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New Zealand Parliament – Ministerial and New Members Developments

Detailed Site Investigation, Rev1

Parliamentary Services

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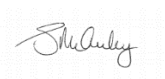
Author signature		Approver signature	
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Executive Summary

Parliamentary Services ('the client') engaged Aurecon NZ Ltd ('Aurecon') to prepare a Detailed Site Investigation (DSI) to support a Resource Consent application for the development of two new structures within the New Zealand Parliamentary Complex Wellington ('the site'). The two developments are described as follows:

- The 'New Ministerial Annex' (in current 2021 nomenclature referred to as Ministerial Building); and
- The 'New Members Building' (in current 2021 nomenclature referred to as Museum Street Building).

The site (which occupies approximately 5 hectares) has been in use as the seat of the New Zealand Government since approximately the 1860s. Aurecon understands that the client intends to develop new facilities to supplement building infrastructure on the site, which will be located in two separate areas on the western side of the Complex.

Aurecon issued a Preliminary Site Investigation (PSI) in support of the proposed developments in 2017, which identified three Hazardous Activities and Industries List (HAIL) activities to have occurred on the site.

An intrusive investigation was undertaken to assess the potential risk associated with HAIL activities, which targeted the footprints of the proposed developments. Investigation stages included drilling boreholes and subsequent piezometer installation, excavation of test pits, chemical analysis of soil and groundwater samples. The investigtions found the following:

- No exceedances of Tier 1 soil criteria with respect to human health criteria for commercial / industrial site use were reported during intrusive investigation works (MfE, 1999 - *Revised 2011*).
- Shallow soil samples generally exceeded background concentrations for the greater Wellington region, indicating the potential presence of uncontrolled fill material across the site.
- Asbestos fibres were not identified in any soil samples collected.
- Copper concentrations are above Tier 1 criteria within perched groundwater with respect to potential natural receiving environments (ANZECC 2000).
- Laboratory results at BH1-2 reported elevated E. Coli and ammonia concentrations, which can be indicative of the presence of wastewater. Please see Appendix A for intrusive investigation locations.
- The conceptual site model has identified potentially complete source-pathway-receptor linkages between:
  - Construction workers and uncontrolled fill mateiral; and
  - On- and off-site users and uncontrolled wastewater discharge.
- Shallow soil present across the site is likley fill material and should be managed appropriately for if disposed on- or off-site.

Based on the findings of this DSI, the following actions are recommended:

- Application for a controlled activity Resource Consent prior to development of the site is likely to be required to comply with NES-Soil regulations and completion of a Contaminated Site Management Plan.
- Application for a discretionary activity (restricted) consent is likely to be required to comply with Rule 32.2.1 of the Wellington City Council District Plan (WCCDP)
- Any work involving the disturbance of shallow soil should be undertaken in accordance with method statements and risk assessment prepared in accordance with relevant guidance including the Health and Safety Act (2016).

1 Introduction

1.1 Project Background

Parliamentary Services ('the client') engaged Aurecon NZ Ltd ('Aurecon') to prepare a Detailed Site Investigation (DSI) to support a Resource Consent application for the development of two new structures within the New Zealand Parliamentary Complex in Wellington (hereafter 'the site'). The two structures are described as follows:

- The 'New Ministerial Annex' (in current 2021 nomenclature referred to as Ministerial Building); and
- The 'New Members Building' (in current 2021 nomenclature referred to as Museum Street Building).

A site location plan showing the site and the locations of the proposed developments is presented in **Appendix A**.

1.2 Proposed Developments

1.2.1 New Ministerial Annex

The proposed 'New Ministerial Annex' is to form an extension to the western side of the Executive Wing. The western side of the Executive Wing currently comprises a structure that is in use as the 'Press Gallery' and also incorporates two service access entranceways into the building.

This Press Gallery structure is to be fully demolished and replaced as part of the development. A small raised, walled ornamental garden is also located to the immediate west of the Executive Wing, which will also be removed (the new development does not cover the whole area of the garden, but it will likely be fully removed during construction) to make way for the New Ministerial Annex structure.

The development will be rectangular in covering an area of 972 m^2 and will incorporate multiple levels and a basement structure below some or all of the footprint of the new development. Figure 1 shows the layout of the Parliamentary Complex, and the approximate locations of the structures within the site:

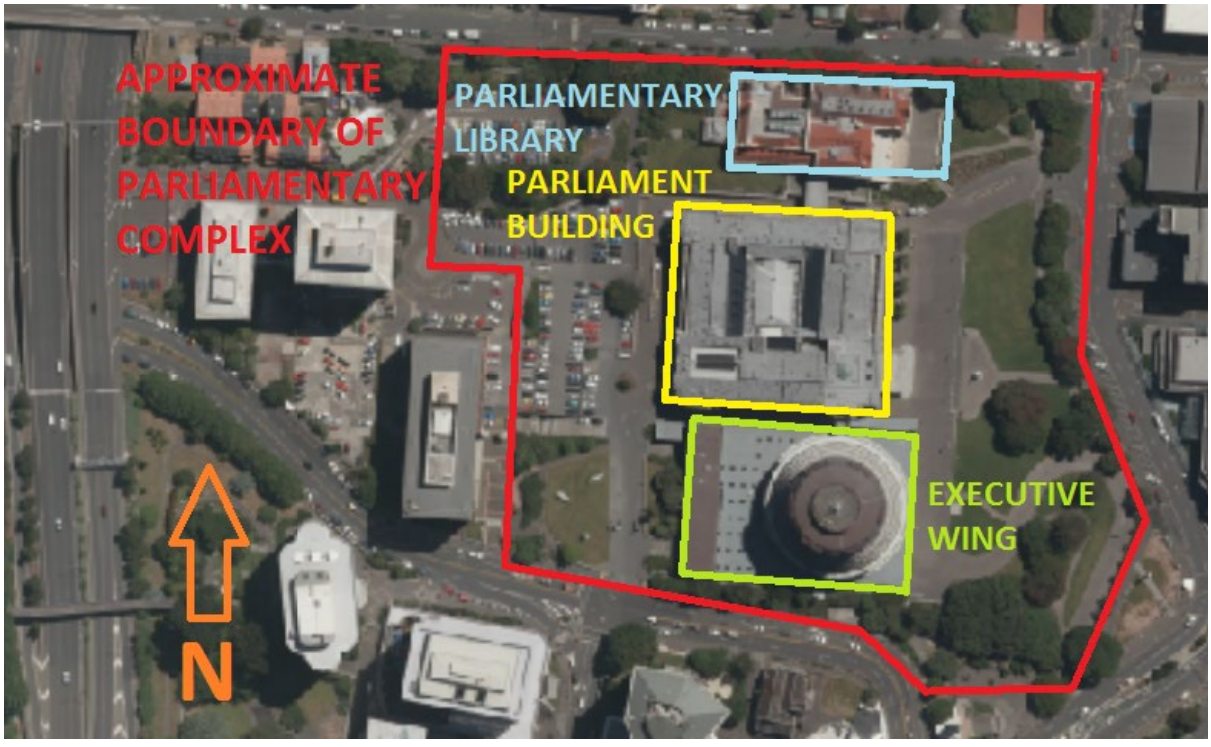


Figure 1: Site boundary, and location of features within the Parliamentary Complex (image courtesy of WCC Webmap, wellington.govt.nz/webmap/wccmap.html)

1.2.2 New Members Building

The proposed 'New Members Building' is to be constructed on land currently used for car parking to the west of the Parliament House Building. This building is to be a multi-storey rectangular-plan covering an area of 2000 m^2, with abasement structure below some or all of the footprint of the new development.

1.3 Legislative Requirements

The site is recorded on the Greater Wellington Regional Council Selected Land Use Register (GWRC SLUR) as a Hazardous Activities and Industries List (HAIL) site (refer to **Section 3**), defined under the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations (2011) (the 'NES'). Therefore, the proposed development will require a resource consent under the NES to undertake proposed development works.

In addition to the NES, potential contamination associated with historical uses may also present a risk to the health of construction workers (not currently legislated by the NES) and nearby environmental receptors; legislated in accordance with the Proposed Natural Resources Plan for the Wellington Region, the Health and Safety at Work Act 2015 and its various associated Regulations. A DSI is required to assess the potential risk to human health and environmental receptors as a result of historical and current site activities.

1.4 Objectives and Scope

This contamination assessment was undertaken to assess the risk from ground to human health and the built environment as a result of proposed development works, and consisted of soil and groundwater sampling to assess contamination conditions.

At the time of the investigation design and writing of this report the developments were still at conceptual design stage so many details of the buildings have not been finalised, but available architectural information indicates that the proposed developments will incorporate single-level basement structures.

This assessment comprises a review of existing reports (refer to **Section 3**) with incorporation of updated background information and supplementary soil and groundwater sampling to confirm conditions. The following scope of works was undertaken:

- Desktop review of current sub-surface conditions and historical site use;
- Soil profile logging and sampling via mechanically-drilled boreholes and mechanically-advanced / hand-excavated shallow test pits across the footprints of the proposed developments;
- Use of a photoionisation detector (PID) to screen for the presence of volatile compounds in soil;
- Installation of piezometers in the boreholes;
- Undertake ground gas monitoring and groundwater sampling;
- Analysis of soil and groundwater samples at an accredited laboratory for identified contaminants of concern; and
- Review and assessment of analytical results.

This DSI has been conducted in accordance with Ministry for the Environment (MfE) *Contaminated Land Management Guidelines*, within the framework of the *Resource Management Act 1991*. This assessment has been undertaken and verified by Suitably Qualified and Experienced Practitioners (SQEPs) as required under the NES.

2 Site Setting

2.1 Site Setting

The site, which covers a total area of approximately 5 hectares, is located in Pipitea, at the northern end of the Wellington Central Business District (CBD), and is bounded by Bowen Street to the south, Lambton Quay to the southeast, Molesworth Street to the east, Hill Street to the north, and Museum Street and the 'Bowen Campus' complex of high-rise buildings to the west.

2.2 Site General Description

The site is the seat of the New Zealand Government (comprising the Parliament and Executive), and contains three main buildings, which occupy the central, central–northern and central–southern parts of the site, along with car parks, and landscaped garden areas.

As shown in Figure 1A, the Executive Wing is the southernmost building (Bowen Street is located to the immediate south and Museum Street to the immediate west), Parliament House is in the central part of the site immediately north of the Executive Wing, and the Parliamentary Library is the northernmost (immediately south of Hill Street), and is connected to Parliament House by a short covered walkway.

All of the large buildings are built on level platforms, but the site slopes down gently towards the south, with the northern area (containing car parks and access roads) being noticeably elevated above the rest of the site (the base of the Parliamentary Library at the northern end of site is situated at a higher elevation than the Parliament Building and Executive Wings. The southern boundary (adjoining Bowen Street and Lambton Quay) contains a short steeper slope, and the ground to the west of the Parliamentary Library immediately adjacent to Hill Street at the northern boundary also slopes steeply up to the site boundary.

2.3 Geological and Hydrogeological Setting

2.3.1 Regional and Local Geology

The geology of the Central Wellington area has been mapped and described in the 1:50,000 scale Geological Map of New Zealand – Sheet 22 – Wellington Area Map (Begg and Mazengarb, 1996). This map indicates that the soil underlying the site is *"Alluvium, silty, peat, loess, including Haywards and Kaitoke gravels, and subsurface Moera Gravel; sand; minor tephra, principally Rangitawa Tephra on erosion surface (In)"*.

The GNS Science report 'It's Our Fault' (Semmens et al, 2010) provides a 1:12,500 scale map of the Wellington CBD, which shows that the site underlain by '*Old Alluvium / Colluvium: Pleistocene alluvial and colluvial deposits consisting of sands, silts, weathered gravels and clays. Poorly sorted to well sorted, medium dense to very dense / effective bedrock'*. Greywacke and argillite bedrock is inferred to lie beneath the alluvium soils at a depth of approximately 50 to 90 metres below ground level (m bgl).

The map also shows a former ('fossil') stream passing through the site from east to west (approximately midway on the north-south axis on the western side, and flowing on a curve towards the southeast on the eastern side of site), at a depth of between 4 m and 5 m bgl. which means that this fossil stream flowed approximately under Parliament House and the proposed New Members Building development area. The route of this fossil stream underlays *'Reclamation Fill: Locally quarried, end dumped, weathered greywacke sandstone, mudstone and spoil, domestic waste (bricks, glass, wood, etc), sand, boulders and engineered fill, poorly compacted to compact'*, which indicates that the stream course was infilled to provide a level surface for construction, and that the stream may still flow as a subsurface feature on the same (or similar course / alignment).

A report compiled by Nick Perrin (1986) discussed the likely presence of other fossil stream channels across the site. Any such fossil stream channels could potentially be significant for the site as a preferential flow path for shallow groundwater, and therefore for liquid phase or dissolved contaminants as well.

The geology beneath the site was described by Aurecon in 2017 as:

New Ministerial Annex

- The site is underlain by fill comprising silt and gravels at the top. The depth of fill is likely to vary between 1.5 m bgl and 4.5 m bgl. It was difficult to indicate the exact depth of fill due to compositional similarity between the fill and in-situ materials.
- The fill is underlain by undifferentiated alluvium and colluvium soils to bedrock. The soils to approximate 7 m bgl comprises alternating layers of silt, sand and gravels. The silts are logged as soft to stiff and sand and gravels as loose to medium dense.
- The soils below 7 m bgl are predominantly sandy / silty gravel with random interbedded layers of sand, silt and clay mixtures. The thickness of interbedding varies from 0.3 m bgl to up to 2 m bgl. The gravels are generally moderately dense to very dense.
- The above alluvium and colluvium soils are underlain by bedrock at 75 m bgl to 85 m bgl. The bedrock is logged as slightly weathered, highly fractured and strong greywacke siltstone with few thin quartz veins up to 100 mm thick; bluish grey to orange grey.

New Members Building

- The site is underlain by fill comprising silt and gravels at the top. The depth of fill is likely to vary between 1.5 m bgl and 3.8 m bgl. It was difficult to indicate the exact depth of fill due to compositional similarity between the fill and *in-situ* materials.
- The fill is underlain by undifferentiated alluvium and colluvium soils to bedrock. The soils to approximate 11.5 m bgl comprises alternating layers of silt, sand and gravels. The silts are logged as soft to stiff and sand and gravels as loose to medium dense.
- The soils below 7 m bgl are predominantly sandy/silty gravel with interbedded layers of sand, silt and clay mixtures. The thickness of interbedded soil varies from 0.3 m bgl to up to 2.1 m bgl. The gravels are generally moderately dense to very dense
- The above alluvium and colluvium soils are underlain by bedrock at 53 m to 66 m bgl. The bedrock is logged as slightly weathered, highly fractured and strong greywacke siltstone with few thin quartz veins up to 100 mm thick; bluish grey to orange grey.

2.3.2 Hydrological and Hydrogeological Setting

There are no permanent surface water bodies within the site boundary. The nearest surface water body is Wellington Harbour, the shoreline of which is located approximately 400 m southeast of the site. Before land reclamation was undertaken in approximately the late 1800s the harbour shoreline was located in close proximity to the site.

Prior to development of the site as the New Zealand Parliament Complex at least one small stream flowed approximately east-west across the site (these streams likely discharged to the historical shoreline of Wellington Harbour in close proximity to the east) but all surface water flowpaths were infilled, likely at the time of the site's development.

During the 2017 Aurecon geotechnical investigations, groundwater was noted during drilling at between 0.8 and 2.6 m bgl within the footprint of the proposed location of the New Ministerial Annex, and 2.4 and 2.9 m bgl within the footprint of the proposed location of the New Members Building. Based on observations from the construction works at the Bowen Campus to the immediate west of site, the groundwater was observed to occur as a perched groundwater unit within the top 5 m.

Regional groundwater flow is expected to the east towards Wellington Harbour though flow may vary on local scales due to heterogeneity in the fill material, and the presence of foundations and basement structures in the shallow subsurface. It should be noted that the groundwater levels are likely to be subject to seasonal and geographical variations.

3 Site History and Record Search Review

This section provides a summary of the review of site history and record search review that was undertaken in the Aurecon PSI:

3.1 Greater Wellington Regional Council Selected Land Use Register – HAIL Sites

A search was undertaken of the GWRC online Selected Land Use Register (SLUR), and this identified that the site is recorded as having activities listed on the MfE HAIL. Details are as follows:

- SN/05/907/02 (Parliament Buildings), verified history of hazardous activity or industry. HAIL category: **A2** – Chemical manufacture, formulation or bulk storage. Sub-category: Storage tanks or drums for fuel, chemicals or liquid waste.

3.2 Greater Wellington Regional Council Database – Consents and Bores

A search of the GWRC Resource Consents and Wells database (which provides data on Water Take Consents, Resource Consents and Wells and Bores) was undertaken, no information of relevance to this assessment was identified.

3.3 Wellington City Council Property Files

Council property file information (supplied by the Wellington City Council (WCC) Archives) provides a record of former resource and building consents related to individual properties located within the site area. The records with greatest potential significance for ground contamination conditions are summarised as follows (other records are summarised in the PSI, but these are of lesser direct relevance to potential ground contamination conditions):

- Architectural drawings for the '*Departmental Building and Broadcasting House, Bowen Street Wellington'* (1957). This record provided details of the Departmental Building and Broadcasting House, which were located to the west of the current Parliament Complex buildings. This record provides confirmation of the presence of asbestos containing material (ACM) within Broadcasting House.
- Project consent application (including plans) for refurbishment at *'Bowen Street, Broadcasting House, Levels 1-4'* (1993 – 94). This record provides evidence that ACM removal works were undertaken in several locations within Broadcasting House.
- Application for building consent at *'Bowen Street, Broadcasting House, Wellington'* (1997 – 98). This record provides detail of the plans for demolition of Broadcasting House, but no mention of any remaining ACM in the structure is given.
- Record for *'1 Molesworth Street (40 Bowen Street)'* (2010 – 11). This record describes the replacement diesel tanks installed within the Executive Wing building. These works (comprising 2 x 7000 litre tanks) took place at a location at the eastern end of the building, which is outside of the proposed development areas.

3.4 Historical Land Survey Information and Historical Aerial Photography

This section summarises the broad findings of the historical land title information (made available from Land Information New Zealand) and historical photography (both ground level and aerial, made available from Opus International Consultants, the National Library of New Zealand collection, the VC Browne aerial photography collection and Google Earth),

The earliest survey record (1869) showed that the land on which the site was constructed was immediately adjacent to the shoreline with Wellington Harbour to the east. Development of the site commenced in the late 1800s and by the early 20th century the site (which was noted as being earmarked for government use) contained numerous buildings including the Parliamentary Library and roadways (which were closed off as use of the site expended).

By the 1930s large-scale land reclamation had extended the shoreline to the east of the site, and the 'Old and New Parliament Wings' ('New Parliament Wing' refers to the current Parliament House), as well as a series of smaller buildings labelled as 'Government Workshops' had been constructed on the site. The site and its immediate surrounds subsequently underwent significant development in the 1950s and 1960s with the construction of Broadcasting House and the New Zealand Electricity Department Building to the immediate west of the Parliament buildings.

The 'Old Parliament Wing' was demolished and the Executive Wing constructed on the same location during the 1970s. Few major changes were made on the site during the 1980s and 1990s, but the Workshops, Broadcasting House and New Zealand Electricity Department Buildings had all been demolished and fully cleared by the early 2000s, with the land use to the west of the Parliamentary Complex changed to large-scale car parking; that land use has continued to the present day.

3.5 Previous Investigation and Reporting

3.5.1 Aurecon 2017 PSI Report

The PSI carried out by Aurecon provides a summary of the site's environmental setting and historical uses and activities from the initial development of the site as the location of the national Parliamentary Complex in the late 1800s, through to the current day.

Potential sources of contamination identified by the PSI have been summarised in **Section 4**. HAIL activities identified at the site included the on-site storage of hydrocarbons (as recorded in the GWRC SLUR), the infilling of the ground from successive rounds of building construction and demolition, along with the potential importation of fill material, and the presence of asbestos in the ground due uncontrolled building demolition and presence of uncontrolled fill.

The preliminary contamination linkage assessment concluded that the on-site storage of hydrocarbons may have resulted in limited impacts to groundwater (including off-site migration), and the presence of fill material (potentially containing asbestos) could pose a risk to construction and maintenance works, future site users, and environmental / ecological receptors. The PSI recommended that this DSI be undertaken to inform the risks posed to these receptors as part of the proposed new developments.

3.5.2 Aurecon 2017 Geotechnical Reports

Geotechnical investigations were carried out by Aurecon which were reported separately for the two proposed development areas. The geotechnical investigation of this location was undertaken between 19 November 2016 and 24 February 2017. The findings of this investigation have been integrated into the ground model presented in this report.

3.5.3 Aurecon 2016 Bowen Campus Geotechnical Report

Geotechnical investigations were carried out by Aurecon at the Bowen Campus site, which is located to the immediate west of the site. The investigations were undertaken between 17 November and 21 December 2015, and investigation have been integrated into the ground model presented in this report

4 Summary of Potential Contaminating Sources

Based on the reviewed historical information and data provided by the SLUR, three HAIL activities have been identified to have occurred on the site.

- **A2 – Chemical manufacture, formulation or bulk storage.**

The SLUR identifies this HAIL category as being applicable to the site, and consent records confirm that several underground storage tanks (USTs) and above-ground storage tanks (ASTs) are present at the site.

No specific information was available on the size, age or condition of the tanks except those at the eastern end of the Executive Wing (which date from 2010 – 11) so it is inferred that the USTs at the western end of Parliament House and the Parliamentary Library are of older installation and are therefore the most likely historical and potentially ongoing source of hydrocarbon contamination. There is potential for diesel-range hydrocarbons to have entered soil directly surrounding the tank from leaks and other defects in the tank, pumps and piping systems, and also potentially from spills and leaks from filling of the tank, and extraction of product from the tanks.

- **E1 – Asbestos products manufacture or disposal including sites with buildings containing asbestos products known to be in a deteriorated condition.**

The building consents records identify ACM was present in Broadcasting House (removal works are recorded as having taken place, but no record is made of the completeness of these works), and therefore may have been present in other nearby buildings which were demolished during the approximate period 1960s – 2000s.

Demolition of these buildings may potentially have led to may have led to ACM and asbestos fibres and dust becoming incorporated into shallow fill material from the demolition process itself, or from the disposal of ACM-bearing demolition waste directly to ground (see below).

- **G5 – Waste disposal to land (excluding where biosolids have been used as soil conditioners**).

During the period from the late 19th century to the early 21st century significant land-use changes (construction and removal of buildings and roads) have been undertaken in the area to the west of the Parliamentary Complex. These land-use changes have been undertaken as several successive ‘rounds’ of development and as such site infilling may have taken place to some degree within the whole Parliamentary Complex. A number of the buildings that have been removed were large and so will have produced large quantities of demolition waste, all or some of which may have been retained on site.

Successive layers of fill material could potentially have been emplaced, and even if later works had removed significant quantities of fill, it is feasible that earlier fill material may have been left in place on top of natural deposits. It is also possible that uncontrolled fill from other unknown/unrecorded sites could have been brought in for levelling and surface build-up purposes during one or more of the historical construction phases.

5 Conceptual Site Model

Risk is assessed on the basis of a Conceptual Site Model (CSM) considering source – pathway – receptor linkages. Central to the requirements for the assessment of risk is the development of a CSM based on the existing available information.

5.1 Ground Model

The stratigraphy of the site, compiled from published geological data and previous intrusive site works, is presented in Table 1.

Table 1: Stratigraphy

Geological unit	Generalised lithology	Depth below ground level to top of unit (m bgl)	Thickness (m)
Fill	Sandy gravel, silt	0.0	1.5 – 2.2 **(3.0 – 4.5 [1])**
Undifferentiated Colluvium / Alluvium	Silty clay, clayey silt, silt, sandy silt, silty sand, sand, silty gravel, gravelly sand, sandy gravel, gravel / cobbles	1.5 – 2.2 **(3.0 – 4.5 [1])**	51.5 – 72.9
Bedrock	Weathered, fractured siltstone with quartz veins	53.7 – 75.1	Unknown

[1] The Aurecon 2017 geotechnical reports both note that "It was difficult to indicate the exact depth of fill due to compositional similarity between the fill and in-situ materials", so the thickness of fill is uncertain.

The groundwater surface was encountered during the investigation over the two proposed development areas between 0.8 and 2.9 m bgl, with groundwater interface generally closer to ground surface in the location of the New Ministerial Annex to the south, and deeper to the north at the proposed location of the New Members Building.

Several paleo channels are present within the vicinity of the site below the observed groundwater table, these may influence migration of contamination from the site.

5.2 Contamination linkage assessment

Table 2 presents the preliminary contamination linkage assessment identifying sources pathways and receptors. This assessment was undertaken with consideration of the requirements of the forthcoming redevelopment of the site. Receptors considered to potentially be at risk from the proposed development and subsequent site use are as follows:

- Future site users;
- Adjacent site users;
- Construction and maintenance workers;
- Surface water bodies (Wellington Harbour, and also the on-site stormwater system);
- Groundwater;
- Future site infrastructure (such as foundations, buried services and utilities);

In addition, the following will be key considerations for the redevelopment of the site:

- Appropriate on- or off-site management of excavated materials; and
- Appropriate management of water produced by dewatering of excavations.

The preliminary contamination linkage assessment has been developed from an assessment of potential sources of contaminants, potential exposure pathways, and feasible receptors.

Table 2: Preliminary Contamination Linkage Assessment

Site activity, likely affected areas and HAIL designation	Potential contaminants	Pathway	Critical Receptors	Comments
Handling, storage and use of bulk chemicals (hydrocarbons) within USTs / ASTs on the Parliamentary Complex. Known locations of are these are the eastern and western ends of Parliament House, and at the eastern end and sub-basement of the Executive Wing building. Approximate timeframe of activity: The start of bulk on-site hydrocarbon storage is unknown, but is likely to have been ongoing since approximately the 1920s (therefore approximately 90 years ago to present). HAIL category: A2	Hydrocarbons (likely to be mostly in the diesel and fuel oil range), heavy metals, soil vapours	Inhalation Ingestion Dermal Contact Leaching to groundwater and lateral migration from the site	Future site users Adjacent site users Construction and maintenance workers Groundwater Surface water Site Infrastructure	Bulk hydrocarbons are likely to be held on site primarily for the purposes of emergency generation (though no confirmation of any on-site electrical generators was identified in any of the records, though this could be due to confidentiality requirements) and also potentially for ancillary purposes such as vehicle refuelling or as a fuel for on-site space heating (if this is the case, it would likely be historical). USTs installed earlier than approximately the 1990s would be unlikely to be double walled or have any sort of bunding or leakage mitigation features, so are most likely to have caused direct contamination of immediately surrounding ground and / or groundwater.
Use of fill material (including waste from the demolition of on-site buildings and / or uncontrolled imported fill) to reclaim land and / or build up, landscape or otherwise alter the ground surface within the site. Asbestos in soil originating directly from dust and debris released during the uncontrolled demolition of on-site buildings, or contained with building demolition waste used for infill. Asbestos that was surplus to requirements during construction of on-site buildings could also potentially have buried on site, and / or could have been brought to site within uncontrolled imported fill. Approximate timeframe of activity: major land use changes on the site have been undertaken in three distinct 'waves' / phases (refer to Aurecon 2017 PSI), with the first taking place after World War II (therefore approximately 70 years ago to present). HAIL categories: E1 and G5	Various including heavy metals, asbestos, hydrocarbons	Inhalation Ingestion Dermal Contact Leaching to groundwater and lateral migration from the site	Future site users Adjacent site users Construction and maintenance workers Groundwater Surface water Site Infrastructure	The peak period of asbestos use (approximately 1960s to 1980s) broadly coincides with the second major 'phase' of land use change, which was when the Old Parliamentary Wing was demolished to make way for the Executive Wing during the 1970s. Fill emplaced during this period presents the greatest risk of containing asbestos.

6 Intrusive Investigation

6.1 Investigation Objectives

The objective of the intrusive investigation was to obtain site specific data to inform the contamination linkage assessment such that the following assessments can be refined:

- Risks to construction workers during earthworks (bulk excavation and foundation installation) and building construction;
- Risks to future site users;
- Groundwater quality and risk of off-site migration of contaminants;
- Requirements for dewatering during earthworks and options for management of effluent;
- Risks to environmental receptors; and
- Management and disposal options for bulk soil that is to be excavated from the site (including assessment of scope for reuse of excavated materials on-site).

6.2 Investigation Approach

6.2.1 Overall Approach

The intrusive investigation was undertaken through the use of machine-drilled boreholes and machine- / hand-excavated shallow test pits, which targeted the footprints of the proposed developments. Intrusive investigation locations are presented in **Appendix A**.

The intrusive works were undertaken by Webster Drilling and RDL under the observation of Aurecon Engineers between 19 September and 13 October 2017. The breakdown of the investigation stages is as follows:

- Installation of BH1-1 and BH1-2 (within the location of the New Ministerial Annex) to a maximum total depth of 10 m bgl, with standpipe piezometers (screened between 0.5 and 4.5 m bgl), including soil logging and sampling;
- Installation of BH2-1 and BH2-2 (within the location of the New Members Building) to a total depth of 10 m bgl, with standpipe piezometers (screened between 0.5 and 4.5 m bgl), including soil logging and sampling;
- Mechanical excavation of TP1 – 8 (within the location of the New Ministerial Annex) to a maximum total depth of 0.6 m bgl, including soil logging and sampling;
- Hand excavation of TP9 – 10 (within the location of the New Members Building) to a total depth of 0.45 m bgl, including soil logging and sampling;
- Ground gas monitoring in BH1-1, BH1-2, BH 2-1 and BH2-2;
- Borehole piezometer development in BH1-1, BH1-2, BH 2-1 and BH2-2; using a submersible electric pump and hand bailers, including percolation / rising head tests in BH1-1 and BH2-1; and
- Groundwater monitoring and sampling using a low-flow electric pump and hand bailers in BH1-1, BH1-2, BH 2-1 and BH2-2;.

Refer to **Appendix A** for a layout of all of the test locations.

6.2.2 Reasoning for Approach

Borehole drilling allows detailed observation and logging of geological material to be undertaken in both shallow and deeper geological layers, and the piezometers installed in the boreholes permit ground gas and groundwater monitoring and sampling to be subsequently undertaken. The characterisation of shallow fill material within the proposed development areas was identified as a priority for the site investigation, for which test pitting is best suited as it allows observation of large

surface area faces of in-situ soil. As such, a combination of boreholes and test pits was used in this investigation.

The shallow test pits were intended to provide rapid, spatially-distributed 'snapshots' of the general nature of the fill over the footprints of the development areas, rather than to provide detailed logs of the full thickness of the material. Review of historical data indicated the potential for demolition waste and other anthropogenic materials to be present in fill, and the shallow test pits provided a means to assess the presence, composition and distribution of this material.

6.2.3 Intrusive Methodology

The client requested that disruption to the in-use staff car park (where the footprint of the proposed New Members Building is located, corresponding to TP1 – 8) was minimised, which required out-of-hours (night) working.

A contractor was engaged to excavate eight locations (TP1 – TP8) using a conventional 2-tonne excavator and reinstate the locations, within a single night whilst applying appropriate procedures and measures for asbestos control and avoiding service damage (close observation and toothless excavator buckets). The final two test pits (TP9 and TP10) were located within the footprint of the New Ministerial Annex in the walled garden area, so were not subject to the same timing restrictions as those located within the active car park area. These were hand-excavated at a later date, as the wall around the garden prevented access for the 2-tonne excavator, and ground conditions generally permitted hand-excavation.

All locations were scanned for underground services and obstructions prior to excavation by Underground Service Locators (using ground penetrating radar (GPR) and a cable avoidance tool (CAT)), based on available service plans.

Intrusive service clearance was carried out using shallow hand-augered boreholes at BH1-1 and BH1-2, where the lack of surface seal / hardstanding and ground conditions permitted this approach, but this was not possible in the car park area for BH2-1 and BH2-2. Excavation of a service clearance pit to approximately 2 m bgl using the 2-tonne excavator (applying appropriate safety procedures; see above) was undertaken, followed by backfill around an upright (approximately) 200 mm diameter PVC tube which was cut off at the ground surface to provide a 'guidance sleeve' for the drillers.

