databases. Extracts of the aerial photographs are included in Appendix B. A summary of key features observed for the site and surrounding land is presented in Table 1.

Table 1: Summary of Historical Aerial Photographs

Year	Site	Surrounding Land Use
1967	The site appears to be vacant undeveloped land. Immediately north of the site appears to have undergone some ground disturbance. Immediately east of the site, a footpath and road is observed.	The surrounding land appears to be partially developed for a mix of residential and commercial development. To the north and west of the, site vacant land is observed, to the east and south of the site, a mix of residential and commercial properties are observed. Fitzroy Street is already observed immediately east of the site and the alignment of Mount Street observed immediately south of the site.

Year	Site	Surrounding Land Use
1987	The photograph appears to be generally consistent with the current site layout. Some development has occurred in the north eastern portion of the site with a footpath now observed. In the north western corner of the site, some ground disturbance is also evident.	The surrounding land use appears to be relatively unchanged. The public school and associated infrastructure and development works is observed to the west and north of the site. Mount Street is also now observed to be developed.
2002	The site appears to be relatively unchanged. The previously observed ground disturbance in the north western corner of the site is now clearly visible with potential trench lines evident running in a north west to south east orientation from the north western corner to the southern/eastern boundaries of the site.	The surrounding land use appears to be relatively unchanged. The school north of the site appears to have undergone further development. To the west of the site, the preschool is now visible.
2014	The site appears to be relatively unchanged. The previously observed trench line is no longer visible however, a trench line appears to be evident running through the centre of the site in a west to east direction.	The surrounding land use to appears to be relatively unchanged.
2019	The site appears to be relatively unchanged	The surrounding land use appears to be relatively unchanged.

5.2 Public Registers and Planning Records

NSW EPA Notices	No Notices; accessed 7 April 2020
NSW EPA Licences	No Licences; accessed 7 April 2020
SafeWork NSW	Given the undeveloped nature of the site, a search of the records relating to the storage of hazardous chemicals held by SafeWork NSW has not been undertaken.
Planning Certificate(s)	Given the preliminary nature of this PCA, the planning certificates were not reviewed as part of this PCA.
Council Records	An informal request for information was made with Goulburn Mulwaree Council so that their records could be reviewed as part of this PCA. At the time of preparation of this report no information has been made available by Council. Information that is received by Council will be reviewed, and if required will be included in a revised report.

5.3 Site History Integrity Assessment

The information used to establish the history of the site was sourced from reputable and reliable reference documents, many of which were official records held by Government departments/agencies. The databases maintained by various Government agencies potentially can contain high quality information, but some of these do not contain any data at all.

In particular, aerial photographs provide high quality information that is generally independent of memory or documentation. They are only available at intervals of several years, so some gaps exist in the information from this source. The observed site features are open to different interpretations and can be affected by the time of day and/or year at which they were taken, as well as specific events, such as flooding. Care has been taken to consider different possible interpretations of aerial photographs and to consider them in conjunction with other lines of evidence.

5.4 Summary of Site History

A review of the historical aerial photographs suggest that the site was vacant and undeveloped until at least 1967 after which time the site has undergone minor development of footpaths in the northern portion of site and some ground disturbance in the north western corner of the site. Sometime between the years of 1967 to 1987, the site was developed into its current configuration and was likely used as vacant land / public open space.

6. Site Walkover

A site walkover was undertaken by an environmental engineer on 20 March 2020. The general site topography was consistent with that described in Section 4. The site layout appears to have remained unchanged from the 2019 aerial photograph. The following key site features pertinent to the PSI were observed (refer to photographs in Appendix C).

- The site was observed to be lightly grassed and vacant /public open space. No fences or other features were present restricting pedestrian or vehicular access to the site;
- Footpaths were observed along the northern, eastern and southern boundaries, with a footpath running in north westerly to south easterly direction observed in the north eastern portion of the site;
- Concrete footings and disturbed ground were observed in the north western corner of the site and immediately adjacent to the site;
- Signs of a service trench were observed running through the centre of the site in a west to east direction;
- No evidence of staining or odorous soils were noted during the site walkover; and
- No evidence of potential bonded asbestos-containing materials (ACM) were noted on the site's surface during the walkover.

7. Potential Areas of Environmental Concern

From the site history review and the site inspection, it is considered that a potential for contamination exists at the site. Two areas were identified as potential areas of environmental concern (PAEC) and are summarised in Table 2.

Table 2: Summary of Identified Potential Areas of Environmental Concern

PAEC#	Identified from	Description	Comment
1	Aerials and site walkover	Footpaths	Possible importation of fill for construction of footpaths observed in the aerials and during the walkover
2	Aerials and site walkover	Removed or demolished structure	Disturbed ground was observed in the aerials as well as during the walkover and concrete footings were also observed during the walkover

8. Preliminary Conceptual Site Model

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

Potential Sources

Based on the current investigation, the following potential sources of contamination and associated contaminants of potential concern (COPC) have been identified.

- S1: Fill: Associated with levelling and construction of footpaths.
  - COPC include metals, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylene (BTEX), polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), organochlorine pesticides (OCP), phenols and asbestos.
- S2: HBM: Associated with the removed or demolished structure.
  - o COPC include asbestos, synthetic mineral fibres (SMF), lead (in paint) and PCB.

Potential Receptors

The following potential human receptors have been identified:

- R1: Current users [public open space];
- R2: Construction and maintenance workers;
- R3: End users [commercial]; and
- R4: Adjacent site users [residential / commercial].

The following potential environmental receptors have been identified:

- R5: Surface water [Wollondilly River];
- R6: Groundwater; and
- R7: Terrestrial ecology.

Potential Pathways

The following potential pathways have been identified:

- P1: Ingestion and dermal contact;
- P2: Inhalation of dust and/or vapours;
- P3: Surface water run-off;
- P4: Lateral migration of groundwater providing base flow to water bodies;
- P5: Leaching of contaminants and vertical migration into groundwater; and
- P6: Contact with terrestrial ecology.

Summary of Potentially Complete Exposure Pathways

A 'source–pathway–receptor' approach has been used to assess the potential risks of harm being caused to human or environmental receptors from contamination sources on or in the vicinity of the site, via exposure pathways (potential complete pathways). The possible pathways between the above sources (S1 to S2) and receptors (R1 to R7) are summarised in Table 3.

Table 3: Summary of Potentially Complete Exposure Pathways

Source and COPC	Transport Pathway	Receptor	Risk Management Action
S1: Fill Metals, TRH, BTEX, PAH, OCP and asbestos S2: HBM from removal or demolishment of site structure asbestos, SMF, lead (in paint) and PCB	P1: Ingestion and dermal contact P2: Inhalation of dust and/or vapours P3: Surface water run-off P4: Lateral migration of groundwater providing base flow to water bodies P5: Leaching of contaminants and vertical migration into groundwater P6: Contact with terrestrial ecology	R1: Current users [public open space] R2: Construction and maintenance workers R3: End users [commercial] R4: Adjacent site users [commercial / residential].	An intrusive investigation is recommended to assess possible contamination including testing of the soils (undertaken as part of this PCA). The results of the chemical testing of soils are to be used as a screen for the potential for migration of contaminants to surface water or groundwater receptors.

9. Sampling and Analysis Quality Plan

In order to address the objectives of this PCA, a sampling plan for the site was established with reference to *Schedule B2, Guideline on Site Characterisation* of the National Environment Protection Council's *National Environment Protection (Assessment of Site Contamination) Measure 1999* as amended 2013 (NEPC, 2013) and the NSW EPA *Contaminated Sites Sampling Design Guidelines* 1995 (NSW EPA, 1995).

Based on an area of 0.26 ha, nine grid-based sampling locations were required in order to meet the minimum sampling points required for site characterisation recommended in NSW EPA (1995).

The investigation locations are shown on Drawing CCP1, Appendix A.

9.1 Sample Depths

Generally, soil samples were collected from the surface, then at regular depth intervals after that, including at least one sample from each stratum encountered and at signs of potential contamination. A total of 27 soil samples were collected from the nine test pits. Two QC replicate samples were collected. Sample depths ranged from 0.1 m to 1 m bgl.

9.2 Sampling Methodology

Test pits were excavated using a 1.5 tonne excavator with a 300 mm gummy bucket or 450 mm toothed bucket attachment to termination depths of between 0.8 m bgl and 1.2 m bgl. Environmental sampling was conducted with reference to standard operating procedures described in the DP *Field Procedures Manual* which included:

- The use of disposable gloves for the collection of soil samples. The gloves were replaced between each sample;
- Labelling of the sample containers with individual and unique identification details including Project No., Sample Location. and depth;
- Collection of at least 10% QC replicate samples;
- Placement of containers into a chilled, enclosed and secure container for transport to the laboratory; and
- Use of chain-of-custody documentation to ensure that sample tracking and custody can be cross-checked at any point in the transfer of samples from the field to hand-over to the laboratory.

9.3 Analytical Rationale

Nine primary soil samples and one replicate sample were submitted to a National Association of Testing Authorities (NATA) accredited laboratory (Envirolab Services Pty Ltd) for the analysis of COPC, which were selected based on the potential for contamination identified in the CSM for the site (as discussed in Section 8). The samples were selected based on the type and depth of the ground conditions encountered.

10. Site Assessment Criteria

The site is proposed to be used as a contractor's car park (commercial use). The relevant site assessment criteria (SAC) have been selected accordingly. The analytical results from the laboratory testing have been assessed (as a Tier 1 assessment) against the investigation and screening levels in Schedule B1 of NEPC (2013). The Schedule provides investigation and screening levels for commonly encountered contaminants which are applicable to generic land uses and include consideration of, where relevant, the soil type and the depth of contamination.

10.1 Health Investigation and Screening Levels

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

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

HSLs are applicable to selected petroleum compounds and fractions to assess the risk to human health via inhalation and direct contact pathways. HSLs have been developed for different land uses, soil types and depths to contamination.

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

- HIL-D: Commercial / industrial (includes premises such as shops, offices, factories and industrial sites); and
- HSL-D: Commercial / industrial (for direct contact).

The HSL adopted are predicated on the inputs summarised in the following table.

Table 4: Inputs to the Derivation of HSLs

Variable	Input	Rationale
Potential exposure pathway	Soil vapour intrusion (inhalation) / Direct contact *	Both potential exposure pathways were identified in the CSM. It is noted that direct contact HSLs are generally not the risk drivers for further site assessment for the same contamination source as the HSLs for vapour intrusion (NEPC, 2013).
Soil Type	Silt	This soil type is the predominant soil type within samples tested. If exceedances of this HSL are detected, the HSL criteria for the relevant soil type were used.
Depth to contamination	0 m to <1 m	This depth range is the most conservative and is the depth range for the samples tested.

* Developed by CRC CARE (2011)

Only those contaminants common to both Table 1A(1) (NEPC, 2013) and the list of potential contaminants applied to samples from the proposed analyte list have been included. The adopted soil HILs and HSLs are shown on the following table.

Table 5: Health Investigation and Screening Levels in mg/kg

Contaminants		HIL- D and HSL- D
Metals	Arsenic	3000
	Cadmium	900
	Chromium (III+VI)	3600
	Copper	240,000
	Lead	1500
	Nickel	6000
	Zinc	400,000
	Mercury	730
TRH	C6 – C10 (less BTEX) [F1]	260
	>C10-C16 (less Naphthalene) [F2]	NL
	>C16-C34 [F3]	NC
	>C34-C40 [F4]	NC
BTEX	Benzene	3
	Toluene	NL
	Ethylbenzene	NL
	Xylenes	NL
PAH	Benzo(a)pyrene TEQ[1]	40
	Naphthalene	NL
PAH	Total PAH	4000
OCP	Aldrin + Dieldrin	45
	Chlordane	530
	DDT+DDE+DDD	3600
	Endosulfan	2000
	Endrin	100
	Heptachlor	50
	HCB	80
	Methoxychlor	2500
OPP	Chlorphyrifos	2000

Contaminants		HIL- D and HSL- D
PCB [2]		7
Phenol	Pentachlorophenol (used as an initial screen)	660

Notes:
1 sum of carcinogenic PAH
2 non dioxin-like PCBs only
NL Non limiting
NC No criteria

10.2 Ecological Investigation and Screening Levels

Ecological investigation levels (EIL) and ecological screening level (ESL) have been derived for selected metals and organic compounds and are applicable for assessing risk to terrestrial ecosystems (NEPC, 2013). EIL and ESL depend on specific soil physiochemical properties and land use scenarios and generally apply to the top 2 m of soil, which corresponds to the root zone and habitation zone of many species.

The adopted EILs and ESLs are based on the following assumptions and obtained data:

- Soil pH of 7.3;
- Soil cation exchange capacity of 12 $cmol_c/kg$;
- Clay content of 30%;
- Contamination is 'aged' (>2 years);
- Traffic conditions 'high'; and
- Soil texture of 'fine', based on this soil type being the primary soil type of the soil samples tested.

The adopted EIL are shown in Table 6.

Table 6: Ecological Investigation Levels in mg/kg

Analyte		EIL
Metals	Arsenic	160
	Copper	320
	Nickel	330
	Chromium (VI)	970
	Lead	1800
	Zinc	840
PAH	Naphthalene	370
OCP	DDT	640

ESLs have been derived in NEPC (2013) for the same four petroleum fractions as the HSLs (F1 to F4) as well as BTEX and Benzo(a)pyrene. The ESLs are shown on the following table. The following site-specific data and assumptions have been used to determine the ESLs:

- The ESLs will apply to the top 2 m of the soil profile;
- The ESLs for commercial and industrial land use have been adopted; and
- A "fine" soil texture has been adopted based on clays and silts being the primary soil type of the soil samples tested. If exceedances of this ESL are detected, then the ESL criteria for the relevant soil texture will be used.

Table 7: Ecological Screening Levels in mg/kg

Analyte		ESL	Comments
TRH	$C_6 – C_{10}$ (less BTEX) [F1]	215*	All ESLs are low reliability apart from those marked with * which are moderate reliability
	$>C_{10}-C_{16}$ (less Naphthalene) [F2]	170*	
	$>C_{16}-C_{34}$ (F3)	2500	
	$>C_{34}-C_{40}$ (F4)	6600	
BTEX	Benzene	95	
	Toluene	135	
	Ethylbenzene	185	
	Xylenes	95	
PAH	B(a)P	1.4	

10.3 Management Limits for Petroleum Hydrocarbons

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

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

Management Limits to avoid or minimise these potential effects have been adopted in NEPC (2013) as interim Tier 1 guidance. Management Limits have been derived for the same four petroleum fractions as the HSLs (F1 to F4). The adopted Management Limits are shown on the following table. The following site-specific data and assumptions have been used to determine the Management Limits:

- The Management Limits will apply to any depth within the soil profile;
- The Management Limits for commercial and industrial land use apply; and
- A "fine" soil texture has been adopted based on clay and silts being the primary soil type of the soil samples tested. If exceedances of this management limit are detected, then the management limit criteria for the relevant soil texture will be used.

Table 8: Management Limits in mg/kg

Analyte		Management Limit
TRH	$C_6 – C_{10}$ (F1)	800
	$>C_{10}$-C_{16} (F2)	1000
	$>C_{16}$-C_{34} (F3)	5000
	$>C_{34}$-C_{40} (F4)	10,000

Notes:

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

10.4 Asbestos in Soil

A detailed asbestos assessment was not undertaken as part of these works as asbestos was not an identified as a contaminant of concern at the time of writing the proposal. Therefore, the presence or absence of asbestos at a limit of reporting of 0.1 g/kg (for asbestos ID) and 0.001 g/kg (for FA and AF) has been adopted for this assessment as an initial screen.