All four of the boreholes were advanced to their target depth of 10 m bgl using a rotary drilling rig driving PQ (approximately 120 mm diameter) casing, with full core recovery. Aurecon observed the first stage of borehole drilling (approximately the first three - four metres, depending on conditions observed) at each location (to log and sample core from shallow depth, which potentially contained volatile contaminants). Core from the remainder of the hole was logged and sampled by Aurecon at a later date.

6.3 Sampling Methodology

6.3.1 Soil Sampling

Samples were collected from multiple depths within the boreholes and test pits; this was steered by planned sampling frequency (i.e. sampling at regular and representative depth) and also based observations made during excavation/drilling and soil logging. Samples were targeted to areas where evidence (visual and olfactory indicators, and 'head space' readings) of contaminants was observed, at the groundwater surface, and where ground conditions and the underlying soil strata may have varied.

The 'head space' readings were taken by collecting soil samples from soil cores (as soon as practical following core recovery) and the walls and base of test pits, which were then placed into zip lock plastic bags and a PID was used to measure the presence of volatile compounds in the soil after approximately 10 minutes.

Samples were collected in general accordance with Contaminated Land Management Guidelines (CLMG) *Volume 5: Site Investigation and Analysis of Soils.* Between each location, the sampling

equipment was cleaned with Decon90 (phosphate free detergent) and disposable nitrile gloves were used to collect each sample to minimise the risk of cross contamination. Soil samples were placed directly into clean containers provided by the laboratory, which were then placed in a chilled container and sent to the laboratory under chain of custody documentation for analysis.

A total of 61 soil samples (19 from the test pits, 42 from the boreholes) were collected during the investigation. A total of 28 of these samples were placed in cold storage at the analytical laboratory, and 33 samples (taken from both the boreholes and test pits) were scheduled for analysis. The following describes the analyses that were carried out, excluding duplicates which are further discussed in **Section 7.4**:

- 33 samples were analysed for heavy metals;
- 11 samples were analysed for Total Petroleum Hydrocarbons (TPH);
- 11 samples were analyses for Benzene, Toluene, Ethylbenzene and Xylenes (BTEX);
- 33 samples were analysed for Polycyclic Aromatic Hydrocarbons (PAH); and
- 33 samples were analysed for asbestos presence / absence (P/A).

6.3.2 Ground Gas and Soil Vapour Monitoring

Measurements for CH_4, CO_2, CO and H_2S ('ground gas') indicate the potential presence of putrescible organic matter (such that might be found in waste materials and fill) and microbial activity (related to breakdown of elevated levels of organic matter) in the soil and/or groundwater, and measurement for O_2 provides indication of modification of ambient atmospheric conditions. Measurements with the PID provides indication of the presence of volatile low molecular weight organic contaminants ('soil vapour') originating from soil and/or groundwater.

Ground gas and soil vapour monitoring of the boreholes was undertaken prior to the borehole development and groundwater monitoring / sampling due to equipment availability constraints. Valve-controlled gas taps were fitted to the top of each of the standpipe to create a gas-tight seal and these were then left in place for a minimum of 24 hours to allow gases to accumulate within the standpipe from surrounding soil and groundwater.

Using an adapter that fitted to the gas tap to produce a sealed and controlled gas flow, a landfill gas analyser (LFGA) was used to measure prevailing atmospheric pressure, relative pressure within the standpipe, methane, oxygen, carbon dioxide, carbon monoxide, hydrogen sulphide, and the gas flow rate at timed intervals over a period of 270 seconds.

Gas from the exhaust vent of the LFGA was directed into a specialised valve-controlled sampling bag, and the PID was used to measure the concentrations of volatiles in this gas two or three times (dependant on the rate that it filled) over the 270 second monitoring period. A final PID reading was taken directly from the gas tap following the completion of landfill gas monitoring. Refer to **Sections 6.4.3 and Section 6.4.4** for the results and discussion of the monitoring.

6.3.3 Borehole Development and Groundwater Sampling

Four boreholes were installed at the site to provide data on the following aspects of groundwater:

- Groundwater level and hydrogeological gradients / flow characteristics within, and between the two proposed development locations;
- Groundwater quality at spatially separate locations within, and between the two proposed development locations; and
- To provide an even spread that may give insights on contaminants distributions and flows that may not be evident from analysis of historical features and conditions.

Table 3 provides details of the borehole installation, including the standpipe piezometers:

Table 3: Borehole Piezometer Installation Details

Borehole	Relative Level of borehole headworks (ground surface, m RL)	Depth of borehole (m bgl / RL)	Top of Screen (m bgl / RL)	Length of Screen (m)	Strata Screened	Coordinates (NZTM)
BH1-1	11.2	10.0 / 1.2	0.5 / 10.7	4	Fill / Undifferentiated Colluvium - Alluvium	1748722.5 E 5428824.3 N
BH1-2	11.2	10.0 / 1.2	0.5 / 10.7	4	Fill / Undifferentiated Colluvium - Alluvium	1748723.1 E 5428806.3 N
BH2-1	12.4	10.0 / 2.4	0.5 / 11.9	4	Fill / Undifferentiated Colluvium - Alluvium	1748704.6 E 5428902.5 N
BH2-2	11.6	10.0 / 1.6	0.5 / 11.1	4	Fill / Undifferentiated Colluvium - Alluvium	1748700.3 E 5428871.8 N

The locations are shown on the investigation location plan in **Appendix A**.

All locations have been screened across material which the 2017 Aurecon geotechnical investigations identified as being "…*difficult to indicate the exact depth of fill due to compositional similarity between the fill and* in-situ *materials*", and as such may comprise fill, Undifferentiated Colluvium – Alluvium, or a reworked mixture of both of these materials.

The screened (slotted) section was sufficient to ensure samples could be recovered and because the material over the length of the screened section was generally of similar permeability. Due to these conditions we do not consider this investigation likely to have created additional pathways for the transport of contaminants to greater depth.

Groundwater sampling was undertaken between 9 and 13 October 2017. An interface probe was initially used to measure the depth to the water table, and to detect the potential presence of any free-phase hydrocarbon layers on the groundwater surface and within the water column. Development of BH2-1 and BH2-2 was started using an electrically-driven submersible pump, but the water column was rapidly drawn down to the base of the screened section in both boreholes.

The observation of rapid water column draw-down followed by slow recharge and high silt concentrations gave cause to undertake percolation / rising head tests to gain an understanding of general hydrogeological characteristics. These tests were carried out in one borehole in each of the proposed development areas (BH1-1 in the New Ministerial Annex location, and BH2-1 in the New Members Building location).

The recharge rates observed in both of these boreholes indicate that groundwater gradients and / or transmissivity of the surrounding material to be low, as the recharge rates were slow (on the order of 0.25 m hr^{-1} in BH1-1 and 1 m hr^{-1} in BH2-1). The graphs from the test are provided in **Appendix C**.

Sampling of all of the boreholes was due to be undertaken by extracting groundwater from the central part of the water column using low-flow equipment. A YSI Professional Plus Water Quality Meter was to be used to measure temperature, dissolved oxygen, electrical conductivity, oxidation/reduction potential and pH at five-minute intervals for a 30 minute period prior to sampling.

This was successfully completed at BH2-1, but in BH2-2 significant air pockets started to appear in the water flow after 25 minutes of monitoring of groundwater conditions (with the water quality meter). Measurement of groundwater level indicated that the water column had dropped significantly (to the sampling level) so steady flow was re-established by lowering the sampling tube by approximately 0.1 – 0.2 m further into the standpipe, but the final water quality measurements were foregone so that water samples could be successfully taken.

In BH1-1 air pockets started to appear in the water flow after 20 minutes of groundwater condition monitoring, and after measuring the groundwater level and lowering the sampling tube, the flow

ceased completely. Groundwater level measurement indicated that water was still present in the standpipe but the low-flow pump was unable to draw any fluid to the surface, so a hand-bailer was then used to obtain 'grab samples' of groundwater from the lower part of the standpipe.

Measurement of groundwater level in BH1-2 indicated that there was unlikely to be sufficient water to undertake low-flow sampling in line with procedure (based on the experiences with the other boreholes), so a hand-bailer was used to immediately obtain 'grab samples' of groundwater without any low-flow pumping being attempted. The strong odour noted during well development was present during sampling. Silt was noted to persist in significant quantities at the base of BH1-1 and BH1-2.

Sample containers were supplied by an IANZ-accredited laboratory and groundwater was pumped / poured (in the case of the 'grab samples') directly into these containers, and care was taken during this process to not overfill the containers so that the preservatives were not spilled from the containers. The containers were placed directly into a chilled container and sent to the laboratory under chain of custody documentation. The following describes the analyses that were carried out:

- 4 samples were analysed for dissolved heavy metals;
- 4 samples were analysed for TPH;
- 4 samples were analysed for BTEX;
- 4 samples were analysed for PAH;
- 1 sample (from BH1-2 only; see above) was analysed for aggregated nutrients (nitrate, nitrite, ammonia and dissolved reactive phosphorus) and the presence / absence of total / faecal coliforms.

The specialist analyses were scheduled for water samples from BH1-2 due to the strong 'organic' odours (associated with the water and silt) noted during the development and sampling of BH1-2. It is possible that the olfactory signature could be associated with concentrations of organic matter in the ground, sources of which could potentially include organic matter emplaced with fill, or wastewater leaking from nearby underground services.

6.4 Ground Conditions and Results of Field Testing

6.4.1 Soil

In the proposed location of the New Ministerial Annex, all of the intrusive investigations were undertaken within the walled garden area, so there was no surface seal or hardstanding requiring removal, but surficial turf was removed in 'slabs' for ease of reinstatement. The proposed location of the New Members Building is in active use as a staff car park (including access roadways) so is sealed with asphalt with a thickness of approximately 0.2 m (including underlying gravelly basecourse). In a single location (TP8) the surface was sealed with interlocking bricks with a thickness of approximately 0.15 m (including underlying sandy basecourse).

In all locations with surface hardstanding, a circular saw was used to cut an approximately square-profile penetration into this asphalt (approximately 1 x 1 m for the test pits, and approximately 2 x 2 m for the borehole service clearance pits), which was subsequently lifted by the 2-tonne excavator to give access to underlying soil.

Table 4 is the ground model developed from logging of the borehole cores, and in the shallow test pits across both proposed development areas during this investigation.

Table 4: Investigation stratigraphy

Geological unit	Generalised lithology	Depth below ground level to top of unit (m bgl)	Thickness (m)
Surface Seal (proposed New Members Building area only) Topsoil (proposed New Ministerial Annex area only)	Asphalt with silty or sandy gravel basecourse. Interlocking bricks with gravelly sand basecourse. All surface hardstanding was in good condition with no notable breaks or penetrations. Clayey silt, silt, sandy silt	0.0	0.15 – 0.2
Fill	Clayey silt, silty sand, gravelly silt, gravel, cobbles	0.15 – 0.2	1.05 – 1.35
Alluvium (and colluvium)	Clayey silt, silty sand, gravelly sand, silty gravel,	1.05 – 1.35	Base of unit not encountered

Table 5 provides detail on locations and depths where anthropogenic materials or other clear evidence of contamination was noted along with corresponding PID readings obtained from head space tests in the boreholes. Borehole logs providing more detail of the soils encountered are included in **Appendix B.**

Table 5: Significant Soil Sampling Observations and PID Readings

Borehole / Test Pit ID	Observations of note (PID readings are max steady value in parts per million (ppm))
TP1	Fine brick fragments observed between 0.2 and 0.6 m bgl PID readings: 0.1 m bgl – 0.8, 0.4 m bgl – 0.8
TP2	Weathered timber observed between 0.2 and 0.55 m bgl PID readings taken at 0.15 and 0.45 m bgl – no response recorded
TP3	No anthropogenic materials observed PID readings: 0.2 m bgl – 0.2, 0.4 m bgl – 0.1
TP4	No anthropogenic materials observed PID readings: 0.15 m bgl – 0.2, 0.35 m bgl – 0.1
TP5	Frequent brick fragments and whole bricks observed between 0.17 and 0.6 m bgl (highest concentration below 0.4 m bgl) PID readings: 0.15 m bgl – 0.3, 0.5 m bgl – 0.3
TP6	Frequent fine brick fragments and infrequent whole bricks observed between 0.3 and 0.55 m bgl PID readings: 0.25 m bgl – 0.2, 0.5 m bgl – no response recorded
TP7	No anthropogenic materials observed PID readings: 0.15 m bgl – 0.1, 0.45 m bgl – 0.3
TP8	Frequent brick fragments observed between 0.15 and 0.5 m bgl PID readings: 0.2 m bgl – 0.1, 0.45 m bgl – 0.1
TP9	No anthropogenic materials observed PID readings: 0.1 and 0.3 m bgl – no response recorded
TP10	No anthropogenic materials observed PID reading: 0.2 m bgl – 0.2

Borehole / Test Pit ID	Observations of note (PID readings are max steady value in parts per million (ppm))
BH1-1	Wood fragments observed between 0.0 and 0.2 m bgl and at 8.2 m bgl, and rootlets observed between 0.0 and 8.0 m bgl 11 PID readings taken from whole borehole profile; highest reading – 1.4
BH1-2	Wood fragments observed between 0.0 and 0.2 m bgl and rootlets observed between 0.0 and 0.9 m bgl 12 PID readings taken from whole borehole profile; highest reading – 1.7
BH2-1	Rootlets observed between 3.0 and 3.8 m bgl 8 PID readings taken from whole borehole profile; highest reading – 1.0
BH2-1 (service clearance excavation)	No fill – alluvium / colluvium boundary observed in pit Frequent anthropogenic materials including bricks and brick fragments, concrete fragments (including a large horizontal concrete 'shelf' at approximately 0.4 m bgl) and metallic items (including a section of crumpled, narrow aluminium or steel I-beam) observed in excavation wall.
BH2-2	Rootlets observed between 7.25 and 7.7 m bgl 9 PID readings taken from whole borehole profile; highest reading – 2.0
BH2-2 (service clearance excavation)	Sharp interval between grey-brown gravelly material (containing anthropogenic materials) and yellow brown silty material (without anthropogenic material) observed at 1.05 m bgl - potential fill – alluvium / colluvium boundary. Frequent anthropogenic materials including bricks / brick fragments and concrete fragments observed in excavation wall (above 1.05 m bgl).

6.4.1.1 Summary of Fill – Alluvium / Colluvium Boundary Observations

During the Aurecon 2017 geotechnical investigations it was noted that a clear boundary between fill material and underlying undifferentiated colluvium / alluvium could not be readily identified in either of the development areas, so a precise depth of fill could not be determined.

In this investigation the test pits were specified as shallow and so did not reach a depth where the base of fill would be expected, and for two of the boreholes (BH2-1 and BH2-2) service clearance excavations were completed to approximately 2 m bgl before drilling commenced so core was not returned from shallow depth from these locations.

Core was returned from surface level in BH1-1 and BH1-2 which allowed observation of the fill – alluvium / colluvium boundary, which was supplemented by observations in the BH2-2 service clearance excavation. Based on this information an approximate range for the boundary has been formulated, but uncertainty remains in defining the boundary due to the limited data available.

6.4.2 Groundwater

A summary of the groundwater levels and observations during sampling are summarised in Table 6.

Table 6: Summary of Ground Levels and Field Observations

Bore-hole	Relative Level of borehole headworks (m RL)	Groundwater surface (m bgl / m RL) [Date]	Groundwater surface (m bgl / m RL) [Date]	Groundwater surface (m bgl / m RL) [Date]	Observations (during dipping and well development)
BH1-1	**11.2**	3.27 / 7.93 [10/10/17]	3.96 / 7.24 [11/10/17]	3.05 / 8.15 [12/10/17]	Submersible electric pump not used for well development due to accessibility constraints; groundwater removed by hand-bailing. The water column was rapidly fully drawn down to the base of the screened section during initial development. Very high silt levels persisted even after purging and (at least partial) recharge cycles had occurred twice. In order to remove silt and other detritus to allow effective groundwater sampling to be undertaken, approximately 10 – 15 litres of clean (tap) water was poured into the borehole to break up the silt 'plug' at the base of the standpipe up into the water column, after which purging to dry conditions was immediately undertaken. This cycle was repeated twice in each location, after which each borehole was left in an undisturbed condition (i.e. to recharge with groundwater) for a minimum of 24 hours before sampling was undertaken. *BH1-2, Only:* During development a distinct and strong 'organic' / 'ammonia-like' odour was noted coming from the standpipe, and water and silt that was brought to the surface. This did not diminish to any significant degree during the cycles of purging from the well, so the PID was used to take measurement at top of the standpipe, over recovered water, and the hand-bailer itself; no elevated readings were noted.
BH1-2	**11.2**	3.52 / 7.68 [10/10/17]	2.91 / 8.29 [11/10/17]	4.09 / 7.11 [12/10/17]	
BH2-1	**12.4**	2.74 / 9.66 [9/10/17]	2.79 / 9.61 [10/10/17]	2.77 / 9.63 [12/10/17]	Submersible electric pump used for initial well development. The water column was rapidly fully drawn down to the base of the screened section during initial development. Very high silt levels persisted even after purging and (at least partial) recharge cycles had occurred twice. In order to remove silt and other detritus to allow effective groundwater sampling to be undertaken, approximately 10 – 15 litres of clean (tap) water was poured into the borehole to break up the silt 'plug' at the base of the standpipe up into the water column, after which purging to dry conditions was immediately undertaken. This cycle was repeated twice in each location, after which each borehole was left in an undisturbed condition (i.e. to recharge with groundwater) for a minimum of 24 hours before sampling was undertaken.
BH2-2	**11.6**	2.78 / 8.82 [9/10/17]	2.78 / 8.82 [10/10/17]	2.85 / 8.75 [12/10/17]	

The 2017 Aurecon geotechnical reports for the two proposed development areas state that the groundwater detected is likely to comprise perched water tables associated with layers of higher permeability lithologies (sands and gravels) within the alluvium / colluvium.

Table 7 compares the measured groundwater levels (refer to Table 6) against the borehole logs (refer to **Appendix B**) to assess whether groundwater is likely to comprise perched lenses, rather than being part of a dominant surficial aquifer.

Table 7: Measured Groundwater Ranges and Associated Lithologies

Borehole Number	Highest measured groundwater surface (m bgl)	Lowest measured groundwater surface (m bgl)	Lithology in measured range	Underlying lithology
BH1-1	3.05	3.96	Gravel, sand, silty sand	Silt
BH1-2	2.91	4.09	Silty clay, silty sand, sandy gravel	Sand and silty sand
BH2-1	2.74	2.79	Silt	Silt and sand
BH2-2	2.78	2.85	Sandy silt, sand	Sandy silt, sand

The spatial relationship between the measured groundwater levels and the lithologies identified in the borehole cores indicates surficial groundwater in the vicinity of the site is likely to occur in discrete, perched water tables. The slow recharge rates, as shown by the percolation / rising head tests; generally support this, as limited lateral extent and poor connectivity between perched water tables would limit total capacity and therefore recharge rate.

The two proposed development areas are separated by approximately 50 m at their closest points so the groundwater bodies identified in the two clusters of boreholes in the two development areas are unlikely to be hydraulically connected.

The significant variation in groundwater level in the vicinity of the proposed new ministerial annex indicates an intermittent perched table which may be influenced by building services. This is supported by the odour observed in BH1-2.

6.4.3 Ground Gas and Soil Vapour

Ground gas was measured in all four of the boreholes on 9 October 2017. A summary of the findings is presented in Table 8:

Table 8: Summary of Ground Gas Measurements

Bore-hole Number	Average PID reading from sample bag (ppm)	PID reading direct from gas tap (ppm)	Maximum PID Reading (ppm)	Steady CH_4 (% v/v)	Steady CO_2 (% v/v)	Steady O_2 (% v/v)	Steady CO (ppm)	Steady H_2S (ppm)	Peak Flow (litres/ hour)	Average Flow (litres/hour)
BH1-1	0.26	0.1	0.27	0.0	0.7	20.1	1	0	0.3	0.3
BH1-2	0.28	0.2	0.3	0.0	0.4	20.5	2	0	0.2	0.15
BH2-1	0.41	0.24	0.5	0.0	0.0	20.8	2	0	0.2	0.2
BH2-2	0.76	0.48	1.2	0.0	0.1	20.8	1	0	0.3	0.25

No visual or olfactory indicators of gases or vapours were noted, and the relative pressure and flow rate figures (refer to **Appendix D** for the field sheets completed during monitoring) did not indicate that a significant build-up of gases had occurred in the standpipes prior to monitoring.

The readings at locations BH1-1 and BH1-2 were notable because CO_2 was noted above ambient atmospheric concentrations (approximately 0.04 %v/v), and O_2 levels were very slightly decreased relative to ambient atmospheric concentrations (approximately 21% v/v). CO levels were also elevated in both locations (BH1-2 especially), but H_2S and CH_4 were not recorded in any locations.

The PID readings identified the presence of volatiles / soil vapours in all of the locations, with the highest average and peak readings recorded in BH2-1 and BH2-2. Concentrations > 10ppm are considered to be indicative of the presence of more than trace levels of volatiles in soil surrounding the monitoring well and this level was not detected in any of the boreholes.

Flow rates were fairly uniform across the four locations, and below the limit of quantification for the instrument. The prevailing atmospheric conditions at the time of measurement were very slightly below average, but are unlikely to have had a significant influence on flow rates.

The measured levels of ground gas and soil vapour parameters were low at all locations.

Based on the low concentrations of ground gas detected, highly permeable ground conditions, absence of detectable flow and absence of any significant source of ground gas we consider the risk posed by ground gas to be low.

7 Screening Assessment

The analytical results are summarised in the following sections for soil and groundwater. The laboratory transcripts are attached in **Appendix F**.

7.1 Assessment Criteria

Assessment criteria were selected for the site to enable a consideration of potential risk to human health, environmental receptors, and waste disposal. Criteria were selected based on advice from GWRC (2015) *Proposed Natural Resources Plan for the Wellington Region* and MfE (2011) *Contaminated Land Management Guidelines No. 2, Hierarchy and Application in New Zealand of Environmental Guideline Values*. The reported concentrations for each contaminant were compared with relevant guideline values selected from the following legislature / publications:

- Australian and New Zealand Environment and Conservation Council (ANZECC) (2000), *Guidelines for Fresh and Marine Water Quality*. (Under the Rule 55 of the *Proposed Natural Resources Plan for the Wellington Region*, the 95% protection of species is required to be considered).
- MfE, (2011), *Method for Deriving Standard for Contaminants in Soil to Protect Human Health*.
- MfE, 1999 (Revised 2011), *Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand, Module 4 – Tier 1 soil acceptance criteria*.
- MfE, 1999 (Revised 2011), *Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand, Module 5 – Tier 1 groundwater acceptance criteria*.
- Ministry of Health (MoH) *Drinking-water Standards for New Zealand 2005 (revised 2008)* (Under the Rule 55 of the *Proposed Natural Resources Plan for the Wellington Region* the potable water for 90% of species[1] is required to be considered).

In addition to the above guidance, soil results have been compared with criteria presented in URS, (2003), *Determination of Common Pollutant Background Soil Concentrations for the Wellington Region* as an added line of evidence to estimate the interface between fill material and natural soils.

Where required for application of these guidelines, this Tier 1 assessment has considered all samples as *sandy* soil. This is generally reflective of the lithologies encountered in the test pits and boreholes (shallow sandy and gravelly soils in the New Members Building area and clayey and sandy silts in the New Ministerial Annex area, and predominantly sandy, gravelly, and sandy silt alluvial / colluvial soils at greater depth in both areas) but is nonetheless considered to be a conservative assessment given that soil with a silt component are widespread through the depth profile to 10 m bgl, and were also observed in significant quantities during piezometer development.

7.2 Soil

Soil samples from both the fill material and underlying natural deposits were submitted for laboratory analysis. The results are described in the following subsections.

7.2.1 Heavy Metals

A total of 33 soil samples were analysed for 10 heavy metals (arsenic, beryllium, boron, cadmium, chromium, copper, lead, mercury, nickel and zinc). The results were compared to Tier 1 commercial/industrial human health screening criteria, and the Wellington Regional Background concentrations for sandy soil. No applicable tier 1 human health assessment criteria were exceeded.

[1] The MoH 2008 document does not present criteria as protecting percentages of species. Therefore, maximum acceptable values have been used for this criteria required by GWRC.

The results are summarised as follows:

- None of the samples contained heavy metal concentrations in excess of applicable Tier 1 human health criteria for commercial / industrial site use.
- All of the samples submitted (with the exception of BH2-1 at 3.3 m bgl) contained at least one metal at a concentration in excess of the maximum published background concentration value for sandy soils in the Wellington Region.
- The majority of results for chromium (32 of 33), copper (23 of 33) and nickel (29 of 33) were reported in excess of background concentration
- All of these exceedances were identified within shallow fill material.

7.2.2 Total Petroleum Hydrocarbons

A total of 11 samples were analysed for TPH. The results that were reported above the limit of reporting (LoR) were compared to Tier 1 human health screening criteria, the Wellington Regional Background concentrations for sandy soil.

The results are summarised as follows:

- None of the sample results reported TPH concentrations in excess of applicable Tier 1 human health criteria for commercial / industrial site use.
- Two samples collected in fill material reported results above LoR (TP6 at 0.25 m bgl and TP10 at 0.2 m bgl) for TPH C_{15}-C_{26}.
- Both results above LoR were below the maximum published background concentration value for sandy soils in the Wellington Region.

7.2.3 Benzene, Toluene, Ethylbenzene and Xylenes

A total of 11 samples were analysed for BTEX. All results were reported below LoR, and LoR were below respective Tier 1 human health criteria.

7.2.4 Polycyclic Aromatic Hydrocarbons

A total of 33 samples were analysed for PAH. The results were compared to Tier 1 human health screening criteria, the Wellington Regional Background concentrations for sandy soil and landfill criteria. The results are summarised as follows:

- None of the sample results reported PAH concentrations in excess of applicable Tier 1 human health criteria for commercial / industrial site use.
- Samples collected from test pits reported various PAH concentrations above the LoR (except TP4 at 0.15 m bgl, which reported all PAH below LoR), and above Wellington background concentrations at some locations.
- No samples collected below 1.75 m bgl reported concentrations of PAH concentrations above the LoR.

7.2.5 Asbestos

A total of 33 samples were analysed for the presence / absence of asbestos. No ACM or asbestos dust / fibres was detected in any of these samples.

7.3 Groundwater

Groundwater samples collected from wells installed as part of the intrusive investigation works were submitted for laboratory analysis. GWRC *Proposed Natural Resources Plan for the Wellington Region* requires the concentration of contaminants in groundwater meet criteria set out in ANZECC 2000 *Guidelines for Fresh and Marine Water Quality* and MoH *Drinking-water Standards for New Zealand 2005*.

7.3.1 Heavy metals

A total of four water samples were submitted for soluble heavy metal analysis. The results are summarised as follows:

- Two results for copper (BH1-1, 0.0016 mg/l, and BH2-1, 0.0033 mg/l) were found to be in excess of the ANZECC marine trigger value for the protection of 95% protection of species (0.0013 mg/l).
- All of the other above LoR results were below ANZECC trigger levels for protection of marine species.

7.3.2 Total Petroleum Hydrocarbons, Benzene, Toluene, Ethylbenzene and Xylenes

All laboratory results reported concentrations of TPH and BTEX below the LoR.

7.3.3 Polycyclic Aromatic Hydrocarbons

A total of four water samples were submitted for PAH analysis. The results are summarised as follows:

- Various PAH were reported above LoR, but below Tier 1 acceptance criteria, at BH1-2, BH2-1 and BH2-2.
- BH1-1 analytical results reported concentrations of all PAH below the LoR.

7.3.4 Aggregated Nutrients

A single water sample, from BH1-2, was submitted for analysis for aggregated nutrients. The results are summarised as follows:

- The sample submitted for aggregated nutrient analysis was analysed for nitrate (nitrate-N i.e. nitrogen which is combined into the nitrate ion), nitrite (nitrite-N), ammonia (ammonia-N) and dissolved reactive phosphorus.
- The result for ammonia was reported above the ANZECC marine trigger value for the protection of 95% protection of species.
- Nitrate, ammonia and dissolved reactive phosphorus were reported below LoR.

7.3.5 Microbial Analysis (Total / Faecal Coliforms)

A single water sample, from BH1-2, was submitted for analysis for total / faecal *Escherichia coli* ('E. coli') Coliforms. The results are summarised as follows:

- The result for E. coli was reported above the DoH drinking water standards.
- Total Coliforms were reported at 1720 MPN / 100 ml.

8 Risk Assessment

A risk is present if a complete pathway is present between the source of contamination and the receptors. This risk assessment takes into account site-specific information including the contaminant level information obtained from the intrusive investigations and the groundwater monitoring. It also takes into account the specific development works for the site. The disposability of excavated soils and groundwater produced by dewatering is not explicitly included in the risk assessment.

8.1 Investigation Summary

The key findings of the investigations completed to date are as follows:

- A boundary between fill and alluvium / colluvium was observed in several locations and fill is estimated to be between approximately 1 and 1.4 m thick in the proposed development areas, but uncertainty remains.
- The groundwater surface was measured during the Aurecon investigation as varying between approximately 2.8 and 4.1 m bgl over the two development areas.
- Groundwater appears to comprise perched water tables associated with higher permeability sandy and gravelly layers within the alluvium / colluvium, rather than there being a substantial aquifer (the 2017 Aurecon geotechnical investigations did not identify an aquifer at depth).
- Groundwater levels were notably different in the two borehole clusters in the two development areas, and responded differently in terms of draw-down and recharge (in the percolation / rising head tests), so are likely to be associated with sandy / gravelly lenses that are not (directly) linked.
- No Tier 1 human health criteria were exceeded
- The heavy metal and hydrocarbon results indicate a higher spatial prevalence of background exceedances in the shallow fill material, primarily in the New Members Building area. Regional background concentrations of multiple analytes were exceeded.
- The groundwater was found to contain concentrations of copper slightly elevated above ANZECC criteria.

The odour noted in BH1-2 during borehole development and sampling, combined with the significantly elevated ammonia and total Coliform levels are indicative of wastewater (sewage) in the groundwater, which implies a localised (i.e. none of these indicators were noted in BH1-1 at a distance of approximately 15 m) source of contamination. This is mostly likely due to a leaking wastewater pipeline at the approximate depth of the perched groundwater table.

The Conceptual Site Model is presented in Table 12. Note that HAIL category E1 (which was listed as a potential source of contamination in the CSM is not included in the risk assessment, as no asbestos was identified in any of the soil samples taken from the test pits or boreholes at any depth in any part of the site, so risks from this contaminant have been discounted.

Table 9: Conceptual site model

Source	Contaminants	Receptor	Pathway	Potential Effects	Likelihood of Source-Receptor Linkage	Risk Considerations
Use of fill material (including waste from the demolition of on-site buildings and / or uncontrolled imported fill) to reclaim land and / or build up, landscape or otherwise alter the ground surface within the site.	**Heavy metals, hydrocarbons**	**Groundwater**	**Permeation through soil profile**	**Groundwater Contamination**	**Unlikely**	▪ Heavy metals concentrations elevated above regional background were found to be widespread, but concentrations were generally not elevated to a very significant degree; lead above Class A landfill WAC was detected in only two isolated locations. ▪ Copper was identified above ANZECC 95% protection of marine species concentration, which implied that leaching of this metal from the fill to groundwater has occurred. The application of this criteria is however conservative as there is no direct pathway to the marine environmental, and concentrations of copper and other metals were below all other Tier 1 screening criteria. ▪ Measures as set out in the CSMP will require implementation to control minor risks to construction and maintenance workers, site users and off-site users from the low levels of contamination detected in the fill material.
Leakage of wastewater into groundwater at the southern end of the New Ministerial Annex area	**Ammonia, heavy metals and Coliforms (including E. coli)**	**Construction and maintenance workers**	**Ingestion, inhalation, dermal contact**	**Toxic, hazardous to human health**	**Possible**	▪ The excavation of basement voids means that impacted soil and groundwater (which is likely to be intersected by the excavation) will be exposed. ▪ Measures as set out in the CSMP will require implementation to control the risks to construction and maintenance workers, site users and off-site users from exposure to ammonia and pathogens.
		Groundwater	**Permeation through soil profile**	**Groundwater Contamination**	**Possible**	▪ The presence of impacted water at a distance (at BH1-2) from the wastewater route implies some degree of lateral spread of impacted groundwater but vertical migration is potentially less likely to have occurred due to the interbedded nature of the alluvium / colluvium, i.e. cohesive layers will limit percolation between the granular layers.

9 Development Implications

As a result of contamination being identified on the site, there are implications for the proposed development works in relation to resource consents, appropriate offsite disposal facilities and worker health and safety requirements.

9.1 Resource Consents

9.1.1 National Environmental Standard

The NES is applicable to any HAIL sites with proposed development works that includes soil disturbance or sampling, removal of fuel storage systems, subdivision or change in land use.

Based on the proposed soil disturbance and disposal volumes, risk assessment and the anticipated duration of works, the requirements for land disturbance to be a permitted activity under Regulation 8(3) of the NES cannot be met. No contaminants were encountered on site at a concentration that exceeded human health guidelines. A CSMP should be prepared (as a separate document) to address potential impacts on human health and environment resulting from the ground disturbance activities.

9.1.2 Wellington City Council District Plan – Contaminated Land

The Wellington City Council District Plan (WCCDP) contains requirements relating to the management of contaminated land in addition to those required under the NES within Section 32. Of particular relevance is Rule 32.2.1 which states:

- '*32.2.1 Except as provided for in the Airport Precinct Rules, the remediation, use, development and subdivision of any contaminated land, or potentially contaminated land (unless it has been confirmed as not being contaminated through investigations in a report forwarded in accordance with Rule 32.1.3.1), is a discretionary activity (restricted) in respect of:'*

The rule then details the technical matters governing assessment of contaminated land in New Zealand. Application for consent under this rule is also likely to be required for the site.

9.1.3 Proposed Natural Resources Plan for the Wellington Region

The Proposed Natural Resources Plan for the Wellington Region (PNRP, appeals version 2019) contains four rules (in Section 5.2.5, 'Contaminated Land and Hazardous Substances') that are of direct relevance to the redevelopment of the site. The first rule (R54) relates to this DSI. The second rule (R55) requires the site to comply with ANZECC criteria (95%) which the site does have concentrations above 95% ANZECC criteria with two exceedances for copper. The third rule R56 is as follows:

- R56: Discharges from contaminated land – discretionary activity

  'The use of the land, and discharge of contaminants onto or into land from contaminated land where the discharge may enter water that is not permitted by Rule R54 or Rule R55 is a discretionary activity.'

The fourth rule (R57) relates to discharge of a hazardous substance as a non-complying activity, which is unlikely to be applicable to this site.

9.1.4 Greater Wellington Regional Discharges to Land Plan Updated July 2014

The Greater Wellington Regional Discharges to Land Plan remains in effect in conjunction with the PNRP until such time as the PNRP is operative. Rules 21 and 22 of the Regional Discharges to Land Plan deal specifically with contaminated sites and should be assessed by a planner as part of an Assessment of Environmental Effects (AEE).

9.2 Occupational Health and Safety

Due to the extent of unconfirmed fill material at the site, a CSMP should be implemented prior to construction works to protect construction workers at the site.

The objective of the CSMP should be to document the minimum procedures and standards to be followed during the course of earthworks and construction to manage and/or remove the risks posed by soil and groundwater contamination. Through implementation of the CSMP, the risk posed to site users (principally construction workers during redevelopment) and the surrounding environment (including human receptors) can be substantially reduced to an acceptable standard.

The CSMP is for the purpose of providing a framework for the development of particular contaminated soil and groundwater control practices and procedures to improve health and safety during the works and minimise effects on the surrounding environment and community as part of the current activity. The CSMP should be designed to provide detail regarding general management principles for contaminated soil and groundwater that may arise during the construction works.

10 Conclusions and Recommendations

10.1 Conclusions

DSI has been completed in order to assess the quality of shallow soils and investigate HAIL activities identified on site at PSI stage. This DSI was completed to support a Resource Consent application for the development of two major new structures within the New Zealand Parliamentary Complex.

A review of existing available desktop information identified three HAIL activities on the site, including bulk chemical storage (A8), use of ACM of unconfirmed quality (E1) and histsorical uncontrolled filling (G5). The assessment of contamination was based on targeted ground investigation, laboratory testing and risk assessment.

No exceedances of Tier 1 soil criteria were reported during intrusive investigation works. Shallow soil samples consistently exceeded generaly background concentrations for the greater Wellington region, indicating the potential presence of uncontrolled fill material across the site. Asbestos fibres were not identified in any soil samples collected.

Groundwater sample laboratory results identified zinc concentrations above Tier 1 criteria within perched groundwater. Laboratory results at BH1-2 reported elevated E. Coli and ammonia concentrations, which can be indicative of the presence of wastewater. Figure 2 indicates sub-surface utilities, including wastewater lines, are in close proximity to BH1-2.

Figure 2: Location wastewater infrastructure in vicinity of BH1-2 (image courtesy of WCC Webmap, wellington.govt.nz/webmap/wccmap.html)

The conceptual site model has identified potentially complete source-pathway-receptor linkages between:

- Construction workers and uncontrolled fill mateiral; and
- On- and off-site users and uncontrolled wastewater discharge.

Based on laboratory results collected to date the shallow soil present across the site is considered likely fill material and should be managed appropriately or if disposed on- or off-site.

10.2 Recommendations

Based on the findings of this DSI, the following actions are recommended:

- Application for a controlled activity Resource Consent prior to development of the site is likely to be required to comply with NES-Soil regulations and completion of a Contaminated Site Management Plan.
- Application for a discretionary activity (restricted) consent is likely to be required to comply with Rule 32.2.1 of the Wellington City Council District Plan (WCCDP).
- Any work involving the disturbance of shallow soil should be undertaken in accordance with method statements and risk assessment prepared in accordance with relevant guidance including the Health and Safety Act (2016).

11 Limitations

Aurecon has prepared this report for Parliamentary Services in accordance with the brief described at the start of this report. This report is based on field work undertaken between 19 September and 15 November 2017, and is based on the conditions encountered and information reviewed at the time of preparation of the report. Aurecon does not make any representation or warranty that the conclusions in the report can be extrapolated for future use as there may be changes in the condition of the site, applicable legislation or other factors that would affect the conclusions contained in this report.

This report has been prepared on instruction of Parliamentary Services and may be used by and relied on by Parliamentary Services. Aurecon accepts no responsibility or liability for damages, if any, suffered by any other third party. This report should be read in full and no excerpts are to be taken as representative of the whole report. To ensure its contextual integrity Parliamentary Services must not distribute the report to third parties in part only.

Soil and rock formations are often variable, resulting in heterogeneous distribution of contaminants across a site. Contaminant concentrations may be estimated at chosen sample locations, however, conditions between sample sites can only be inferred on the basis of geological and hydrological conditions and the nature and the extent of identified contamination. Boundaries between zones of variable contamination are often indistinct, and therefore interpretation is based on available information and the application of professional judgement.

Only a finite amount of information has been collected to meet the specific technical requirements of the Client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgment and it must be appreciated that actual conditions could vary from the assumed model.

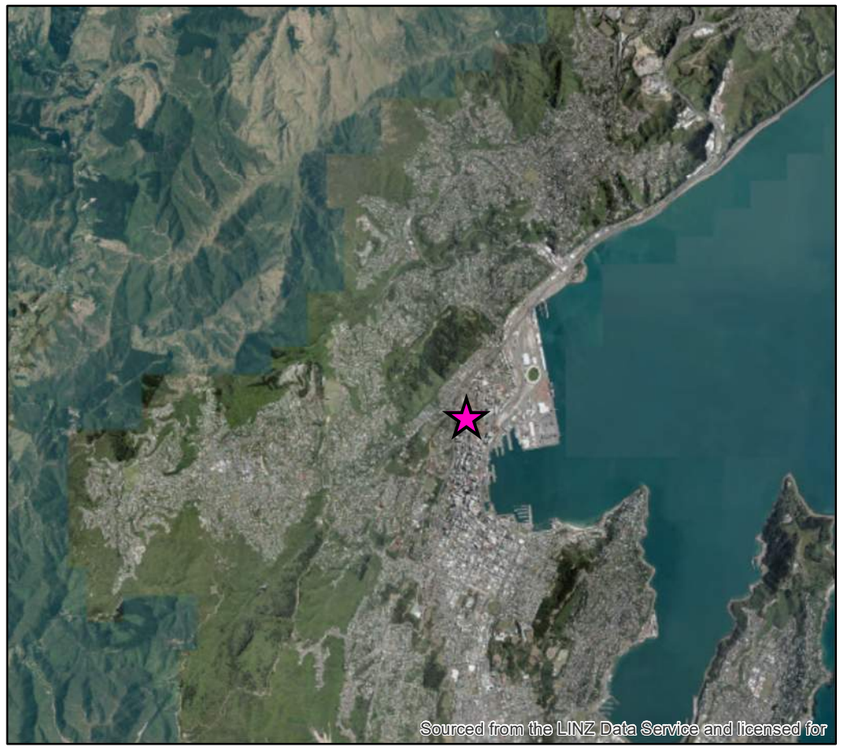
This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should further information become available regarding the conditions at the site, including previously unknown likely sources of contamination, Aurecon reserves the right to review the report in the context of the additional information.

Where this report indicates that information has been provided to Aurecon by Parliamentary Services or third parties, Aurecon has made no independent verification of this information except as expressly stated in the report.

All relevant legislation in the jurisdiction in which the site is located and relating to the works has been complied with by Aurecon as at the date of this report.

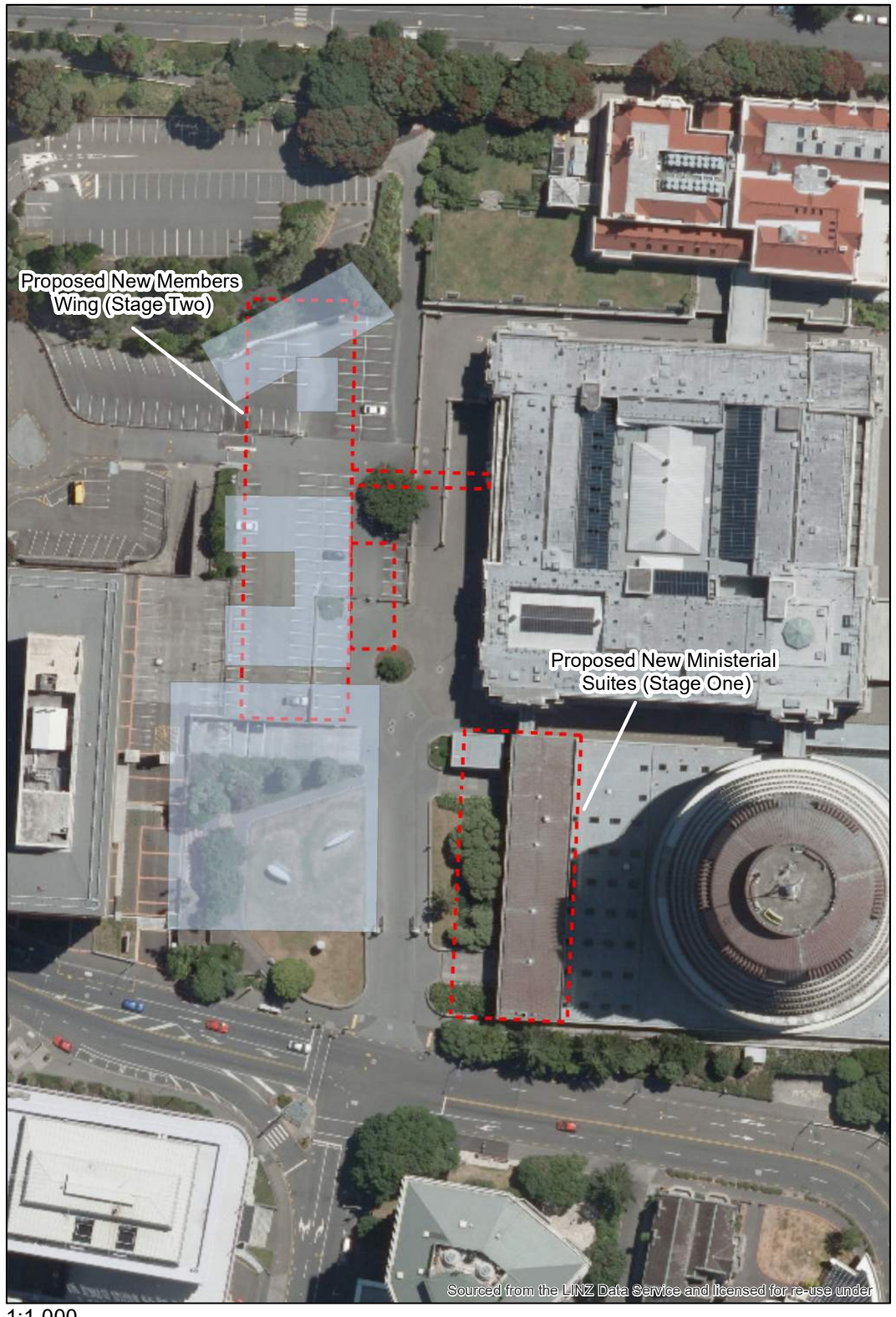
Appendices

Appendix A
Figures



1:80,000

1:80,000



1:1,000

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Legend

- Site Location
- Former Building Footprint
- Proposed Development Footprint

Date: 27/10/2017 Version: 0

N:\Admin\GIS\Natasha GIS\248221 Parliament WLG\SiteLocationPlan.mxd

Job No: 248221

Projection: NZGD 2000 NZTM Drawn: NDS Reviewed: SFH

New Zealand Parliament - Ministerial and New Members Development Detailed Site Investigation

Figure A.1: Site Location Plan

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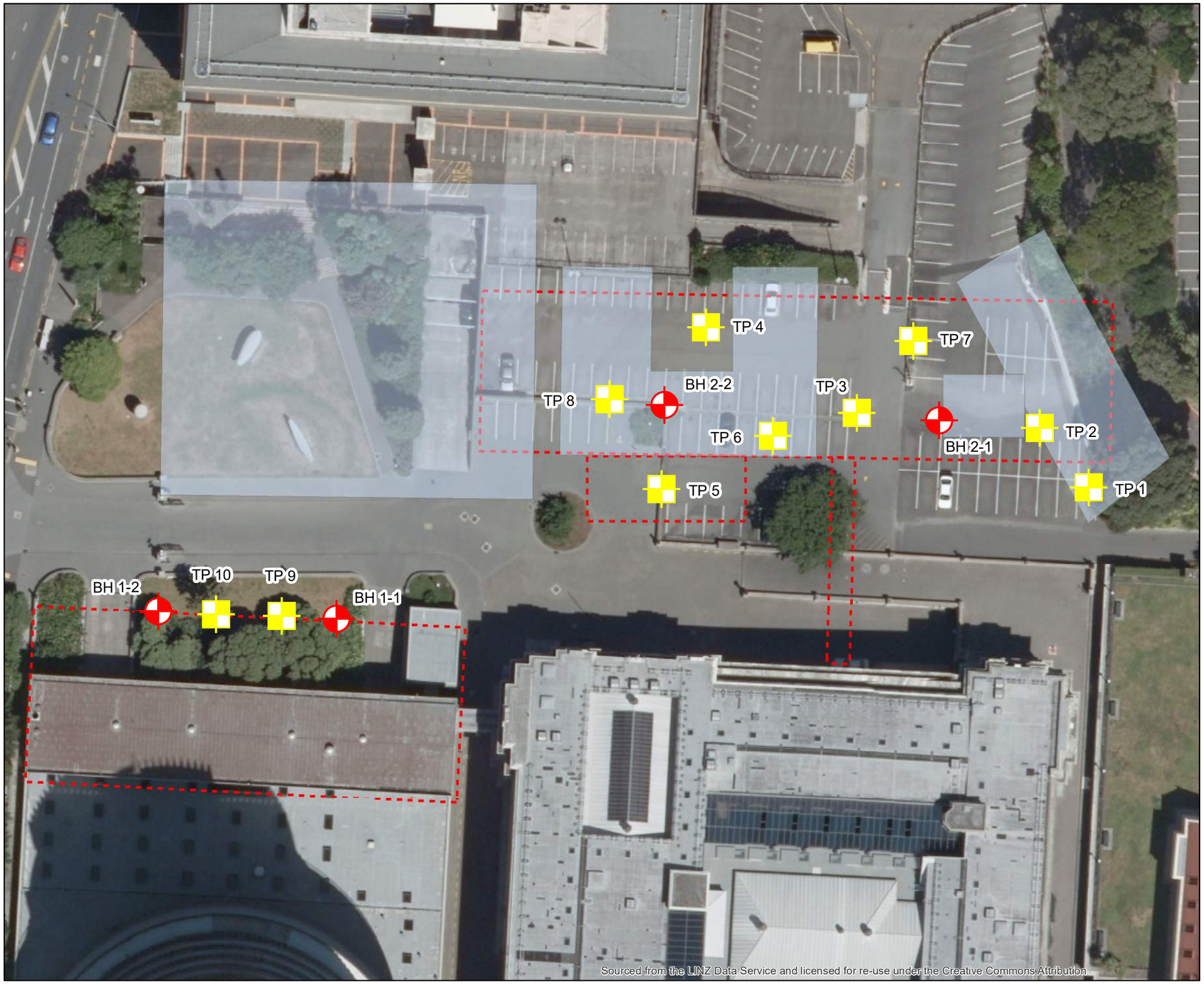

Legend

- Former Building Footprint
- Proposed Development Footprint
- Borehole Locations
- Test Pit Locations

Date: 27/10/2017 Version: 0

N:\Admin\GIS\Natasha GIS\248221 Parliament WLG\InvestigationLocationPlan.mxd

1:500

Job No: 248221

Projection: NZGD 2000 NZTM Drawn: NDS Reviewed: SFH

New Zealand Parliament - Ministerial and New Members Development Detailed Site Investigation

Figure A.2: Investigation Location Plan

Appendix B
Bore Hole and Test Pit Logs

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Client: **Parliamentary Services**
Project: **Parliament Future Accommodation**
Location: **Proposed New Ministerial Suites (Stage One)**
Project Reference: **248221**

BH1-1

BOREHOLE INFORMATION
Drilling Method: 30HP Tractor
Diameter Core:
Contractor: Webster Drilling

CO-ORDINATES: NZTM
Easting: 1748722.5m
Northing: 5428824.3m
Ground Level: N/A

Date Started: 22/08/17
Date Completed: 23/08/17
Inclination: N/A
Orientation: N/A

Logged by: I. Allan
Input by: I. Allan
Checked by: S. Howell
Verified by:

Method/Date	R.L. (m)	Length (m)	Sample	Graphic Log	Layer Code	Material Description	Weathering/USC	In Situ Testing	MC (%)	TCR (%)	SCR (%)	RQD (%)	Fracture Spacing (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description	Installation
						0m: SILT with some sand, minor clay; brown. "Soft to firm", moist to wet, low plasticity. Many rootlets, few wood fragments. [Based on material removed by drillers using spade/hand auger]								0m: TOPSOIL	
						0.2m: Sandy SILT with minor gravel; dark orange grey. "Firm to stiff", moist, low plasticity; sand is fine to coarse; gravel is fine, angular to subangular. Some rootlets. [Based on material removed by drillers using spade/hand auger]								0.2m: ALLUVIUM/COLLUVIUM	
		1				**0.9m:** Clayey SILT; grey. "Firm to stiff", moist, moderately plasticity. Few layers of fine to coarse SAND and fine GRAVEL, angular to subangular. [Based on material removed by drillers using spade/hand auger]									
			ES			**1.5m:** Clayey, sandy SILT; grey. "Stiff to very stiff", moist to wet, moderate to high plasticity; sand is fine to coarse.								1.75m: PID = 0.6 ppm	
		2				**2.2m:** Fine to coarse GRAVEL; grey. Wet to saturated; angular to subangular. Note: only 200mm of disturbed material obtained.									
		3	ES			**3.5m:** Silty fine SAND; grey. Moist. Rare rootlets.								3.5m: PID = 0.8 ppm	
						3.6m: …with some silt									
			ES			**3.8m:** Fine to medium SAND with some gravel; grey. Moist; gravel is fine to medium, angular to subangular.								3.8m: PID = 1.4 ppm	
		4	ES											4m: PID = 0.9 ppm	
			ES			**4.2m:** SILT with some sand and clay; grey. "Very stiff to hard, moist, low to moderate placticity.								4.4m: PID = 0.8 ppm	
		5				**4.5m:** …becomes: Clayey SILT; no sand, moderate to high plasticity.									

REMARKS:
1. Co-ordinates are obtained from GWRC aerial photography, accuracy approx. +/- 5m (ref: http://mapping.gw.govt.nz/gwrc/).
2. Logging descriptions are based on NZGS Field Description of Soil and Rock 2005.
3. Soil consistency for cohesive soils in "parenthesis" are based on logging observations.
4. Abbreviations: TCR = Total Core Recovery; PID = Photoionization Detector; ES = Environmental Soil Sample.
5. Piezometer from GL: Toby cover, 0.5m Pipe & Bentonite, 4.5m Slotted pipe and sand, sand base, bentonite base.
6. Dashed lines show estimated layer depth.

Water Level Readings mbgl

Log Scale 1:25

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Contractor: Webster Drilling

CO-ORDINATES: NZTM
Easting: 1748722.5m
Northing: 5428824.3m
Ground Level: N/A

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Inclination: N/A
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Logged by: I. Allan
Input by: I. Allan
Checked by: S. Howell
Verified by:

Method/Date	R.L. (m)	Length (m)	Sample	Graphic Log	Layer Code	Material Description	Weathering/USC	In Situ Testing	MC (%)	TCR (%)	SCR (%)	RQD (%)	Fracture Spacing (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description	Installation
			ES			**4.2m:** SILT with some sand and clay; grey. "Very stiff to hard, moist, low to moderate placticity.								5m: ALLUVIUM/COLLUVIUM 5.05m: PID = 1.1 ppm	
						5.2m: Fine to coarse SAND with some silt and gravel; bluish grey. Moist; gravel is fine, angular. Rare rootlets. **5.4m:** …no silt, gravel fine to coarse, angular to subangular.									
						5.5m: SILT / SAND / GRAVEL disturbed sample obtained.									
			ES			**5.7m:** Sandy fine to coarse GRAVEL; grey. Moist; angular to subangular; sand is fine to coarse.								5.8m: PID = 0.5 ppm	
		6				**5.8m:** Silty fine SAND; grey. Moist to wet.									
						6.2m: Sandy SILT; grey. "Very stiff to hard", moist, low plasticity; sand is fine.									
						6.7m: …no sand, some clay; moderate to high plasticity, rare rootlets									
			ES			**6.75m:** Fine to coarse GRAVEL with some sand and minor silt; blue grey. Moist to wet; angular to subangular; sand is fine to coarse.								6.9m: PID = 1.3 ppm	
		7				**7.05m:** Fine SAND with some silt; blue grey. Moist to wet. **7.4m:** …rare rootlets									
			ES			**7.7m:** …no rootlets, minor gravel, fine, subrounded.									
						7.8m: Silty, sandy fine to medium GRAVEL; brownish grey. Moist; angular to subrounded; sand is fine to coarse. Rare rootlets.								7.8m: PID = 0.8 ppm	
		8				**8m:** Gravelly, silty fine to coarse SAND; grey. Moist; gravel is fine to medium, angular to subrounded. Rare rootlets.									
						8.2m: Fine to coarse SAND with some gravel; grey. Moist to wet; gravel is angular to subrounded. Rare organics (black/brown small wood fragments).									
			ES											8.7m: PID = 1.3 ppm	
						8.8m: Fine to coarse GRAVEL with some sand; grey. Wet to saturated; angular to subangular; sand is fine to coarse.									
		9				**9m:** SILT with some sand and clay; bluish grey. "Hard", moist, low to medium plasticity; sand is fine.									
						9.4m: Silty fine SAND with minor gravel; bluish grey. Moist; gravel is fine to medium, angular.									
						9.6m: Sandy fine to coarse GRAVEL with some silt; bluish grey. Moist; angular to subrounded; sand is fine to coarse.									
			ES											9.9m: PID = 1.0 ppm	
		10				End of Borehole at 10m (required depth reached)									

REMARKS:
1. Co-ordinates are obtained from GWRC aerial photography, accuracy approx. +/- 5m (ref: http://mapping.gw.govt.nz/gwrc/).
2. Logging descriptions are based on NZGS Field Description of Soil and Rock 2005.
3. Soil consistency for cohesive soils in "parenthesis" are based on logging observations.
4. Abbreviations: TCR = Total Core Recovery; PID = Photoionization Detector; ES = Environmental Soil Sample.
5. Piezometer from GL: Toby cover, 0.5m Pipe & Bentonite, 4.5m Slotted pipe and sand, sand base, bentonite base.
6. Dashed lines show estimated layer depth.

Water Level Readings mbgl

Log Scale 1:25

Database File: 248221 ENVIRO INVESTIGATION.GPJ **Library file:** AURECON LIBRARY 2011-06-03(1).GLB **Template File:** AURECON DH LOG V3.0 **Date Generated:** 27/10/2017

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Client: **Parliamentary Services**
Project: **Parliament Future Accommodation**
Location: **Proposed New Ministerial Suites (Stage One)**
Project Reference: **248221**

BH1-2

BOREHOLE INFORMATION
Drilling Method: 30HP Tractor
Diameter Core:
Contractor: Webster Drilling

CO-ORDINATES: NZTM
Easting: 1748723.1m
Northing: 5428806.3m
Ground Level: N/A

Date Started: 28/08/17
Date Completed: 29/08/17
Inclination: N/A
Orientation: N/A

Logged by: I. Allan
Input by: I. Allan
Checked by: S. Howell
Verified by:

Method/Date	R.L. (m)	Length (m)	Sample	Graphic Log	Layer Code	Material Description	Weathering/USC	In Situ Testing	MC (%)	TCR (%)	SCR (%)	RQD (%)	Fracture Spacing (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description	Installation
			ES			**0m:** SILT with some sand, minor clay; brown. "Soft to firm", moist to wet, low plasticity. Many rootlets, few wood fragments. [Based on material removed by drillers using spade/hand auger]								0m: TOPSOIL 0.1m: PID = 1.3 ppm	
			ES			**0.2m:** Sandy SILT with minor gravel; dark orange grey. "Firm to stiff", moist, low plasticity; sand is fine to coarse; gravel is fine, angular to subangular. Some rootlets. [Based on material removed by drillers using spade/hand auger]								0.2m: ALLUVIUM/COLLUVIUM 0.4m: PID = 1.0 ppm	
		1	ES			**0.9m:** Clayey SILT; grey. "Firm to stiff", moist, moderately plasticity. Few layers of fine to coarse SAND and fine GRAVEL, angular to subangular. [Based on material removed by drillers using spade/hand auger]								1.2m: PID = 1.5 ppm	
						1.6m: SILT/CLAY, brown, very soft, saturated to fine to coarse GRAVEL, saturated, angular [disturbed material]									
		2	ES			**1.75m:** Clayey SILT; greyish brown. "Firm to stiff", moist, moderate to high plasticity. **2.2m:** …grey								2.1m: PID = 1.0 ppm	
			ES			**2.4m:** Silty CLAY; grey. "Stiff to very stiff", moist, high plasticity.								2.6m: PID = 1.4 ppm	
		3	ES			**3m:** …grey with orange staining.								3.1m: PID = 1.6 ppm	
						3.2m: Silty fine to medium SAND with some gravel; light blue. Moist; gravel is fine to medium, angular to subrounded.									
			ES			**3.4m:** Sandy fine to coarse GRAVEL with some silt; light blue. Moist to wet; angular to subrounded; sand is fine to medium.								3.6m: PID = 1.8 ppm	
		4				**4m:** …silty, light blue with light orange staining, some gravel breaks down to sand by hand.									
						4.2m: Silty fine SAND; bluish grey with orange staining. Moist to wet.									
			ES			**4.5m:** Fine to medium SAND with some silt and gravel; yellow grey. Moist to wet; gravel is fine to medium, angular to subrounded.								4.7m: PID = 1.7 ppm	
		5													

REMARKS:
1. Co-ordinates are obtained from GWRC aerial photography, accuracy approx. +/- 5m (ref: http://mapping.gw.govt.nz/gwrc/).
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			ES			**4.9m:** SILT with minor clay; light orange with light blue speckles. "Very stiff to hard", moist, low plasticity.								5m: ALLUVIUM/COLLUVIUM	
						5.2m: Silty, sandy fine to coarse GRAVEL; orange grey. Moist to wet; angular to subangular; sand is fine to coarse.									
						5.4m: Sandy SILT with some gravel; orange grey. "Very stiff to hard, moist, low plasticity; sand is fine to coarse; gravel is fine to medium, angular to subrounded.								5.6m: PID = 1.6 ppm	
		6				**5.9m:** Silty, sandy fine to coarse GRAVEL; yellowish orange. Moist; angular to subangular; sand is fine to coarse.									
						6.3m: SILT with minor sand and trace gravel; yellowish grey. "Hard", moist, low plasticity; sand is fine; gravel is fine, angular to rounded.									
			ES			**6.6m:** Silty, sandy fine to coarse GRAVEL; greyish orange. Moist to wet; angular to subrounded; sand is fine to coarse.								6.7m: PID = 1.7 ppm	
		7													
			ES											7.8m: PID = 1.4 ppm	
		8													
		9				**9m:** Fine to coarse GRAVEL; yellow grey, saturated; angular to subangular. 100mm of disturbed material obtained.									
						9.1m: Fine to coarse GRAVEL with some silt and sand; orange grey. Moist to wet; angular to subangular; sand is fine to coarse.									
			ES											9.8m: PID = 0.7 ppm	
		10													

End of Borehole at 10m (required depth reached)

REMARKS:
1. Co-ordinates are obtained from GWRC aerial photography, accuracy approx. +/- 5m (ref: http://mapping.gw.govt.nz/gwrc/).
2. Logging descriptions are based on NZGS Field Description of Soil and Rock 2005.
3. Soil consistency for cohesive soils in "parenthesis" are based on logging observations.
4. Abbreviations: TCR = Total Core Recovery; PID = Photoionization Detector; ES = Environmental Soil Sample
5. Piezometer from GL: Toby cover, 0.5m Pipe & Bentonite, 4.5m Slotted pipe and sand, sand base, bentonite base.
6. Dashed lines show estimated layer depth.