10.5 Waste Classification Criteria

EPA (2014) contains a six-step procedure for determining the type of waste and the waste classification. Part of the procedure, for materials not classified as special waste or pre-classified waste, is an initial comparison of analytical data against contaminant threshold (CT) values specific to a waste category.

Alternatively, the data can be assessed against specific contaminant concentration (SCC) thresholds when used in conjunction with toxicity characteristic leaching procedure (TCLP) thresholds.

The CT values relevant to this *in-situ* waste classification are shown in the laboratory summary table included in appendix.

The POEO Act defines virgin excavated natural material (VENM) as:

'*natural material (such as clay, gravel, sand, soil or rock fines):*

(a) that has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial, mining or agricultural activities and

(b) that does not contain any sulfidic ores or soils or any other waste

As a means of assessing the presence of manufactured chemicals or process residues, the analytical data for samples of natural soils were compared against published background concentrations, shown in the laboratory summary tables E1 and E2 included in the Appendix E.

11. Results

11.1 Field Work Observations

Details of the subsurface conditions encountered are given on the test pit logs included in Appendix D. These should be read in conjunction with the accompanying notes defining classification methods and descriptive terms.

Slightly variable conditions were encountered underlying the site, with the principal succession of strata broadly summarised as follows:

FILL/TOPSOIL	Brown clayey silt with trace sand and gravel and rootlets throughout encountered in Pits 4, 5 and 7 to 9 to depths 0.15 m bgl and 0.6 m bgl respectively.
FILL	Brown, red silty clay with gravel and trace rootlets encountered in Pit 6 to a depth of 0.4 m bgl.
TOPSOIL:	Dark brown clayey silt with trace sand and gravel and rootlets throughout encountered in Pits 1 to 3 to depths of between 0.15 m bgl and 0.2 m bgl.
SILTY CLAY	Brown, orange silty clay underlying the fill and topsoil in Pits 1 to 5 and 7 to 9 to termination depths of between 0.8 m bgl and 1.2 m bgl.
SANDY GRAVEL:	Brown, pale brown sandy gravel underlying the fill in Pit 6 to a termination depth of 1.0 m bgl.

Anthropogenic items were encountered in the subsurface fill to depths of 0.3 m to 0.45 m bgl in Pits 4 and 9. The anthropogenic items included glass and a redundant service pipe.

A fibrous cement fragment (suspected to contain asbestos), was observed in the subsurface fill / topsoil in Pit 8 at a depth 0.1 m bgl. The fibrous cement fragment was included in sample 8/0.1 and submitted to the lab for asbestos analysis.

A fibrous cement fragment (suspected to contain asbestos) was observed on the surface in the north eastern corner of the site. The fibrous cement fragment was sampled (AF1) and submitted to the lab for asbestos identification.

No free groundwater was encountered in any of the investigation locations. It is noted, that the test pits were backfilled immediately following excavation, thus precluding any longer-term monitoring of groundwater levels. Furthermore, groundwater levels are affected by preceding climatic conditions and soil permeability and can, therefore, fluctuate with time.

11.2 Analytical Results

The soil laboratory test results are summarised in the tables E1 and E2 provided in Appendix E along with the adopted SAC. The laboratory certificates of analysis, chain-of-custody documentation and sample receipt are included in Appendix F.

With exception of lead and asbestos, all of the analytical results for the samples collected were either less than the laboratory's practical quantitation limit (PQL) or within the adopted SAC.

The concentration of lead in two samples (1/0.1 and 2/0.1) exceeded the CT1 value for general solid waste (GSW), however was below the SCC1 criteria for GSW, with reported concentrations of 200 mg/kg and 190 mg/kg respectively. Subsequently, leachability analysis (TCLP) was undertaken on these samples, which reported TCLP concentrations less than the laboratory's PQL or below the TCLP1 criteria for GSW.

Asbestos including FA and AF, was detected via laboratory analysis in sample 8/0.1. The FA and AF detected was below the adopted SAC.

The fibrous cement fragment sample (AF1) was found not to contain asbestos.

In order to confirm the quality of the assessment data, the seven-step data quality objective process has been completed in accordance with Appendix B, Schedule B2 of NEPC (2013). The full DQO are included in the Data Quality Assessment included in Appendix G.

The QA/QC assessment is also included in the Data Quality Assessment provided in Appendix G. The results of the QA/QC assessment indicate that there are no issues precluding the use of the analytical results in the assessment.

12. Discussion

12.1 Contamination Status of the Site

Information on historical aerial photographs suggests that the site was originally vacant / open public space and has since undergone minor development including the construction of a footpath and removal or demolition of a site structure.

The field work for the PCA found minor amounts of fill to depths of between 0.15 m to 0.6 m bgl. Minor amounts of anthropogenic items including an asbestos fragment were observed within the fill.

Laboratory analysis for this PCA comprised nine primary soil samples and one intra-laboratory replicate sample. All the reported analytical results were below the adopted SAC for a commercial use. It is noted that asbestos including FA and AF has been detected via laboratory analysis, which is deemed to be friable asbestos.

Given that the proposed commercial development will consist of some form of hardstand car park and given that no other asbestos or construction and demolition waste was observed in any of the test pit locations, it is considered the there is a generally low risk to identified receptors from the asbestos encountered. If further confidence is required regarding the contamination status of the site a detailed asbestos investigation could be undertaken.

12.2 Preliminary Waste Classification

If off-site disposal is proposed as part of the proposed development, a waste classification in accordance with NSW EPA (2014) is required. Table 9 presents the results of the six-step procedure outlined in NSW EPA (2014) for determining the type of waste and the waste classification for the fill and topsoil within the site.

Table 9: Six Step Classification Procedure

Step	Comments	Rationale
1. Is the waste special waste?	Fill/Topsoil within Pit 8 and surrounding areas to the nearest pits: Yes Fill and Topsoil in remaining areas of site: No	Fill/Topsoil within Pit 8 and surrounding areas to the nearest pits: Asbestos has been observed within the fill and detected through laboratory analysis. Fill and Topsoil in remaining areas: No asbestos has been observed or detected through laboratory analysis.
2. Is the waste liquid waste?	No	The fill and topsoil at the site comprised a soil matrix.
3. Is the waste "pre-classified"?	No	The fill and topsoil are not pre-classified with reference to EPA (2014).
4. Does the waste possess hazardous waste characteristics?	No	The waste was not observed to contain or considered at risk of containing explosives, gases, flammable solids, oxidising agents, organic peroxides, toxic substances, corrosive substances, coal tar, batteries, lead paint or dangerous goods containers.
5. Determining a wastes classification using chemical assessment	Conducted	Refer to Tables E1 and E2, Appendix E.
6. Is the waste putrescible or non-putrescible?	Non-putrescible	The fill and topsoil do not contain materials considered to be putrescible [a].

As shown in Tables E1 and E2 in Appendix E, with the exception of lead in two samples collected from topsoil in Pits 1 and 2, all contaminant concentrations from the analysed samples were within the contaminant thresholds (CT1) for GSW.

The reported concentrations of lead in samples 1/0.1 and 2/0.1 did not exceed the SCC1 and TCLP1 value to classify as GSW.

Based on the observations at the time of the sampling and the reported analytical results, the following waste classifications apply:

- Fill/Topsoil within Pit 8 and surrounding areas to the nearest pit: Special Waste (Asbestos), with the soil component classified as General Solid Waste (Non-Putrescible)
- Fill and Topsoil in remaining areas of the site: General Solid Waste (Non-Putrescible)

Table 10 presents the results of the VENM assessment of natural materials at the site, if off-site disposal of natural material is proposed as part of the development works

Table 10: VENM Classification Procedure

Item	Comments	Rationale
1. Is the material natural?	Yes	Natural materials logged in the investigation locations as comprising silty clay and sandy gravel.
2. Is the material impacted by manufactured chemicals or process residues?	No	There were no visual indicators of chemical contamination of the materials in the test pits. Contaminant concentrations were within typical background levels (Tables 1 and 2 in Appendix E).
3. Are the materials acid sulfate soils?	No	A review of the Acid Sulfate Soil Risk Map shows the site is in an area of no known ASS occurrence.
4. Are there current or previous land uses that have (or may have) contaminated the materials?	No	Previous land uses may have impacted on surface soils overlying the materials. Low chemical concentrations indicate no likely impact on the natural materials.

As shown in Tables E1 and E2 in Appendix E, all contaminant concentrations for the analysed natural soil samples were within the typical background concentrations. Based on the outcomes presented in Table 10, the natural soils described as comprising brown silty clay and brown, pale brown sandy gravel within the site, are classified as VENM.

Following the removal of the fill, the VENM classification of the natural soils should be confirmed via analytical or other means, particularly in the asbestos contaminated area, to confirm that all impacted materials have been removed and the natural soil has not been cross-contaminated by the fill.

The materials classified as VENM are pre-classified as General Solid Waste (non-putrescible) under EPA (2014). Furthermore, VENM may be applied to land in an off-site location without the requirement of a licence under the POEO Act.

12.2.1 Conditions

If any materials are encountered that are different to those sampled and tested or exhibit signs of potential contamination (e.g.: anthropogenic inclusions, staining or odours) this waste classification does not apply and the advice of a qualified environmental consultant should be sought.

All asbestos works involving non-friable asbestos must be undertaken by an Asbestos Contractor with a Class A asbestos removal licence issued by SafeWork NSW (formerly WorkCover). The Asbestos Contractor must ensure that the remediation and transportation work is adequately supervised and carried out in a safe manner.

If during excavation, the natural in-situ soil is found to contain possible signs of contamination or is cross-contaminated with any non-VENM materials, the excavated natural soil cannot be classified as VENM. In this regard, it is also recommended that care should be taken during the bulk excavation of the VENM to prevent cross contamination between the VENM and non-VENM materials.

Both the receiving site and the site disposing of the material should satisfy the requirements of the licence before disposal of the material is undertaken. Note that appropriate prior arrangement with the receiving site/relevant authorities should be obtained prior to the disposal of any material off site. The receiving site should check to ensure that the material received matches the description provided in this report and contains no cross contamination. The handling, transport and disposal of the materials should be conducted in accordance with regulatory and statutory requirements. DP does not accept liability for the unlawful disposal of waste materials from any site. DP accepts no responsibility for the material tracking, loading, management, transport or disposal of waste from the site.

13. Conclusions and Recommendations

Based on the results of the assessment, the following conclusions are made:

- The site is considered to have a low likelihood of substantial contamination that would impact the suitability of the site for the proposed contractor's car park from a contaminated land perspective;
- If off-site disposal of any surplus materials is required, the following classifications apply:
    - Fill/Topsoil within Pit 8 and surrounding areas to the nearest pit: Special Waste (Asbestos), with the soil component classified as General Solid Waste (Non-Putrescible);
    - Fill and Topsoil in remaining areas of the site: General Solid Waste (Non-Putrescible); and
    - Natural materials at the site are classified as VENM.

Based on the above conclusions the following recommendations are made:

- As a matter of due diligence, an unexpected finds protocol (UFP) should be implemented as part of a construction environmental management plan (CEMP) for any proposed development works; and
- If a more sensitive land use or substantial ground disturbance are proposed at the site in future, further detailed asbestos investigation may be warranted.

14. References

Australian Collaborative Land Evaluation Program, Acid Sulfate Soils Risk Map [http://www.asris.csiro.au/arcgis/rest/services/ASRIS/Acid_Sulfate_Soils/MapServer]

CLM Act *Contaminated Land Management Act 1997;*

CLM Regulation *Contaminated Land Management Regulation 2013;*

Geological Survey of NSW Goulburn, 1:100 000 Geology Sheet

NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013)

NSW EPA (2017) Guidelines for the NSW Site Auditor Scheme (3rd Edition)
NSW EPA (2014) Waste Classification Guidelines, New South Wales Environmental Protection Authority,

NSW OEH (2011) Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites

POEO Act Protection of the Environment Operations Act 1997; and

POEO (Waste) Regulation Protection of the Environment Operations (Waste) Regulation 2014

15. Limitations

Douglas Partners (DP) has prepared this supplementary investigation report for this project at Corner of Fitzroy Street and Mount Street in accordance with DP's proposal CAN200051 dated 21 February 2020 and acceptance received from Hansen Yuncken Pty Ltd . This report is provided for the exclusive use of Hansen Yuncken Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

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

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

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report. This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

Asbestos has been detected by observation and by laboratory analysis, in filling materials at the test locations sampled and analysed. Although the sampling plan adopted for this investigation is considered appropriate to achieve the stated project objectives, there are necessarily parts of the site that have not been sampled and analysed. This is either due to undetected variations in ground conditions or to budget constraints or to vegetation preventing visual inspection. It is therefore considered possible that HBM, including asbestos, may be present in unobserved or untested parts of the site, between and beyond sampling locations, and hence no warranty can be given that asbestos is not present.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the environmental components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

Douglas Partners Pty Ltd

Appendix A

About This Report
Drawings

About this Report

Douglas Partners

Introduction

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

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

Copyright

Borehole and Test Pit Logs

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

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

Groundwater

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

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

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

Reports

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

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

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

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

About this Report

Site Anomalies

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

Information for Contractual Purposes

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

Site Inspection

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

Sampling Methods

Douglas Partners

Sampling

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

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

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

Test Pits

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

Large Diameter Augers

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

Continuous Spiral Flight Augers

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

Non-core Rotary Drilling

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

Continuous Core Drilling

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

Standard Penetration Tests

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

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

The test results are reported in the following form.