Water Level Readings mbgl

Log Scale 1:25

Database File: 248221 ENVIRO INVESTIGATION.GPJ **Library file:** AURECON LIBRARY 2011-06-03(1).GLB **Template File:** AURECON DH LOG V3.0 **Date Generated:** 27/10/2017

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Tel: +64 4 472 9589
www.aurecongroup.com

Client: **Parliamentary Services**
Project: **Parliament Future Accommodation**
Location: **Proposed New Ministerial Suites (Stage One)**
Project Reference: **248221**

BH2-1

BOREHOLE INFORMATION
Drilling Method: 30HP Tractor
Diameter Core:
Contractor: Webster Drilling

CO-ORDINATES: NZTM
Easting: 1748704.6m
Northing: 5428902.5m
Ground Level: N/A

Date Started: 19/09/17
Date Completed: 20/09/17
Inclination: N/A
Orientation: N/A

Logged by: I. Allan
Input by: I. Allan
Checked by: S. Howell
Verified by:

Method/Date	R.L. (m)	Length (m)	Sample	Graphic Log	Layer Code	Material Description	Weathering/USC	In Situ Testing	MC (%)	TCR (%)	SCR (%)	RQD (%)	Fracture Spacing (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description	Installation
						0m: ASPHALT **0.05m:** BASECOARSE								0m: ASPHALT/BASE COARSE	
		1				**0.3m:** Silty, sandy fine to coarse GRAVEL with numerous bricks and concrete pieces; brownish grey. Moist; angular to subangular; sand is fine to coarse. [fill material observed during service clearance excavation] **0.4m:** ...concrete shelf and metal beam exposed on side of excavation								0.3m: FILL	
		2				**1m:** SILT with some clay and minor gravel; orangy grey. "Firm", moist, high plasticity; gravel is fine, angular. [depth to top of layer assumed]								1m: ALLUVIUM/COLLUVIUM	
			ES											2.4m: PID = 1 ppm	
		3	ES			**2.8m:** ...some gravel, grey, gravel is fine to coarse, angular to subangular								2.8m: PID = 1 ppm	
			ES			**3m:** Sandy SILT with minor gravel; light bluish grey. "Stiff", moist, low plasticity; sand is fine; gravel is fine, angular. Rare rootlets.									
			ES			**3.2m:** Silty fine SAND with trace of gravel; light bluish grey. Moist; gravel is fine, angular.								3.2m: PID = 1 ppm	
			ES			**3.5m:** Fine SAND with some silt; brownish grey. Wet. Some roots and rootlets.								3.5m: PID = 0 ppm	
						3.6m: SILT with some sand; dark brownish grey. "Soft", wet, high plasticity. Abundant roots and rootlets.									
		4				**3.8m:** Sandy fine to coarse GRAVEL with some silt; dark bluish grey. Wet; sand is fine to coarse. Some rootlets.									
						4m: Medium to coarse GRAVEL; grey. Moist; angular to subangular. Some roots. [washout material]									
			ES			**4.3m:** Clayey, silty fine to coarse GRAVEL; light bluish grey. Moist; angular to subangular.								4.4m: PID = 1 ppm	
		5				**4.4m:** Fine to coarse SAND with some gravel and minor silt; orangy grey. Moist; gravel is fine to medium, angular to subrounded.									

REMARKS:
1. Co-ordinates are obtained from GWRC aerial photography, accuracy approx. +/- 5m (ref: http://mapping.gw.govt.nz/gwrc/).
2. Logging descriptions are based on NZGS Field Description of Soil and Rock 2005.
3. Soil consistency for cohesive soils in "parenthesis" are based on logging observations.
4. Abbreviations: TCR = Total Core Recovery; PID = Photoionization Detector; ES = Environmental Soil Sample
5. Piezometer from GL: Toby cover, 0.5m Pipe & Bentonite, 4.5m Slotted pipe and sand, sand base, bentonite base.
6. Dashed lines show estimated layer depth.

Water Level Readings mbgl
(1) 19/09/2017 at 1.80m (Afternoon)
(2) 20/09/2017 at 2.50m (Morning)

Log Scale 1:25

Database File: 248221 ENVIRO INVESTIGATION.GPJ **Library file:** AURECON LIBRARY 2011-06-03(1).GLB **Template File:** AURECON DH LOG V3.0 **Date Generated:** 27/10/2017

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Project: **Parliament Future Accommodation**
Location: **Proposed New Ministerial Suites (Stage One)**
Project Reference: **248221**

BH2-1

BOREHOLE INFORMATION
Drilling Method: 30HP Tractor
Diameter Core:
Contractor: Webster Drilling

CO-ORDINATES: NZTM
Easting: 1748704.6m
Northing: 5428902.5m
Ground Level: N/A

Date Started: 19/09/17
Date Completed: 20/09/17
Inclination: N/A
Orientation: N/A

Logged by: I. Allan
Input by: I. Allan
Checked by: S. Howell
Verified by:

Method/Date	R.L. (m)	Length (m)	Sample	Graphic Log	Layer Code	Material Description	Weathering/USC	In Situ Testing	MC (%)	TCR (%)	SCR (%)	RQD (%)	Fracture Spacing (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description	Installation
			ES			**5m:** Sandy fine to coarse GRAVEL with some silt; light orangy grey. Moist; angular to subrounded; sand is fine to coarse.								5m: ALLUVIUM/COLLUVIUM 5.5m: PID = 0 ppm	
		6				**6m:** SILT with some clay, trace of gravel; yellowish grey with some thin orange banding. "Very stiff", moist, low plasticity.									
			ES			**6.4m:** SILT with some fine sand; dark orange. "Very stiff", moist, low plasticity.								6.4m: PID = 0 ppm	
						6.6m: Silty, sandy fine to medium GRAVEL; orange grey. Moist; angular to subrounded; sand is fine to coarse. **6.8m:** ...some sand									
		7				**7m:** SILT with some clay; yellow. "Very stiff", moist, low plasticity. Rare sand, coarse. **7.6m:** ...10mm black in colour									
		8	ES			**7.7m:** Fine SAND with some silt; orangy grey. Moist. Rare gravel, fine, angular to subrounded. **7.9m:** ...minor silt								8m: PID = 0 ppm	
						8.2m: Sandy SILT; light yellowish grey. "Very stiff", moist, low plasticity.									
		9				**8.5m:** Sandy fine to coarse GRAVEL with some silt; greyish orange. Wet; angular to subrounded; sand is fine to coarse.									
		10				End of Borehole at 10m (required depth reached)									

REMARKS:
1. Co-ordinates are obtained from GWRC aerial photography, accuracy approx. +/- 5m (ref: http://mapping.gw.govt.nz/gwrc/).
2. Logging descriptions are based on NZGS Field Description of Soil and Rock 2005.
3. Soil consistency for cohesive soils in "parenthesis" are based on logging observations.
4. Abbreviations: TCR = Total Core Recovery; PID = Photoionization Detector; ES = Environmental Soil Sample
5. Piezometer from GL: Toby cover, 0.5m Pipe & Bentonite, 4.5m Slotted pipe and sand, sand base, bentonite base.
6. Dashed lines show estimated layer depth.

Water Level Readings mbgl
(1) 19/09/2017 at 1.80m (Afternoon)
(2) 20/09/2017 at 2.50m (Morning)

Log Scale 1:25

Database File: 248221 ENVIRO INVESTIGATION.GPJ **Library file:** AURECON LIBRARY 2011-06-03(1).GLB **Template File:** AURECON DH LOG V3.0 **Date Generated:** 27/10/2017

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Client: **Parliamentary Services**
Project: **Parliament Future Accommodation**
Location: **Proposed New Ministerial Suites (Stage One)**
Project Reference: **248221**

BH2-2

BOREHOLE INFORMATION
Drilling Method: 30HP Tractor
Diameter Core:
Contractor: Webster Drilling

CO-ORDINATES: NZTM
Easting: 1748700.3m
Northing: 5428871.8m
Ground Level: N/A

Date Started: 17/09/17
Date Completed: 18/09/17
Inclination: N/A
Orientation: N/A

Logged by: I. Allan
Input by: I. Allan
Checked by: S. Howell
Verified by:

Method/Date	R.L. (m)	Length (m)	Sample	Graphic Log	Layer Code	Material Description	Weathering/USC	In Situ Testing	MC (%)	TCR (%)	SCR (%)	RQD (%)	Fracture Spacing (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description	Installation
						0m: ASPHALT **0.05m:** BASECOARSE								0m: ASPHALT/BASE COARSE	
		1				**0.3m:** Silty, sandy fine to coarse GRAVEL with numerous bricks, timber and concrete pieces; brownish grey. Moist; angular to subangular; sand is fine to coarse. [fill observed during excavation]								0.3m: FILL	
		2				**1.05m:** Clayey SILT; yellowish brown with grey patching. "Stiff", moist, high plasticicity. [soil observed during excavation]								1.05m: ALLUVIUM/COLLUVIUM	
			ES			**2m:** Sandy SILT; greyish orange with dark orange banding. "Very stiff", moist, low plasticity; sand is fine. Banding at approx 45 degrees.								2.1m: PID = 2 ppm	
						2.3m: Sandy fine to medium GRAVEL, greyish orange. Moist; angular to subangular; sand is fine to coarse. **2.4m:** Silty fine SAND with minor gravel; light grey. Moist; gravel is fine, angular to subrounded. **2.5m:** Sandy SILT; light grey with orange banding. "Very stiff", moist, low plasticity.									
		3	ES											2.8m: PID = 0 ppm	
						3.5m: Fine to medium SAND with some silt and minor gravel; orange. Moist; gravel is fine, angular to rounded. **3.6m:** ...light bluish grey, gravel is fine to medium.									
		4	ES											3.9m: PID = 0 ppm	
						4m: Silty, gravelly fine to medium SAND; light grey. Moist; gravel is fine to coarse, angular to subangular. **4.1m:** Fine SAND with minor silt; light bluish grey. Moist. **4.2m:** Sandy SILT; greenish grey with orange banding. "Hard", moist, low plasticity. Rare gravel, fine, angular to rounded.									
						4.5m: Silty fine SAND; light blue with dark orange banding. Moist. Banding at approx 20 degrees.									
			ES											4.7m: PID = 1 ppm	
		5				**4.9m:** ...rare gravel, fine to medium, subangular.									

REMARKS:
1. Co-ordinates are obtained from GWRC aerial photography, accuracy approx. +/- 5m (ref: http://mapping.gw.govt.nz/gwrc/).
2. Logging descriptions are based on NZGS Field Description of Soil and Rock 2005.
3. Soil consistency for cohesive soils in "parenthesis" are based on logging observations.
4. Abbreviations: TCR = Total Core Recovery; PID = Photoionization Detector; ES = Environmental Soil Sample
5. Piezometer from GL: Toby cover, 0.5m Pipe & Bentonite, 4.5m Slotted pipe and sand, sand base, bentonite base.
6. Dashed lines show estimated layer depth.

Water Level Readings mbgl
(1) 17/09/2017 at 1.30m (Afternoon)
(2) 18/09/2017 at 0.70m (Morning)

Log Scale 1:25

Database File: 248221 ENVIRO INVESTIGATION.GPJ **Library file:** AURECON LIBRARY 2011-06-03(1).GLB **Template File:** AURECON DH LOG V3.0 **Date Generated:** 27/10/2017

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Client: **Parliamentary Services**
Project: **Parliament Future Accommodation**
Location: **Proposed New Ministerial Suites (Stage One)**
Project Reference: **248221**

BH2-2

BOREHOLE INFORMATION
Drilling Method: 30HP Tractor
Diameter Core:
Contractor: Webster Drilling

CO-ORDINATES: NZTM
Easting: 1748700.3m
Northing: 5428871.8m
Ground Level: N/A

Date Started: 17/09/17
Date Completed: 18/09/17
Inclination: N/A
Orientation: N/A

Logged by: I. Allan
Input by: I. Allan
Checked by: S. Howell
Verified by:

Method/Date	R.L. (m)	Length (m)	Sample	Graphic Log	Layer Code	Material Description	Weathering/USC	In Situ Testing	MC (%)	TCR (%)	SCR (%)	RQD (%)	Fracture Spacing (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description	Installation
		6	ES			**5m:** Gravelly fine to coarse SAND with minor silt; dark greyish green. Moist; gravel is fine to coarse, angular to subrounded.								5m: ALLUVIUM/COLLUVIUM 5.3m: PID = 0 ppm	
		7	ES			**6m:** SILT with minor clay; greenish grey with some orange banding. "Very stiff", moist, low plasticity. **6.7m:** Silty fine to coarse SAND with some gravel; bluish grey. Moist; gravel is fine, angular to subrounded.								6.7m: PID = 1 ppm	
		8	ES			**7.25m:** Sandy SILT; greyish blue. "Very stiff", wet, low plasticity. Rare roots and rootlets. **7.7m:** Clayey SILT; greyish blue. "Firm", moist, high plasticity. Rare roots and rootlets.								7.8m: PID = 1 ppm	
		9	ES			**8.1m:** Fine to coarse GRAVEL with some sand; dark greyish blue. Wet; angular to subangular; sand is fine to coarse. **8.9m:** SILT with minor sand; light bluish grey. "Very stiff", moist, low plasticity. **9.2m:** Clayey SILT; bluish grey. "Stiff", moist, high plasticity. **9.4m:** Gravelly fine to coarse SAND; dark greyish blue. Wet; gravel is fine to medium, angular to subrounded.								8.4m: PID = 0 ppm	
		10				**9.7m:** Sandy fine to coarse GRAVEL; dark greyish blue. Wet; angular to subrounded; sand is fine to coarse.								9.7m: PID = 0 ppm	

End of Borehole at 10m (required depth reached)

REMARKS:
1. Co-ordinates are obtained from GWRC aerial photography, accuracy approx. +/- 5m (ref: http://mapping.gw.govt.nz/gwrc/).
2. Logging descriptions are based on NZGS Field Description of Soil and Rock 2005.
3. Soil consistency for cohesive soils in "parenthesis" are based on logging observations.
4. Abbreviations: TCR = Total Core Recovery; PID = Photoionization Detector; ES = Environmental Soil Sample
5. Piezometer from GL: Toby cover, 0.5m Pipe & Bentonite, 4.5m Slotted pipe and sand, sand base, bentonite base.
6. Dashed lines show estimated layer depth.

Water Level Readings mbgl
(1) 17/09/2017 at 1.30m (Afternoon)
(2) 18/09/2017 at 0.70m (Morning)

Log Scale 1:25

Database File: 248221 ENVIRO INVESTIGATION.GPJ **Library file:** AURECON LIBRARY 2011-06-03(1).GLB **Template File:** AURECON DH LOG V3.0 **Date Generated:** 27/10/2017

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TEST PIT RECORD

TEST PIT NO. **TP1**

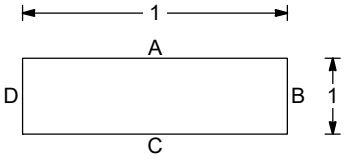
PROJECT NO. **248221**

PROJECT **New Zealand Parliament - Ministerial and New Members, Detailed Site Investigation**
New Zealand Parliament

METHOD **Test Pit**	CO-ORDINATES ()	LOGGED **N KING**	CHECKED **S HOWELL**
MACHINE & NO. **2T Excavator**			
CONTRACTOR **Aurecon**	GROUND LEVEL m RL	DATE **18/09/2017**	DATE **25/10/2017**

STRATA			SAMPLES & TESTS		
Depth	Legend	Description	Depth	No	Remarks/Tests
0.00-0.05		Asphalt [FILL - SURFACE SEAL]			
0.05-0.20		Silty sandy fine to coarse, subangular to subrounded GRAVEL, grey to dark grey. Loosely packed to medium dense, wet. Sand is medium to coarse [FILL].	0.10		TP1_0.1 PID = 0.8 ppm
0.20-0.60		Silty gravelly fine to coarse SAND, yellowish brown. Medium dense, moist. Gravel is fine to coarse, subrounded to subangular. Occasional fine brick fragments [FILL].	0.40		TP1_0.4 PID = 0.8 ppm
		End of Test Pit at 0.60m, on 18/09/2017 *Termination Reason:* Target depth reached			

SHORING/SUPPORT: **None**
STABILITY:



GENERAL REMARKS

All dimensions in metres

CLIENT **Parliamentary Services**

Pocket Penetrometer Test
Insitu Vane Shear Test
Water Level

Aurecon, 139 Carlton Gore Road, Newmarket 1023. Tel: Fax: Natasha.Simpson@aurecongroup.com

Report ID: AGS4 TEST PIT RECORD (NO SKETCH) || Project: TP LOGS.GPJ || Library: AGS 4_0.GLB || Date: 27 October 2017

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TEST PIT RECORD

TEST PIT NO. **TP2**

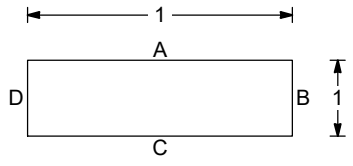
PROJECT NO. **248221**

PROJECT **New Zealand Parliament - Ministerial and New Members, Detailed Site Investigation**
New Zealand Parliament

METHOD **Test Pit**	CO-ORDINATES ()	LOGGED **N KING**	CHECKED **S HOWELL**
MACHINE & NO. **2T Excavator**		DATE **18/09/2017**	DATE **25/10/2017**
CONTRACTOR **Aurecon**	GROUND LEVEL m RL		

STRATA			SAMPLES & TESTS		
Depth	Legend	Description	Depth	No	Remarks/Tests
0.00-0.05		Asphalt [FILL - SURFACE SEAL]			
0.05-0.20		Sandy fine to coarse, subangular GRAVEL with trace of silt, grey to dark grey. Loosely packed, wet. Sand is medium to coarse [FILL].	0.15		TP2_0.15 PID = (no reading)
0.20-0.55		Sandy gravelly SILT with minor clay, grey. Soft to firm, moist, low plasticity. Sand is fine to medium, gravel is medium to coarse, subangular to angular. Single piece of weathered timber [FILL]	0.45		TP2_0.45 PID = (no reading)
		End of Test Pit at 0.55m, on 18/09/2017 *Termination Reason:* Target depth reached			

SHORING/SUPPORT: **None**
STABILITY:



GENERAL REMARKS

All dimensions in metres

CLIENT **Parliamentary Services**

Pocket Penetrometer Test **Insitu Vane Shear Test** **Water Level**

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Report ID: AGS4 TEST PIT RECORD (NO SKETCH) || Project: TP LOGS.GPJ || Library: AGS 4_0.GLB || Date: 27 October 2017

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TEST PIT RECORD

TEST PIT NO. **TP3**

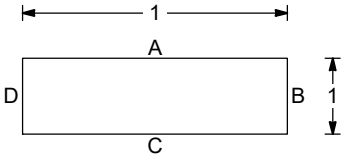
PROJECT NO. **248221**

PROJECT **New Zealand Parliament - Ministerial and New Members, Detailed Site Investigation**
New Zealand Parliament

METHOD **Test Pit**	CO-ORDINATES ()	LOGGED **N KING**	CHECKED **S HOWELL**
MACHINE & NO. **2T Excavator**			
CONTRACTOR **Aurecon**	GROUND LEVEL m RL	DATE **18/09/2017**	DATE **25/10/2017**

STRATA			SAMPLES & TESTS		
Depth	Legend	Description	Depth	No	Remarks/Tests
0.00-0.09		Asphalt [FILL - SURFACE SEAL]			
0.09-0.50		Silty gravelly fine to coarse SAND, greyish brown (with orangeish brown inclusions). Loosely packed to medium dense, moist. Gravel is fine to coarse, some cobbles, subangular to angular [FILL].	0.20		TP3_0.2 PID = 0.2 ppm
			0.40		TP3_0.4 PID = 0.1 ppm
		End of Test Pit at 0.50m, on 18/09/2017 *Termination Reason:* Target depth reached			

SHORING/SUPPORT: **None**
STABILITY:



GENERAL REMARKS

All dimensions in metres

CLIENT **Parliamentary Services**

Pocket Penetrometer Test
Insitu Vane Shear Test
Water Level

Aurecon, 139 Carlton Gore Road, Newmarket 1023. Tel: Fax: Natasha.Simpson@aurecongroup.com

Report ID: AGS4 TEST PIT RECORD (NO SKETCH) || Project: TP LOGS.GPJ || Library: AGS 4_0.GLB || Date: 27 October 2017

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TEST PIT RECORD

TEST PIT NO. **TP4**

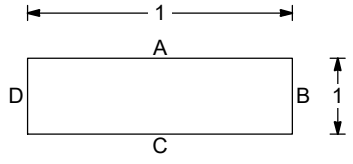
PROJECT NO. **248221**

PROJECT **New Zealand Parliament - Ministerial and New Members, Detailed Site Investigation**
New Zealand Parliament

METHOD **Test Pit**	CO-ORDINATES ()	LOGGED **N KING**	CHECKED **S HOWELL**
MACHINE & NO. **2T Excavator**		DATE **18/09/2017**	DATE **25/10/2017**
CONTRACTOR **Aurecon**	GROUND LEVEL m RL		

STRATA			SAMPLES & TESTS		
Depth	Legend	Description	Depth	No	Remarks/Tests
0.00-0.07		Asphalt [FILL - SURFACE SEAL]			
0.07-0.27		Silty gravelly fine to coarse SAND, grey to dark grey. Loosely packed to medium dense, wet. Gravel is medium to coarse, subangular to angular [FILL].	0.15		TP4_0.15 PID = 0.2 ppm
0.27-0.53		Sandy gravelly SILT, yellowish brown (with light grey inclusions). Soft to firm, moist, high plasticity. Sand is medium to coarse, gravel is medium to coarse with some cobbles, angular [FILL].	0.35		TP4_0.35 PID = 0.1 ppm
		End of Test Pit at 0.53m, on 18/09/2017 *Termination Reason:* Target depth reached			

SHORING/SUPPORT: **None**
STABILITY:



GENERAL REMARKS

All dimensions in metres

CLIENT **Parliamentary Services**

Pocket Penetrometer Test
Insitu Vane Shear Test
Water Level

Aurecon, 139 Carlton Gore Road, Newmarket 1023. Tel: Fax: Natasha.Simpson@aurecongroup.com

Report ID: AGS4 TEST PIT RECORD (NO SKETCH) || Project: TP LOGS.GPJ || Library: AGS 4_0.GLB || Date: 27 October 2017

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TEST PIT RECORD

TEST PIT NO. **TP5**

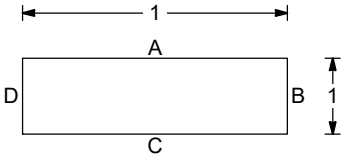
PROJECT NO. **248221**

PROJECT **New Zealand Parliament - Ministerial and New Members, Detailed Site Investigation**
New Zealand Parliament

METHOD **Test Pit**	CO-ORDINATES ()	LOGGED **N KING**	CHECKED **S HOWELL**
MACHINE & NO. **2T Excavator**		DATE **18/09/2017**	DATE **25/10/2017**
CONTRACTOR **Aurecon**	GROUND LEVEL m RL		

STRATA			SAMPLES & TESTS		
Depth	Legend	Description	Depth	No	Remarks/Tests
0.00-0.10		Asphalt [FILL - SURFACE SEAL]			
0.10-0.17		Silty gravelly fine to coarse SAND, grey to dark grey. Loosely packed, wet. Gravel is fine to coarse, some cobbles, subangular to angular [FILL].			
0.17-0.60		Silty gravelly fine to coarse SAND, yellowish brown (with grey inclusions). Medium dense to dense, moist. Gravel is fine to coarse, some cobbles, subangular to angular. Frequent brick fragments and whole bricks (from 0.4 m bgl) [FILL].	0.15		TP5_0.15 PID = 0.3 ppm
			0.35		TP5_0.35
			0.50		PID = 0.3 ppm
		End of Test Pit at 0.60m, on 18/09/2017 *Termination Reason:* Target depth reached			

SHORING/SUPPORT: **None**
STABILITY:



GENERAL REMARKS

All dimensions in metres

CLIENT **Parliamentary Services**

Pocket Penetrometer Test
Insitu Vane Shear Test
Water Level

Aurecon, 139 Carlton Gore Road, Newmarket 1023. Tel: Fax: Natasha.Simpson@aurecongroup.com

Report ID: AGS4 TEST PIT RECORD (NO SKETCH) || Project: TP LOGS.GPJ || Library: AGS 4_0.GLB || Date: 27 October 2017

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TEST PIT RECORD

TEST PIT NO. **TP6**

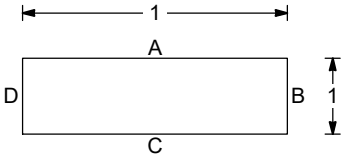
PROJECT NO. **248221**

PROJECT **New Zealand Parliament - Ministerial and New Members, Detailed Site Investigation**
New Zealand Parliament

METHOD **Test Pit**	CO-ORDINATES ()	LOGGED **N KING**	CHECKED **S HOWELL**
MACHINE & NO. **2T Excavator**		DATE **18/09/2017**	DATE **25/10/2017**
CONTRACTOR **Aurecon**	GROUND LEVEL m RL		

STRATA			SAMPLES & TESTS		
Depth	Legend	Description	Depth	No	Remarks/Tests
0.00-0.09		Asphalt [FILL - SURFACE SEAL]			
0.09-0.30		Silty gravelly fine to coarse SAND, grey (with orange inclusions). Medium dense, moist to wet. Gravel is medium to coarse, some cobbles, subangular to angular [FILL].	0.25		TP6_0.25 PID = 0.2 ppm
0.30-0.55		Sandy gravelly SILT, yellowish brown (with orange inclusions). Medium dense to dense, moist. Sand is fine to coarse, gravel is medium to coarse, some cobbles, subangular to angular. Frequent brick fragments and occasional whole bricks [FILL].	0.50		TP6_0.5 PID = (no reading)
		End of Test Pit at 0.55m, on 18/09/2017 *Termination Reason:* Target depth reached			

SHORING/SUPPORT: **None**
STABILITY:



GENERAL REMARKS

All dimensions in metres

CLIENT **Parliamentary Services**

Pocket Penetrometer Test
Insitu Vane Shear Test
Water Level

Aurecon, 139 Carlton Gore Road, Newmarket 1023. Tel: Fax: Natasha.Simpson@aurecongroup.com

Report ID: AGS4 TEST PIT RECORD (NO SKETCH) || Project: TP LOGS.GPJ || Library: AGS 4_0.GLB || Date: 27 October 2017

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TEST PIT RECORD

TEST PIT NO. **TP7**

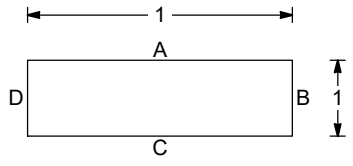
PROJECT NO. **248221**

PROJECT **New Zealand Parliament - Ministerial and New Members, Detailed Site Investigation**
New Zealand Parliament

METHOD **Test Pit**	CO-ORDINATES ()	LOGGED **N KING**	CHECKED **S HOWELL**
MACHINE & NO. **2T Excavator**		DATE **18/09/2017**	DATE **25/10/2017**
CONTRACTOR **Aurecon**	GROUND LEVEL m RL		

STRATA			SAMPLES & TESTS		
Depth	Legend	Description	Depth	No	Remarks/Tests
0.00-0.08		Asphalt [FILL - SURFACE SEAL]			
0.08-0.20		Gravelly medium to coarse SAND with trace of silt, greyish brown. Loosely packed, wet. Gravel is medium to coarse, some cobbles, subangular to angular [FILL].	0.15		TP7_0.15 PID = 0.1 ppm
0.20-0.50		Silty gravelly medium to coarse SAND, yellowish brown (with grey inclusions). Medium dense, moist. Gravel is medium to coarse, some cobbles, angular [FILL].	0.45		TP7_0.45 PID = 0.3 ppm
		End of Test Pit at 0.50m, on 18/09/2017 *Termination Reason:* Target depth reached			

SHORING/SUPPORT: **None**
STABILITY:



GENERAL REMARKS

All dimensions in metres

CLIENT **Parliamentary Services**

Pocket Penetrometer Test
Insitu Vane Shear Test
Water Level

Aurecon, 139 Carlton Gore Road, Newmarket 1023. Tel: Fax: Natasha.Simpson@aurecongroup.com

Report ID: AGS4 TEST PIT RECORD (NO SKETCH) || Project: TP LOGS.GPJ || Library: AGS 4_0.GLB || Date: 27 October 2017

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TEST PIT RECORD

TEST PIT NO. **TP8**

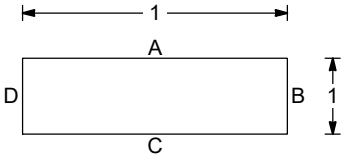
PROJECT NO. **248221**

PROJECT **New Zealand Parliament - Ministerial and New Members, Detailed Site Investigation**
New Zealand Parliament

METHOD **Test Pit**	CO-ORDINATES ()	LOGGED **N KING**	CHECKED **S HOWELL**
MACHINE & NO. **2T Excavator**		DATE **18/09/2017**	DATE **25/10/2017**
CONTRACTOR **Aurecon**	GROUND LEVEL m RL		

STRATA			SAMPLES & TESTS		
Depth	Legend	Description	Depth	No	Remarks/Tests
0.00-0.08		Interlocking bricks [FILL - SURFACE SEAL]			
0.08-0.15		Medium to coarse SAND with some gravel, yellowish brown. Loosely packed to medium dense, moist. Gravel is fine to medium, subrounded to rounded [FILL - BASECOURSE]			
0.15-0.50		Silty gravelly fine to coarse SAND, greyish brown. Loosely packed to medium dense, moist to wet. Gravel is medium to coarse, some cobbles, subrounded to subangular. Brick fragments [FILL].	0.20		TP8_0.2 PID = 0.1 ppm
			0.45		TP8_0.45 PID = 0.1 ppm
		End of Test Pit at 0.50m, on 18/09/2017 *Termination Reason:* Target depth reached			

SHORING/SUPPORT: **None**
STABILITY:



GENERAL REMARKS

All dimensions in metres

CLIENT **Parliamentary Services**

Pocket Penetrometer Test **Insitu Vane Shear Test** **Water Level**

Aurecon, 139 Carlton Gore Road, Newmarket 1023. Tel: Fax: Natasha.Simpson@aurecongroup.com

Report ID: AGS4 TEST PIT RECORD (NO SKETCH) || Project: TP LOGS.GPJ || Library: AGS 4_0.GLB || Date: 27 October 2017

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TEST PIT RECORD

TEST PIT NO. **TP9**

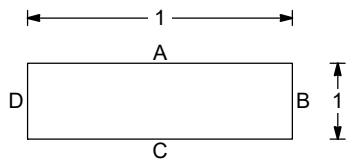
PROJECT NO. **248221**

PROJECT **New Zealand Parliament - Ministerial and New Members, Detailed Site Investigation**
New Zealand Parliament

METHOD **Test Pit**	CO-ORDINATES ()	LOGGED **N KING / S McAULEY**	CHECKED **S HOWELL**
MACHINE & NO. **NONE**			
CONTRACTOR **Aurecon**	GROUND LEVEL m RL	DATE **20/09/2017**	DATE **25/10/2017**

STRATA			SAMPLES & TESTS		
Depth	Legend	Description	Depth	No	Remarks/Tests
0.00-0.25		Clayey SILT, greyish brown. Soft to firm, moist, high plasticity. Roots and rootlets in top 0.1 m, anthropogenic items including corroded steel bolt [TOPSOIL].	0.10		TP9_0.1 PID = (no reading)
0.25-0.45		Sandy SILT, orangeish brown (with grey mottles and inclusions). Firm to stiff, dry to moist, low plasticity. Sand is fine to coarse [FILL / REWORKED ALLUVIUM].	0.30		TP9_0.3 PID = (no reading)
		End of Test Pit at 0.45m, on 20/09/2017 *Termination Reason:* Target depth reached			

SHORING/SUPPORT: **None**
STABILITY:



GENERAL REMARKS

Hand excavated

All dimensions in metres

CLIENT **Parliamentary Services**

Pocket Penetrometer Test **Insitu Vane Shear Test** **Water Level**

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TEST PIT RECORD

TEST PIT NO. **TP10**

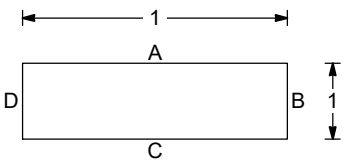
PROJECT NO. **248221**

PROJECT **New Zealand Parliament - Ministerial and New Members, Detailed Site Investigation**
New Zealand Parliament

METHOD **Test Pit**	CO-ORDINATES ()	LOGGED **N KING / S McAULEY**	CHECKED **S HOWELL**
MACHINE & NO. **NONE**		DATE **20/09/2017**	DATE **25/10/2017**
CONTRACTOR **Aurecon**	GROUND LEVEL m RL		

STRATA			SAMPLES & TESTS		
Depth	Legend	Description	Depth	No	Remarks/Tests
0.00-0.20		Clayey SILT with trace of sand, greyish brown. Soft to firm, moist, high plasticity. Sand is fine to medium [TOPSOIL].			
		End of Test Pit at 0.20m, on 20/09/2017 *Termination Reason:* Roots obstructed further excavation	0.20		TP10_0.2 PID = 0.2 ppm

SHORING/SUPPORT: **None**
STABILITY:



GENERAL REMARKS

Hand excavated

All dimensions in metres

CLIENT **Parliamentary Services**

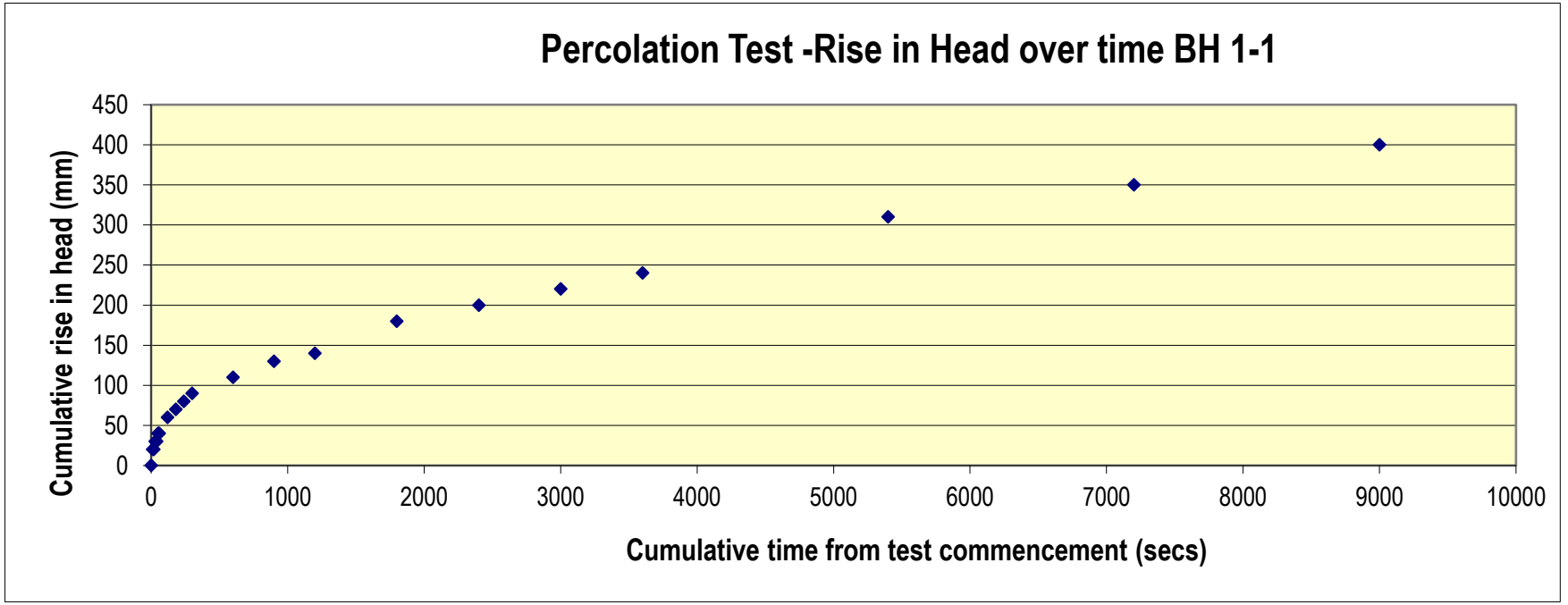
Pocket Penetrometer Test **Insitu Vane Shear Test** **Water Level**

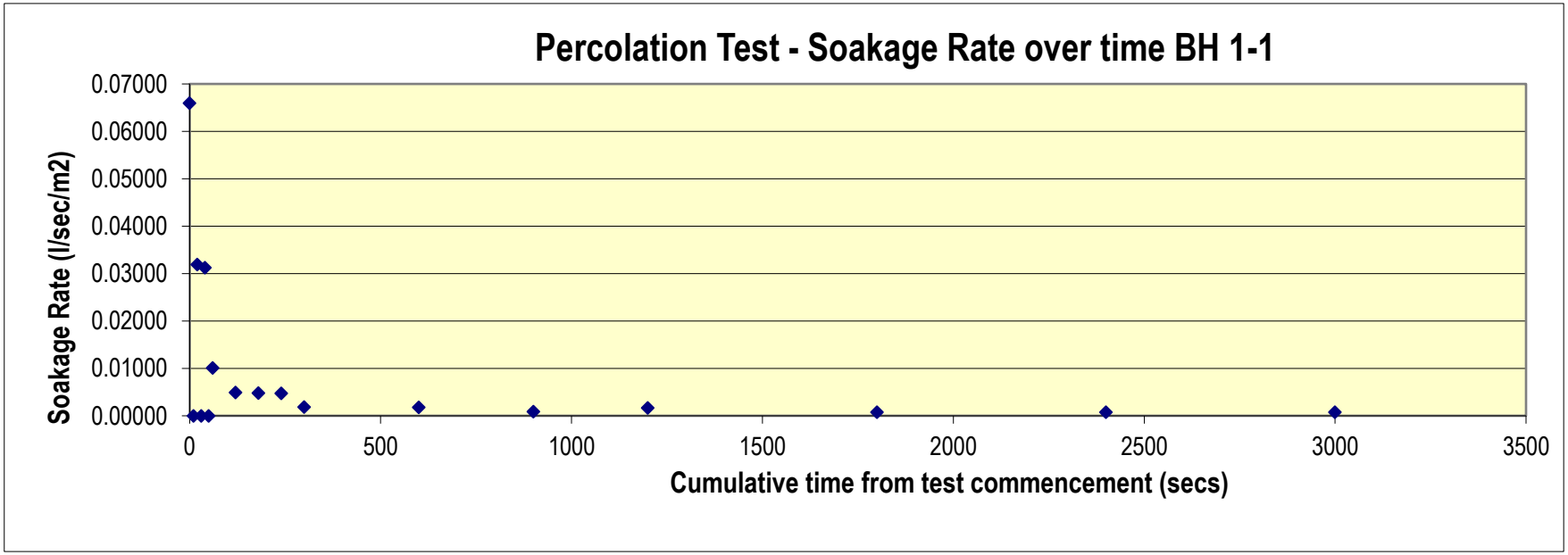
Aurecon, 139 Carlton Gore Road, Newmarket 1023. Tel: Fax: Natasha.Simpson@aurecongroup.com

Appendix C
Percolation Tests

Job Location	Parliament	**Soil conditions**	
Client	Parliamentary Services	**Antecedent weather**	Fine
Job No.	248221	**Depth to water table**	N/A - bore empty
Test Location	BH 1-1	**Depth of hole (below egl)**	4970 (mm)
		Diameter of bore	60 (mm)

TIME (24 hr clock) hh:mm:ss	Depth to water level (mm below egl)	Height above base of hole (Head) (mm)	Difference between depth readings (mm)	Time between readings (secs)	Cumulative water level rise (mm)	Time between readings (secs) ignoring refills	Cumulative time elapsed (secs)	Cumulative time elapsed (secs) (removing refills)	Cumulative water level rise (mm)	Soakage Area (m2)	Soaked Volume (L)	Soakage Rate (l/sec/m2)
12:00:00	4540	430			0	0	0	0	0			
12:00:10	4520	450	20	10	20	10	10	10	20	0.086	0.06	0.06593
12:00:20	4520	450	0	10	20	10	20	20	20	0.088	0.00	0.00000
12:00:30	4510	460	10	10	30	10	30	30	30	0.089	0.03	0.03191
12:00:40	4510	460	0	10	30	10	40	40	30	0.090	0.00	0.00000
12:00:50	4500	470	10	10	40	10	50	50	40	0.090	0.03	0.03125
12:01:00	4500	470	0	10	40	10	60	60	40	0.091	0.00	0.00000
12:02:00	4480	490	20	60	60	60	120	120	60	0.093	0.06	0.01010
12:03:00	4470	500	10	60	70	60	180	180	70	0.096	0.03	0.00490
12:04:00	4460	510	10	60	80	60	240	240	80	0.098	0.03	0.00481
12:05:00	4450	520	10	60	90	60	300	300	90	0.100	0.03	0.00472
12:10:00	4430	540	20	300	110	300	600	600	110	0.103	0.06	0.00183
12:15:00	4410	560	20	300	130	300	900	900	130	0.106	0.06	0.00177
12:20:00	4400	570	10	300	140	300	1200	1200	140	0.109	0.03	0.00086
12:30:00	4360	610	40	600	180	600	1800	1800	180	0.114	0.11	0.00165
12:40:00	4340	630	20	600	200	600	2400	2400	200	0.120	0.06	0.00079
12:50:00	4320	650	20	600	220	600	3000	3000	220	0.123	0.06	0.00076
13:00:00	4300	670	20	600	240	600	3600	3600	240	0.127	0.06	0.00074
13:30:00	4230	740	70	1800	310	1800	5400	5400	310	0.136	0.20	0.00081
14:00:00	4190	780	40	1800	350	1800	7200	7200	350	0.146	0.11	0.00043
14:30:00	4140	830	50	1800	400	1800	9000	9000	400	0.155	0.14	0.00051
15:30:00												
										AVE RATE	**L/sec/m2**	0.00169
											L/Min/m2	0.10125

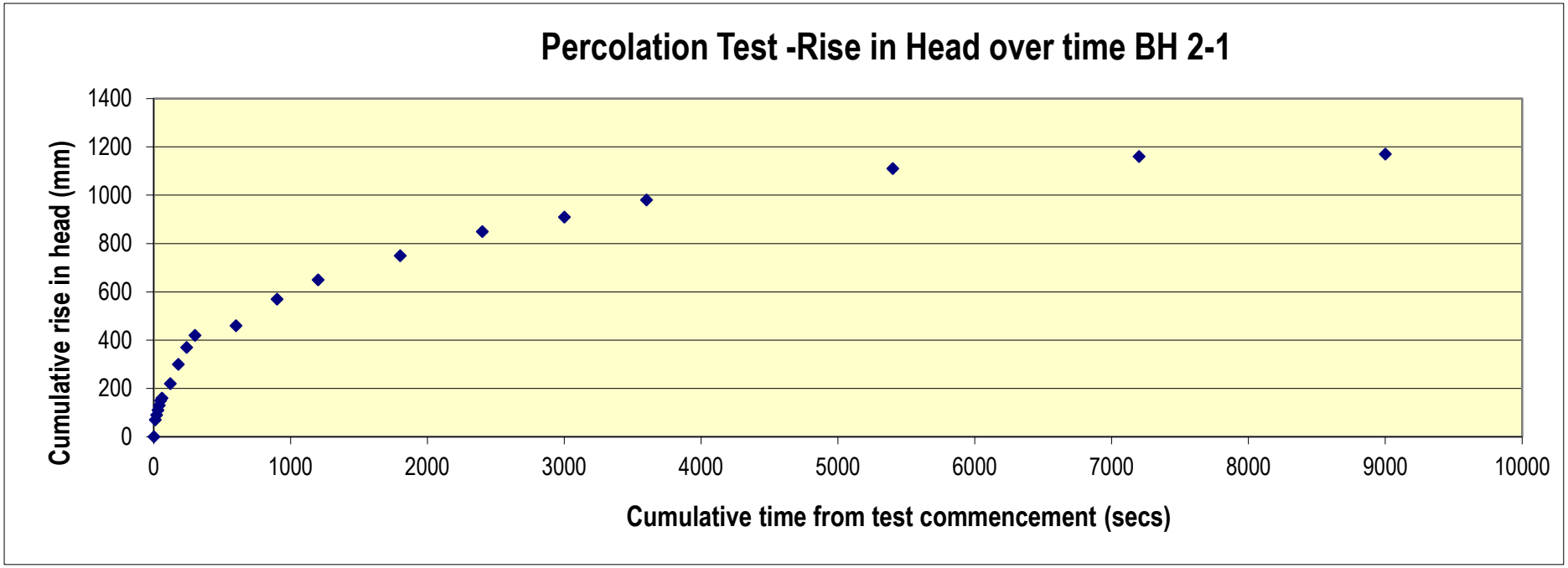

Percolation Test -Rise in Head over time BH 1-1
Cumulative rise in head (mm)
450
400
350
300
250
200
150
100
50
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Cumulative time from test commencement (secs)

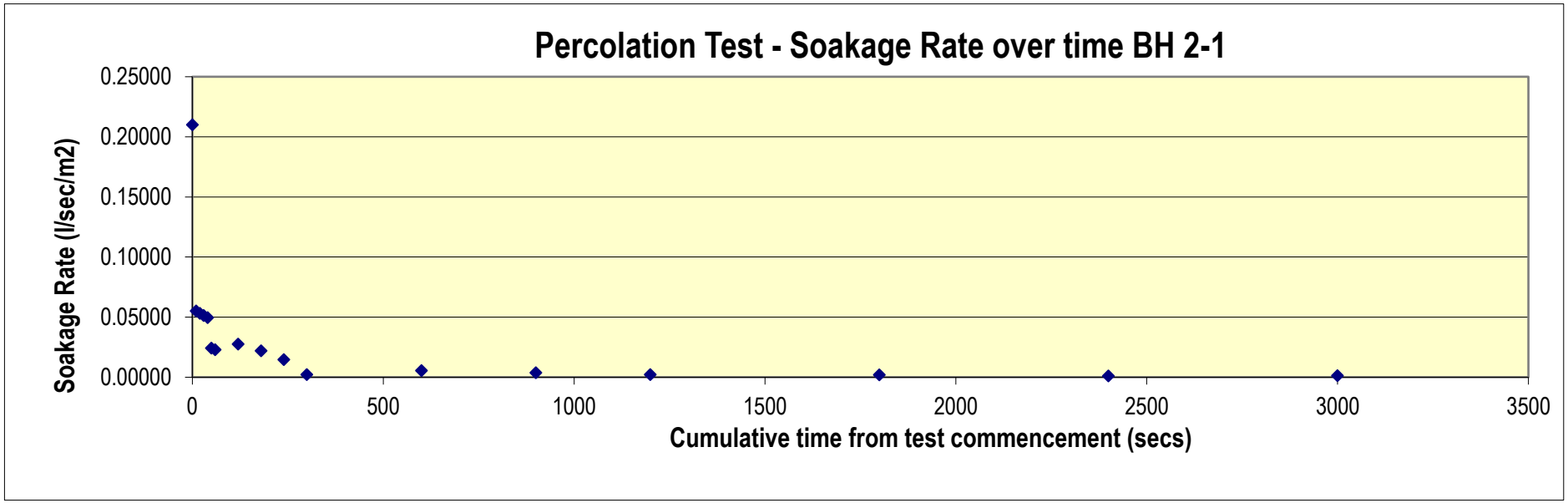

Percolation Test - Soakage Rate over time BH 1-1
Soakage Rate (l/sec/m2)
0.07000
0.06000
0.05000
0.04000
0.03000
0.02000
0.01000
0.00000
0
500
1000
1500
2000
2500
3000
3500
Cumulative time from test commencement (secs)

Job Location	Parliament
Client	Parliamentary Services
Job No.	248221
Test Location	BH 2-1

Soil conditions		
Antecedent weather		Fine
Depth to water table		N/A - bore emptied
Depth of hole (below egl)	4480	(mm)
Diameter of bore	60	(mm)

TIME (24 hr clock) hh:mm:ss	Depth to water level (mm below egl)	Height above base of hole (Head) (mm)	Difference between depth readings (mm)	Time between readings (secs)	Cumulative water level rise (mm)	Time between readings (secs) ignoring refills	Cumulative time elapsed (secs)	Cumulative time elapsed (secs) (removing refills)	Cumulative water level rise (mm)	Soakage Area (m2)	Soaked Volume (L)	Soakage Rate (l/sec/m2)
12:00:00	4030	450			0	0	0	0	0			
12:00:10	3960	520	70	10	70	10	10	10	70	0.094	0.20	0.21000
12:00:20	3940	540	20	10	90	10	20	20	90	0.103	0.06	0.05505
12:00:30	3920	560	20	10	110	10	30	30	110	0.106	0.06	0.05310
12:00:40	3900	580	20	10	130	10	40	40	130	0.110	0.06	0.05128
12:00:50	3880	600	20	10	150	10	50	50	150	0.114	0.06	0.04959
12:01:00	3870	610	10	10	160	10	60	60	160	0.117	0.03	0.02419
12:02:00	3810	670	60	60	220	60	120	120	220	0.123	0.17	0.02290
12:03:00	3730	750	80	60	300	60	180	180	300	0.137	0.23	0.02759
12:04:00	3660	820	70	60	370	60	240	240	370	0.151	0.20	0.02188
12:05:00	3610	870	50	60	420	60	300	300	420	0.162	0.14	0.01453
12:10:00	3570	910	40	300	460	300	600	600	460	0.171	0.11	0.00221
12:15:00	3460	1020	110	300	570	300	900	900	570	0.185	0.31	0.00561
12:20:00	3380	1100	80	300	650	300	1200	1200	650	0.203	0.23	0.00372
12:30:00	3280	1200	100	600	750	600	1800	1800	750	0.220	0.28	0.00215
12:40:00	3180	1300	100	600	850	600	2400	2400	850	0.238	0.28	0.00198
12:50:00	3120	1360	60	600	910	600	3000	3000	910	0.254	0.17	0.00112
13:00:00	3050	1430	70	600	980	600	3600	3600	980	0.266	0.20	0.00124
13:30:00	2920	1560	130	1800	1110	1800	5400	5400	1110	0.285	0.37	0.00072
14:00:00	2870	1610	50	1800	1160	1800	7200	7200	1160	0.302	0.14	0.00026
14:30:00	2860	1620	10	1800	1170	1800	9000	9000	1170	0.307	0.03	0.00005
14:45:00	2860	1620										
										AVE RATE	**L/sec/m2**	0.00528
											L/Min/m2	0.31691


Percolation Test -Rise in Head over time BH 2-1
Cumulative rise in head (mm)
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Cumulative time from test commencement (secs)


Percolation Test - Soakage Rate over time BH 2-1
Soakage Rate (l/sec/m2)
0.25000
0.20000
0.15000
0.10000
0.05000
0.00000
0
500
1000
1500
2000
2500
3000
3500
Cumulative time from test commencement (secs)

Appendix D
Field Monitoring Sheets

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LOW-FLOW MONITORING RECORDING SHEET

Project Number: 248221
Site: PARLIAMENT
Date: 12/10/17

Monitoring Engineer: SMA / NK
Task Manager:
Weather: Fine, Dry
Multiprobe No:

Due to slow recharge rate, sampled below central column

Well ID: BH 2-1 | Time: 1:10 pm | NAPL Depth: — | DTW: 2.77 m | DTB: 4.51 m | Sampled At: 4.00m | Sampling Method: Peri. Pump

DTW Measured From (delete as appropriate): Ground Level / Top Hat / Well Pipe

Delete as applicable		Time (minutes)										
Old YSI	New YSI	0	5	10	15	20	25	30				
°C	°C	15.1	15.0	14.8	14.7	14.9	14.8	14.7				
µS/cm	DO%	90.0	73.7	72.4	71.6	71.0	70.4	68.0				
µS/cm	DO mg/l	9.03	7.45	7.33	7.27	7.17	7.09	6.93				
DO%	µS/cm	498.0	478.3	488.9	494.0	498.9	511.1	517.3				
~~DO mg/l~~	~~µS/cm~~											
pH	pH	~~6.98~~ 7.28	7.29	7.26	7.23	7.21	7.20	7.14				
ORP	ORP	120.4	99.0	95.0	93.4	92.8	93.1	94.3				
DTW								2.80m				
Approx. Pump Speed												

Groundwater Comments: (colour, sediment, odour etc.)
Recharge rate possibly faster today due to ground saturation/recent rainfall.
Volume of water removed during purging:

Containers Collected:

Number:	Type:
	1 Litre Glass 40ml Vial 1 Litre Plastic

Well Condition:	Is Well Cover Damaged?	Cover Bolts Present?	Rubber Seal Present?	Water Inside Cover?	Bung Present?	Surrounding Condition (e.g. Sunken? etc.)	Other Comments (e.g. Maintenance Required? Obstruction in Pipe?)
	N	Y	N	Y	Y	FLUSH W/GRND	as above, for precaution.

Well ID: BH 2-2 | Time: 2:50 pm | NAPL Depth: — | DTW: 2.85m | DTB: 4.52m | Sampled At: 4.00m | Sampling Method: Peri. Pump

DTW Measured From (delete as appropriate): Ground Level / Top Hat / Well Pipe

Delete as applicable		Time (minutes)										
Old YSI	New YSI	0	5	10	15	20	25	30				
°C	°C	15.3	15.4	15.0	15.1	15.3	15.5					
µS/cm	DO%	58.2	62.9	68.2	63.4	59.9	68.6					
µS/cm	DO mg/l	5.72	6.29	6.82	6.37	5.99	6.85					
DO%	µS/cm	590.1	564.0	512.4	509.7	508.5	555.4					
~~DO mg/l~~	~~µS/cm~~											
pH	pH	6.68	6.76	6.85	6.81	6.75	6.70					
ORP	ORP	-15.2	-5.6	1.3	8.3	11.2	0.3					
DTW							3.16m					
Approx. Pump Speed							~~3.16~~					

Groundwater Comments: (colour, sediment, odour etc.)
Issues with continuity of flow - pump drew air 3 times, but reestablished. Final readings not taken to ensure samples could be taken
Volume of water removed during purging:

ORP value shows odd pattern, stable at time of sampling

Containers Collected:

Number:	Type:
	1 Litre Glass 40ml Vial 1Litre Plastic

Well Condition:	Is Well Cover Damaged?	Cover Bolts Present?	Rubber Seal Present?	Water Inside Cover?	Bung Present?	Surrounding Condition (e.g. Sunken? etc.)	Other Comments (e.g. Maintenance Required? Obstruction in Pipe?)
	N	Y	N	Y	Y	FLUSH W/GRND	

NAPL: Non-Aqueous Phase Liquid
DTW: Depth To Water
DTB: Depth To Base

Note: Indicator parameters have stabilised when 3 consecutive readings are within ±0.1pH, ±3% conductivity and temperature, ±10mv redox and ±10% dissolved oxygen

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LOW-FLOW MONITORING RECORDING SHEET

Project Number: 248221
Site: PARLIAMENT
Date: 12/10/17

Monitoring Engineer: SMA/NK
Task Manager:
Weather: fine, dry
Multiprobe No:

Well ID: BH 1-1 | Time: 2:40pm | NAPL Depth: — | DTW: 3.05m | DTB: 4.97m | Sampled At: 4.00m | Sampling Method: Peri Pump

DTW Measured From (delete as appropriate): Ground Level / Top Hat / Well Pipe

Delete as applicable		Time (minutes)											
Old YSI	New YSI	0	5	10	15	20	25	30					
°C	°C	16.0	15.4	15.3	15.5	15.8							
µS/cm	DO%	77.6	70.2	70.4	69.2	71.4							
µS/cm	DO mg/l	7.65	7.01	7.04	6.92	7.1							
DO%	µS/cm	801	842	855	852	849							
DO mg/l	µS/cm												
pH	pH	7.59	7.54	7.54	7.54	7.55							
ORP	ORP	14.2	29.9	33.0	37.5	38.4							
DTW							3.66						
Approx. Pump Speed													

SAMPLING ABANDONED - FLOW CEASED COMPLETELY @ 20-25 MINS
↳ PUMP RUN AT HIGH SPEED BUT INSUFFICIENT TO DRAW HEAD DOWN - GW FLOW TOO LOW/ SURFACE TENSION BETWEEN GRAINS TOO HIGH FOR PUMP

Groundwater Comments: (colour, sediment, odour etc.)
Steadily to draw air @ 20 mins - flow maintained despite air pockets. Final readings not taken to ensure samples could be taken

Volume of water removed during purging:
HC + MM GRAB SAMPLES

Containers Collected: TAKEN WITH BAILER

Number:	Type:
	1 Litre Glass 40ml Vial 1 Litre Plastic

↳ LAB FILTRATION REQ'D

Well Condition:	Is Well Cover Damaged?	Cover Bolts Present?	Rubber Seal Present?	Water Inside Cover?	Bung Present?	Surrounding Condition (e.g. Sunken? etc.)	Other Comments (e.g. Maintenance Required? Obstruction in Pipe?)
	N	Y	N	Y	Y	FLUSH W/GRND	

Well ID: BH1-2 | Time: 3:15 | NAPL Depth: — | DTW: 4.09 | DTB: 5.15 | Sampled At: 4.5 | Sampling Method:

DTW Measured From (delete as appropriate): Ground Level / Top Hat / Well Pipe

Delete as applicable		Time (minutes)											
Old YSI	New YSI	0	5	10	15	20	25	30					
°C	°C												
µS/cm	DO%												
µS/cm	DO mg/l												
DO%	µS/cm												
DO mg/l	µS/cm												
pH	pH												
ORP	ORP												
DTW													
Approx. Pump Speed													

INSUFFICIENT WATER FOR 30 MINS OF PARAMETER MEASUREMENT
↳ LOW FLOW SAMPLES OBTAINED DIRECTLY FOR HC + MM, GRAB SAMPLES TAKEN WITH BAILER FOR NUTRIENTS + MICROBIOLOGY - LAB FILTRATION REQ'D

Groundwater Comments: (colour, sediment, odour etc.)

Volume of water removed during purging:

Containers Collected:

Number:	Type:
	1 Litre Glass 40ml Vial 1 Litre Plastic

Well Condition:	Is Well Cover Damaged?	Cover Bolts Present?	Rubber Seal Present?	Water Inside Cover?	Bung Present?	Surrounding Condition (e.g. Sunken? etc.)	Other Comments (e.g. Maintenance Required? Obstruction in Pipe?)
	N	Y	N	Y	Y	FLUSH W/GRND	

NAPL: Non-Aqueous Phase Liquid
DTW: Depth To Water
DTB: Depth To Base

Note: Indicator parameters have stabilised when 3 consecutive readings are within ±0.1pH, ±3% conductivity and temperature, ±10mv redox and ±10% dissolved oxygen

Aurecon Bulk Soil Gas Monitoring Form

Moisture trap present? ✓

Site: ~~Reynolds Place~~ PARLIAMENT

Well ID: BH1-2 (SOUTHERN MOST GARDEN WELL)

Barometric Pressure: 1009 mb

Job No: 248221

Weather: ~~Rain~~ OVERCAST

Realtive Pressure: 0.10 mh

Client: ~~Marra~~ PARLIMENTARY SERVICES

Unit: VAN HALT ~~Enveo~~ GA5000

Peak Flow: 0.2 l/h

Date: 9/10/17 ~~25/11/2016~~

Operative: SMCAULEY N KING ~~L.Beirne~~

Average Flow: 0.15 l/h

Flow
10s: 0.1 l/h
30s: 0.1 l/h
50s: 0.2 l/h
60s: 0.2 l/h

me (secs)		0	10	20	30	60	90	120	150	180	210	240	270	PEAK (Min 02)
CH4	(% v/v)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
CO2	(% v/v)	0.1	3.8	3.3	2.8	1.9	1.1	1.0	0.6	0.5	0.4	0.4	0.3	
O2	(% v/v)	21.5	17.0	16.6	17.1	18.5	19.2	19.6	20.3	20.5	20.7	20.5	20.8	
CO	ppm	2	2	2	2	2	1	2	2	1	1	1	1	
H2S	ppm	0	0	0	0	0	0	0	0	0	0	0	0	
	ppm						0.3			0.3			0.24	

DTP:		DTW:		DTB:	

Ground conditions:

DO NOT USE GAS ANLYSER WITHOUT MOISTURE TRAP PRESENT.
Watch for water in lines and disconnect immediately if seen.
Zero flow reader between each well.

Flow fresh air through gas analyser between each well until concentrations return to normal level
Measure depths from ground level. If not possible ensure you note where recorded from.

Final PID: ~~0.12~~ 0.2

Aurecon Bulk Soil Gas Monitoring Form

Moisture trap present? ☐

Site: ~~Reynolds Place~~ PARLIAMENT (NORTHERNMOST CAR PARK WELL) **Well ID:** BH2-1 **Barometric Pressure:** 1009 mb

Job No: 248 221 **Weather:** ~~Rain~~ OVERCAST **Realtive Pressure:** ~~0.21~~ mb 0.174

Client: ~~Marra~~ PARLIAMENTARY SERVICES **Unit:** VAN WALT ~~Envco GA5000~~ **Peak Flow:** 0.2 l/h

Date: ~~25/11/2016~~ 09/10/2017 **Operative:** ~~L.Beirne~~ S McAULEY/N WONG **Average Flow:** 0.2 l/h

me (secs)		0	10	20	30	60	90	120	150	180	210	240	270	PEAK (Min 02)
CH4	(% v/v)	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	—
CO2	(% v/v)	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	—
O2	(% v/v)	21.2	21.6	21.3	21.1	20.8	20.5	20.8	20.8	20.8	20.8	20.8	20.8	20.8
CO	ppm	1	2	2	2	2	2	2	2	2	2	2	2	2
H2S	ppm	0	0	0	0	0	0	0	0	0	0	0	0	—
	PID ppm						0.3		0.44			0.500		

DTP:		DTW:		DTB:	

Ground conditions: _____

DO NOT USE GAS ANLYSER WITHOUT MOISTURE TRAP PRESENT.
Watch for water in lines and disconnect immediately if seen.
Zero flow reader between each well.

Flow fresh air through gas analyser between each well until concentrations return to normal level
Measure depths from ground level. If not possible ensure you note where recorded from.

PID - 0.24 (from tap)
final reading

Aurecon Bulk Soil Gas Monitoring Form

Moisture trap present? ✓

Site: ~~Reynolds Place~~ PARLIAMENT

Job No: 248221

Client: ~~Marra~~ PARLIAMENTARY SERVICES

Date: ~~25/11/2016~~ 9/10/17

Well ID: BH1-1 (NORTHERNMOST GARDEN WELL)

Weather: ~~Rain~~ OVERCAST

Unit: ~~Enveo~~ GA5000 VAN WALT

Operative: ~~L.Beirne~~ SMCAULEY, N KING

Barometric Pressure: 1009 mb

Realtive Pressure: 0.10 mb

Peak Flow: 0.3 l/h

Average Flow: 0.3 l/h

Flow
10 s 0.3 l/h
30 s 0.3 l/h
50s 0.3 l/h
60 s 0.3 l/h

me (secs)		0	10	20	30	60	90	120	150	180	210	240	270	PEAK (Min 02)
CH4	(% v/v)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
CO2	(% v/v)	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.5	
O2	(% v/v)	20.4	20.2	20.1	20.1	20.1	20.1	20.2	20.2	20.3	20.3	20.4	20.5	
CO	ppm	1	1	1	1	1	1	1	1	1	1	1	1	
H2S	ppm	0	0	0	0	0	0	0	0	0	0	0	0	
	ppm					0.27			0.26		0.24			

DTP:		DTW:		DTB:	

Ground conditions:

DO NOT USE GAS ANLYSER WITHOUT MOISTURE TRAP PRESENT.
Watch for water in lines and disconnect immediately if seen.
Zero flow reader between each well.

Flow fresh air through gas analyser between each well until concentrations return to normal level
Measure depths from ground level. If not possible ensure you note where recorded from.

PID final - 0.1

Aurecon Bulk Soil Gas Monitoring Form

Moisture trap present? ☐

Site: ~~Reynolds Place~~ PARLIAMENT

Well ID: BH2-2 (SOUTHERN MOST CARPARK WELL)

Barometric Pressure: 1009 mb

Job No: 248221

Weather: ~~Rain~~ OVERCAST

Realtive Pressure: -0.10 mb

Client: PARLIMENTARY ~~Marra~~ SERVICES

Unit: VAN WALT ~~Enmco~~ GA5000

Peak Flow: 0.3 l/h

Date: 9/10/17 ~~25/11/2016~~

Operative: SMCALLEY, N KING ~~L.Beirne~~

Average Flow: 0.25 l/h

Flow
30s - 0.2 l/h
50s - 0.3 l/h
60s - 0.3 l/h
180s - 0.3 l/h

me (secs)		0	10	20	30	60	90	120	150	180	210	240	270	PEAK (Min 02)
CH4	(% v/v)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	—
CO2	(% v/v)	0.1	0.5	0.5	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
O2	(% v/v)	21.0	20.2	19.9	20.1	20.4	20.7	20.8	20.8	20.7	21.1	21.0	20.9	20.8
CO	ppm	1	2	2	2	2	2	2	1	1	1	1	1	2
H2S	ppm	0	0	0	0	0	0	0	0	0	0	0	0	—
PID	PPM						1.2		0.7				0.37	

DTP:		DTW:		DTB:	

Ground conditions: _____

DO NOT USE GAS ANLYSER WITHOUT MOISTURE TRAP PRESENT.
Watch for water in lines and disconnect immediately if seen.
Zero flow reader between each well.