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

  4,6,7
  N=13

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

  15, 30/40 mm

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

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

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

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

Symbols & Abbreviations

Douglas Partners

Introduction

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

Drilling or Excavation Methods

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

Water

▷	Water seep
▽	Water level

Sampling and Testing

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

Description of Defects in Rock

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

Defect Type

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

Orientation

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

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

Coating or Infilling Term

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

Coating Descriptor

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

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

Symbols & Abbreviations

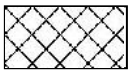
Graphic Symbols for Soil and Rock

General


Asphalt


Road base


Concrete

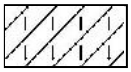

Filling

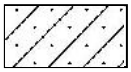
Soils


Topsoil

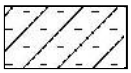

Peat


Clay

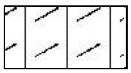

Silty clay

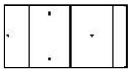

Sandy clay

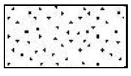

Gravelly clay

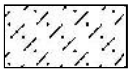

Shaly clay

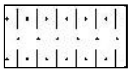

Silt


Clayey silt


Sandy silt

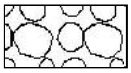

Sand

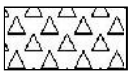

Clayey sand


Silty sand


Gravel


Sandy gravel


Cobbles, boulders

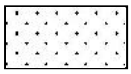

Talus

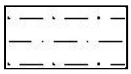
Sedimentary Rocks

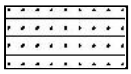

Boulder conglomerate

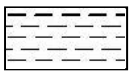

Conglomerate


Conglomeratic sandstone

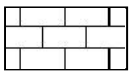

Sandstone


Siltstone

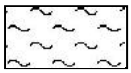

Laminite

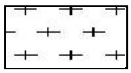

Mudstone, claystone, shale

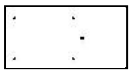

Coal


Limestone

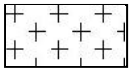
Metamorphic Rocks

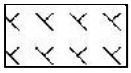

Slate, phyllite, schist


Gneiss

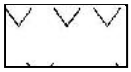

Quartzite

Igneous Rocks

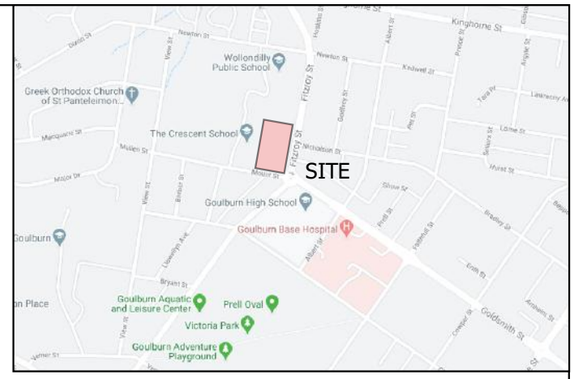

Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry



LOCALITY MAP

Notes:
1. Basemap from nearmap.com (dated 6 April 2019)
2. Test locations shown are approximate only

Legend

- Approximate Car Park Area
- Approximate Area claasifed as Special Waste (Asbestos) with Soil Component Classifed as General Solid Waste
- Test Pit Location with Asbestos Detected
- Test Pit Locations

0 10 20 30 40 50 m

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Hansen Yuncken Pty Ltd		
OFFICE:	Wollongong	DRAWN BY:	KJ
SCALE:	As Shown	DATE:	3.04.2020

TITLE: **Test Pit Location Plan**
Proposed Contractor's Car Park
Corner Fiztroy Street and Mount Street, Goulburn

N

PROJECT No:	94054.08
DRAWING No:	CCP1
REVISION:	0

Appendix B

Historical Aerial Photographs

Douglas Partners
Geotechnics / Environment / Groundwater

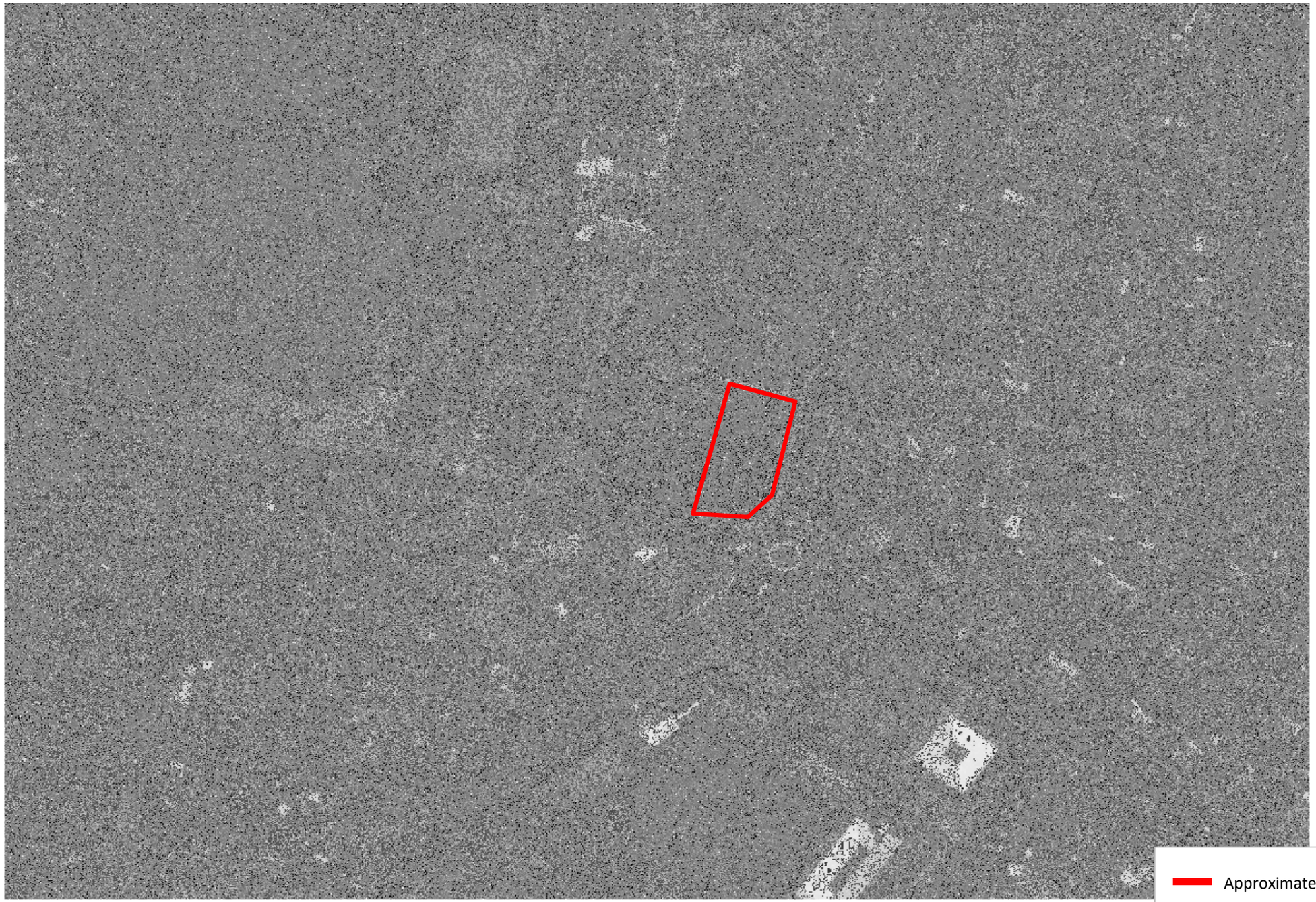
Client:	Hansen Yuncken Pty Ltd		
Office:	Wollongong	Drawn by:	KJ
Scale:	NTS	Date:	Apr-20

Aerial Photograph 1967

Preliminary Contamination Assessment

Proposed Contractor's Car Park, Corner of Fitzroy Street and Mount Street, Goulburn

Project No.	94054.08
Plate no	1
Revision:	0



Douglas Partners
Geotechnics / Environment / Groundwater

Client:	Hansen Yuncken Pty Ltd		
Office:	Wollongong	Drawn by:	KJ
Scale:	NTS	Date:	Apr-20

Aerial Photograph 1987

Preliminary Contamination Assessment

Proposed Contractor's Car Park, Corner of Fitzroy Street and Mount Street, Goulburn

Project No.	94054.08
Plate no	2
Revision:	0

Douglas Partners Geotechnics / Environment / Groundwater	Client: Hansen Yuncken Pty Ltd		Aerial Photograph 1987	Project No.	94054.08
	Office: Wollongong	Drawn by: KJ	Preliminary Contamination Assessment	Plate no	3
	Scale: NTS	Date: Apr-20	Proposed Contractor's Car Park, Corner of Fitzroy Street and Mount Street, Goulburn	Revision:	0

Approximate Site Location

Douglas Partners Geotechnics / Environment / Groundwater	Client:	Hansen Yuncken Pty Ltd		Aerial Photograph 2014	Project No. 94054.08
	Office: Wollongong	Drawn by: KJ		Preliminary Contamination Assessment	Plate no 4
	Scale: NTS	Date: Apr-20		Proposed Contractor's Car Park, Corner of Fitzroy Street and Mount Street, Goulburn	Revision: 0

Appendix C

Site Photographs

Photo 1: View from south eastern corner of site looking north along eastern boundary.

Photo 2: View from south east corner of the site looking west along southern boundary.

Photo 3: Concrete footings observed in north western corner of the site.

Photo 4: View of asbestos fragment observed in the fill in Pit 8.

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Hansen Yuncken Pty Ltd	**Site Photographs 1 to 4**	PROJECT No: 94054.08
	OFFICE: Wollongong — Undertaken By: KJ	**Preliminary Contamination Assessment**	PLATE No: 1
	SCALE: NTS — Date: 7 Apr 2020	**Proposed Contractors Car Park, Corner of Fitzroy Street and Mount Street, Goulburn**	REVISION: 0

Appendix D

Test Pit Logs

TEST PIT LOG

CLIENT: Hansen Yunken Pty Ltd
PROJECT: Proposed Contractor's Car Park
LOCATION: Corner Fiztroy Street and Mount Street, Goulburn

SURFACE LEVEL: --
EASTING: 748185
NORTHING: 6151842

PIT No: 1
PROJECT No: 94054.08
DATE: 20/3/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
		TOPSOIL/Clayey SILT OL: low plasticity, dark brown, with trace fine to coarse grained sand and fine to coarse gravel (ironstone) and rootlets throughout, w > PL, firm.		E	0.1				
	0.2	Silty CLAY CH: medium to high plasticity, brown-pale brown, with fine to coarse gravel (ironstone) and trace rootlets, w ~ PL, firm to stiff		E	0.5		pp = 100-150		
		- becoming brown-orange, w < PL, very stiff to hard							
1	1.0	Pit discontinued at 1.0m Refusal		E	1.0		pp = 350-400		1
2									2

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: 1.5 tonne excavator with 300mm gummy bucket

LOGGED: KJ

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: BR1 taken at 0.1m

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

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Hansen Yunken Pty Ltd
PROJECT: Proposed Contractor's Car Park
LOCATION: Corner Fiztroy Street and Mount Street, Goulburn

SURFACE LEVEL: --
EASTING: 748170
NORTHING: 6151849

PIT No: 2
PROJECT No: 94054.08
DATE: 20/3/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
		TOPSOIL/Clayey SILT OL: low plasticity, dark brown, with trace fine to coarse grained sand and fine to coarse gravel (ironstone) and rootlets throughout, w > PL, firm.		E	0.1				
	0.15	Silty CLAY CH: medium to high plasticity, brown-pale brown, with fine to coarse gravel (ironstone) and trace rootlets, w ~ PL, firm to stiff		E	0.5		pp = 200-250		
		- becoming brown-orange, w < PL, very stiff to hard							
1	1.0	Pit discontinued at 1.0m Refusal		E	1.0		pp = 400-450		1
2									2

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: 1.5 tonne excavator with 300mm gummy bucket

LOGGED: KJ

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Hansen Yunken Pty Ltd
PROJECT: Proposed Contractor's Car Park
LOCATION: Corner Fiztroy Street and Mount Street, Goulburn

SURFACE LEVEL: --
EASTING: 748154
NORTHING: 6151839

PIT No: 3
PROJECT No: 94054.08
DATE: 20/3/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
		TOPSOIL/Clayey SILT OL: low plasticity, dark brown, with trace fine to coarse grained sand and fine to coarse gravel (ironstone) and rootlets throughout, w > PL, firm.		E	0.1				
	0.15	Silty CLAY CH : medium to high plasticity, brown-pale brown, with fine to coarse gravel (ironstone) and trace rootlets, w ~ PL, firm to stiff							
		- becoming brown-orange, w < PL, very stiff to hard		E	0.5		pp = 250-300		
	1.0	Pit discontinued at 1.0m Refusal		E	1.0		pp = 400-450		

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20; 1; 2

RIG: 1.5 tonne excavator with 300mm gummy bucket

LOGGED: KJ

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Hansen Yunken Pty Ltd
PROJECT: Proposed Contractor's Car Park
LOCATION: Corner Fiztroy Street and Mount Street, Goulburn

SURFACE LEVEL: --
EASTING: 748160
NORTHING: 6151858

PIT No: 4
PROJECT No: 94054.08
DATE: 20/3/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
		FILL/TOPSOIL: Clayey SILT OL, low plasticity, brown, with trace fine to coarse grained sand and fine to coarse gravel (ironstone) and rootlets throughout, w > PL.		E	0.1				
		- glass bottle observed							
	0.4	Silty CLAY CH : medium to high plasticity, brown-pale brown, with fine to coarse gravel (ironstone) and trace rootlets, w ~ PL, firm to stiff		E	0.5		pp = 150-200		
		- becoming brown-orange, w < PL, very stiff to hard							
	0.8	Pit discontinued at 0.8m		E	0.8		pp = 450-500		
		Refusal							
	1								
	2								

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: 1.5 tonne excavator with 300mm gummy bucket

LOGGED: KJ

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Hansen Yunken Pty Ltd
PROJECT: Proposed Contractor's Car Park
LOCATION: Corner Fiztroy Street and Mount Street, Goulburn

SURFACE LEVEL: --
EASTING: 748163
NORTHING: 6151876

PIT No: 5
PROJECT No: 94054.08
DATE: 20/3/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
	0.15	FILL/TOPSOIL: Clayey SILT OL, low plasticity, brown, with trace fine to coarse grained sand and fine to coarse gravel (ironstone) and rootlets throughout, w > PL.		E	0.1				
	0.6	FILL/Silty CLAY CH: medium to high plasticity, brown-pale brown, with fine to coarse gravel (ironstone) and trace rootlets, w < PL		E	0.5		pp = 150-200		
	0.9	Silty CLAY CH : medium to high plasticity, brown-pale brown, with fine to coarse gravel (ironstone) and trace rootlets, w ~ PL, very stiff to hard		E	0.9		pp = 450-500		
	1	Pit discontinued at 0.9m Refusal							
	2								

5 10 15 20

RIG: 1.5 tonne excavator with 300mm gummy bucket

LOGGED: KJ

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Hansen Yunken Pty Ltd
PROJECT: Proposed Contractor's Car Park
LOCATION: Corner Fiztroy Street and Mount Street, Goulburn

SURFACE LEVEL: --
EASTING: 748169
NORTHING: 6151905

PIT No: 6
PROJECT No: 94054.08
DATE: 20/3/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
		FILL/Silty CLAY CH: medium to high plasticity, brown-red, with fine to coarse gravel (ironstone) and trace rootlets, w < PL		E	0.1				
	0.4	Sandy GRAVEL GC: fine to coarse, brown-pale brown, fine to coarse grained sand with trace cobbles (sandstone) and clay. (Gravels mostly comprised sandstone)		E	0.5		pp = 100-150		
1	1.0	Pit discontinued at 1.0m Refusal		E	1.0		pp = 400-450		
2									

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: 1.5 tonne excavator with 450mm toothed bucket

LOGGED: KJ

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Hansen Yunken Pty Ltd
PROJECT: Proposed Contractor's Car Park
LOCATION: Corner Fiztroy Street and Mount Street, Goulburn

SURFACE LEVEL: --
EASTING: 748196
NORTHING: 6151901

PIT No: 7
PROJECT No: 94054.08
DATE: 20/3/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
	0.2	FILL/TOPSOIL: Clayey SILT OL, low plasticity, brown, with trace fine to coarse grained sand and fine to coarse gravel (ironstone) and rootlets throughout, w > PL.		E	0.1				
		Silty CLAY CH : medium to high plasticity, brown-orange, with fine to coarse gravel (ironstone) and trace rootlets, w ~ PL, firm to stiff		E	0.5		pp = 100-150		
		- w < PL, very stiff to hard							
	0.9	Pit discontinued at 0.9m		E	0.9		pp = 400-450		
	1	Refusal							
	2								

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: 1.5 tonne excavator with 300mm gummy bucket

LOGGED: KJ

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Hansen Yunken Pty Ltd
PROJECT: Proposed Contractor's Car Park
LOCATION: Corner Fiztroy Street and Mount Street, Goulburn

SURFACE LEVEL: --
EASTING: 748180
NORTHING: 6151889

PIT No: 8
PROJECT No: 94054.08
DATE: 20/3/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
		FILL/TOPSOIL: Clayey SILT OL, low plasticity, brown, with trace fine to coarse grained sand and fine to coarse gravel (ironstone) and rootlets throughout, w > PL. fibre cement fragment observed (contains asbestos)		E	0.1				
	0.4	Silty CLAY CH : medium to high plasticity, brown-orange, with fine to coarse gravel (ironstone) and trace rootlets, w ~ PL, firm to stiff		E	0.5		pp = 100-150		
	1	- w < PL, very stiff to hard		E	1.0		pp = 400-450		
	1.2	Pit discontinued at 1.2m Refusal							
	2								

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: 1.5 tonne excavator with 300mm gummy bucket

LOGGED: KJ

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: BR2 taken at 0.1m

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

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Hansen Yunken Pty Ltd
PROJECT: Proposed Contractor's Car Park
LOCATION: Corner Fiztroy Street and Mount Street, Goulburn

SURFACE LEVEL: --
EASTING: 748189
NORTHING: 6151867

PIT No: 9
PROJECT No: 94054.08
DATE: 20/3/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
		FILL/TOPSOIL: Clayey SILT OL, low plasticity, brown, with trace fine to coarse grained sand and fine to coarse gravel (ironstone) and rootlets throughout, w > PL.		E	0.1				
				E	0.5		pp = 100-150		
	0.6	Silty CLAY CH : medium to high plasticity, brown-orange, with fine to coarse gravel (ironstone) and trace rootlets, w ~ PL, firm to stiff							
		- w < PL, very stiff to hard							
1	1.0	Pit discontinued at 1.0m Refusal		E	1.0		pp = 400-450		1
2									2

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: 1.5 tonne excavator with 300mm gummy bucket

LOGGED: KJ

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

SAMPLING & IN SITU TESTING LEGEND

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

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Appendix E

Summary of Laboratory Results: Tables 1 and 2

Douglas Partners
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Table E1: Summary of Laboratory Results – Metals, TRH, BTEX, PAH

			Metals									TRH						BTEX				PAH			
			Arsenic	Cadmium	Total Chromium[d]	Copper	Lead	Lead TCLP	Mercury (inorganic)	Nickel	Zinc	TRH C6 - C9	TRH >C10-C36	F1 ((C6-C10)-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)	Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene[b]	Benzo(a)pyrene (BaP)	Benzo(a)pyrene TEQ	Total PAHs
		PQL	4	0.4	1	1	1	0.03	0.1	1	1	25	50	25	50	100	100	0.2	0.5	1	1	1	0.05	0.5	0.05
Sample Id	Depth	Sampled Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
1	0.1m	20/03/2020	6 3000 160	<0.4 900 NC	47 3600 970	30 240000 320	**200** 1500 1800	<0.03 NC NC	0.2 730 NC	8 6000 330	170 400000 840	<25 NC NC	<50 NC NC	<25 NC NC	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	<1 NL 370	0.1 NC 1.4	<0.5 40 NC	0.54 4000 NC
2	0.1m	20/03/2020	9 3000 160	<0.4 900 NC	46 3600 970	37 240000 320	**190** 1500 1800	0.09 NC NC	0.2 730 NC	18 6000 330	260 400000 840	<25 NC NC	<50 NC NC	<25 250 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	<1 NL 370	0.1 NC 1.4	<0.5 40 NC	0.92 4000 NC
3	0.1m	20/03/2020	<4 3000 160	<0.4 900 NC	24 3600 970	11 240000 320	37 1500 1800	NT NC NC	<0.1 730 NC	6 6000 330	40 400000 840	<25 NC NC	<50 NC NC	<25 250 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	<1 NL 370	<0.05 NC 1.4	<0.5 40 NC	<0.05 4000 NC
4	0.1m	20/03/2020	5 3000 160	<0.4 900 NC	25 3600 970	12 240000 320	53 1500 1800	NT NC NC	<0.1 730 NC	6 6000 330	69 400000 840	<25 NC NC	<50 NC NC	<25 250 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	<1 NL 370	<0.05 NC 1.4	<0.5 40 NC	0.1 4000 NC
5	0.5m	20/03/2020	6 3000 160	<0.4 900 NC	36 3600 970	10 240000 320	20 1500 1800	NT NC NC	<0.1 730 NC	7 6000 330	25 400000 840	<25 NC NC	<50 NC NC	<25 250 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	<1 NL 370	<0.05 NC 1.4	<0.5 40 NC	<0.05 4000 NC
6	0.1m	20/03/2020	10 3000 160	<0.4 900 NC	91 3600 970	12 240000 320	23 1500 1800	NT NC NC	<0.1 730 NC	8 6000 330	9 400000 840	<25 NC NC	<50 NC NC	<25 250 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	<1 NL 370	<0.05 NC 1.4	<0.5 40 NC	<0.05 4000 NC
7	0.1m	20/03/2020	7 3000 160	<0.4 900 NC	61 3600 970	9 240000 320	16 1500 1800	NT NC NC	<0.1 730 NC	5 6000 330	7 400000 840	<25 NC NC	<50 NC NC	<25 250 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	<1 NL 370	<0.05 NC 1.4	<0.5 40 NC	<0.05 4000 NC
8	0.1m	20/03/2020	6 3000 160	<0.4 900 NC	45 3600 970	11 240000 320	17 1500 1800	NT NC NC	0.2 730 NC	8 6000 330	16 400000 840	<25 NC NC	<50 NC NC	<25 250 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	<1 NL 370	<0.05 NC 1.4	<0.5 40 NC	<0.05 4000 NC
BR2[a]	0.1m	20/03/2020	6 3000 160	<0.4 900 NC	44 3600 970	16 240000 320	18 1500 1800	NT NC NC	0.2 730 NC	10 6000 330	17 400000 840	<25 NC NC	<50 NC NC	<25 250 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	<1 NL 370	NT NC 1.4	NT 40 NC	NT 4000 NC
9	0.1m	20/03/2020	<4 3000 160	<0.4 900 NC	37 3600 970	10 240000 320	41 1500 1800	NT NC NC	<0.1 730 NC	5 6000 330	45 400000 840	<25 NC NC	<50 NC NC	<25 250 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	<1 NL 370	<0.05 NC 1.4	<0.5 40 NC	<0.05 4000 NC
Waste Classifcation Criteria																									
CT1			100	20	100	NC	100	NC	4	40	NC	650	10000	NC	NC	NC	NC	10	288	600	1000	NC	0.8	NC	200
SCC1			500	100	1900	NC	1500	NC	50	1050	NC	650	10000	NC	NC	NC	NC	18	518	1080	1800	NC	10	NC	200
TCLP1			NA	NA	NA	NC	NA	5	NA	NA	NC	NC	NC	NC	NC	NC	NC	NA	NA	NA	NA	NC	NA	NC	NC
Published Background Values																									
Olszowy et al (1995) - Urban Soils (0-150mm) [g]			<5-40	<0.5-14	5-131	<5-466	3-1465	<0.1-3.4	<5-160	5-3820	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Berkman 4th Edition (2001) - Field Geologists Manual [h]			1-50	1	5-1000	2-100	2-200	0.03	5-500	10-300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Adopted Comparative Values for VENM Classification																									
Adopted Comparative Values			20	1	75	100	50	0.5	30	150	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC

Lab result
HIL/HSL value EIL/ESL value

HIL/HSL exceedance EIL/ESL exceedance HIL/HSL and EIL/ESL exceedance ML exceedance ML and HIL/HSL or EIL/ESL exceedance

Indicates that asbestos has been detected by the lab below the PQL, refer to the lab report **Blue** = DC exceedance

Bold = Exceedance of waste classifcation criteria NT = Not tested NL = Non limiting NC = No criteria NA = Not applicable NAD = No asbestos detected

Notes:

HIL/HSL/DC	NEPC, Schedule B1 - HIL D (Commercial / Industrial), HSL D (Commercial / Industrial), DC HSL D (Direct contact HSL D Commercial/Industrial)
EIL/ESL	NEPC, Schedule B1 - EIL C/Ind (Commercial and Industrial), ESL C/Ind (Commercial and Industrial)
ML	NEPC, Schedule B1 - ML C/Ind (Commercial and Industrial)
a	QA/QC replicate of sample listed directly below the primary sample
b	Reported naphthalene laboratory result obtained from BTEXN suite
c	Criteria applies to DDT only
d	Total Chromium used as an initial screen.
e	Criteria for Scheduled Chemicals used as an initial screen
f	Criteria for Chlorpyrifos used as initial screen
g	Olszowy, H., P. Torr, and P. Imray. 1995. Trace element concentrations in soil from rural and urban areas of Australia. Contaminated Sites Monograph Series 4. South Australian Health Commission. Glenelg Press, Glenelg, Australia.
h	Average abundance of selected minor elements in the earth's crust (soils) - taken predominantly from Swaine D J, 1995, The trace element content of soils
CT1	NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values of specific contaminant concentration (SCC) for classification without TCLP: General solid waste
SCC1	NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste
TCLP1	NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste

Douglas Partners
Geotechnics | Environment | Groundwater

Table E2: Summary of Laboratory Results – Phenol, OCP, OPP, PCB, Asbestos, Asbestos

			Phenol	OCP									OPP		PCB	Asbestos								
			Phenol	DDT+DDE+DDD [c]	Aldrin & Dieldrin	Total Chlordane	Total Endosulfan	Endrin	Heptachlor	HCB	Methoxychlor	Total OCP[e]	Chlorpyriphos	Total OCP[f]	Total PCB	Trace Analysis	Asbestos ID in Materials	Asbestos ID in soil >0.1g/kg	Trace Analysis	Asbestos ID in soil <0.1g/kg	ACM >7mm Estimation	FA and AF Estimation	FA and AF Estimation	Asbestos (500 ml)
		PQL	5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1								<0.001	0.001
Sample ID	Depth	Sampled Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	-	-	-	-	g	g	%(w/w)	-
1	0 - 0.1m	20/03/2020	<5 660 NC	<0.1 3600 640	<0.1 45 NC	<0.1 530 NC	<0.1 2000 NC	<0.1 100 NC	<0.1 50 NC	<0.1 80 NC	<0.1 2500 NC	<0.1 NC NC	<0.1 2000 NC	<0.1 NC NC	<0.1 7 NC	NAD	NT	NAD	NAD	NAD	NT	NT	NAD	NAD
2	0 - 0.1m	20/03/2020	<5 660 NC	<0.1 3600 640	<0.1 45 NC	<0.1 530 NC	<0.1 2000 NC	<0.1 100 NC	<0.1 50 NC	<0.1 80 NC	<0.1 2500 NC	<0.1 NC NC	<0.1 2000 NC	<0.1 NC NC	<0.1 7 NC	NAD	NT	NAD	NAD	NAD	NT	NT	NAD	NAD
3	0 - 0.1m	20/03/2020	<5 660 NC	<0.1 3600 640	<0.1 45 NC	<0.1 530 NC	<0.1 2000 NC	<0.1 100 NC	<0.1 50 NC	<0.1 80 NC	<0.1 2500 NC	<0.1 NC NC	<0.1 2000 NC	<0.1 NC NC	<0.1 7 NC	NAD	NT	NAD	NAD	NAD	NT	NT	NAD	NAD
4	0 - 0.1m	20/03/2020	<5 660 NC	<0.1 3600 640	<0.1 45 NC	<0.1 530 NC	<0.1 2000 NC	<0.1 100 NC	<0.1 50 NC	<0.1 80 NC	<0.1 2500 NC	NT NC NC	<0.1 2000 NC	<0.1 NC NC	<0.1 7 NC	NAD	NT	NAD	NAD	NAD	NT	NT	NAD	NAD
5	0 - 0.5m	20/03/2020	<5 660 NC	<0.1 3600 640	<0.1 45 NC	<0.1 530 NC	<0.1 2000 NC	<0.1 100 NC	<0.1 50 NC	<0.1 80 NC	<0.1 2500 NC	<0.1 NC NC	<0.1 2000 NC	<0.1 NC NC	<0.1 7 NC	NAD	NT	NAD	NAD	NAD	NT	NT	NAD	NAD
6	0 - 0.1m	20/03/2020	<5 660 NC	<0.1 3600 640	<0.1 45 NC	<0.1 530 NC	<0.1 2000 NC	<0.1 100 NC	<0.1 50 NC	<0.1 80 NC	<0.1 2500 NC	NT NC NC	<0.1 2000 NC	<0.1 NC NC	<0.1 7 NC	NAD	NT	NAD	NAD	NAD	NT	NT	NAD	NAD
7	0 - 0.1m	20/03/2020	<5 660 NC	<0.1 3600 640	<0.1 45 NC	<0.1 530 NC	<0.1 2000 NC	<0.1 100 NC	<0.1 50 NC	<0.1 80 NC	<0.1 2500 NC	NT NC NC	<0.1 2000 NC	<0.1 NC NC	<0.1 7 NC	NAD	NT	NAD	NAD	NAD	NT	NT	NAD	NAD
8	0 - 0.1m	20/03/2020	<5 660 NC	<0.1 3600 640	<0.1 45 NC	<0.1 530 NC	<0.1 2000 NC	<0.1 100 NC	<0.1 50 NC	<0.1 80 NC	<0.1 2500 NC	<0.1 NC NC	<0.1 2000 NC	<0.1 NC NC	<0.1 7 NC	NAD	NT	Detected	NAD	NAD	Detected	Detected	NAD	Detected
BR2[a]	0m	20/03/2020	NT 660 NC	NT 3600 640	NT 45 NC	NT 530 NC	NT 2000 NC	NT 100 NC	NT 50 NC	NT 80 NC	NT 2500 NC	<0.1 NC NC	NT 2000 NC	NT NC NC	NT 7 NC	NT	NT	NT	NT	NT	NT	NT	NT	NT
9	0 - 0.1m	20/03/2020	<5 660 NC	<0.1 3600 640	<0.1 45 NC	<0.1 530 NC	<0.1 2000 NC	<0.1 100 NC	<0.1 50 NC	<0.1 80 NC	<0.1 2500 NC	NT NC NC	<0.1 2000 NC	<0.1 NC NC	<0.1 7 NC	NAD	NT	NAD	NAD	NAD	NT	NT	NAD	NAD
AF1	0m	20/03/2020	NT 660 NC	NT 3600 640	NT 45 NC	NT 530 NC	NT 2000 NC	NT 100 NC	NT 50 NC	NT 80 NC	NT 2500 NC	NT 2500 NC	NT 2000 NC	NT NC NC	NT 7 NC	NT	NAD	NT	NT	NT	NT	NT	NT	NT
Waste Classifcation Criteria																								
CT1			288	NC	NC	NC	60	NC	NC	NC	NC	<50	4	4	<50	NA	NA	NA	NA	NA	NA	NA	NA	NA
SCC1			518	NC	NC	NC	108	NC	NC	NC	NC	<50	7.5	7.5	<50	NA	NA	NA	NA	NA	NA	NA	NA	NA
TCLP1			NA	NC	NC	NC	NA	NC	NC	NC	NC	NC	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Published Background Values																								
Olszowy et al (1995) - Urban Soils (0-150mm) [g]			NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Berkman 4th Edition (2001) - Field Geologists Manual [h]			NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Adopted Comparative Values For VENM Classification																								
Adopted Comparative Values			NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC

Lab result
HIL/HSL value EIL/ESL value

HIL/HSL exceedance EIL/ESL exceedance HIL/HSL and EIL/ESL exceedance ML exceedance ML and HIL/HSL or EIL/ESL exceedance

Indicates that asbestos has been detected by the lab below the PQL, refer to the lab report **Blue** = DC exceedance

Bold = Exceedance of waste classifcation criteria NT = Not tested NL = Non limiting NC = No criteria NA = Not applicable NAD = No asbestos detected

Notes:

HIL/HSL/DC	NEPC, Schedule B1 - HIL D (Commercial / Industrial), HSL D (Commercial / Industrial), DC HSL D (Direct contact HSL D Commercial/Industrial)
EIL/ESL	NEPC, Schedule B1 - EIL C/Ind (Commercial and Industrial), ESL C/Ind (Commercial and Industrial)
ML	NEPC, Schedule B1 - ML C/Ind (Commercial and Industrial)
a	QA/QC replicate of sample listed directly below the primary sample
b	Reported naphthalene laboratory result obtained from BTEXN suite
c	Criteria applies to DDT only
d	Total Chromium used as an initial screen.
e	Criteria for Scheduled Chemicals used as an initial screen
f	Criteria for Chlorpyrifos used as initial screen
g	Olszowy, H., P. Torr, and P. Imray. 1995. Trace element concentrations in soil from rural and urban areas of Australia. Contaminated Sites Monograph Series 4. South Australian Health Commission. Glenelg Press, Glenelg, Australia.
h	Average abundance of selected minor elements in the earth's crust (soils) - taken predominantly from Swaine D J, 1995, The trace element content of soils
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SCC1	NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste
TCLP1	NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste

Appendix F

Laboratory Certificate of Analysis, Sample Receipt Advice and Chain-of Custody Documentation

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	94054.08	**Suburb:**	Goulburn	**To:**	Envirolab Services Pty Ltd
Project Name:	Proposed Contractor's Car Park	**Order Number**	94054.08		
Project Manager:	Tom Mrdjen	**Sampler:**	KJ	**Attn:**	Simon Song
Emails:	tom.mrsjen@douglaspartners/com.au	kyle.johannes@douglaspartners.com.au		**Phone:**	9910 6200
Date Required:	Standard			**Email:**	samplereceipt@envirolabservices.com.au
Prior Storage:	☐ Esky ☐ Fridge ☐ Shelved	Do samples contain 'potential' HBM?	Yes		

Sample ID	Lab ID	Date Sampled	Sample Type (S - soil, W - water)	Container Type (G - glass, P - plastic)	Analytes: Combo 8A NEPM	Combo 1m	Asbestos I.D							Notes/preservation
1/0.1	1	20/03/20	S	G&P	X									
2/0.1	2	20/03/20	S	G&P	X									
3/0.1	3	20/03/20	S	G&P	X									
4/0.1	4	20/03/20	S	G&P	X									
5/0.5	5	20/03/20	S	G&P	X									
6/0.1	6	20/03/20	S	G&P	X									
7/0.1	7	20/03/20	S	G&P	X									
8/0.1	8	20/03/20	S	G&P	X									
9/0.1	9	20/03/20	S	G&P	X									
BR2	10	20/03/20				X								
AF1	11	20/03/20					X							
PQL (S) mg/kg													**ANZECC PQLs req'd for all water analytes** ☐	

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

Job No: 230540
Date Received: 24/3/20
Time Received: 1200
Received By: CM
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

Metals to Analyse: 8HM unless specified here: Include manganese

Lab Report/Reference No:

Total number of samples in container: 11 **Relinquished by:** KJ **Transported to laboratory by:** TNT

Send Results to: Douglas Partners Pty Ltd **Address:** 1/1 Luso Drive, Unanderra, NSW 2526 **Phone:** (02) 4271 1836 **Fax:**

Signed: **Received by:** Eurosydney CHARLIE MACKENZIE **Date & Time:** 23/03/2020 3:00pm

24/3/20 1200

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	Douglas Partners Unanderra
Attention	Kyle Johannes, Tom Mrdjen

Sample Login Details

Your reference	94054.08/Proposed Contractor's Car Park
Envirolab Reference	239540
Date Sample Received	24/03/2020
Date Instructions Received	24/03/2020
Date Results Expected to be Reported	31/03/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	10 Soil, 1 Material
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	19.9
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	Organophosphorus Pesticides in Soil	PCBsin Soil	Acid Extractable metalsin soil	Misc Soil - Inorg	Asbestos ID - materials	Asbestos ID - soils NEPM - ASB-001
1-0.1	✓	✓	✓	✓	✓	✓	✓	✓		✓
2-0.1	✓	✓	✓	✓	✓	✓	✓	✓		✓
3-0.1	✓	✓	✓	✓	✓	✓	✓	✓		✓
4-0.1	✓	✓	✓	✓	✓	✓	✓	✓		✓
5-0.5	✓	✓	✓	✓	✓	✓	✓	✓		✓
6-0.1	✓	✓	✓	✓	✓	✓	✓	✓		✓
7-0.1	✓	✓	✓	✓	✓	✓	✓	✓		✓
8-0.1	✓	✓	✓	✓	✓	✓	✓	✓		✓
9-0.1	✓	✓	✓	✓	✓	✓	✓	✓		✓
BR2	✓	✓					✓			
AF1									✓	

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.

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 239540

Client Details

Client	Douglas Partners Unanderra
Attention	Kyle Johannes, Tom Mrdjen
Address	Unit 1, 1 Luso Drive, Unanderra, NSW, 2526

Sample Details

Your Reference	**94054.08/Proposed Contractor's Car Park**
Number of Samples	10 Soil, 1 Material
Date samples received	24/03/2020
Date completed instructions received	24/03/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	31/03/2020
Date of Issue	31/03/2020
Reissue Details	This report replaces R00 created on 31/03/2020 due to: registration error. part of sample removed prior to analysis

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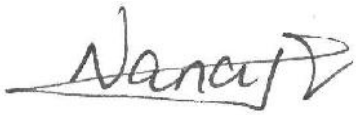
Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Asbestos Approved By
Analysed by Asbestos Approved Identifier: Lucy Zhu
Authorised by Asbestos Approved Signatory: Lucy Zhu

Results Approved By
Diego Bigolin, Team Leader, Inorganics
Hannah Nguyen, Senior Chemist
Josh Williams, Senior Chemist
Lucy Zhu, Asbestos Supervisor
Steven Luong, Organics Supervisor

Authorised By



Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		239540-1	239540-2	239540-3	239540-4	239540-5
Your Reference	UNITS	1	2	3	4	5
Depth		0.1	0.1	0.1	0.1	0.5
Date Sampled		20/03/2020	20/03/2020	20/03/2020	20/03/2020	20/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Date analysed	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	96	113	90	98	110

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		239540-6	239540-7	239540-8	239540-9	239540-10
Your Reference	UNITS	6	7	8	9	BR2
Depth		0.1	0.1	0.1	0.1	-
Date Sampled		20/03/2020	20/03/2020	20/03/2020	20/03/2020	20/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Date analysed	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	103	109	105	118	100

svTRH (C10-C40) in Soil						
Our Reference		239540-1	239540-2	239540-3	239540-4	239540-5
Your Reference	UNITS	1	2	3	4	5
Depth		0.1	0.1	0.1	0.1	0.5
Date Sampled		20/03/2020	20/03/2020	20/03/2020	20/03/2020	20/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Date analysed	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	99	94	94	101	100

svTRH (C10-C40) in Soil						
Our Reference		239540-6	239540-7	239540-8	239540-9	239540-10
Your Reference	UNITS	6	7	8	9	BR2
Depth		0.1	0.1	0.1	0.1	-
Date Sampled		20/03/2020	20/03/2020	20/03/2020	20/03/2020	20/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Date analysed	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	26/03/2020
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	92	91	92	92	93

PAHs in Soil						
Our Reference		239540-1	239540-2	239540-3	239540-4	239540-5
Your Reference	UNITS	1	2	3	4	5
Depth		0.1	0.1	0.1	0.1	0.5
Date Sampled		20/03/2020	20/03/2020	20/03/2020	20/03/2020	20/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Date analysed	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.2	0.2	<0.1	0.1	<0.1
Pyrene	mg/kg	0.2	0.2	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	0.1	0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.1	0.1	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	0.54	0.92	<0.05	0.1	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	103	104	101	106	106

PAHs in Soil					
Our Reference		239540-6	239540-7	239540-8	239540-9
Your Reference	UNITS	6	7	8	9
Depth		0.1	0.1	0.1	0.1
Date Sampled		20/03/2020	20/03/2020	20/03/2020	20/03/2020
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Date analysed	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	111	101	103	114

Organochlorine Pesticides in soil						
Our Reference		239540-1	239540-2	239540-3	239540-4	239540-5
Your Reference	UNITS	1	2	3	4	5
Depth		0.1	0.1	0.1	0.1	0.5
Date Sampled		20/03/2020	20/03/2020	20/03/2020	20/03/2020	20/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Date analysed	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	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
gamma-BHC	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
delta-BHC	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
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
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
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	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
pp-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
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	111	115	116	120	118

Organochlorine Pesticides in soil					
Our Reference		239540-6	239540-7	239540-8	239540-9
Your Reference	UNITS	6	7	8	9
Depth		0.1	0.1	0.1	0.1
Date Sampled		20/03/2020	20/03/2020	20/03/2020	20/03/2020
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Date analysed	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	112	122	110	116

Organophosphorus Pesticides in Soil						
Our Reference		239540-1	239540-2	239540-3	239540-4	239540-5
Your Reference	UNITS	1	2	3	4	5
Depth		0.1	0.1	0.1	0.1	0.5
Date Sampled		20/03/2020	20/03/2020	20/03/2020	20/03/2020	20/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Date analysed	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	111	115	116	120	118

Organophosphorus Pesticides in Soil					
Our Reference		239540-6	239540-7	239540-8	239540-9
Your Reference	UNITS	6	7	8	9
Depth		0.1	0.1	0.1	0.1
Date Sampled		20/03/2020	20/03/2020	20/03/2020	20/03/2020
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Date analysed	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	112	122	110	116

PCBs in Soil						
Our Reference		239540-1	239540-2	239540-3	239540-4	239540-5
Your Reference	UNITS	1	2	3	4	5
Depth		0.1	0.1	0.1	0.1	0.5
Date Sampled		20/03/2020	20/03/2020	20/03/2020	20/03/2020	20/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Date analysed	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	111	115	116	120	118

PCBs in Soil					
Our Reference		239540-6	239540-7	239540-8	239540-9
Your Reference	UNITS	6	7	8	9
Depth		0.1	0.1	0.1	0.1
Date Sampled		20/03/2020	20/03/2020	20/03/2020	20/03/2020
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Date analysed	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	112	122	110	116

Acid Extractable metals in soil						
Our Reference		239540-1	239540-2	239540-3	239540-4	239540-5
Your Reference	UNITS	1	2	3	4	5
Depth		0.1	0.1	0.1	0.1	0.5
Date Sampled		20/03/2020	20/03/2020	20/03/2020	20/03/2020	20/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Date analysed	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Arsenic	mg/kg	6	9	<4	5	6
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	47	46	24	25	36
Copper	mg/kg	30	37	11	12	10
Lead	mg/kg	200	190	37	53	20
Mercury	mg/kg	0.2	0.2	<0.1	<0.1	<0.1
Nickel	mg/kg	8	18	6	6	7
Zinc	mg/kg	170	260	40	69	25

Acid Extractable metals in soil						
Our Reference		239540-6	239540-7	239540-8	239540-9	239540-10
Your Reference	UNITS	6	7	8	9	BR2
Depth		0.1	0.1	0.1	0.1	-
Date Sampled		20/03/2020	20/03/2020	20/03/2020	20/03/2020	20/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Date analysed	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Arsenic	mg/kg	10	7	6	<4	6
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	91	61	45	37	44
Copper	mg/kg	12	9	11	10	16
Lead	mg/kg	23	16	17	41	18
Mercury	mg/kg	<0.1	<0.1	0.2	<0.1	0.2
Nickel	mg/kg	8	5	8	5	10
Zinc	mg/kg	9	7	16	45	17

Misc Soil - Inorg						
Our Reference		239540-1	239540-2	239540-3	239540-4	239540-5
Your Reference	UNITS	1	2	3	4	5
Depth		0.1	0.1	0.1	0.1	0.5
Date Sampled		20/03/2020	20/03/2020	20/03/2020	20/03/2020	20/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Date analysed	-	26/03/2020	26/03/2020	26/03/2020	26/03/2020	26/03/2020
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Misc Soil - Inorg					
Our Reference		239540-6	239540-7	239540-8	239540-9
Your Reference	UNITS	6	7	8	9
Depth		0.1	0.1	0.1	0.1
Date Sampled		20/03/2020	20/03/2020	20/03/2020	20/03/2020
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Date analysed	-	26/03/2020	26/03/2020	26/03/2020	26/03/2020
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5

Moisture						
Our Reference		239540-1	239540-2	239540-3	239540-4	239540-5
Your Reference	UNITS	1	2	3	4	5
Depth		0.1	0.1	0.1	0.1	0.5
Date Sampled		20/03/2020	20/03/2020	20/03/2020	20/03/2020	20/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Date analysed	-	26/03/2020	26/03/2020	26/03/2020	26/03/2020	26/03/2020
Moisture	%	9.6	10	9.4	7.8	7.6

Moisture						
Our Reference		239540-6	239540-7	239540-8	239540-9	239540-10
Your Reference	UNITS	6	7	8	9	BR2
Depth		0.1	0.1	0.1	0.1	-
Date Sampled		20/03/2020	20/03/2020	20/03/2020	20/03/2020	20/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/03/2020	25/03/2020	25/03/2020	25/03/2020	25/03/2020
Date analysed	-	26/03/2020	26/03/2020	26/03/2020	26/03/2020	26/03/2020
Moisture	%	9.4	8.6	11	9.4	14

Asbestos ID - materials		
Our Reference		239540-11
Your Reference	UNITS	AF1
Depth		-
Date Sampled		20/03/2020
Type of sample		Material
Date analysed	-	27/03/2020
Mass / Dimension of Sample	-	100x65x10mm
Sample Description	-	Beige compressed fibre cement material
Asbestos ID in materials	-	No asbestos detected Synthetic mineral fibres detected
Trace Analysis	-	No asbestos detected

Asbestos ID - soils NEPM - ASB-001						
Our Reference		239540-1	239540-2	239540-3	239540-4	239540-5
Your Reference	UNITS	1	2	3	4	5
Depth		0.1	0.1	0.1	0.1	0.5
Date Sampled		20/03/2020	20/03/2020	20/03/2020	20/03/2020	20/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	27/03/2020	27/03/2020	27/03/2020	27/03/2020	27/03/2020
Sample mass tested	g	565.09	600.83	540.14	592.58	656.67
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected
Total Asbestos[#1]	g/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	–	–	–	–	–
FA and AF Estimation*	g	–	–	–	–	–
ACM >7mm Estimation*	%(w/w)	<0.01	<0.01	<0.01	<0.01	<0.01
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001

Asbestos ID - soils NEPM - ASB-001					
Our Reference		239540-6	239540-7	239540-8	239540-9
Your Reference	UNITS	6	7	8	9
Depth		0.1	0.1	0.1	0.1
Date Sampled		20/03/2020	20/03/2020	20/03/2020	20/03/2020
Type of sample		Soil	Soil	Soil	Soil
Date analysed	-	27/03/2020	27/03/2020	27/03/2020	27/03/2020
Sample mass tested	g	600.96	618.69	615.97	558.16
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	Chrysotile asbestos detected Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected
Total Asbestos#1	g/kg	<0.1	<0.1	4.4848	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	See Above	No visible asbestos detected
ACM >7mm Estimation*	g	–	–	2.7618	–
FA and AF Estimation*	g	–	–	0.0007	–
ACM >7mm Estimation*	%(w/w)	<0.01	<0.01	0.4484	<0.01
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
ASB-001	Asbestos ID - Identification of asbestos in soil samples using Polarised Light Microscopy and Dispersion Staining Techniques. Minimum 500mL soil sample was analysed as recommended by "National Environment Protection (Assessment of site contamination) Measure, Schedule B1 and "The Guidelines from the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia - May 2009" with a reporting limit of 0.1g/kg (0.01% w/w) as per Australian Standard AS4964-2004. Results reported denoted with * are outside our scope of NATA accreditation. **NOTE** #1 Total Asbestos g/kg was analysed and reported as per Australian Standard AS4964 (This is the sum of ACM >7mm, <7mm and FA/AF) **NOTE** #2 The screening level of 0.001% w/w asbestos in soil for FA and AF only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres. Estimation = Estimated asbestos weight Results reported with "--" is equivalent to no visible asbestos identified using Polarised Light microscopy and Dispersion Staining Techniques.
AT-008	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
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.