Flow fresh air through gas analyser between each well until concentrations return to normal level
Measure depths from ground level. If not possible ensure you note where recorded from.

Final PID : 0.48

Appendix E
Screening Tables

New Zealand Parliament - Ministerial and New Members Development
Detailed Site Investigation
Table F1 - Soil Analytical Results

Laboratory Reference			Screening Criteria			17-24091-1	17-24091-2	17-24091-3	17-24091-4	17-24091-5	17-24091-6	17-24091-7	17-24091-8	17-24091-9	17-24091-10
Sample ID			NES Commerical / Industrial (1)	MfE Tier 1 All Pathways - Commerical, Sand, < 1 m (2)	Background Max Value, Sand (3)	TP1	TP2	TP3	TP4	TP5	TP6	TP7	TP8	TP9	TP10
Sample Date						29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Depth	Units	LOR				0.4	0.15	0.4	0.15	0.5	0.25	0.45	0.2	0.3	0.2
Arsenic	mg/kg dry wt	0.125	70		7	8	*12.3*	*8.47*	*9.49*	*8.73*	*10.6*	*11.9*	*7.1*	3.16	3.58
Beryllium	mg/kg dry wt	0.013				1.12	0.99	1.19	1.41	1.21	1.57	1.36	1.09	1.08	0.49
Boron	mg/kg dry wt	1.25	>10,000		2.1	*3.37*	*3.52*	*3.18*	*3.46*	*4.05*	*4.03*	*3.47*	*3.06*	<1.25	*2.63*
Cadmium	mg/kg dry wt	0.005	1,300		0.1	0.094	0.078	0.061	0.05	*0.12*	0.055	*0.1*	0.042	0.029	*0.15*
Chromium	mg/kg dry wt	0.125	6,300		12	*33.2*	*17.4*	*19*	*20.6*	*18.5*	*20.8*	*19.3*	*17.3*	*16.3*	*15*
Copper	mg/kg dry wt	0.075	>10,000		10	*19.4*	*20.2*	*19.9*	*22.1*	*25.9*	*22.6*	*20.3*	*16.3*	*8.27*	*12.7*
Lead	mg/kg dry wt	0.05	3,300		180	116	26.9	26.9	23.4	*399*	24.1	45.3	18.1	15.2	21.5
Mercury	mg/kg dry wt	0.025	4,200		0.1	*0.11*	0.077	0.055	0.048	*0.21*	0.052	0.082	0.052	0.063	0.095
Nickel	mg/kg dry wt	0.05			9	*19.9*	*17.6*	*16.7*	*19.4*	*17.2*	*19.6*	*17.4*	*15.7*	*9.92*	*9.04*
Zinc	mg/kg dry wt	0.05			79	*108*	78	*83.6*	*81.1*	*186*	*82.6*	*106*	68.5	45.9	50.5
C7-C9	mg/kg dry wt	10		120		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
C10-C14	mg/kg dry wt	15		1500		<15	<15	<15	<15	<15	<15	<15	<15	<15	<15
C15-C36	mg/kg dry wt	25		NA		<25	<25	<25	<25	<25	26	<25	<25	<25	48
C7-C36 (Total)	mg/kg dry wt	50			110	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Benzene	mg/kg	0.05		3		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	mg/kg	0.05		180		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Toluene	mg/kg	0.05		94		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
m,p-xylene	mg/kg	0.05		150		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
o-xylene	mg/kg	0.05				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1-Methylnaphthalene	mg/kg	0.01				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
2-Methylnaphthalene	mg/kg	0.01				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Acenaphthene	mg/kg	0.01				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	mg/kg	0.01				<0.01	<0.01	0.02	<0.01	0.05	<0.01	0.09	<0.01	<0.01	<0.01
Anthracene	mg/kg	0.01			0.01	*0.01*	<0.01	*0.01*	<0.01	*0.04*	<0.01	*0.09*	<0.01	<0.01	<0.01
Benz[a]anthracene	mg/kg	0.02				0.06	<0.02	0.07	<0.02	0.27	<0.02	0.29	<0.02	<0.02	<0.02
Benzo[a]pyrene	mg/kg	0.01			0.08	0.07	<0.01	*0.09*	<0.01	*0.38*	<0.01	*0.32*	0.02	<0.01	<0.01
Benzo[b]&[j] fluoranthene	mg/kg	0.02				0.08	<0.02	0.12	<0.02	0.4	<0.02	0.36	0.03	<0.02	<0.02
Benzo[g,h,i]perylene	mg/kg	0.02				0.07	<0.02	0.1	<0.02	0.34	0.02	0.25	0.03	<0.02	<0.02
Benzo[k]fluoranthene	mg/kg	0.01				0.03	<0.01	0.04	<0.01	0.17	<0.01	0.13	<0.01	<0.01	<0.01
Chrysene	mg/kg	0.01				0.08	<0.01	0.08	<0.01	0.29	<0.01	0.28	0.02	<0.01	<0.01
Dibenz(a,h)anthracene	mg/kg	0.01				<0.01	<0.01	0.02	<0.01	0.06	<0.01	0.05	<0.01	<0.01	<0.01
Fluoranthene	mg/kg	0.02				0.16	<0.02	0.12	<0.02	0.6	<0.02	0.67	0.04	<0.02	<0.02
Fluorene	mg/kg	0.01			0.14	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.03	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	mg/kg	0.01				0.06	<0.01	0.09	<0.01	0.34	<0.01	0.26	0.02	<0.01	<0.01
Naphthalene	mg/kg	0.01		190	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	mg/kg	0.01			0.07	*0.07*	<0.01	0.04	<0.01	*0.22*	<0.01	*0.53*	0.02	<0.01	<0.01
Pyrene	mg/kg	0.02		NL	0.12	*0.16*	<0.02	*0.14*	<0.02	*0.69*	<0.02	*0.67*	0.05	<0.02	<0.02
Benzo[a]pyrene TEQ	mg/kg	0.01	35	11		0.09	ND	0.14	ND	0.56	ND	0.48	0.02	ND	ND

LOR - Laboratory Limit of Reporting
NL - Contaminant not limiting, as estimated health-based critirion is significantly hire than that likley to be encountered on site
TEQ - Toxicity equivilent
ND - Non-detect calculated value is less than limit of reporting for all calculation inputs
NA - Not analysed
Italics indicate concentration above URS 2003 Background Soil Conentrations
(1) MfE, (2011), Method for Deriving Standard for Contaminants in Soil to Protect Human Health, Table ES1 and ES2
(2) MfE, 1999 (Revised 2011), Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand, Module 4 – Tier 1 soil acceptance criteria, Table 4.11
(3) URS, (2003), Determination of Common Pollutant Background Soil Concentrations for the Wellington Region, Table ES-1

New Zealand Parliament - Ministerial and New Members Development
Detailed Site Investigation
Table F1 - Soil Analytical Results

Laboratory Reference			Screening Criteria			17-24091-11	17-24091-12	17-24091-13	17-24091-14	17-24091-15	17-24091-16	17-24091-17	17-24091-18	17-24091-19	17-24091-20	17-24091-21	17-24091-22
Sample ID			NES Commerical / Industrial (1)	MfE Tier 1 All Pathways - Commerical, Sand, < 1 m (2)	Background Max Value, Sand (3)	BH1/1	BH1/1	BH1/1	BH1/1	BH1/1	BH1/1	BH1/2	BH1/2	BH1/2	BH1/2	BH1/2	BH2/1
Sample Date						29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Depth	Units	LOR				1.75	3.5	4.4	5.1	5.7	6.9	2.1	3.1	3.6	4.7	5.6	2.4
Arsenic	mg/kg dry wt	0.125	70		7	4.25	2.23	1.73	1.67	2.7	2.12	2.33	1.71	0.447	3.05	4.97	3.42
Beryllium	mg/kg dry wt	0.013				1.2	1	1.01	1.34	1.07	1.28	1.11	0.36	0.66	0.87	1.31	0.98
Boron	mg/kg dry wt	1.25	>10,000		2.1	1.46	<1.25	<1.25	<1.25	<1.25	<1.25	1.43	<1.25	1.33	<1.25	<1.25	1.64
Cadmium	mg/kg dry wt	0.005	1,300		0.1	0.037	0.024	0.014	0.022	0.016	0.039	0.024	0.008	0.02	0.009	0.008	0.026
Chromium	mg/kg dry wt	0.125	6,300		12	*20.1*	*16.8*	*19.3*	*22*	*22.5*	*26.6*	*21.2*	*25.5*	*28.5*	*22.3*	*23.5*	*19.5*
Copper	mg/kg dry wt	0.075	>10,000		10	*14*	8.72	9.69	*11.6*	9.75	*10.9*	*10.8*	7.96	*23.1*	*15.3*	*17.5*	*16*
Lead	mg/kg dry wt	0.05	3,300		180	14.9	12.1	14.6	19	14.3	16.4	14.4	19.2	26	19.6	22.6	32.9
Mercury	mg/kg dry wt	0.025	4,200		0.1	0.046	<0.025	<0.025	0.026	<0.025	0.026	<0.025	0.044	<0.025	<0.025	<0.025	*0.14*
Nickel	mg/kg dry wt	0.05			9	*12.9*	*11.4*	*12.1*	*12.5*	*12.2*	*14.7*	*15*	*9.64*	*18.9*	*14.2*	*14.9*	*11.4*
Zinc	mg/kg dry wt	0.05			79	54.6	48.2	52.4	56.5	55.4	63	56.3	19.5	63.9	52.3	56.6	59.9
C7-C9	mg/kg dry wt	10		120		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C10-C14	mg/kg dry wt	15		1500		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C15-C36	mg/kg dry wt	25		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C7-C36 (Total)	mg/kg dry wt	50			110	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	mg/kg	0.05		3		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	mg/kg	0.05		180		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	mg/kg	0.05		94		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-xylene	mg/kg	0.05		150		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-xylene	mg/kg	0.05				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Methylnaphthalene	mg/kg	0.01				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2-Methylnaphthalene	mg/kg	0.01				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	mg/kg	0.01				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	mg/kg	0.01				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	mg/kg	0.01			0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benz[a]anthracene	mg/kg	0.02				<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[a]pyrene	mg/kg	0.01			0.08	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo[b]&[j] fluoranthene	mg/kg	0.02				<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[g,h,i]perylene	mg/kg	0.02				<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[k]fluoranthene	mg/kg	0.01				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	mg/kg	0.01				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Dibenz(a,h)anthracene	mg/kg	0.01				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	mg/kg	0.02				<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Fluorene	mg/kg	0.01			0.14	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	mg/kg	0.01				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene	mg/kg	0.01		190	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	mg/kg	0.01			0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	mg/kg	0.02		NL	0.12	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02
Benzo[a]pyrene TEQ	mg/kg	0.01	35	11		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

LOR - Laboratory Limit of Reporting
NL - Contaminant not limiting, as estimated health-based critirion is significantly hire than that likley to be encour
TEQ - Toxicity equivilent
ND - Non-detect calculated value is less than limit of reporting for all calculation inputs
NA - Not analysed
Italics indicate concentration above URS 2003 Background Soil Conentrations
(1) MfE, (2011), Method for Deriving Standard for Contaminants in Soil to Protect Human Health, Table ES1 and E
(2) MfE, 1999 (Revised 2011), Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Site
(3) URS, (2003), Determination of Common Pollutant Background Soil Concentrations for the Wellington Region,

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Table F1 - Soil Analytical Results

Laboratory Reference			Screening Criteria			17-24091-23	17-24091-24	17-24091-25	17-24091-26	17-24091-27	17-24091-28	17-24091-29	17-24091-30	17-24091-31	17-24091-32	17-24091-33
Sample ID			NES Commerical / Industrial (1)	MfE Tier 1 All Pathways - Commerical, Sand, < 1 m (2)	Background Max Value, Sand (3)	BH2/1	BH2/1	BH2/1	BH2/1	BH2/2	BH2/2	BH2/2	BH2/2	BH2/2	BH2/2	BH2/2
Sample Date						29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Depth	Units	LOR				3.3	3.5	4.4	5.5	2.1	2.8	3.9	4.7	5.3	7.8	8.4
Arsenic	mg/kg dry wt	0.125	70		7	0.828	2.52	3.15	4.62	1.98	3.04	0.405	0.827	0.558	1.29	1.89
Beryllium	mg/kg dry wt	0.013				0.32	1.33	2.03	1.7	0.88	1.26	1.19	0.77	1.15	0.99	1.27
Boron	mg/kg dry wt	1.25	>10,000		2.1	<1.25	1.43	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25
Cadmium	mg/kg dry wt	0.005	1,300		0.1	0.005	0.06	0.025	0.019	0.006	0.009	0.006	0.005	0.01	0.017	0.022
Chromium	mg/kg dry wt	0.125	6,300		12	10.6	*15.3*	*18.3*	*22.4*	*14.2*	*23.8*	*15.1*	*14.5*	*18.8*	*18.8*	*21.7*
Copper	mg/kg dry wt	0.075	>10,000		10	1.96	*10.5*	*10.7*	*14.2*	6.33	7.8	9.84	8.32	*12.8*	*11.4*	*10.5*
Lead	mg/kg dry wt	0.05	3,300		180	8.71	10.4	14.8	15.1	13.7	16.6	13.2	12.3	13.9	16.2	15.4
Mercury	mg/kg dry wt	0.025	4,200		0.1	0.041	0.046	0.028	<0.025	<0.025	0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Nickel	mg/kg dry wt	0.05			9	5.33	*10.5*	*11.6*	*13.3*	7.79	7.75	*10.4*	8.76	*11*	*9.62*	*12.1*
Zinc	mg/kg dry wt	0.05			79	28.6	48.2	53.7	63.8	34.8	41.8	48.5	38.3	51.6	55.8	59.9
C7-C9	mg/kg dry wt	10		120		NA	NA	<10	NA	NA	NA	NA	NA	NA	NA	NA
C10-C14	mg/kg dry wt	15		1500		NA	NA	<15	NA	NA	NA	NA	NA	NA	NA	NA
C15-C36	mg/kg dry wt	25		NA		NA	NA	<25	NA	NA	NA	NA	NA	NA	NA	NA
C7-C36 (Total)	mg/kg dry wt	50			110	NA	NA	<50	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	mg/kg	0.05		3		NA	NA	<0.05	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	mg/kg	0.05		180		NA	NA	<0.05	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	mg/kg	0.05		94		NA	NA	<0.05	NA	NA	NA	NA	NA	NA	NA	NA
m,p-xylene	mg/kg	0.05		150		NA	NA	<0.05	NA	NA	NA	NA	NA	NA	NA	NA
o-xylene	mg/kg	0.05				NA	NA	<0.05	NA	NA	NA	NA	NA	NA	NA	NA
1-Methylnaphthalene	mg/kg	0.01				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2-Methylnaphthalene	mg/kg	0.01				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	mg/kg	0.01				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	mg/kg	0.01				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	mg/kg	0.01			0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benz[a]anthracene	mg/kg	0.02				<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[a]pyrene	mg/kg	0.01			0.08	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo[b]&[j] fluoranthene	mg/kg	0.02				<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[g,h,i]perylene	mg/kg	0.02				<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[k]fluoranthene	mg/kg	0.01				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	mg/kg	0.01				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	mg/kg	0.01				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	mg/kg	0.02				<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Fluorene	mg/kg	0.01			0.14	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	mg/kg	0.01				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene	mg/kg	0.01		190	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	mg/kg	0.01			0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	mg/kg	0.02		NL	0.12	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[a]pyrene TEQ	mg/kg	0.01	35	11		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

LOR - Laboratory Limit of Reporting
NL - Contaminant not limiting, as estimated health-based critirion is significantly hire than that likley to be encour
TEQ - Toxicity equivilent
ND - Non-detect calculated value is less than limit of reporting for all calculation inputs
NA - Not analysed
Italics indicate concentration above URS 2003 Background Soil Conentrations
(1) MfE, (2011), Method for Deriving Standard for Contaminants in Soil to Protect Human Health, Table ES1 and E
(2) MfE, 1999 (Revised 2011), Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Site
(3) URS, (2003), Determination of Common Pollutant Background Soil Concentrations for the Wellington Region, T

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Detailed Site Investigation
Table F2 - Groundwater Analytical Results

Laboratory Reference Sample ID Sample Date	Units	LOR	Screening Criteria ANZECC 95% Protection of Marine Species (1)	 ANZECC 95% Protection of Freshwater Species (1)	 MoH Drinking Water (2)	 Hydrocarbon, Inhalation, 2 m, Sand, Indoor (3)	17-25011 BH1-1 12/10/2017	17-25011 BH1-2 12/10/2017	17-25011 BH2-1 12/10/2017	17-25011 BH2-2 12/10/2017
Arsenic	g/m3	0.0005	ID	0.013	0.01		0.0014	0.0028	0.0006	<0.0005
Beryllium	g/m3	0.00001	ID	ID			<0.00001	<0.00001	<0.00001	<0.00001
Boron	g/m3	0.005	ID	0.370	1.4		0.148	0.185	0.068	0.069
Cadmium	g/m3	0.00001	0.0055	0.0002	0.004		<0.00001	<0.00001	0.00002	<0.00001
Chromium	g/m3	0.0002	0.0044	0.0010	0.05		<0.0002	<0.0002	<0.0002	<0.0002
Copper	g/m3	0.0002	0.0013	0.0014	2		0.0016	0.0004	0.0033	0.0007
Lead	g/m3	0.00005	0.0044	0.0034	0.01		<0.00005	<0.00005	<0.00005	<0.00005
Mercury	g/m3	0.0001	0.0004	0.0006	0.007		<0.0001	<0.0001	<0.0001	<0.0001
Nickel	g/m3	0.0002	0.070	0.011	0.08		0.0024	0.0027	0.0029	0.003
Zinc	g/m3	0.001	0.015	0.008			<0.001	0.0017	0.0049	0.0047
Benzene	g/m3	0.001	0.7	0.95	0.01	5.2	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	g/m3	0.001	ID	ID	0.3	460	<0.001	<0.001	<0.001	<0.001
Toluene	g/m3	0.001	ID	ID	0.8	110	<0.001	<0.001	<0.001	<0.001
m,p-xylene	g/m3	0.001	ID	ID	0.6	S	<0.001	<0.001	<0.001	<0.001
o-xylene	g/m3	0.001	ID	0.35			<0.001	<0.001	<0.001	<0.001
C7-C9	g/m3	0.2				S	<0.2	<0.2	<0.2	<0.2
C10-C14	g/m3	0.2				S	<0.2	<0.2	<0.2	<0.2
C15-C36	g/m3	0.3				S	<0.3	<0.3	<0.3	<0.3
C7-C36 (Total)	g/m3	0.5					<0.5	<0.5	<0.5	<0.5
1-Methylnaphthalene	g/m3	0.00006					<0.00006	<0.00006	<0.00006	0.00009
2-Methylnaphthalene	g/m3	0.00006					<0.00006	<0.00006	<0.00006	0.00009
Acenaphthene	g/m3	0.00002	ID	ID			<0.00002	<0.00002	<0.00002	0.00004
Acenaphthylene	g/m3	0.00002					<0.00002	<0.00002	0.00004	0.00003
Anthracene	g/m3	0.00002	ID	ID			<0.00002	<0.00002	<0.00002	<0.00002
Benz[a]anthracene	g/m3	0.00003					<0.00003	<0.00003	<0.00003	<0.00003
Benzo[a]pyrene	g/m3	0.00002	ID	ID	0.0007	S	<0.00002	<0.00002	<0.00002	<0.00002
Benzo[b]&[j] fluoranthene	g/m3	0.00002					<0.00002	<0.00002	<0.00002	<0.00002
Benzo[g,h,i]perylene	g/m3	0.00002					<0.00002	<0.00002	<0.00002	<0.00002
Benzo[k]fluoranthene	g/m3	0.00002					<0.00002	<0.00002	<0.00002	<0.00002
Chrysene	g/m3	0.00002					<0.00002	<0.00002	<0.00002	<0.00002
Dibenz[a,h]anthracene	g/m3	0.00002					<0.00002	<0.00002	<0.00002	<0.00002
Fluoranthene	g/m3	0.00002					<0.00002	<0.00002	0.00005	<0.00002
Fluorene	g/m3	0.00002					<0.00002	<0.00002	<0.00002	0.00015
Indeno[1,2,3-cd]pyrene	g/m3	0.00003					<0.00003	<0.00003	<0.00003	<0.00003
Naphthalene	g/m3	0.00006	0.070	0.016		S	<0.00006	0.00019	<0.00006	0.00024
Phenanthrene	g/m3	0.00003	ID	ID			<0.00003	<0.00003	<0.00003	0.00005
Pyrene	g/m3	0.00002				S	<0.00002	<0.00002	0.00004	0.00004
Nitrate-N	g/m3	0.05	ID	0.700	50		NA	<0.05	NA	NA
Nitrite-N	g/m3	0.0025			3		NA	<0.02	NA	NA
Ammonia-N	g/m3	0.01	0.910	0.900			NA	3.62	NA	NA
Dissolved Reactive Phosphorus	g/m3	0.004					NA	<0.04	NA	NA
E Coli Enumerated	MPN/100mL	1			1		NA	1	NA	NA
Total Coliforms Enumerated	MPN/100mL	1					NA	1720	NA	NA

LOR - Laboratory Limit of Reporting
S - Calculated water criteria exceeds solubility limit for pure compound in water
ID - Insufficient data to derive trigger value
NA - Not analysed
(1) ANZECC (2000), Guidelines for Fresh and Marine Water Quality, Table 3.4.1
(2) MoH 2005 (Revised 2008) Drinking-water Standards for New Zealand, Tables 2.1, 2.2, 2.3
(3) MfE, 1999 (Revised 2011), Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand, Module 5 – Tier 1 groundwater acceptance criteria, Table 5.10

Appendix F
Laboratory Certificates and Chain of Custody Documentation

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Certificate of Analysis

Aurecon New Zealand Ltd
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Attention: Nick King
Phone: 027 471 3030
Email: nick.king@aurecongroup.com

Lab Reference: 17-24091
Submitted by:
Date Received: 5/10/2017
Date Completed: 11/10/2017
Order Number:
Reference: 248221

Sampling Site: Parliment Building

Heavy Metals in Soil

			Client Sample ID	TP1 0.4	TP2 0.15	TP3 0.4	TP4 0.15	TP5 0.5
			Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*		17-24091-1	17-24091-2	17-24091-3	17-24091-4	17-24091-5
Arsenic	mg/kg dry wt	*0.125*		8.00	12.3	8.47	9.49	8.73
Beryllium	mg/kg dry wt	*0.013*		1.12	0.99	1.19	1.41	1.21
Boron	mg/kg dry wt	*1.25*		3.37	3.52	3.18	3.46	4.05
Cadmium	mg/kg dry wt	*0.005*		0.094	0.078	0.061	0.050	0.12
Chromium	mg/kg dry wt	*0.125*		33.2	17.4	19.0	20.6	18.5
Copper	mg/kg dry wt	*0.075*		19.4	20.2	19.9	22.1	25.9
Lead	mg/kg dry wt	*0.05*		116	26.9	26.9	23.4	399
Mercury	mg/kg dry wt	*0.025*		0.11	0.077	0.055	0.048	0.21
Nickel	mg/kg dry wt	*0.05*		19.9	17.6	16.7	19.4	17.2
Zinc	mg/kg dry wt	*0.05*		108	78.0	83.6	81.1	186

Heavy Metals in Soil

			Client Sample ID	TP6 0.25	TP7 0.45	TP8 0.2	TP9 0.3	TP10 0.2
			Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*		17-24091-6	17-24091-7	17-24091-8	17-24091-9	17-24091-10
Arsenic	mg/kg dry wt	*0.125*		10.6	11.9	7.10	3.16	3.58
Beryllium	mg/kg dry wt	*0.013*		1.57	1.36	1.09	1.08	0.49
Boron	mg/kg dry wt	*1.25*		4.03	3.47	3.06	<1.25	2.63
Cadmium	mg/kg dry wt	*0.005*		0.055	0.10	0.042	0.029	0.15
Chromium	mg/kg dry wt	*0.125*		20.8	19.3	17.3	16.3	15.0
Copper	mg/kg dry wt	*0.075*		22.6	20.3	16.3	8.27	12.7
Lead	mg/kg dry wt	*0.05*		24.1	45.3	18.1	15.2	21.5
Mercury	mg/kg dry wt	*0.025*		0.052	0.082	0.052	0.063	0.095
Nickel	mg/kg dry wt	*0.05*		19.6	17.4	15.7	9.92	9.04
Zinc	mg/kg dry wt	*0.05*		82.6	106	68.5	45.9	50.5

IANZ ACCREDITED LABORATORY

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation, with the exception of tests marked *, which are not accredited.

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Heavy Metals in Soil

		Client Sample ID	BH1/1 1.75	BH1/1 3.5	BH1/1 4.4	BH1/1 5.0	BH1/1 5.7
		Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*	17-24091-11	17-24091-12	17-24091-13	17-24091-14	17-24091-15
Arsenic	mg/kg dry wt	*0.125*	4.25	2.23	1.73	1.67	2.70
Beryllium	mg/kg dry wt	*0.013*	1.20	1.0	1.01	1.34	1.07
Boron	mg/kg dry wt	*1.25*	1.46	<1.25	<1.25	<1.25	<1.25
Cadmium	mg/kg dry wt	*0.005*	0.037	0.024	0.014	0.022	0.016
Chromium	mg/kg dry wt	*0.125*	20.1	16.8	19.3	22.0	22.5
Copper	mg/kg dry wt	*0.075*	14.0	8.72	9.69	11.6	9.75
Lead	mg/kg dry wt	*0.05*	14.9	12.1	14.6	19.0	14.3
Mercury	mg/kg dry wt	*0.025*	0.046	<0.025	<0.025	0.026	<0.025
Nickel	mg/kg dry wt	*0.05*	12.9	11.4	12.1	12.5	12.2
Zinc	mg/kg dry wt	*0.05*	54.6	48.2	52.4	56.5	55.4

Heavy Metals in Soil

		Client Sample ID	BH1/1 6.9	BH1/2 2.1	BH1/2 3.1	BH1/2 3.6	BH1/2 4.7
		Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*	17-24091-16	17-24091-17	17-24091-18	17-24091-19	17-24091-20
Arsenic	mg/kg dry wt	*0.125*	2.12	2.33	1.71	0.447	3.05
Beryllium	mg/kg dry wt	*0.013*	1.28	1.11	0.36	0.66	0.87
Boron	mg/kg dry wt	*1.25*	<1.25	1.43	<1.25	1.33	<1.25
Cadmium	mg/kg dry wt	*0.005*	0.039	0.024	0.008	0.020	0.009
Chromium	mg/kg dry wt	*0.125*	26.6	21.2	25.5	28.5	22.3
Copper	mg/kg dry wt	*0.075*	10.9	10.8	7.96	23.1	15.3
Lead	mg/kg dry wt	*0.05*	16.4	14.4	19.2	26.0	19.6
Mercury	mg/kg dry wt	*0.025*	0.026	<0.025	0.044	<0.025	<0.025
Nickel	mg/kg dry wt	*0.05*	14.7	15.0	9.64	18.9	14.2
Zinc	mg/kg dry wt	*0.05*	63.0	56.3	19.5	63.9	52.3

Heavy Metals in Soil

		Client Sample ID	BH1/2 5.6	BH2/1 2.4	BH2/1 3.3	BH2/1 3.5	BH2/1 4.4
		Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*	17-24091-21	17-24091-22	17-24091-23	17-24091-24	17-24091-25
Arsenic	mg/kg dry wt	*0.125*	4.97	3.42	0.828	2.52	3.15
Beryllium	mg/kg dry wt	*0.013*	1.31	0.98	0.32	1.33	2.03
Boron	mg/kg dry wt	*1.25*	<1.25	1.64	<1.25	1.43	<1.25
Cadmium	mg/kg dry wt	*0.005*	0.008	0.026	0.005	0.060	0.025
Chromium	mg/kg dry wt	*0.125*	23.5	19.5	10.6	15.3	18.3
Copper	mg/kg dry wt	*0.075*	17.5	16.0	1.96	10.5	10.7
Lead	mg/kg dry wt	*0.05*	22.6	32.9	8.71	10.4	14.8
Mercury	mg/kg dry wt	*0.025*	<0.025	0.14	0.041	0.046	0.028
Nickel	mg/kg dry wt	*0.05*	14.9	11.4	5.33	10.5	11.6
Zinc	mg/kg dry wt	*0.05*	56.6	59.9	28.6	48.2	53.7

Heavy Metals in Soil

		Client Sample ID	BH2/1 5.5	BH2/2 2.1	BH2/2 2.8	BH2/2 3.9	BH2/2 4.7
		Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*	17-24091-26	17-24091-27	17-24091-28	17-24091-29	17-24091-30
Arsenic	mg/kg dry wt	*0.125*	4.62	1.98	3.04	0.405	0.827
Beryllium	mg/kg dry wt	*0.013*	1.70	0.88	1.26	1.19	0.77
Boron	mg/kg dry wt	*1.25*	<1.25	<1.25	<1.25	<1.25	<1.25

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Heavy Metals in Soil

			Client Sample ID	BH2/1 5.5	BH2/2 2.1	BH2/2 2.8	BH2/2 3.9	BH2/2 4.7
			Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Cadmium	mg/kg dry wt	*0.005*		0.019	0.006	0.009	0.006	0.005
Chromium	mg/kg dry wt	*0.125*		22.4	14.2	23.8	15.1	14.5
Copper	mg/kg dry wt	*0.075*		14.2	6.33	7.80	9.84	8.32
Lead	mg/kg dry wt	*0.05*		15.1	13.7	16.6	13.2	12.3
Mercury	mg/kg dry wt	*0.025*		<0.025	<0.025	0.025	<0.025	<0.025
Nickel	mg/kg dry wt	*0.05*		13.3	7.79	7.75	10.4	8.76
Zinc	mg/kg dry wt	*0.05*		63.8	34.8	41.8	48.5	38.3

Heavy Metals in Soil

			Client Sample ID	BH2/2 5.3	BH2/2 7.8	BH2/2 8.4
			Date Sampled	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*		17-24091-31	17-24091-32	17-24091-33
Arsenic	mg/kg dry wt	*0.125*		0.558	1.29	1.89
Beryllium	mg/kg dry wt	*0.013*		1.15	0.99	1.27
Boron	mg/kg dry wt	*1.25*		<1.25	<1.25	<1.25
Cadmium	mg/kg dry wt	*0.005*		0.010	0.017	0.022
Chromium	mg/kg dry wt	*0.125*		18.8	18.8	21.7
Copper	mg/kg dry wt	*0.075*		12.8	11.4	10.5
Lead	mg/kg dry wt	*0.05*		13.9	16.2	15.4
Mercury	mg/kg dry wt	*0.025*		<0.025	<0.025	<0.025
Nickel	mg/kg dry wt	*0.05*		11.0	9.62	12.1
Zinc	mg/kg dry wt	*0.05*		51.6	55.8	59.9

Total Petroleum Hydrocarbons - Soil

			Client Sample ID	TP1 0.4	TP2 0.15	TP3 0.4	TP4 0.15	TP5 0.5
			Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*		17-24091-1	17-24091-2	17-24091-3	17-24091-4	17-24091-5
C7-C9	mg/kg dry wt	*10*		<10	<10	<10	<10	<10
C10-C14	mg/kg dry wt	*15*		<15	<15	<15	<15	<15
C15-C36	mg/kg dry wt	*25*		<25	<25	<25	<25	<25
C7-C36 (Total)	mg/kg dry wt	*50*		<50	<50	<50	<50	<50