Method ID	Methodology Summary
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.
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-7	239540-2
Date extracted	-			25/03/2020	1	25/03/2020	25/03/2020		25/03/2020	25/03/2020
Date analysed	-			25/03/2020	1	25/03/2020	25/03/2020		25/03/2020	25/03/2020
TRH C_6 - C_9	mg/kg	25	Org-016	<25	1	<25	<25	0	89	84
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	1	<25	<25	0	89	84
Benzene	mg/kg	0.2	Org-016	<0.2	1	<0.2	<0.2	0	89	94
Toluene	mg/kg	0.5	Org-016	<0.5	1	<0.5	<0.5	0	86	82
Ethylbenzene	mg/kg	1	Org-016	<1	1	<1	<1	0	89	80
m+p-xylene	mg/kg	2	Org-016	<2	1	<2	<2	0	90	82
o-Xylene	mg/kg	1	Org-016	<1	1	<1	<1	0	94	84
naphthalene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	108	1	96	109	13	118	99

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	239540-2
Date extracted	-			25/03/2020	1	25/03/2020	25/03/2020		25/03/2020	25/03/2020
Date analysed	-			25/03/2020	1	25/03/2020	25/03/2020		25/03/2020	25/03/2020
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	1	<50	<50	0	86	83
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	1	<100	<100	0	74	70
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	1	<100	<100	0	77	129
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	1	<50	<50	0	86	83
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	1	<100	<100	0	74	70
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	1	<100	<100	0	77	129
Surrogate o-Terphenyl	%		Org-003	91	1	99	96	3	109	94

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	239540-2
Date extracted	-			25/03/2020	1	25/03/2020	25/03/2020		25/03/2020	25/03/2020
Date analysed	-			25/03/2020	1	25/03/2020	25/03/2020		25/03/2020	25/03/2020
Naphthalene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	82	80
Acenaphthylene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	76	86
Phenanthrene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	0.3	100	88	91
Anthracene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012/017	<0.1	1	0.2	0.5	86	88	96
Pyrene	mg/kg	0.1	Org-012/017	<0.1	1	0.2	0.4	67	82	90
Benzo(a)anthracene	mg/kg	0.1	Org-012/017	<0.1	1	0.1	0.2	67	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	0.2	67	96	93
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012/017	<0.2	1	<0.2	0.3	40	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012/017	<0.05	1	0.1	0.2	67	80	83
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012/017	103	1	103	104	1	112	108

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	239540-2
Date extracted	-			25/03/2020	1	25/03/2020	25/03/2020		25/03/2020	25/03/2020
Date analysed	-			25/03/2020	1	25/03/2020	25/03/2020		25/03/2020	25/03/2020
alpha-BHC	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	90	94
HCB	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	86	94
gamma-BHC	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	86	92
delta-BHC	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	104	108
Heptachlor Epoxide	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	94	102
gamma-Chlordane	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	96	106
Dieldrin	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	108	106
Endrin	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	108	108
Endosulfan II	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	100	102
Endrin Aldehyde	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	82	92
Methoxychlor	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-012/017	105	1	111	109	2	110	113

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	239540-2
Date extracted	-			25/03/2020	1	25/03/2020	25/03/2020		25/03/2020	25/03/2020
Date analysed	-			25/03/2020	1	25/03/2020	25/03/2020		25/03/2020	25/03/2020
Dichlorvos	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	86	88
Dimethoate	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	94	104
Fenitrothion	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	86	96
Malathion	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	92	118
Chlorpyriphos	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	98	110
Parathion	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	86	90
Bromophos-ethyl	mg/kg	0.1	AT-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	108	110
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-012/017	105	1	111	109	2	110	113

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	239540-2
Date extracted	-			25/03/2020	1	25/03/2020	25/03/2020		25/03/2020	25/03/2020
Date analysed	-			25/03/2020	1	25/03/2020	25/03/2020		25/03/2020	25/03/2020
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	82	82
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-006	105	1	111	109	2	110	113

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	239540-2
Date prepared	-			25/03/2020	1	25/03/2020	25/03/2020		25/03/2020	25/03/2020
Date analysed	-			25/03/2020	1	25/03/2020	25/03/2020		25/03/2020	25/03/2020
Arsenic	mg/kg	4	Metals-020	<4	1	6	6	0	107	91
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	102	86
Chromium	mg/kg	1	Metals-020	<1	1	47	38	21	115	92
Copper	mg/kg	1	Metals-020	<1	1	30	31	3	112	110
Lead	mg/kg	1	Metals-020	<1	1	200	220	10	116	107
Mercury	mg/kg	0.1	Metals-021	<0.1	1	0.2	0.3	40	98	99
Nickel	mg/kg	1	Metals-020	<1	1	8	8	0	105	90
Zinc	mg/kg	1	Metals-020	<1	1	170	170	0	109	#

QUALITY CONTROL: Misc Soil - Inorg						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	239540-2
Date prepared	-			25/03/2020	1	25/03/2020	25/03/2020		25/03/2020	25/03/2020
Date analysed	-			26/03/2020	1	26/03/2020	26/03/2020		26/03/2020	26/03/2020
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	1	<5	<5	0	101	106

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.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

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 sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

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

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 for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

8 metals in soil - # Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Asbestos-ID in soil: NEPM
This report is consistent with the reporting recommendations in the National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1, May 2013. This is reported outside our scope of NATA accreditation.

Jessica Hie

From: Nick Sarlamis
Sent: Tuesday, 31 March 2020 12:27 PM
To: Kyle Johannes
Cc: Lucy Zhu; Jessica Hie
Subject: RE: Results for Registration 239540 94054.08/Proposed Contractor's Car Park

Hi Kyle,

I'll have Lucy, Asbestos supervisor reply to you,

Jess, could you please log in the pH CEC request below

239540-A
Due: 7/4/20
Std TAT

Kind Regards,

Nick Sarlamis | Inorganics Supervisor | Envirolab Services Pty Ltd

***Celebrating 15 years of* Great Science. Great Service.**
12 Ashley Street Chatswood NSW 2067
T 612 9910 6200 **F** 612 9910 6201
E nsarlamis@envirolab.com.au | **W** www.envirolab.com.au

From: Kyle Johannes <Kyle.Johannes@douglaspartners.com.au>
Sent: Tuesday, 31 March 2020 12:22 PM
To: Nick Sarlamis <NSarlamis@envirolab.com.au>
Subject: RE: Results for Registration 239540 94054.08/Proposed Contractor's Car Park

Hi Nick,

Thanks for sending the results through.

I do have a question about sample 8/0.1 (sample code: 239540-8). I noticed that asbestos was detected in the sample however it was <7mm. I thought there was a fragment a bit larger than 7mm in the sample bag. Was it not in the sample bag? See attached photo of the fragment I thought was in there.

Also could we get pH and CEC testing on sample 2/0.1 (sample code: 239540-2) please? On a standard turnaround how long would this testing take?

Regards,

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	Douglas Partners Unanderra
Attention	Kyle Johannes

Sample Login Details

Your reference	94054.08/Proposed Contractor's Car Park
Envirolab Reference	239540-A
Date Sample Received	24/03/2020
Date Instructions Received	31/03/2020
Date Results Expected to be Reported	07/04/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	10 Soil, 1 Material
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	19.9
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
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12 Ashley St Chatswood NSW 2067
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customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	Misc Inorg - Soil	CEC	On Hold
1-0.1			✓
2-0.1	✓	✓	
3-0.1			✓
4-0.1			✓
5-0.5			✓
6-0.1			✓
7-0.1			✓
8-0.1			✓
9-0.1			✓
BR2			✓
AF1			✓

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.

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customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 239540-A

Client Details

Client	Douglas Partners Unanderra
Attention	Kyle Johannes
Address	Unit 1, 1 Luso Drive, Unanderra, NSW, 2526

Sample Details

Your Reference	**94054.08/Proposed Contractor's Car Park**
Number of Samples	10 Soil, 1 Material
Date samples received	24/03/2020
Date completed instructions received	31/03/2020

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	06/04/2020
Date of Issue	06/04/2020

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

Results Approved By
Jaimie Loa-Kum-Cheung, Metals Supervisor
Priya Samarawickrama, Senior Chemist

Authorised By

Nancy Zhang, Laboratory Manager

Misc Inorg - Soil		
Our Reference		239540-A-2
Your Reference	UNITS	2
Depth		0.1
Date Sampled		20/03/2020
Type of sample		Soil
Date prepared	-	03/04/2020
Date analysed	-	03/04/2020
pH 1:5 soil:water	pH Units	7.3

CEC		
Our Reference		239540-A-2
Your Reference	UNITS	2
Depth		0.1
Date Sampled		20/03/2020
Type of sample		Soil
Date prepared	-	06/04/2020
Date analysed	-	06/04/2020
Exchangeable Ca	meq/100g	8.9
Exchangeable K	meq/100g	0.7
Exchangeable Mg	meq/100g	2.0
Exchangeable Na	meq/100g	<0.1
Cation Exchange Capacity	meq/100g	12

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Metals-009	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-AES analytical finish.

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			03/04/2020	[NT]	[NT]	[NT]	[NT]	03/04/2020	[NT]
Date analysed	-			03/04/2020	[NT]	[NT]	[NT]	[NT]	03/04/2020	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	102	[NT]

QUALITY CONTROL: CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			06/04/2020	[NT]	[NT]	[NT]	[NT]	06/04/2020	[NT]
Date analysed	-			06/04/2020	[NT]	[NT]	[NT]	[NT]	06/04/2020	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	108	[NT]
Exchangeable K	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	110	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Exchangeable Na	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	107	[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.
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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.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

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 sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

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

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 for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

239540-B
Due: 6/4/20.
1 day TAT

Aileen Hie

From: Kyle Johannes <Kyle.Johannes@douglaspartners.com.au>
Sent: Friday, 3 April 2020 1:55 PM
To: Aileen Hie
Subject: RE: Sample Receipt for 239540-A 94054.08/Proposed Contractor's Car Park

Hi Aileen,

Could we please get TCLP testing for Lead on your fastest turnaround on the following samples:

- 239540-1 (1/0.1)
- 239540-2 (2/0.1)

Also is possible to speed up the pH and CEC testing for sample 239540-2 (2/0.1)?

Regards,

Kyle Johannes | Environmental Engineer
Douglas Partners Pty Ltd | ABN 75 053 980 117 | www.douglaspartners.com.au
1/1 Luso Drive Unanderra NSW 2526 | PO Box 486 Unanderra NSW 2526
P: 02 4271 1836 | M: 0447 976 999 | E: Kyle.Johannes@douglaspartners.com.au

To find information on our COVID-19 preparations, please visit douglaspartners.com.au/news/covid-19

From: Aileen Hie <AHie@envirolab.com.au>
Sent: Tuesday, 31 March 2020 5:18 PM
To: Kyle Johannes <Kyle.Johannes@douglaspartners.com.au>
Subject: Sample Receipt for 239540-A 94054.08/Proposed Contractor's Car Park

Please refer to attached for:
a copy of the COC/paperwork received from you
a copy of our Sample Receipt Advice (SRA)
Please open and read the SRA as it contains important information.
Please let the lab know immediately if there are any issues.

Results will be available by 6.30pm on the date indicated.

PLEASE NOTE COMBO PRICES WILL ONLY APPLY IF COMBOS ARE SELECTED ON COC.

We have a new reporting format and would welcome your feedback. Sydney@envirolab.com.au

Please note that subcontracted testing or non routine testing may take significantly longer than just the standard 5 day TAT, contact the lab to get an approximate due date.

Enquiries should be made directly to:
customerservice@envirolab.com.au

Regards

Envirolab Services
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au

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	Douglas Partners Unanderra
Attention	Kyle Johannes

Sample Login Details

Your reference	94054.08/Proposed Contractor's Car Park
Envirolab Reference	239540-B
Date Sample Received	24/03/2020
Date Instructions Received	03/04/2020
Date Results Expected to be Reported	06/04/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	10 Soil, 1 Material
Turnaround Time Requested	1 day
Temperature on Receipt (°C)	19.9
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:

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12 Ashley St Chatswood NSW 2067
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customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	pH of soil for fluid#determ.	pH of soil TCLP (after HCl)	Extraction fluid used	pH of final Leachate	Lead in TCLP	On Hold
1-0.1	✓	✓	✓	✓	✓	
2-0.1	✓	✓	✓	✓	✓	
3-0.1						✓
4-0.1						✓
5-0.5						✓
6-0.1						✓
7-0.1						✓
8-0.1						✓
9-0.1						✓
BR2						✓
AF1						✓

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.

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customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 239540-B

Client Details

Client	Douglas Partners Unanderra
Attention	Kyle Johannes
Address	Unit 1, 1 Luso Drive, Unanderra, NSW, 2526

Sample Details

Your Reference	**94054.08/Proposed Contractor's Car Park**
Number of Samples	10 Soil, 1 Material
Date samples received	24/03/2020
Date completed instructions received	03/04/2020

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	06/04/2020
Date of Issue	06/04/2020

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

Results Approved By
Hannah Nguyen, Senior Chemist

Authorised By

Nancy Zhang, Laboratory Manager

Metals in TCLP USEPA1311			
Our Reference		239540-B-1	239540-B-2
Your Reference	UNITS	1	2
Depth		0.1	0.1
Date Sampled		20/03/2020	20/03/2020
Type of sample		Soil	Soil
Date extracted	-	06/04/2020	06/04/2020
Date analysed	-	06/04/2020	06/04/2020
pH of soil for fluid# determ.	pH units	7.2	7.3
pH of soil TCLP (after HCl)	pH units	1.7	1.7
Extraction fluid used	-	1	1
pH of final Leachate	pH units	4.9	4.9
Lead in TCLP	mg/L	<0.03	0.09

Method ID	Methodology Summary
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP) using Zero Headspace Extraction (zHE) using AS4439 and USEPA 1311.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using in house method INORG-004. Please note that the mass used may be scaled down from the default based on sample mass available.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.

QUALITY CONTROL: Metals in TCLP USEPA1311						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			06/04/2020	[NT]	[NT]	[NT]	[NT]	06/04/2020	[NT]
Date analysed	-			06/04/2020	[NT]	[NT]	[NT]	[NT]	06/04/2020	[NT]
Lead in TCLP	mg/L	0.03	Metals-020 ICP-AES	<0.03	[NT]	[NT]	[NT]	[NT]	98	[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.
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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.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

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.

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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 sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

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

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 for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Appendix G

Data Quality Assessment

DATA QUALITY ASSESSMENT

Q1. Data Quality Objectives

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

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

The DQOs have been addressed within the report as shown in Table Q1.

Table Q1: Data Quality Objectives

Data Quality Objective	Report Section where Addressed
State the Problem	S1 Introduction
Identify the Decision	S1 Introduction (objective) S12 Discussion S13 Conclusion and Recommendations
Identify Inputs to the Decision	S1 Introduction S3 Site Information S2 Scope of Works S10 Site Assessment Criteria S11 Results
Define the Boundary of the Assessment	S3 Site Information S4 Environmental Setting Site Drawings – Appendix A
Develop a Decision Rule	S10 Site Assessment Criteria
Specify Acceptable Limits on Decision Errors	S11 Results S10 Site Assessment Criteria QA/QC Procedures and Results – Sections Q2, Q3
Optimise the Design for Obtaining Data	S4 Scope of Works S9 Sampling and Analysis Quality Plan QA/QC Procedures and Results – Sections Q2, Q3

Q2. FIELD AND LABORATORY QUALITY CONTROL

The field and laboratory quality control (QC) procedures and results are summarised in Tables Q2 and Q3. Reference should be made to the fieldwork and analysis procedures in Section 9 and the laboratory results certificates in Appendix F for further details.