Total Petroleum Hydrocarbons - Soil

			Client Sample ID	TP6 0.25	TP7 0.45	TP8 0.2	TP9 0.3	TP10 0.2
			Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*		17-24091-6	17-24091-7	17-24091-8	17-24091-9	17-24091-10
C7-C9	mg/kg dry wt	*10*		<10	<10	<10	<10	<10
C10-C14	mg/kg dry wt	*15*		<15	<15	<15	<15	<15
C15-C36	mg/kg dry wt	*25*		26	<25	<25	<25	48
C7-C36 (Total)	mg/kg dry wt	*50*		<50	<50	<50	<50	<50

Total Petroleum Hydrocarbons - Soil

			Client Sample ID	BH2/1 4.4
			Date Sampled	29/09/2017
Analyte	Unit	*Reporting Limit*		17-24091-25
C7-C9	mg/kg dry wt	*10*		<10
C10-C14	mg/kg dry wt	*15*		<15
C15-C36	mg/kg dry wt	*25*		<25

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Total Petroleum Hydrocarbons - Soil

			Client Sample ID	BH2/1 4.4
			Date Sampled	29/09/2017
C7-C36 (Total)	mg/kg dry wt	*50*	<50	

BTEX in Soil

		Client Sample ID	TP1 0.4	TP2 0.15	TP3 0.4	TP4 0.15	TP5 0.5
		Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*	17-24091-1	17-24091-2	17-24091-3	17-24091-4	17-24091-5
Benzene	mg/kg	*0.05*	<0.05	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	mg/kg	*0.05*	<0.05	<0.05	<0.05	<0.05	<0.05
Toluene	mg/kg	*0.05*	<0.05	<0.05	<0.05	<0.05	<0.05
m,p-xylene	mg/kg	*0.05*	<0.05	<0.05	<0.05	<0.05	<0.05
o-xylene	mg/kg	*0.05*	<0.05	<0.05	<0.05	<0.05	<0.05
Benzene-d6 (Surrogate)	%	*1*	99.8	95.9	98.4	95.6	99.4

BTEX in Soil

		Client Sample ID	TP6 0.25	TP7 0.45	TP8 0.2	TP9 0.3	TP10 0.2
		Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*	17-24091-6	17-24091-7	17-24091-8	17-24091-9	17-24091-10
Benzene	mg/kg	*0.05*	<0.05	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	mg/kg	*0.05*	<0.05	<0.05	<0.05	<0.05	<0.05
Toluene	mg/kg	*0.05*	<0.05	<0.05	<0.05	<0.05	<0.05
m,p-xylene	mg/kg	*0.05*	<0.05	<0.05	<0.05	<0.05	<0.05
o-xylene	mg/kg	*0.05*	<0.05	<0.05	<0.05	<0.05	<0.05
Benzene-d6 (Surrogate)	%	*1*	98.4	100.6	99.3	102.2	99.8

BTEX in Soil

		Client Sample ID	BH2/1 4.4
		Date Sampled	29/09/2017
Analyte	Unit	*Reporting Limit*	17-24091-25
Benzene	mg/kg	*0.05*	<0.05
Ethylbenzene	mg/kg	*0.05*	<0.05
Toluene	mg/kg	*0.05*	<0.05
m,p-xylene	mg/kg	*0.05*	<0.05
o-xylene	mg/kg	*0.05*	<0.05
Benzene-d6 (Surrogate)	%	*1*	98.2

Polycyclic Aromatic Hydrocarbons - Soil

		Client Sample ID	TP1 0.4	TP2 0.15	TP3 0.4	TP4 0.15	TP5 0.5
		Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*	17-24091-1	17-24091-2	17-24091-3	17-24091-4	17-24091-5
1-Methylnaphthalene	mg/kg	*0.01*	<0.01	<0.01	<0.01	<0.01	<0.01
2-Methylnaphthalene	mg/kg	*0.01*	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	mg/kg	*0.01*	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	mg/kg	*0.01*	<0.01	<0.01	0.02	<0.01	0.05
Anthracene	mg/kg	*0.01*	0.01	<0.01	0.01	<0.01	0.04
Benz[a]anthracene	mg/kg	*0.02*	0.06	<0.02	0.07	<0.02	0.27
Benzo[a]pyrene	mg/kg	*0.01*	0.07	<0.01	0.09	<0.01	0.38
Benzo[b]&[j] fluoranthene	mg/kg	*0.02*	0.08	<0.02	0.12	<0.02	0.40

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Polycyclic Aromatic Hydrocarbons - Soil

			Client Sample ID	TP1 0.4	TP2 0.15	TP3 0.4	TP4 0.15	TP5 0.5
			Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Benzo[g,h,i]perylene	mg/kg	*0.02*		0.07	<0.02	0.10	<0.02	0.34
Benzo[k]fluoranthene	mg/kg	*0.01*		0.03	<0.01	0.04	<0.01	0.17
Chrysene	mg/kg	*0.01*		0.08	<0.01	0.08	<0.01	0.29
Dibenz(a,h)anthracene	mg/kg	*0.01*		<0.01	<0.01	0.02	<0.01	0.06
Fluoranthene	mg/kg	*0.02*		0.16	<0.02	0.12	<0.02	0.60
Fluorene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	0.01
Indeno(1,2,3-cd)pyrene	mg/kg	*0.01*		0.06	<0.01	0.09	<0.01	0.34
Naphthalene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	mg/kg	*0.01*		0.07	<0.01	0.04	<0.01	0.22
Pyrene	mg/kg	*0.02*		0.16	<0.02	0.14	<0.02	0.69
Benzo[a]pyrene TEQ (LOR)	mg/kg	*0.01*		0.10	0.03	0.14	0.03	0.56
Benzo[a]pyrene TEQ (Zero)	mg/kg	*0.01*		0.09	<0.01	0.14	<0.01	0.56
Anthracene-d10 (Surrogate)	%	*1*		90.0	89.6	90.3	91.5	90.8

Polycyclic Aromatic Hydrocarbons - Soil

			Client Sample ID	TP6 0.25	TP7 0.45	TP8 0.2	TP9 0.3	TP10 0.2
			Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*		17-24091-6	17-24091-7	17-24091-8	17-24091-9	17-24091-10
1-Methylnaphthalene	mg/kg	*0.01*		<0.01	0.01	<0.01	<0.01	<0.01
2-Methylnaphthalene	mg/kg	*0.01*		<0.01	0.01	<0.01	<0.01	<0.01
Acenaphthene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	mg/kg	*0.01*		<0.01	0.09	<0.01	<0.01	<0.01
Anthracene	mg/kg	*0.01*		<0.01	0.09	<0.01	<0.01	<0.01
Benz[a]anthracene	mg/kg	*0.02*		<0.02	0.29	<0.02	<0.02	<0.02
Benzo[a]pyrene	mg/kg	*0.01*		<0.01	0.32	0.02	<0.01	<0.01
Benzo[b]&[j] fluoranthene	mg/kg	*0.02*		<0.02	0.36	0.03	<0.02	<0.02
Benzo[g,h,i]perylene	mg/kg	*0.02*		0.02	0.25	0.03	<0.02	<0.02
Benzo[k]fluoranthene	mg/kg	*0.01*		<0.01	0.13	<0.01	<0.01	<0.01
Chrysene	mg/kg	*0.01*		<0.01	0.28	0.02	<0.01	<0.01
Dibenz(a,h)anthracene	mg/kg	*0.01*		<0.01	0.05	<0.01	<0.01	<0.01
Fluoranthene	mg/kg	*0.02*		<0.02	0.67	0.04	<0.02	<0.02
Fluorene	mg/kg	*0.01*		<0.01	0.03	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	mg/kg	*0.01*		<0.01	0.26	0.02	<0.01	<0.01
Naphthalene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	mg/kg	*0.01*		<0.01	0.53	0.02	<0.01	<0.01
Pyrene	mg/kg	*0.02*		<0.02	0.67	0.05	<0.02	<0.02
Benzo[a]pyrene TEQ (LOR)	mg/kg	*0.01*		0.03	0.48	0.04	0.03	0.03
Benzo[a]pyrene TEQ (Zero)	mg/kg	*0.01*		<0.01	0.48	0.02	<0.01	<0.01
Anthracene-d10 (Surrogate)	%	*1*		91.5	93.0	94.0	93.8	93.9

Polycyclic Aromatic Hydrocarbons - Soil

			Client Sample ID	BH1/1 1.75	BH1/1 3.5	BH1/1 4.4	BH1/1 5.0	BH1/1 5.7
			Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*		17-24091-11	17-24091-12	17-24091-13	17-24091-14	17-24091-15
1-Methylnaphthalene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
2-Methylnaphthalene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01

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Polycyclic Aromatic Hydrocarbons - Soil

			Client Sample ID	BH1/1 1.75	BH1/1 3.5	BH1/1 4.4	BH1/1 5.0	BH1/1 5.7
			Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Acenaphthene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Benz[a]anthracene	mg/kg	*0.02*		<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[a]pyrene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Benzo[b]&[j] fluoranthene	mg/kg	*0.02*		<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[g,h,i]perylene	mg/kg	*0.02*		<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[k]fluoranthene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	mg/kg	*0.02*		<0.02	<0.02	<0.02	<0.02	<0.02
Fluorene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	mg/kg	*0.02*		<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[a]pyrene TEQ (LOR)	mg/kg	*0.01*		0.03	0.03	0.03	0.03	0.03
Benzo[a]pyrene TEQ (Zero)	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene-d10 (Surrogate)	%	*1*		89.1	89.3	89.2	89.7	90.5

Polycyclic Aromatic Hydrocarbons - Soil

			Client Sample ID	BH1/1 6.9	BH1/2 2.1	BH1/2 3.1	BH1/2 3.6	BH1/2 4.7
			Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*		17-24091-16	17-24091-17	17-24091-18	17-24091-19	17-24091-20
1-Methylnaphthalene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
2-Methylnaphthalene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Benz[a]anthracene	mg/kg	*0.02*		<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[a]pyrene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Benzo[b]&[j] fluoranthene	mg/kg	*0.02*		<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[g,h,i]perylene	mg/kg	*0.02*		<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[k]fluoranthene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	mg/kg	*0.02*		<0.02	<0.02	<0.02	<0.02	<0.02
Fluorene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	mg/kg	*0.02*		<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[a]pyrene TEQ (LOR)	mg/kg	*0.01*		0.03	0.03	0.03	0.03	0.03
Benzo[a]pyrene TEQ (Zero)	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene-d10 (Surrogate)	%	*1*		85.5	86.3	89.4	90.4	90.8

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Polycyclic Aromatic Hydrocarbons - Soil

			Client Sample ID	BH1/2 5.6	BH2/1 2.4	BH2/1 3.3	BH2/1 3.5	BH2/1 4.4
			Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*		17-24091-21	17-24091-22	17-24091-23	17-24091-24	17-24091-25
1-Methylnaphthalene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
2-Methylnaphthalene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Benz[a]anthracene	mg/kg	*0.02*		<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[a]pyrene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Benzo[b]&[j] fluoranthene	mg/kg	*0.02*		<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[g,h,i]perylene	mg/kg	*0.02*		<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[k]fluoranthene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	mg/kg	*0.01*		<0.01	0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	mg/kg	*0.02*		<0.02	<0.02	<0.02	<0.02	<0.02
Fluorene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	mg/kg	*0.02*		<0.02	0.02	<0.02	<0.02	<0.02
Benzo[a]pyrene TEQ (LOR)	mg/kg	*0.01*		0.03	0.03	0.03	0.03	0.03
Benzo[a]pyrene TEQ (Zero)	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene-d10 (Surrogate)	%	*1*		88.2	89.4	88.2	86.6	87.6

Polycyclic Aromatic Hydrocarbons - Soil

			Client Sample ID	BH2/1 5.5	BH2/2 2.1	BH2/2 2.8	BH2/2 3.9	BH2/2 4.7
			Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*		17-24091-26	17-24091-27	17-24091-28	17-24091-29	17-24091-30
1-Methylnaphthalene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
2-Methylnaphthalene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Benz[a]anthracene	mg/kg	*0.02*		<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[a]pyrene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Benzo[b]&[j] fluoranthene	mg/kg	*0.02*		<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[g,h,i]perylene	mg/kg	*0.02*		<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[k]fluoranthene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	mg/kg	*0.02*		<0.02	<0.02	<0.02	<0.02	<0.02
Fluorene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	mg/kg	*0.02*		<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[a]pyrene TEQ (LOR)	mg/kg	*0.01*		0.03	0.03	0.03	0.03	0.03
Benzo[a]pyrene TEQ (Zero)	mg/kg	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01

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Polycyclic Aromatic Hydrocarbons - Soil

	Client Sample ID		BH2/1 5.5	BH2/2 2.1	BH2/2 2.8	BH2/2 3.9	BH2/2 4.7
	Date Sampled		29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Anthracene-d10 (Surrogate)	%	*1*	88.1	88.7	89.5	87.2	88.1

Polycyclic Aromatic Hydrocarbons - Soil

	Client Sample ID		BH2/2 5.3	BH2/2 7.8	BH2/2 8.4
	Date Sampled		29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*	17-24091-31	17-24091-32	17-24091-33
1-Methylnaphthalene	mg/kg	*0.01*	<0.01	<0.01	<0.01
2-Methylnaphthalene	mg/kg	*0.01*	<0.01	<0.01	<0.01
Acenaphthene	mg/kg	*0.01*	<0.01	<0.01	<0.01
Acenaphthylene	mg/kg	*0.01*	<0.01	<0.01	<0.01
Anthracene	mg/kg	*0.01*	<0.01	<0.01	<0.01
Benz[a]anthracene	mg/kg	*0.02*	<0.02	<0.02	<0.02
Benzo[a]pyrene	mg/kg	*0.01*	<0.01	<0.01	<0.01
Benzo[b]&[j] fluoranthene	mg/kg	*0.02*	<0.02	<0.02	<0.02
Benzo[g,h,i]perylene	mg/kg	*0.02*	<0.02	<0.02	<0.02
Benzo[k]fluoranthene	mg/kg	*0.01*	<0.01	<0.01	<0.01
Chrysene	mg/kg	*0.01*	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	mg/kg	*0.01*	<0.01	<0.01	<0.01
Fluoranthene	mg/kg	*0.02*	<0.02	<0.02	<0.02
Fluorene	mg/kg	*0.01*	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	mg/kg	*0.01*	<0.01	<0.01	<0.01
Naphthalene	mg/kg	*0.01*	<0.01	<0.01	<0.01
Phenanthrene	mg/kg	*0.01*	<0.01	<0.01	<0.01
Pyrene	mg/kg	*0.02*	<0.02	<0.02	<0.02
Benzo[a]pyrene TEQ (LOR)	mg/kg	*0.01*	0.03	0.03	0.03
Benzo[a]pyrene TEQ (Zero)	mg/kg	*0.01*	<0.01	<0.01	<0.01
Anthracene-d10 (Surrogate)	%	*1*	88.1	94.2	98.2

Moisture Content

	Client Sample ID		TP1 0.4	TP2 0.15	TP3 0.4	TP4 0.15	TP5 0.5
	Date Sampled		29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*	17-24091-1	17-24091-2	17-24091-3	17-24091-4	17-24091-5
Moisture Content	%	*1*	9	6	5	5	6

Moisture Content

	Client Sample ID		TP6 0.25	TP7 0.45	TP8 0.2	TP9 0.3	TP10 0.2
	Date Sampled		29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*	17-24091-6	17-24091-7	17-24091-8	17-24091-9	17-24091-10
Moisture Content	%	*1*	6	8	6	17	24

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Moisture Content

		Client Sample ID	BH1/1 1.75	BH1/1 3.5	BH1/1 4.4	BH1/1 5.0	BH1/1 5.7
		Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*	17-24091-11	17-24091-12	17-24091-13	17-24091-14	17-24091-15
Moisture Content	%	*1*	15	17	18	19	13

Moisture Content

		Client Sample ID	BH1/1 6.9	BH1/2 2.1	BH1/2 3.1	BH1/2 3.6	BH1/2 4.7
		Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*	17-24091-16	17-24091-17	17-24091-18	17-24091-19	17-24091-20
Moisture Content	%	*1*	11	20	29	21	29

Moisture Content

		Client Sample ID	BH1/2 5.6	BH2/1 2.4	BH2/1 3.3	BH2/1 3.5	BH2/1 4.4
		Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*	17-24091-21	17-24091-22	17-24091-23	17-24091-24	17-24091-25
Moisture Content	%	*1*	26	17	17	13	18

Moisture Content

		Client Sample ID	BH2/1 5.5	BH2/2 2.1	BH2/2 2.8	BH2/2 3.9	BH2/2 4.7
		Date Sampled	29/09/2017	29/09/2017	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*	17-24091-26	17-24091-27	17-24091-28	17-24091-29	17-24091-30
Moisture Content	%	*1*	19	18	17	15	18

Moisture Content

		Client Sample ID	BH2/2 5.3	BH2/2 7.8	BH2/2 8.4
		Date Sampled	29/09/2017	29/09/2017	29/09/2017
Analyte	Unit	*Reporting Limit*	17-24091-31	17-24091-32	17-24091-33
Moisture Content	%	*1*	14	17	12

Method Summary

Elements in Soil	Acid digestion followed by ICP-MS analysis. US EPA method 200.8.
TPH in Soil	Solvent extraction, silica cleanup, followed by GC-FID analysis. (C7-C36)
BTEX in Soil	Solvent extraction, followed by Headspace GC-MS analysis. US EPA method 5021A.
PAH in Soil	Solvent extraction, silica cleanup, followed by GC-MS analysis. **Benzo[a]pyrene TEQ (LOR)**: The most conservative TEQ estimate, where a result is reported as less than the limit of reporting (LOR) the LOR value is used to calculate the TEQ for that PAH. **Benzo[a]pyrene TEQ (Zero)**: The least conservative TEQ estimate, PAHs reported as less than the limit of reporting (LOR) are not included in the TEQ calculation. Benzo[a]pyrene toxic equivalence (TEQ) is calculated according to *'Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health'*. Ministry for the Enivronment. 2011.
Moisture	Moisture content is determined gravimetrically by drying at 103 °C.

Report Comments

Samples were received by Analytica Laboratories in acceptable condition unless otherwise noted on this report.

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Karam Wadi, B.E. (Hons)
Technologist

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SUBCONTRACT

Test Type _____

Analytica to Invoice ☐

Subcontractor to Invoice ☐

ASBESTOS

17-24091

CLIENT INFORMATION				Page #	1	of	8
Client	[illegible]			Customer Comments/Instructions			
Address	[illegible]			Samples - BH1/1_0.1 & BH 2/1_9.7 not received. Have emailed client. Hari 29/9/17.			
Project Leader	[illegible]						
Project ID	248221	PO #	—				
Site	[illegible]						
Sampler							
Phone	027 441 3030						
Email	[illegible]						
Invoice Email	[illegible]						

LABORATORY USE ONLY						
Laboratory Job #	17-24091 KC	Seal Status	✓	Priority (mark with X)		
Date Received	5/10/17	Sample Chilled	✓	Routine	✓	Urgent

TESTS REQUESTED

Lab ID	Sample ID	Depth	Date	Time	Matrix	# Cont	Analysis Requests/Status: [Enter Test Name]	[Enter Test Name]	[Enter Test Name]	[Enter Test Name]	[Enter Test Name]	Sample Comments
	TP1 0-0.4 HM	0.4			Soil							
	TP1 0.4 ASb	0.4			"							
	TP1 0.1 HM	0.1										
	TP1 0.1 ASb	0.1										
	TP2 0-0.15 HM	0.15										
	TP2 0.15 ASb	0.15										
	TP2 0.45 HM	0.45										
	TP2 0.45 ASb	0.45										
	TP3 0.2 HM	0.2										
	TP3 0.2 ASb	0.2										
	TP3 0.4 HM	0.4										
	TP3 0.4 ASb	0.4										
	TP4 0.15 HM	0.15										
	TP4 0.15 ASb	0.15										
	TP4 0.35 HM	0.35										
	TP4 0.35 ASb	0.35			"							

Relinquished by		Time		Relinquished by	Hari	Courier	N2 couriers
Date				Date	29/9/17	Time	Courier #	JDQ0000 2543

CLIENT INFORMATION				Page #	2	of	8
Client	AURECON			Customer Comments/Instructions			
Address	42-52 WILLIS ST WELLINGTON 6011						
Project Leader	NICK KING						
Project ID	248221	PO #					
Site	PARLIAMENT						
Sampler							
Phone	027 431 3030						
Email	nick.king@aurecongroup.com						
Invoice Email	NZAP@aurecongroup.com						

LABORATORY USE ONLY								
Laboratory Job #				Seal Status		Priority (mark with X)		
Date Received		Received By		Sample Chilled		Routine		Urgent

TESTS REQUESTED

Lab ID	Sample ID	Depth	Date	Time	Matrix	# Cont	Analysis Requests/Suites					Sample Comments
							[Enter Test Name]	[Enter Test Name]	[Enter Test Name]	[Enter Test Name]	[Enter Test Name]	
	TP5 0.5 Asb	0.5			Soil							
	TP5 0.5 Hm	0.5			"							
	TP5 0.15 Hm	0.5										
	TP5 0.15 Asb	0.15										
	TP6 0.25 Asb	0.25										
	TP6 0.25 Hm	0.25										
	TP6 0.5 Asb	0.5										
	TP6 0.5 Hm	0.5										
	TP7 0.45 Asb	0.45										
	TP7 0.45 Hm	0.45										
	TP7 0.15 Hm	0.15										
	TP7 0.15 Asb	0.15										
	TP8 0.2 Asb	0.2										
	TP8 0.2 Hm	0.2										
	TP8 0.45 Asb	0.45										
	TP8 0.45 Hm	0.45			"							
Relinquished by				Relinquished by			Courier					
Date		Time		Date		Time	Courier #					

CLIENT INFORMATION

Client	AWE Group			Page #	3 of 8
Address	42-52 Lilydale St Newington NSW			Customer Comments/Instructions	
Project Leader	Nick Kane				
Project ID	2021-24272	PO #			
Site	Parliament				
Sampler					
Phone	021 4th 2030				
Email	nick.kane@awecongroup.com				
Invoice Email	NZAP@awecongroup.com				

LABORATORY USE ONLY

Laboratory Job #		Seal Status		Priority (mark with X)			
Date Received		Received by		Sample Chilled		Routine		Urgent	

TESTS REQUESTED

Lab ID	Sample ID	Depth	Date	Time	Matrix	# Cont	Analysis Requests/Suites					Sample Comments
							[Enter Test Name]	[Enter Test Name]	[Enter Test Name]	[Enter Test Name]	[Enter Test Name]	
	TP 9 0.1 Ash	0.1			Soil							
	TP 9 0.1 Hm	0.1										
	TP 9 0.3 Ash	0.3										
	TP 9 0.3 Hm	0.3										
	TP 10 0.2 Hm	0.2										
	TP 10 0.2 Ash	0.2										
	Bh 1/1 0.1 Hm	0.1										Sample not received
	Bh 1/1 1.75 Hm	1.75										
	Bh 1/1 1.75 Ash	1.75										
	Bh 1/1 3.5 Ash	3.5										
	Bh 1/1 3.5 Hm	3.5										
	Bh 1/1 4.0 Hm	4.0										
	Bh 1/1 4.0 Ash	4.0										
	Bh 1/1 4.4 Hm	4.4										
	Bh 1/1 4.4 Ash	4.4										
	Bh 1/1 5.0 Ash	5.0										

Relinquished by			Relinquished by			Courier	
Date		Time	Date		Time	Courier #	

CLIENT INFORMATION				Page #	4	of	8
Client	AGRECON			Customer Comments/Instructions			
Address	U2-52 WILLIS ST WELLINGTON 6011						
Project Leader	NICK KING						
Project ID	248221	PO #					
Site	PARLIAMENT						
Sampler							
Phone	027 471 3030						
Email	NICK.KING@AGRECONGROUP.COM						
Invoice Email	NZAP@AGRECONGROUP.COM						

LABORATORY USE ONLY								
Laboratory Job #				Seal Status		Priority (mark with X)		
Date Received		Received By		Sample Chilled		Routine		Urgent

TESTS REQUESTED

Lab ID	Sample ID	Depth	Date	Time	Matrix	# Cont	Analysis Request/Suites					Sample Comments
							[Enter Test Name]	[Enter Test Name]	[Enter Test Name]	[Enter Test Name]	[Enter Test Name]	
	BH1/1 5.0 Hm	5.0			SOIL							
	BH1/1 5.7 Hm	5.7			"							
	BH1/1 5.7 Ash	5.7										
	BH1/1 6.9 Hm	6.9										
	BH1/1 6.9 Ash	6.9										
	BH1/1 7.8 Hm	7.8										
	BH1/1 7.8 Ash	7.8										
	BH1/1 8.7 Hm	8.7										
	BH1/1 8.7 Ash	8.7										
	BH1/1 9.9 Ash	9.9										
	BH1/1 9.9 Hm	9.9										
	BH1/2 0.1	0.1										
	BH1/2 0.5 Ash	0.5										
	BH1/2 0.5 Hm	0.5										
	BH1/2 1.2 Ash	1.2										
	BH1/2 1.2 Hm	1.2			"							

Relinquished by				Relinquished by				Courier					
Date		Time		Date		Time		Courier #					

CLIENT INFORMATION				Page #	5	of	8
Client	Aurecon			Customer Comments/Instructions			
Address	L2 - 57 ILLIS ST, PERTH 6011						
Project Leader	NICK KING						
Project ID	268221	PO #					
Site	PRELIMINARY						
Sampler							
Phone	023 471 3030						
Email	NICK.KING@AURECONGROUP.COM						
Invoice Email	NLAP@AURECONGROUP.COM						

LABORATORY USE ONLY								
Laboratory Job #			Seal Status		Priority (mark with X)			
Date Received		Received By		Sample Chilled		Routine		Urgent

TESTS REQUESTED

Lab ID	Sample ID	Depth	Date	Time	Matrix	# Cont	Analysis Requested/Notes					Sample Comments
							[Enter Test Name]	[Enter Test Name]	[Enter Test Name]	[Enter Test Name]	[Enter Test Name]	
	BH1/2 2.1 Ash	2.1			Soil							
	BH1/2 2.1 Hm	2.1			"							
	BH1/2 2.6 Hm	2.6										
	BH1/2 2.6 Ash	2.6										
	BH1/2 3.1 Hm	3.1										
	BH1/2 3.1 Ash	3.1										
	BH1/2 3.6 Hm	3.6										
	BH1/2 3.6 Ash	3.6										
	BH1/2 4.7 Hm	4.7										
	BH1/2 4.7 Ash	4.7										
	BH1/2 5.6 Ash	5.6										
	BH1/2 5.6 Hm	5.6										
	BH1/2 6.7 Ash	6.7										
	BH1/2 7.8 Ash	7.8										
	BH1/2 9.8 Hm	9.8										
	BH1/2 9.8 Ash	9.8			"							

Relinquished by			Relinquished by			Courier	
Date		Time	Date		Time	Courier #	

CLIENT INFORMATION				Page #	2	of	8
Client	AURECON			Customer Comments/Instructions			
Address	42-52 WELLS ST, ALBANY 6014						
Project Leader	NICK KING						
Project ID	248221	PO #					
Site	PARLIAMENT						
Sampler							
Phone	021 471 2030						
Email	NICK.KING@AURECONGROUP.COM						
Invoice Email	NZAP@AURECONGROUP.COM						

LABORATORY USE ONLY								
Laboratory Job #				Seal Status		Priority (mark with X)		
Date Received		Received By		Sample Chilled		Routine		Urgent

TESTS REQUESTED

Lab ID	Sample ID	Depth	Date	Time	Matrix	# Cont	Analysis Requests/Notes					Sample Comments
							(Enter Test Name)	(Enter Test Name)	(Enter Test Name)	(Enter Test Name)	(Enter Test Name)	
	Bh 2/1 0.4 Asb	0.4			SOIL							
	Bh 2/1 0.4 Hm	0.4			"							
	Bh 2/1 2.4 Hm	2.4										
	Bh 2/1 2.4 Hm	2.4										
	Bh 2/1 2.8 Asb	2.8										
	Bh 2/1 2.8 Hm	2.8										
	Bh 2/1 3.3 Asb	3.3										
	Bh 2/1 3.3 Hm	3.3										
	Bh 2/1 3.5 Asb	3.5										
	Bh 2/1 3.5 Hm	3.5										
	Bh 2/1 4.4 Asb	4.4										
	Bh 2/1 4.4 Hm	4.4										
	Bh 2/1 5.5 Hm	5.5										
	Bh 2/1 5.5 Asb	5.5										
	Bh 2/1 6.4 Hm	6.4										
	Bh 2/1 6.4 Asb	6.4			"							

Relinquished by		Time		Relinquished by		Time		Courier				
Date				Date				Courier #				

CLIENT INFORMATION

Client	AURECON			Page #	7 of 8
Address	42-52 WILLIS ST, WELLINGTON 6011			Customer Comments/Instructions	
Project Leader	NICK KING				
Project ID	246221	PO #			
Site	PARLIAMENT				
Sampler					
Phone	027 471 3030				
Email	NICK.KING@AURECONGROUP.COM				
Invoice Email	NZAP@AURECONGROUP.COM				

LABORATORY USE ONLY

Laboratory Job #			Seal Status		Priority (mark with X)				
Date Received		Received By		Sample Chilled		Routine		Urgent	

TESTS REQUESTED

Lab ID	Sample ID	Depth	Date	Time	Matrix	# Cont	Analysis Requests/Suites					Sample Comments
							[Enter Test Name]	[Enter Test Name]	[Enter Test Name]	[Enter Test Name]	[Enter Test Name]	
	BH 2/1 8.0 Asb	8.0			soil							
	BH 2/1 8.0 Hm	8.0			"							
	BH 2/1 9.7 Hm	9.7										
	BH 2/1 9.7 Asb	9.7										Samples not received
	BH 2/2 2.1 Asb	2.1										
	BH 2/2 2.1 Hm	2.1										
	BH 2/2 2.8 Asb	2.8										
	BH 2/2 2.8 Hm	2.8										
	BH 2/2 3.9 Asb	3.9										
	BH 2/2 3.9 Hm	3.9										
	BH 2/2 4.7 Asb	4.7										
	BH 2/2 4.7 Hm	4.7										
	BH 2/2 5.3 Asb	5.3										
	BH 2/2 5.3 Hm	5.3										
	BH 2/2 6.7 Asb	6.7										
	BH 2/2 7.3 Hm	7.3										

Relinquished by			Relinquished by			Courier	
Date		Time	Date		Time	Courier #	

ENVIRONMENTAL TESTING

LABORATORIES

CLIENT INFORMATION				Page:	8	of	8
Client	AURECON			Customer Comments/Instructions			
Address	42-52 WILLIS ST, TAURANGA 3110						
Project Leader	NICK KING						
Project ID	248221	PO#					
Site	PARLIAMENT						
Samples							
Phone	027 471 3030						
Email	nick.king@aurecongroup.com						
Invoice Email	NZAP@aurecongroup.com						

LABORATORY USE ONLY								
Laboratory Job #				Site Status		Priority (mark with X)		
Date Received		Received By		Sample Cooler		Routine		Urgent

TESTS REQUESTED

Lab ID	Sample ID	Depth	Date	Time	Matrix	# Cont	Analysis Requested/Notes					Sample Comments
							[Enter Test Name]	[Enter Test Name]	[Enter Test Name]	[Enter Test Name]	[Enter Test Name]	
	BH 2/2 7.8 ASH	7.8			SOIL							
	BH 2/2 8.4 HM	8.4			"							
	BH 2/2 8.4 ASH	8.4			"		HOLD					
	BH 2/2 9.7 HM	9.7			"				COLD			
	BH 2/2 9.7 ASH	9.7			"							
Relinquished by				Relinquished by			Courier					
Date		Time		Date		Time	Courier #					

Analytica Laboratories Ltd
Ruakura Research Centre

10 Bisley Road, Private Bag 3205, Hamilton 3240, New Zealand

Phone +64 7 858 2000
Email enquiry@analytica.co.nz

analytica.co.nz

Environmental Sample Reception

From: Shauna McAuley <Shauna.McAuley@aurecongroup.com>
Sent: Wednesday, 4 October 2017 4:39 p.m.
To: Environmental Sample Reception
Cc: Nick King
Subject: RE: Aurecon Chain of Custody

Hi Hariata

Please see below. Can you please continue to hold cold all the other samples.

Many thanks,

Shauna

Asbestos P/A	Heavy Metals and PAH	Heavy Metals, TPH (C7-36) and BTEX, and PAH
TP1 0.4 Asb	BH 1/1 1.75 HM	TP1 0.4 HM
TP2 0.15 Asb	BH 1/1 3.5 HM	TP2 0.15 HM
TP3 0.4 Asb	BH 1/1 4.4 HM	TP3 0.4 HM
TP4 0.15 Asb	BH 1/1 5.0 HM	TP4 0.15 HM
TP5 0.5 Asb	BH 1/1 5.7 HM	TP5 0.5 HM
TP6 0.25 Asb	BH 1/1 6.9 HM	TP6 0.25 HM
TP7 0.45 Asb		TP7 0.45 HM
TP8 0.2 Asb	BH 1/2 2.1 HM	TP8 0.2 HM
TP9 0.3 Asb	BH 1/2 3.1 HM	TP9 0.3 HM
TP10 0.2 Asb	BH 1/2 3.6 HM	TP10 0.2 HM
	BH 1/2 4.7 HM	BH 2/1 4.4 HM
BH 1/1 1.75 Asb	BH 1/2 5.6 HM	
BH 1/1 3.5 Asb		
BH 1/1 4.4 Asb	BH 2/1 2.4 HM	
BH 1/1 5.0 Asb	BH 2/1 3.3 HM	
BH 1/1 5.7 Asb	BH 2/1 3.5 HM	
BH 1/1 6.9 Asb	BH 2/1 5.5 HM	
BH 1/2 2.1 Asb	BH 2/2 2.1 HM	
BH 1/2 3.1 Asb	BH 2/2 2.8 HM	
BH 1/2 3.6 Asb	BH 2/2 3.9 HM	
BH 1/2 4.7 Asb	BH 2/2 4.7 HM	
BH 1/2 5.6 Asb	BH 2/2 5.3 HM	
	BH 2/2 7.8 HM	
BH 2/1 2.4 Asb	BH 2/2 8.4 HM	
BH 2/1 3.3 Asb		
BH 2/1 3.5 Asb		
BH 2/1 4.4 Asb		
BH 2/1 5.5 Asb		
BH 2/2 2.1 Asb		
BH 2/2 2.8 Asb		
BH 2/2 3.9 Asb		
BH 2/2 4.7 Asb		
BH 2/2 5.3 Asb		
BH 2/2 7.8 Asb		
BH 2/2 8.4 Asb		

Shauna McAuley
Geoenvironmental Engineer, Aurecon
T +64 4 4718790
Shauna.McAuley@aurecongroup.com

DISCLAIMER

From: Environmental Sample Reception [mailto:enviro.reception@analytica.co.nz]
Sent: Wednesday, 4 October 2017 3:27 PM
To: Shauna McAuley <Shauna.McAuley@aurecongroup.com>
Subject: RE: Aurecon Chain of Custody

Hi Shauna

No problem at all, list them here on the email and we will pick up the original CoC form and amend to requested analysis ☺

Thank you

Hari

From: Shauna McAuley [mailto:Shauna.McAuley@aurecongroup.com]
Sent: Wednesday, 4 October 2017 3:06 p.m.
To: Environmental Sample Reception <enviro.reception@analytica.co.nz>
Subject: RE: Aurecon Chain of Custody

Hi again Hariata

I have a list of samples from the batch we sent you last week which we would like analysed – do you require these to be sent through on an official CoC form or can I just list them to you here on email?

Thanks
Shauna

Shauna McAuley
Geoenvironmental Engineer, Aurecon
T +64 4 4718790
Shauna.McAuley@aurecongroup.com

DISCLAIMER

From: Environmental Sample Reception [mailto:enviro.reception@analytica.co.nz]
Sent: Monday, 2 October 2017 5:15 PM
To: Shauna McAuley <Shauna.McAuley@aurecongroup.com>
Subject: RE: Aurecon Chain of Custody

Hi Shauna

No problem at all, yes all samples received had duplicates ☺

Hari

From: Shauna McAuley [mailto:Shauna.McAuley@aurecongroup.com]
Sent: Monday, 2 October 2017 4:04 p.m.
To: Environmental Sample Reception <enviro.reception@analytica.co.nz>
Subject: RE: Aurecon Chain of Custody

ANALYTICA LABORATORIES

From: Shauna McAuley [mailto:Shauna.McAuley@aurecongroup.com]
Sent: Thursday, 28 September 2017 6:55 p.m.
To: Environmental Sample Reception <enviro.reception@analytica.co.nz>
Cc: Nick King <Nick.King@aurecongroup.com>
Subject: Aurecon Chain of Custody
Importance: High

Hi there

Please see the document attached, which is in relation to samples sent to Analytica this afternoon for the attention of Rachael Casey. Please note these samples are for 'Hold Cold' currently. I hope this is all in order – unfortunately we had a bit of a rush to get our items to the courier – if there appears to be anything missing, or any issues at all, then please do not hesitate to get in touch!

Kind regards
Shauna

Shauna McAuley
Geoenvironmental Engineer, Aurecon
T +64 4 4718790
Shauna.McAuley@aurecongroup.com
Spark Central, Level 8, 42-52 Willis Street, Wellington New Zealand 6011
PO Box 1591, Wellington 6140
aurecongroup.com

Bringing ideas to life

DISCLAIMER

Hi Hariata

Thank you so much for chatting to me today. That's fine that BH1/1 0.1 and 2/1 9.7 haven't been received, this is likely input error on my part, I may have misread a label.

There should be an asbestos and a metals sample for every depth – I think I might have missed one or two of the duplicates out on my CoC form! I know you're just holding cold at the minute, but if there are any missing duplicates then, when we do move forward with sampling, I would really appreciate if you could let me know?

Thanks again!

Kind regards
Shauna

Shauna McAuley
Geoenvironmental Engineer, Aurecon
T +64 4 4718790
Shauna.McAuley@aurecongroup.com

DISCLAIMER

From: Environmental Sample Reception [mailto:enviro.reception@analytica.co.nz]
Sent: Friday, 29 September 2017 11:44 AM
To: Shauna McAuley <Shauna.McAuley@aurecongroup.com>
Cc: Nick King <Nick.King@aurecongroup.com>
Subject: RE: Aurecon Chain of Custody
Importance: High

Morena Shauna & Nick

We have received your samples, thank you very much

We have don't have samples BH1/1 Depth 0.1 & BH2/1 Depth 9.7

I've booked them in an you will see I have added them to the sample receipt however in the acceptance part you will see samples not received.

Thank you

Nāku noa, nā (kind regards)

Hariata Anderson

Laboratory Technician
Environmental Sample Reception

Analytica Laboratories Ltd
Ruakura Research Centre
10 Bisley Road,
Hamilton 3214
New Zealand

Ph +64 (7) 974 4740 ext 1

www.analytica.co.nz

Report Date: 11 Oct 2017

Certificate Number: P1710061439

Analytica Laboratories
Ruakura Research Centre, 10 Bisley Road, Private Bag 3123,

Client Reference: 17-24091

Dear Hariata Anderson,

Re: Asbestos Soil Identification Analysis – Parliament Building

33 sample(s) received on 06 Oct 2017 by Karleen Glen.

The results of fibre analysis were performed by Laura Liu of Precise Consulting and Laboratory Ltd on 10 Oct 2017.

The sample(s) were stated to be from Parliament Building.

Sample analysis was performed using polarised light microscopy with dispersion staining in accordance with *AS4964-2004 Method for the qualitative identification of asbestos in soil samples.*

The results of the fibre analysis are presented in the appended table.

Should you require further information please contact Laura Liu .

Yours sincerely

Laura Liu
PRECISE LABORATORY IDENTIFIER

IANZ ACCREDITED LABORATORY
All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

Sample Analysis Results

Certificate Number: P1710061439
Report Date: 11 Oct 2017
Site Location: Parliament Building

PRECISE
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Note 1: The reporting limit for this analysis is 0.1g/kg (0.01%) by application of polarised light microscopy, dispersion staining and trace analysis techniques.

Note 2: If mineral fibres of unknown type are detected (UMF), by PLM and dispersion staining, these may or may not be asbestos fibres. To confirm the identity of this fibre, another independent analytical technique such as XRD analysis is advised.

Note 3: The samples in this report are "As Received". The laboratory does not take responsibility for the sampling procedure or accuracy of sample location description. This document may not be reproduced except in full.

Identified by:

Reviewed by:

Approved Identifier: Laura Liu

Key Technical Person: Laura Liu

Sample ID	Client Sample ID	Sample Location/Description/Dimensions	Analysis Results
TP1 0.4	TP1 0.4	- Non-Homogeneous Soil 186.0g	No Asbestos Detected Organic Fibres
TP3 0.4	TP3 0.4	- Non-Homogeneous Soil 374.0g	No Asbestos Detected Organic Fibres
TP4 0.15	TP4 0.15	- Non-Homogeneous Soil 246.0g	No Asbestos Detected Organic Fibres
TP5 0.5	TP5 0.5	- Non-Homogeneous Soil 205.5g	No Asbestos Detected Organic Fibres
TP9 0.3	TP9 0.3	- Non-Homogeneous Soil 103.5g	No Asbestos Detected Organic Fibres
TP10 0.2	TP10 0.2	- Non-Homogeneous Soil 138.5g	No Asbestos Detected Organic Fibres
BH1/1 3.5	BH1/1 3.5	- Non-Homogeneous Soil 158.5g	No Asbestos Detected Organic Fibres
BH1/1 4.4	BH1/1 4.4	- Non-Homogeneous Soil 165.5g	No Asbestos Detected Organic Fibres

Precise Consulting & Laboratory Limited
Unit 1, 30 Greenpark Road, Penrose, Auckland 8023

P: 09 282 3886 W: www.preciseconsulting.co.nz

IANZ ACCREDITED LABORATORY
All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

Sample Analysis Results

Certificate Number: P1710061439
Report Date: 11 Oct 2017
Site Location: Parliament Building

PRECISE
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Sample ID	Client Sample ID	Sample Location/Description/Dimensions	Analysis Results
BH1/1 5.0	BH1/1 5.0	- Non-Homogeneous Soil 198.0g	No Asbestos Detected Organic Fibres
BH1/1 5.7	BH1/1 5.7	- Non-Homogeneous Soil 231.5g	No Asbestos Detected Organic Fibres
BH1/2 2.1	BH1/2 2.1	- Non-Homogeneous Soil 204.5g	No Asbestos Detected Organic Fibres
BH1/2 3.1	BH1/2 3.1	- Non-Homogeneous Soil 113.5g	No Asbestos Detected Organic Fibres
BH1/2 3.6	BH1/2 3.6	- Non-Homogeneous Soil 140.0g	No Asbestos Detected Organic Fibres
BH1/2 4.7	BH1/2 4.7	- Non-Homogeneous Soil 135.0g	No Asbestos Detected Organic Fibres
BH2/1 2.4	BH2/1 2.4	- Non-Homogeneous Soil 260.5g	No Asbestos Detected Organic Fibres
BH2/1 3.3	BH2/1 3.3	- Non-Homogeneous Soil 183.0g	No Asbestos Detected Organic Fibres
BH2/1 4.4	BH2/1 4.4	- Non-Homogeneous Soil 161.0g	No Asbestos Detected Organic Fibres
BH2/1 5.5	BH2/1 5.5	- Non-Homogeneous Soil 258.5g	No Asbestos Detected Organic Fibres
BH2/2 2.1	BH2/2 2.1	- Non-Homogeneous Soil 131.5g	No Asbestos Detected Organic Fibres
BH2/2 3.9	BH2/2 3.9	- Non-Homogeneous Soil 189.0g	No Asbestos Detected Organic Fibres
BH2/2 4.7	BH2/2 4.7	- Non-Homogeneous Soil 97.6g	No Asbestos Detected Organic Fibres
BH2/1 3.5	BH2/1 3.5	- Non-Homogeneous Soil 119.0g	No Asbestos Detected Organic Fibres
BH2/2 7.8	BH2/2 7.8	- Non-Homogeneous Soil 113.0g	No Asbestos Detected Organic Fibres
BH2/2 8.4	BH2/2 8.4	- Non-Homogeneous Soil 342.0g	No Asbestos Detected Organic Fibres
BH1/2 5.6	BH1/2 5.6	- Non-Homogeneous Soil	No Asbestos Detected Organic Fibres

Precise Consulting & Laboratory Limited
Unit 1, 30 Greenpark Road, Penrose, Auckland 8023

P: 09 282 3886 W: www.preciseconsulting.co.nz

IANZ ACCREDITED LABORATORY
All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

Sample Analysis Results

Certificate Number: P1710061439
Report Date: 11 Oct 2017
Site Location: Parliament Building

PRECISE
CONSULTING & LABORATORY

Sample ID	Client Sample ID	Sample Location/Description/Dimensions	Analysis Results
		91.0g	
BH2/2 2.8	BH2/2 2.8	- Non-Homogeneous Soil 96.5g	No Asbestos Detected Organic Fibres
BH2/2 5.3	BH2/2 5.3	- Non-Homogeneous Soil 108.0g	No Asbestos Detected Organic Fibres
TP20.5	TP20.5	- Non-Homogeneous Soil 111.0g	No Asbestos Detected Organic Fibres
TP6 0.25	TP6 0.25	- Non-Homogeneous Soil 110.5g	No Asbestos Detected Organic Fibres
TP7 0.45	TP7 0.45	- Non-Homogeneous Soil 117.5g	No Asbestos Detected Organic Fibres
TP8 0.2	TP8 0.2	- Non-Homogeneous Soil 125.5g	No Asbestos Detected Organic Fibres
BH1/1 1.75	BH1/1 1.75	- Non-Homogeneous Soil 91.0g	No Asbestos Detected Organic Fibres
BH1/1 6.9	BH1/1 6.9	- Non-Homogeneous Soil 107.0g	No Asbestos Detected Organic Fibres

IANZ ACCREDITED LABORATORY
All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

Appendix 1: Soil Analysis Raw Data

Certificate Number: P1710061439
Report Date: 11 Oct 2017
Site Location: Parliament Building

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Sample ID	Client Sample ID	Total Sample Weight (g)	ACM Approximate Dimensions (g)*	Form	Trace Asbestos Detected**
TP1 0.4	TP1 0.4	186.0	-	-	N
TP3 0.4	TP3 0.4	374.0	-	-	N
TP4 0.15	TP4 0.15	246.0	-	-	N
TP5 0.5	TP5 0.5	205.5	-	-	N
TP9 0.3	TP9 0.3	103.5	-	-	N
TP10 0.2	TP10 0.2	138.5	-	-	N
BH1/1 3.5	BH1/1 3.5	158.5	-	-	N
BH1/1 4.4	BH1/1 4.4	165.5	-	-	N
BH1/1 5.0	BH1/1 5.0	198.0	-	-	N
BH1/1 5.7	BH1/1 5.7	231.5	-	-	N
BH1/2 2.1	BH1/2 2.1	204.5	-	-	N
BH1/2 3.1	BH1/2 3.1	113.5	-	-	N
BH1/2 3.6	BH1/2 3.6	140.0	-	-	N
BH1/2 4.7	BH1/2 4.7	135.0	-	-	N
BH2/1 2.4	BH2/1 2.4	260.5	-	-	N
BH2/1 3.3	BH2/1 3.3	183.0	-	-	N

Precise Consulting & Laboratory Limited
Unit 1, 30 Greenpark Road, Penrose, Auckland 8023

P: 09 282 3886 W: www.preciseconsulting.co.nz

Appendix 1: Soil Analysis Raw Data

Certificate Number: P1710061439
Report Date: 11 Oct 2017
Site Location: Parliament Building

PRECISE
CONSULTING & LABORATORY

Sample ID	Client Sample ID	Total Sample Weight (g)	ACM Approximate Dimensions (g)*	Form	Trace Asbestos Detected**
BH2/1 4.4	BH2/1 4.4	161.0	-	-	N
BH2/1 5.5	BH2/1 5.5	258.5	-	-	N
BH2/2 2.1	BH2/2 2.1	131.5	-	-	N
BH2/2 3.9	BH2/2 3.9	189.0	-	-	N
BH2/2 4.7	BH2/2 4.7	97.6	-	-	N
BH2/1 3.5	BH2/1 3.5	119.0	-	-	N
BH2/2 7.8	BH2/2 7.8	113.0	-	-	N
BH2/2 8.4	BH2/2 8.4	342.0	-	-	N
BH1/2 5.6	BH1/2 5.6	91.0	-	-	N
BH2/2 2.8	BH2/2 2.8	96.5	-	-	N
BH2/2 5.3	BH2/2 5.3	108.0	-	-	N
TP20.5	TP20.5	111.0	-	-	N
TP6 0.25	TP6 0.25	110.5	-	-	N
TP7 0.45	TP7 0.45	117.5	-	-	N
TP8 0.2	TP8 0.2	125.5	-	-	N
BH1/1 1.75	BH1/1 1.75	91.0	-	-	N

Precise Consulting & Laboratory Limited
Unit 1, 30 Greenpark Road, Penrose, Auckland 8023

P: 09 282 3886 W: www.preciseconsulting.co.nz

Appendix 1: Soil Analysis Raw Data

Certificate Number: P1710061439
Report Date: 11 Oct 2017
Site Location: Parliament Building

PRECISE
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Sample ID	Client Sample ID	Total Sample Weight (g)	ACM Approximate Dimensions (g)*	Form	Trace Asbestos Detected**
BH1/1 6.9	BH1/1 6.9	107.0	-	-	N

* The reporting limit for this standard is 0.1g/kg
** Trace asbestos present is indicative that freely liberated respirable fibres are present and dust control measures should be implemented or increased

Precise Consulting & Laboratory Limited
Unit 1, 30 Greenpark Road, Penrose, Auckland 8023

P: 09 282 3886 W: www.preciseconsulting.co.nz

PRECISE CONSULTING & LABORATORY

17-24091

LAB003 Chain of Custody

Laboratory Locations			
Christchurch ☐ Unit 4/91 Byron Street Sydenham, Christchurch 8023	**Dunedin** ☐ 186 Macandrew Road South Dunedin, 9012	**Wellington** ☐ Level 2, 10 Hutt Road Petone,5012	**Auckland** ☑ 1/30 Greenpark Road Penrose
E: admin@preciseconsulting.co.nz			P:0800 002 712

Company Name: Analytica Laboratories	**Email: enviro.reception@analytica.co.nz**
Contact Person: Hariata Anderson	**Phone/Mobile: (07)444 5574**
Office Address: Ruakura Research Centre, 10 Bisley Road, Hamilton	

Site Address: PARLIAMENT BUILDING	
Client Reference: ~~NICK KING~~ 17-24091	**Purchase Order Number:**
PCL Job Number:	**Internal** ☐ **External** ☐

Date Results Requested: (Bulk ID) 24hr / ~~Urgent (<24hr)~~	**Soil Anaylsis:** ~~Quant. (5 days)~~ / Qual. (3days) **Urgent Request (Tick)** ☐

Relinquished By: KARLA	Date: 5/10/17	**Received By:**	Date:

	Asbestos Tests Required							Sample Details
Client Sample ID / Sample #	Qualitative	~~Semi-Quantitative (Soil Only)~~	~~Quantitative (Soil Only)~~	~~Bulk~~	~~Soil~~	~~Tape~~	~~Lead in Paint~~	**Sample Location and Sample Description and Notes**
TP1 0.4	X							
TP2 0.15	X							Please send report to enviro.reception@analytica.co.nz
TP3 0.4	X							
TP4 0.15	X							
TP5 0.5	X							
TP6 0.25	X							PLEASE EMAIL NICK.KING@AURECON group.COM.
TP7 0.45	X							
TP8 0.2	X							
TP9 0.3	X							
TP10 0.2	X							JOB 0005422
BH1/1 1.75	X							
BH 1/1 3.5	X							
BH 1/1 4.4	X							
BH 1/1 5.0	X							
BH 1/1 5.7	X							
BH 1/1 6.9	X							
BH 1/2 2.1	X							

Lab Only:

Report Checked by (Initials):	Date:	**Report sent by (Initials):**	Date:

Payment Received: Yes ☐ No ☐ Payment Method: COD ☐ CC ☐ Account ☐

PRECISE
CONSULTING & LABORATORY

LAB003 Chain of Custody

Laboratory Locations			
Christchurch ☐ Unit 4/91 Byron Street Sydenham, Christchurch 8023 E: admin@preciseconsulting.co.nz	**Dunedin** ☐ 186 Macandrew Road South Dunedin, 9012	**Wellington** ☐ Level 2, 10 Hutt Road Petone,5012	**Auckland** ☑ 1/30 Greenpark Road Penrose P:0800 002 712

Company Name: Analytica Laboratories	**Email: enviro.reception@analytica.co.nz**
Contact Person: Hariata Anderson	**Phone/Mobile: (07)444 5574**
Office Address: Ruakura Research Centre, 10 Bisley Road, Hamilton	

Site Address: PARLIAMENT BUILDING	
Client Reference: ~~NICK~~ ~~KING~~ 17-24091	**Purchase Order Number:**
PCL Job Number: **Internal** ☐	**External** ☐

Date Results Requested: ~~(Bulk ID) 24hr / Urgent (<24hr)~~	**Soil Anaylsis:** ~~Quant. (5 days)~~ / Qual. (3days) **Urgent Request (Tick)** ☐

Relinquished By: KARLA Date: 5/10/17	**Received By:** Date:

	Asbestos Tests Required							**Sample Details**
Client Sample ID / Sample #	Qualitative	~~Semi-Quantitative (Soil Only)~~	~~Quantitative (Soil Only)~~	Bulk	Soil	Tape	Lead in Paint	**Sample Location and Sample Description and Notes**
BH 1/2 3.1	X							
BH 1/2 3.6	X							Please send report to enviro.reception@analytica.co.nz
BH 1/2 4.7	X							
BH 1/2 5.6	X							
BH 2/1 2.4	X							
BH 2/1 3.3	X							PLEASE EMAIL NICK.KING@AURECON group.COM
BH 2/1 3.5	X							
BH 2/1 4.4	X							
BH 2/1 5.5	X							JOP0003422
BH 2/2 2.1	X							
BH 2/2 2.8	X							
BH 2/2 3.9	X							
BH 2/2 4.7	X							
BH 2/2 5.3	X							
BH 2/2 7.8	X							
BH 2/2 8.4	X							

Lab Only:

Report Checked by (Initials): Date:	**Report sent by (Initials):** Date:
Payment Received: Yes ☐ No ☐	Payment Method: COD ☐ CC ☐ Account ☐

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Certificate of Analysis

Aurecon New Zealand Ltd
42-52 Willis Street
Wellington 6011
Attention: Nick King
Phone: 027 471 3030
Email: nick.king@aurecongroup.com

Lab Reference: 17-25011
Submitted by:
Date Received: 16/10/2017
Date Completed: 20/10/2017
Order Number:
Reference: 248221

Sampling Site: Parliament

Water Aggregate Properties and Nutrients

		Client Sample ID	BH1-2
		Date Sampled	12/10/2017
Analyte	Unit	*Reporting Limit*	17-25011-2
Nitrate-N	g/m^3	*0.05*	<0.05
Nitrite-N	g/m^3	*0.0025*	<0.02
Ammonia-N	g/m^3	*0.01*	3.62
Dissolved Reactive Phosphorus	g/m^3	*0.004*	<0.04

Soluble Heavy Metals in Water

		Client Sample ID	BH1-1	BH1-2	BH2-1	BH2-2
		Date Sampled	12/10/2017	12/10/2017	12/10/2017	12/10/2017
Analyte	Unit	*Reporting Limit*	17-25011-1	17-25011-2	17-25011-3	17-25011-4
Arsenic	g/m^3	*0.0005*	0.0014	0.0028	0.0006	<0.0005
Beryllium	g/m^3	*0.00001*	<0.00001	<0.00001	<0.00001	<0.00001
Boron	g/m^3	*0.005*	0.148	0.185	0.068	0.069
Cadmium	g/m^3	*0.00001*	<0.00001	<0.00001	2×10^{-5}	<0.00001
Chromium	g/m^3	*0.0002*	<0.0002	<0.0002	<0.0002	<0.0002
Copper	g/m^3	*0.0002*	0.0016	0.0004	0.0033	0.0007
Lead	g/m^3	*0.00005*	<0.00005	<0.00005	<0.00005	<0.00005
Mercury	g/m^3	*0.0001*	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	g/m^3	*0.0002*	0.0024	0.0027	0.0029	0.0030
Zinc	g/m^3	*0.001*	<0.001	0.0017	0.0049	0.0047

BTEX in Water

		Client Sample ID	BH1-1	BH1-2	BH2-1	BH2-2
		Date Sampled	12/10/2017	12/10/2017	12/10/2017	12/10/2017
Analyte	Unit	*Reporting Limit*	17-25011-1	17-25011-2	17-25011-3	17-25011-4
Benzene	g/m^3	*0.001*	<0.001	<0.001	<0.001	<0.001

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BTEX in Water

	Client Sample ID		BH1-1	BH1-2	BH2-1	BH2-2
	Date Sampled		12/10/2017	12/10/2017	12/10/2017	12/10/2017
Ethylbenzene	g/m^3	*0.001*	<0.001	<0.001	<0.001	<0.001
Toluene	g/m^3	*0.001*	<0.001	<0.001	<0.001	<0.001
m,p-xylene	g/m^3	*0.001*	<0.001	<0.001	<0.001	<0.001
o-xylene	g/m^3	*0.001*	<0.001	<0.001	<0.001	<0.001
Benzene-d6 (Surrogate)	%	*1*	98.2	102.3	101.0	101.8

Total Petroleum Hydrocarbons - Water

	Client Sample ID		BH1-1	BH1-2	BH2-1	BH2-2
	Date Sampled		12/10/2017	12/10/2017	12/10/2017	12/10/2017
Analyte	Unit	*Reporting Limit*	17-25011-1	17-25011-2	17-25011-3	17-25011-4
C7-C9	g/m^3	*0.2*	<0.2	<0.2	<0.2	<0.2
C10-C14	g/m^3	*0.2*	<0.2	<0.2	<0.2	<0.2
C15-C36	g/m^3	*0.3*	<0.3	<0.3	<0.3	<0.3
C7-C36 (Total)	g/m^3	*0.5*	<0.5	<0.5	<0.5	<0.5

Polycyclic Aromatic Hydrocarbons - Water

	Client Sample ID		BH1-1	BH1-2	BH2-1	BH2-2
	Date Sampled		12/10/2017	12/10/2017	12/10/2017	12/10/2017
Analyte	Unit	*Reporting Limit*	17-25011-1	17-25011-2	17-25011-3	17-25011-4
1-Methylnaphthalene	g/m^3	*0.00006*	<0.00006	<0.00006	<0.00006	0.00009
2-Methylnaphthalene	g/m^3	*0.00006*	<0.00006	<0.00006	<0.00006	0.00009
Acenaphthene	g/m^3	*0.00002*	<0.00002	<0.00002	<0.00002	0.00004
Acenaphthylene	g/m^3	*0.00002*	<0.00002	<0.00002	0.00004	0.00003
Anthracene	g/m^3	*0.00002*	<0.00002	<0.00002	<0.00002	<0.00002
Benz[a]anthracene	g/m^3	*0.00003*	<0.00003	<0.00003	<0.00003	<0.00003
Benzo[a]pyrene	g/m^3	*0.00002*	<0.00002	<0.00002	<0.00002	<0.00002
Benzo[b]&[j] fluoranthene	g/m^3	*0.00002*	<0.00002	<0.00002	<0.00002	<0.00002
Benzo[g,h,i]perylene	g/m^3	*0.00002*	<0.00002	<0.00002	<0.00002	<0.00002
Benzo[k]fluoranthene	g/m^3	*0.00002*	<0.00002	<0.00002	<0.00002	<0.00002
Chrysene	g/m^3	*0.00002*	<0.00002	<0.00002	<0.00002	<0.00002
Dibenz[a,h]anthracene	g/m^3	*0.00002*	<0.00002	<0.00002	<0.00002	<0.00002
Fluoranthene	g/m^3	*0.00002*	<0.00002	<0.00002	0.00005	<0.00002
Fluorene	g/m^3	*0.00002*	<0.00002	<0.00002	<0.00002	0.00015
Indeno[1,2,3-cd]pyrene	g/m^3	*0.00003*	<0.00003	<0.00003	<0.00003	<0.00003
Naphthalene	g/m^3	*0.00006*	<0.00006	0.00019	<0.00006	0.00024
Phenanthrene	g/m^3	*0.00003*	<0.00003	<0.00003	<0.00003	0.00005
Pyrene	g/m^3	*0.00002*	<0.00002	<0.00002	0.00004	0.00004
Benzo[a]pyrene TEQ (LOR)	g/m^3	*0.00002*	0.00005	0.00005	0.00005	0.00005
Benzo[a]pyrene TEQ (Zero)	g/m^3	*0.00002*	<0.00002	<0.00002	<0.00002	<0.00002
Anthracene-d10 (Surrogate)	%	*1*	93.3	97.1	96.9	78.2

Method Summary

Nitrate as N (High)	Analysis by Ion exchange chromatography following sample filtration. APHA 4110B. (22nd edition).
Nitrite as N	Samples analysed colourimetrically following a filtration step. APHA 4500-NO_2 B. (22nd edition) - Modified.
Ammonia as N	Samples analysed colourimetrically following a filtration step. APHA 4500-NH_3 F. (22nd edition) - Modified.

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Method Summary

Dis. Reactive Phosphorus	Samples analysed colourimetrically following a filtration step. APHA 4500-P H. (22nd edition) - Modified.
Soluble Trace Elements	Samples were analysed as received by the laboratory using ICP-MS following a 0.45µm membrane filtration (except when field filtered). US EPA method 200.8.
BTEX in Water	Solvent extraction, followed by Headspace GC-MS analysis. US EPA method 5021A.
TPH in Water	Solvent extraction, silica cleanup, followed by GC-FID analysis (C7-C36). MFE Petroleum Industry Guidelines.
PAH in Water	Liquid-liquid extraction with hexane, florisil cleanup with analysis by GC-MS. **Benzo[a]pyrene TEQ (LOR)**: The most conservative TEQ estimate, where a result is reported as less than the limit of reporting (LOR) the LOR value is used to calculate the TEQ for that PAH. **Benzo[a]pyrene TEQ (Zero)**: The least conservative TEQ estimate, PAHs reported as less than the limit of reporting (LOR) are not included in the TEQ calculation. Benzo[a]pyrene toxic equivalence (TEQ) is calculated according to *'Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health'*. Ministry for the Enivronment. 2011.

Report Comments

Samples were received by Analytica Laboratories in acceptable condition unless otherwise noted on this report.

The validated Reporting limits listed are elevated for DRP and Nitrite as sample matrix required a further dilution prior to analysis.

Sharelle Frank, B.Sc. (Tech)	Hao Wang, M.Sc.(Hons)	Tom Featonby, (M.Sc.)	Terry Cooney, Ph.D.
Technologist	Technologist	Technologist	Signatory

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Analysis Report

Analytica

10 Bisley Road
Ruakura Research Centre
Hamilton

Attention: Rachael Casey

Report Number: 5521
Date Issued: 18/10/2017

Shared Services Laboratory
Pukete Rd, RD8, Hamilton
Ph 07-985-5870

2017007524 | 17-25011 BH 1-2 | 12/10/2017

Parameter Name	S Result	Units	Accreditation Status
E.Coli Enumerated	1	MPN/100mL	IANZ
Total Coliforms Enumerated	1720	MPN/100mL	IANZ

Test Methodology

Test	Method	Detection Limit
E.coli Enumerated	APHA Standard Methods 22nd ed. 9223 B	1 MPN/100mL
Total Coliforms Enumerated	APHA Standard Methods 22nd ed. 9223 B	1 MPN/100mL

These samples were received outside of the recommended preservation and storage guidelines of APHA Standard Methods 22nd ed. 9060B. Sampling, transport, storage and testing of the sample should not exceed 24 hours.
These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Shahnaz Nazli
Key Technical Personnel

IANZ ACCREDITED LABORATORY

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Bringing ideas to life

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