Table Q2: Field QC

Item	Frequency	Acceptance Criteria	Achievement
Intra-laboratory replicates	10% primary samples	RPD <30% inorganics), <50% (organics)	yes[1]

NOTES: 1 qualitative assessment of RPD results overall; refer Section Q2.1

Table Q3: Laboratory QC

Item	Frequency	Acceptance Criteria	Achievement
Analytical laboratories used		NATA accreditation	yes
Holding times		In accordance with NEPC (2013) which references various Australian and international standards	yes
Laboratory / Reagant Blanks	1 per lab batch	<PQL	yes
Laboratory duplicates	10% primary samples	Laboratory specific [1]	
Matrix Spikes	1 per lab batch	70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC, speciated phenols)	yes
Surrogate Spikes	organics by GC	70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC, speciated phenols)	yes
Control Samples	1 per lab batch	70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC, speciated phenols)	yes

NOTES: 1 ELS: <5xPQL – any RPD; >5xPQL – 0-50%RPD

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

Q2.1 Intra-Laboratory Replicates

Intra-laboratory replicates were analysed as an internal check of the reproducibility within the primary laboratory ELS and as a measure of consistency of sampling techniques. The comparative results of analysis between original and intra-laboratory replicate samples are summarised in Table Q4.

Note that, where both samples are below LOR/PQL the difference and RPD has been given as zero. Where one sample is reported below LOR/PQL, but a concentration is reported for the other, the LOR/PQL value has been used for calculation of the RPD for the less than LOR/PQL sample.

Table Q4: Relative Percentage Difference Results – Intra-laboratory Replicates

Lab	Sample ID	Date Sampled	Media	Units	Metals								TRH				BTEX			
					As	Cd	Cr	Cu	Pb	Hg	Ni	Zn	F1 C6-C10	F2 >C10-C16	F3 >C16-C34	F4 >C34-C40	Benzene	Toluene	Ethylbenzene	xylene
ELS	8/0.1	20/03/2020	Fill	mg/kg	6	<0.4	45	11	17	0.2	8	16	<25	<50	<100	<100	<0.2	<0.5	<1	<1
ELS	BR2	20/03/2020	Fill	mg/kg	6	<0.4	44	16	18	0.2	10	17	<20	<50	<100	100	<0.1	<0.1	<0.1	<0.3
Difference				mg/kg	0	0	1	5	1	0	2	1	-	-	-	-	-	-	-	-
RPD				%	0%	0%	2%	**37%**	6%	0%	22%	6%	-	-	-	-	-	-	-	-

Notes: - not applicable, not tested

The calculated RPD values were within the acceptable range of ± 30 for inorganic analytes and ± 50% for organics with the with the exception of Copper. However, this is not considered to be significant because:

- The typically low actual differences in the concentrations of the replicate pairs where some RPD exceedances occurred. High RPD values reflect the small differences between two small numbers;
- The number of replicate pairs being collected from fill soils which were heterogeneous in nature;
- Soil replicates, rather than homogenised soil duplicates, were used to minimise the risk of possible volatile loss, hence greater variability can be expected;
- Most of the recorded concentrations being relatively close to the LOR/PQL. High RPD values reflect the low concentrations;
- The majority of RPDs within a replicate pair being within the acceptable limits; and
- All other QA/QC parameters met the DQIs.

Overall, the intra-laboratory replicate comparisons indicate that the sampling techniques were generally consistent and repeatable

Q3. Data Quality Indicators

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

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

The DQIs were assessed as outlined in the following Table Q5.

Table Q5: Data Quality Indicators

Data Quality Indicator	Method(s) of Achievement
Completeness	Planned systematic and selected target locations sampled; Preparation of field logs, sample location plan and chain of custody (COC) records; Preparation of field groundwater sampling sheets; Laboratory sample receipt information received confirming receipt of samples intact and appropriateness of the chain of custody; Samples analysed for contaminants of potential concern (COPC) identified in the Conceptual Site Model (CSM); Completion of COC documentation; NATA endorsed laboratory certificates provided by the laboratory; Satisfactory frequency and results for field and laboratory QC samples as discussed in Section Q2.
Comparability	Using appropriate techniques for sample recovery, storage and transportation, which were the same for the duration of the project; Works undertaken by appropriately experienced and trained DP environmental scientist / engineer; Use of NATA registered laboratories, with test methods the same or similar between laboratories; Satisfactory results for field and laboratory QC samples.
Representativeness	Target media sampled; Spatial and temporal distribution of sample locations; Sample numbers recovered and analysed are considered to be representative of the target media and complying with DQOs; Samples were extracted and analysed within holding times; Samples were analysed in accordance with the analysis request.
Precision	Acceptable RPD between original samples and replicates; Satisfactory results for all other field and laboratory QC samples.
Accuracy	Satisfactory results for all field and laboratory QC samples.

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

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Memorandum

To	Eugene Godfrey	Hansen Yuncken Pty Ltd	egodfrey@hansenyuncken.com.au
From	Jeremy Hill	**Date**	24 Mar 2020
Subject	Vibration Monitoring Report 10 Goulburn Base Hospital Redevelopment	**Project No.** **Doc. No.**	94054.07 94054.07.R.010.Rev0

Installation and Monitoring

On 21 January 2020 Texcel Construction Vibration Monitors #7221, #7153 were relocated to the positions shown in the attached Monitoring Location Plan, before the start of augered piling. Both monitors were coupled to the ground with a surcharge, close to and at ground level of the adjacent building, which includes Pathology (upper floor) and the Mortuary (lower floor). The monitors were installed to manage vibrations generated during piling works. On 26 February 2020, Monitor #7221 was replaced with Omnidot Vibration Monitor "Vujaca".

With reference to the CNVMP (the Monitoring Plan), an "Allowed Vibration Limit" of 25 mm/s vector sum peak particle velocity (VSPPV) was assigned by DP based on the potential for damage to the adjacent structures and a Vibration Dose Value (VDV) of 0.20 $m/s^{1.75}$ for comfort of the occupants (whole body vibration). The monitors were configured for continuous monitoring Mon - Sat, 6 am - 6 pm, with SMS (text message) alarms to be sent automatically to Eugene Godfrey and DP in the event of vibration exceedances (vibration levels exceeding 7 mm/s VSPPV, as a contingency for impulsive events).

The eVDV shown in the attached graphs is a calculated estimate of VDV from velocity data rather than acquired acceleration data. The Dose Rate and Maximum Values refer to accumulated vibration activity per day during daytime hours and includes summations of RMS velocities, wavelength durations and amplitudes (as detailed in NSW EPA Assessing Vibration: A Technical Guideline, February 2006). "Critical Areas" includes hospital operating theatres and precision laboratories where sensitive operations are occurring, and these criteria are indicative only, therefore consideration of continuous and impulsive vibrations is included (as recommended), see attached graphs. The table of acceptable daily Dose Values, Table 2.4, includes a "Preferred Value", being half of the "Maximum Value".

Outcome this period: 16 March to 23 March 2020

Location	Monitor	Exceedances		Time of maximum exceedance
		No.	Max (VSPPV)	
Monitoring Location A	Vujaca	0	n/a	n/a
Monitoring Location B	7153	0	n/a	n/a

Douglas Partners Pty Ltd

Jeremy Hill
Senior Geophysicist

Reviewed by

Peter Oitmaa
Principal

Attachments: Graphs of Vibration Levels, Monitor Location Plan, About This Report

Limitations

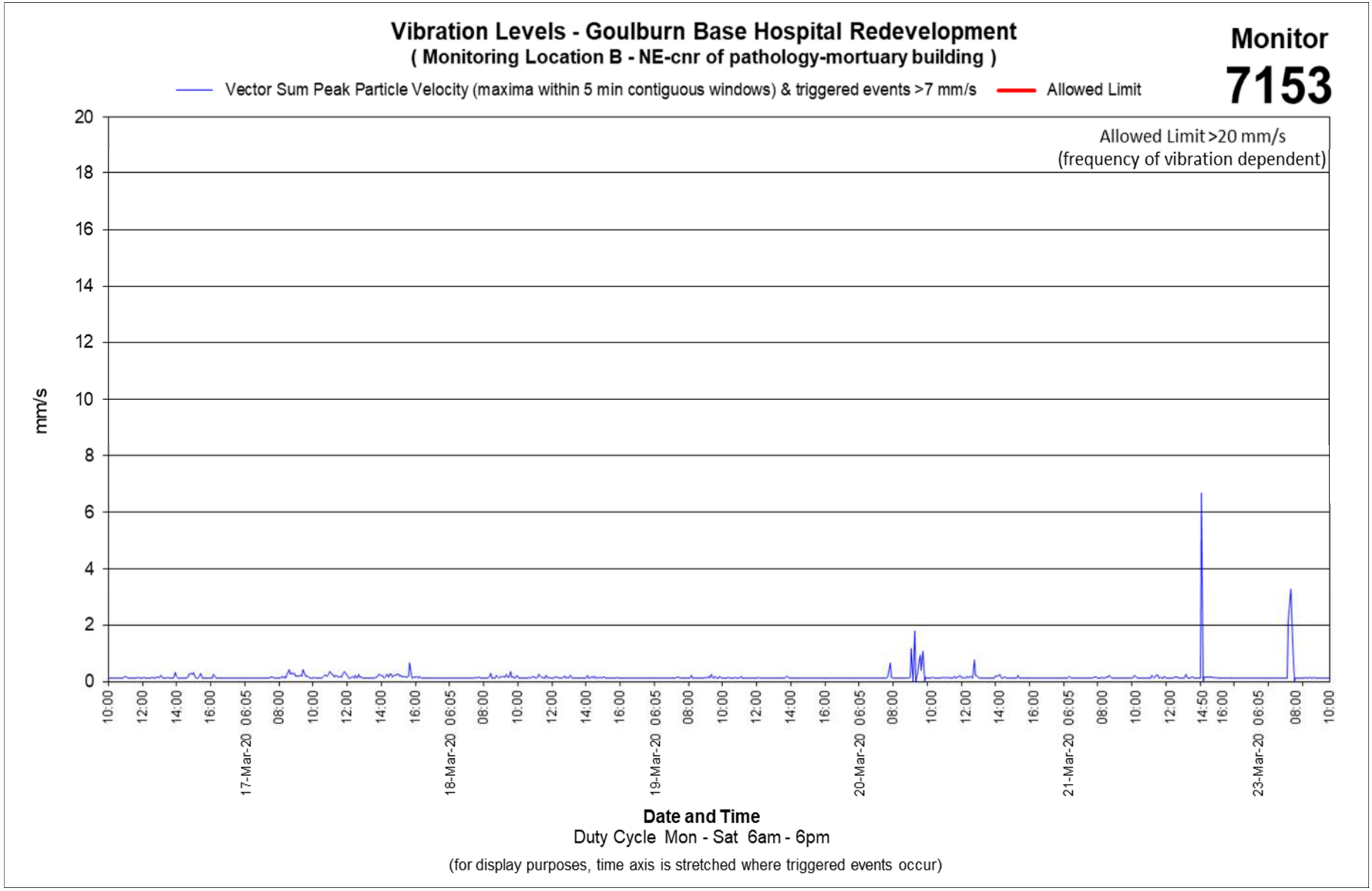
Douglas Partners Pty Ltd (DP) has prepared this report for Hansen Yuncken Pty Ltd. The report is provided for the exclusive use of Hansen Yuncken Pty Ltd for this project only and for the purpose(s) described in the report. It should not be used for other projects or by a third party. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

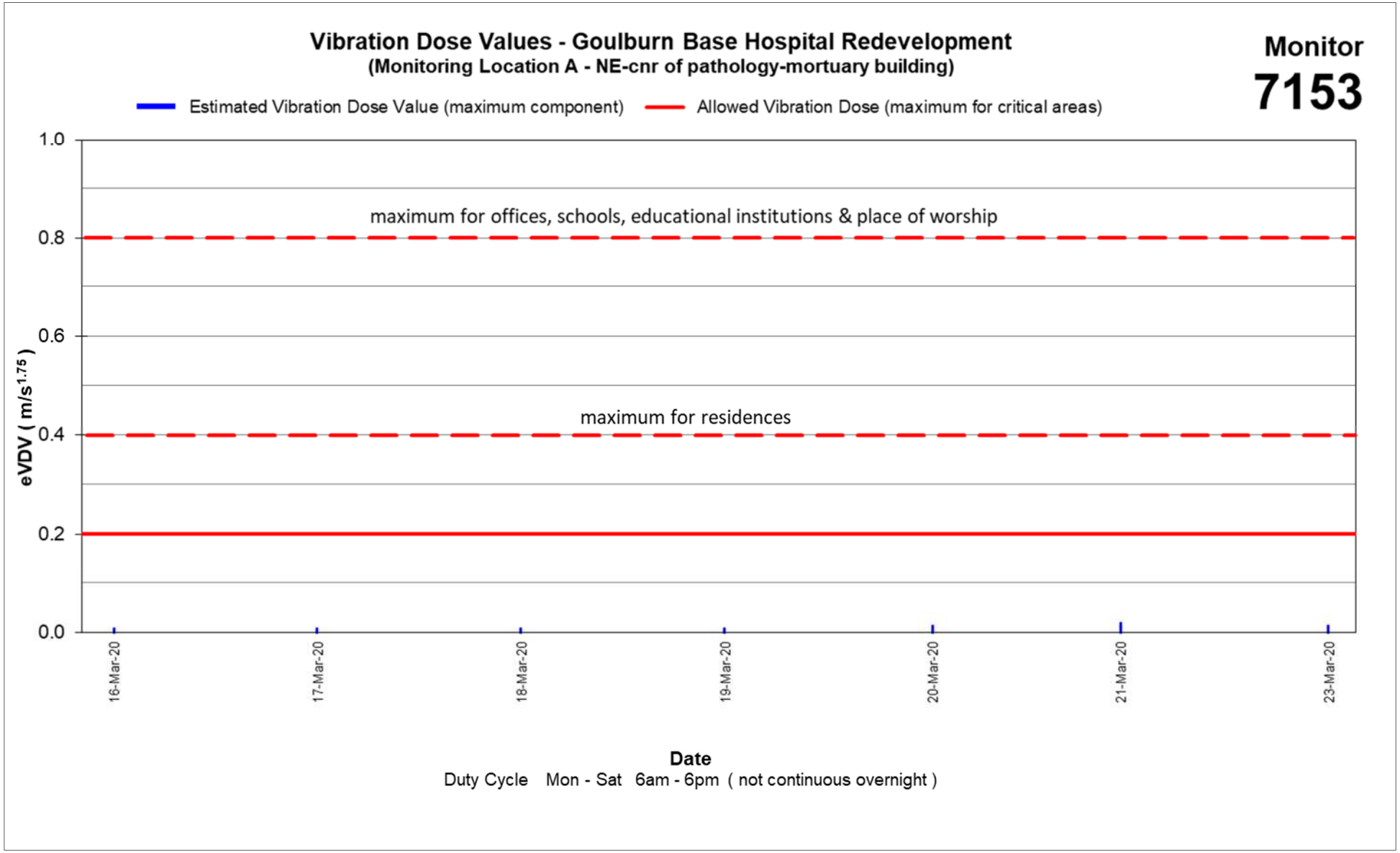
DP's advice may be based on observations, measurements, tests, or derived interpretations. The accuracy of the advice provided by DP in this report may be affected by unobserved features and variations in ground conditions and conditions affecting vibration across the site, between and beyond the testing locations or by variations with time. Vibration monitoring and advice may also be limited by budget constraints imposed by others or by site accessibility.

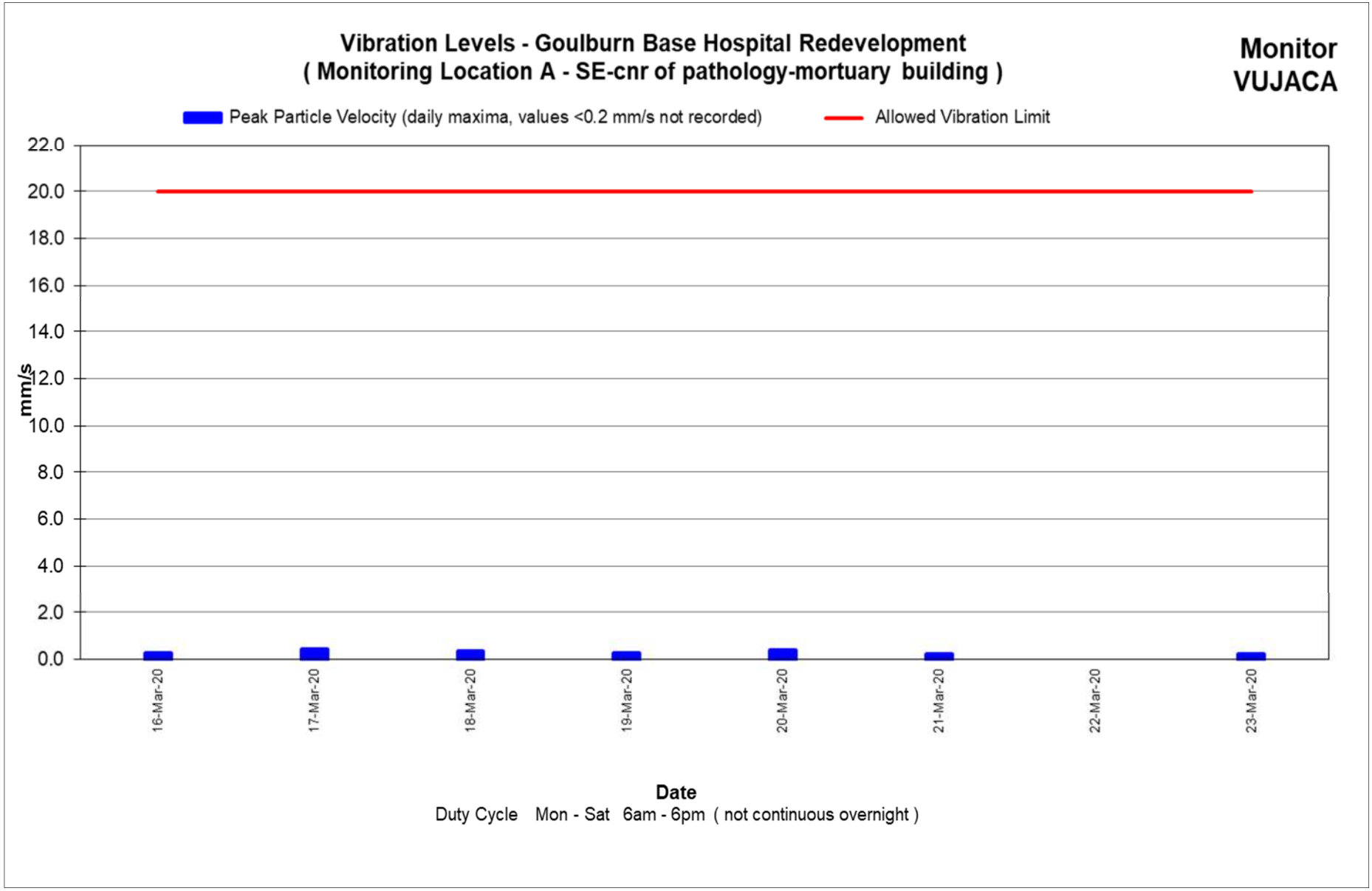
The results provided in the report are indicative of the vibration levels at the sensor location(s) only and only during the specified period of monitoring. Vibration levels in other locations may therefore differ from those reported herein.

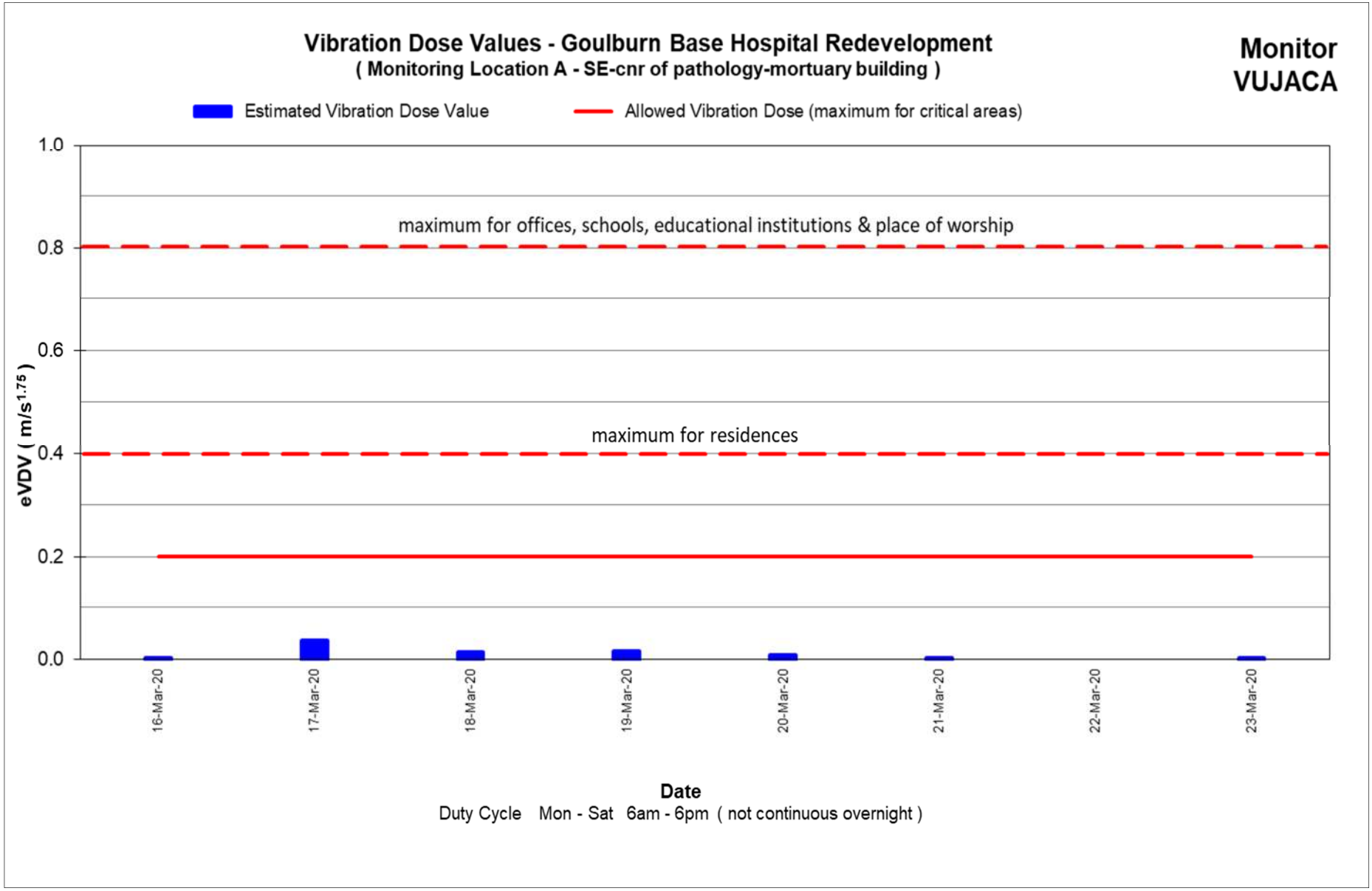
As neither estimations of safe operating distances for vibrations (if provided) nor the presence of an unattended vibration monitor can prevent exceedances, the real-time management of vibration remains the responsibility of Hansen Yuncken Pty Ltd and its plant operators. Interference with (e.g. movement or damage to) the monitoring equipment may influence readings and the Client is responsible for advising DP immediately to assess whether readings are affected, re-installation and/or repair is required.

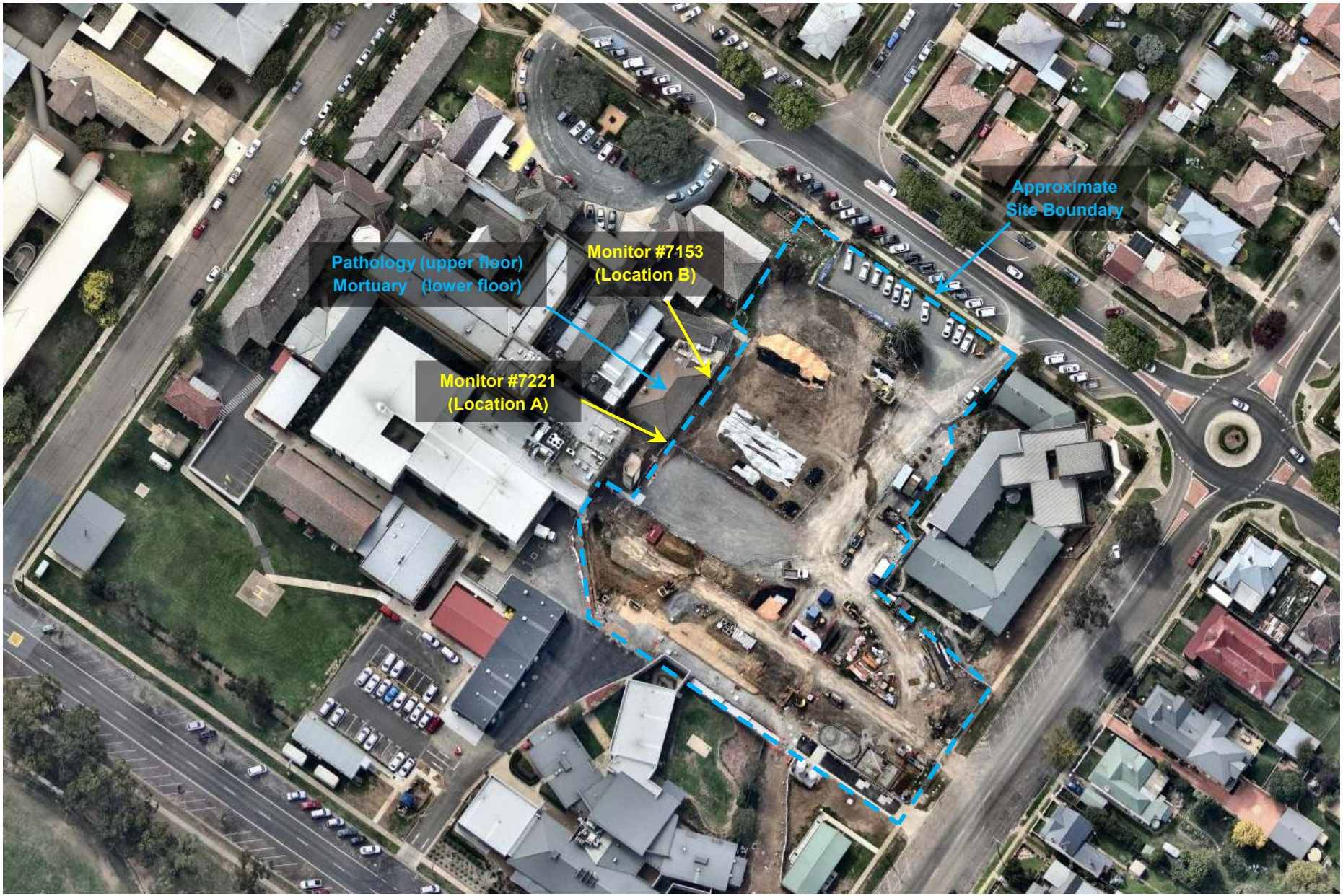
This report must be read in conjunction with all of the attached notes and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation,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


Vibration Levels - Goulburn Base Hospital Redevelopment
(Monitoring Location B - NE-cnr of pathology-mortuary building)
Monitor
7153
Vector Sum Peak Particle Velocity (maxima within 5 min contiguous windows) & triggered events >7 mm/s
Allowed Limit
Allowed Limit >20 mm/s
(frequency of vibration dependent)
mm/s
20
18
16
14
12
10
8
6
4
2
0
10:00
12:00
14:00
16:00
17-Mar-20 06:05
08:00
10:00
12:00
14:00
16:00
18-Mar-20 06:05
08:00
10:00
12:00
14:00
16:00
19-Mar-20 06:05
08:00
10:00
12:00
14:00
16:00
20-Mar-20 06:05
08:00
10:00
12:00
14:00
16:00
21-Mar-20 06:05
08:00
10:00
12:00
14:50
16:00
23-Mar-20 06:05
08:00
10:00
Date and Time
Duty Cycle Mon - Sat 6am - 6pm
(for display purposes, time axis is stretched where triggered events occur)


Vibration Dose Values - Goulburn Base Hospital Redevelopment
(Monitoring Location A - NE-cnr of pathology-mortuary building)
Monitor
7153
Estimated Vibration Dose Value (maximum component)
Allowed Vibration Dose (maximum for critical areas)
maximum for offices, schools, educational institutions & place of worship
maximum for residences
eVDV (m/s1.75)
1.0
0.8
0.6
0.4
0.2
0.0
16-Mar-20
17-Mar-20
18-Mar-20
19-Mar-20
20-Mar-20
21-Mar-20
23-Mar-20
Date
Duty Cycle Mon - Sat 6am - 6pm (not continuous overnight)


Vibration Levels - Goulburn Base Hospital Redevelopment
(Monitoring Location A - SE-cnr of pathology-mortuary building)
Monitor
VUJACA
Peak Particle Velocity (daily maxima, values <0.2 mm/s not recorded)
Allowed Vibration Limit
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
mm/s
16-Mar-20
17-Mar-20
18-Mar-20
19-Mar-20
20-Mar-20
21-Mar-20
22-Mar-20
23-Mar-20
Date
Duty Cycle Mon - Sat 6am - 6pm (not continuous overnight)


Vibration Dose Values - Goulburn Base Hospital Redevelopment
(Monitoring Location A - SE-cnr of pathology-mortuary building)
Monitor
VUJACA
Estimated Vibration Dose Value
Allowed Vibration Dose (maximum for critical areas)
maximum for offices, schools, educational institutions & place of worship
maximum for residences
eVDV (m/s1.75)
1.0
0.8
0.6
0.4
0.2
0.0
16-Mar-20
17-Mar-20
18-Mar-20
19-Mar-20
20-Mar-20
21-Mar-20
22-Mar-20
23-Mar-20
Date
Duty Cycle Mon - Sat 6am - 6pm (not continuous overnight)


Approximate
Site Boundary
Pathology (upper floor)
Mortuary (lower floor)
Monitor #7153
(Location B)
Monitor #7221
(Location A)

About this Report

Douglas Partners

Introduction

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

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

Copyright

Borehole and Test Pit Logs

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

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

Groundwater

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

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

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

Reports

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

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

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

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

About this Report

Site Anomalies

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

Information for Contractual Purposes

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

Site Inspection

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